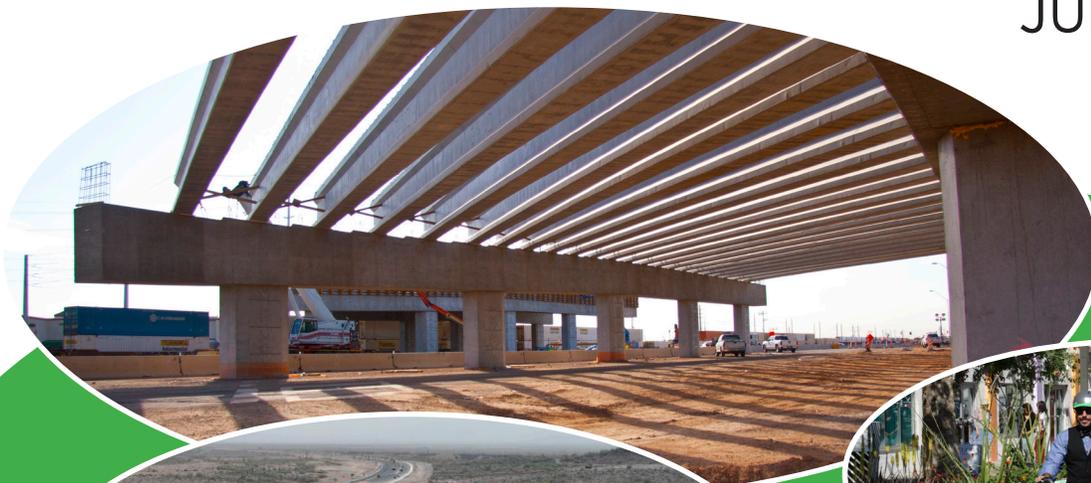


2040 REGIONAL TRANSPORTATION PLAN (RTP)

June 28, 2017



2040 REGIONAL TRANSPORTATION PLAN

June 28, 2017

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This report was funded in part through grant[s] from the Federal Highway Administration and/or Federal Transit Administration, U.S. Department of Transportation. The contents of this report reflect the views and opinions of the author(s) who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily state or reflect the official views or policies of the U.S. Department of Transportation, the Arizona Department of Transportation, or any other State or Federal Agency. This report does not constitute a standard, specification or regulation.

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INTRODUCTION

The “2040 Regional Transportation Plan” (RTP) is a comprehensive, performance based, multi-modal and coordinated regional plan, covering the period through Fiscal Year (FY) 2040. The RTP covers all major modes of transportation from a regional perspective, including freeways/highways, streets, public mass transit, airports, bicycles and pedestrian facilities, goods movement and special needs transportation. In addition, key transportation related activities are addressed, such as transportation demand management, system management, safety, security and air quality conformity analysis. The RTP is prepared, updated and adopted by the Maricopa Association of Governments, which is the regional planning agency for the Phoenix metropolitan area. The RTP is developed through a cooperative effort among government, business and public interest groups, and includes an aggressive community outreach and public involvement program.

Maricopa Association of Governments

The Maricopa Association of Governments (MAG) was formed in 1967, as the designated Metropolitan Planning Organization (MPO) for transportation planning in the Phoenix metropolitan area. On May 9, 2013, the Governor of Arizona approved an expanded metropolitan planning area (MPA) boundary for MAG (see Figure I-1). As shown in Figure I-1, the MAG MPA boundary now extends significantly into Pinal County. The new MPA boundary is in accordance with federal regulations (§450.312 - Metropolitan Planning Area Boundaries), which require that metropolitan planning areas encompass at least the existing urbanized area and the contiguous area expected to become urbanized within a 20-year forecast. The new MAG MPA boundary was determined using the 2010 Census and the latest long-range population forecasts for the Maricopa and Pinal County areas.

In addition to transportation planning, MAG has been designated by the Governor of Arizona to serve as the principal planning agency for the region in a number of other areas, including air quality, water quality and solid waste management. MAG is responsible for the air quality conformity analysis that shows whether the transportation plan complies with the provisions of air quality plans and other air quality standards. MAG also develops population estimates and projections for the region, and conducts human services planning.

MAG members include the region’s 27 incorporated cities and towns, Maricopa County, Pinal County, the Gila River Indian Community, the Fort McDowell Yavapai Nation, the Salt River Pima-Maricopa Indian Community, the Citizens Transportation Oversight Committee, and the Arizona Department of Transportation. The RTP is developed under the direction of the Transportation Policy Committee (TPC). The TPC is a public/private partnership established by MAG and charged with finding solutions to the region’s transportation challenges. The Committee consists of 23 members, including a cross-section of MAG member agencies, community business representatives, and representatives from transit, freight, the Citizens Transportation Oversight Committee, and ADOT. The TPC is dedicated to transportation planning and decision-making that addresses diverse transportation needs throughout the

2040 Regional Transportation Plan

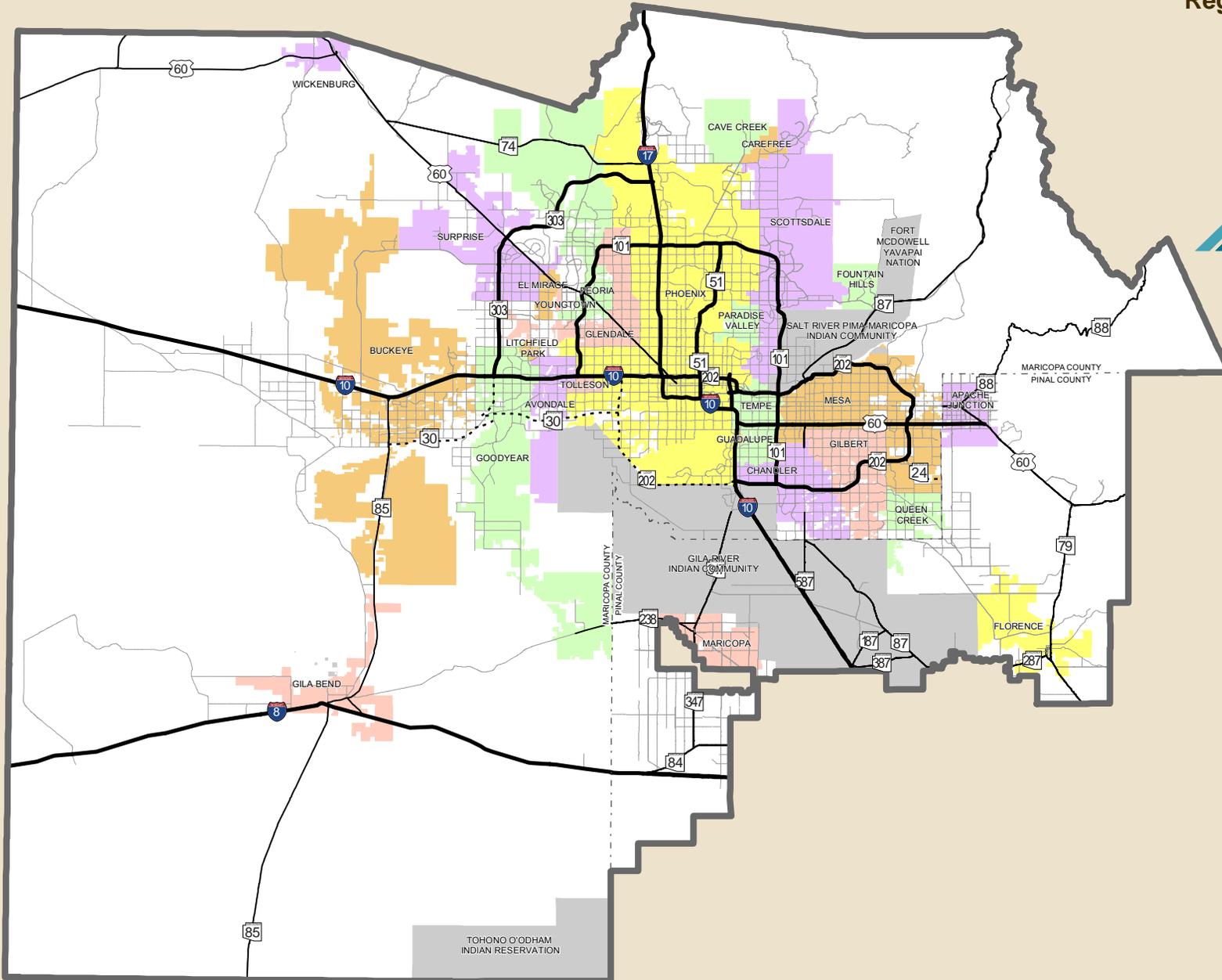
Fig. I-1



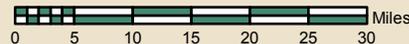
MAG Region

- Metropolitan Planning Area Boundary
- County Boundary
- Indian Communities
- Existing Freeway
- Planned Freeway/Highway
- Highways
- Other Roads

MAP AREA



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region. The Committee makes its recommendations to the MAG Regional Council, which adopts the final RTP.

The MAG Regional Council is the final decision-making body of MAG. The Regional Council consists of elected officials from each member agency. The Chairman of Citizens Transportation Oversight Committee (COTC) and the Maricopa County representatives from the State Transportation Board also sit on the Regional Council, but only vote on transportation-related issues. Many policy and technical committees provide analysis and information to the MAG Regional Council. The MAG Regional Council is the ultimate approving body for the MAG RTP and MAG Transportation Improvement Program. Any changes to the MAG RTP, or the funded projects that affect the Transportation Improvement Program, including priorities, must be approved by the MAG Regional Council.

Regional Transportation Plan Updates

The “Regional Transportation Plan” was adopted by the MAG Regional Council on November 25, 2003, which culminated a three-year comprehensive planning effort. The development of the Plan was distinguished by the use of performance-based planning and the application of performance measures in the evaluation of alternatives. In a letter dated December 9, 2003, the U.S. Department of Transportation issued a finding of air quality conformity for the MAG RTP, as adopted by MAG on November 25, 2003.

Since its adoption in 2003, the RTP has been updated periodically to reflect changing conditions and new information. On July 27, 2005, the MAG Regional Council approved the “Regional Transportation Plan - 2005 Update”. The modifications included within the 2005 RTP Update affected the phase in which certain highway and arterial projects were scheduled for construction. These changes were reflected, as appropriate, in the MAG FY 2006-2010 Transportation Improvement Program. In a letter dated August 31, 2005, the U.S. Department of Transportation issued a finding of air quality conformity for the MAG RTP, as approved by MAG on July 27, 2005.

On July 26, 2006, the MAG Regional Council approved the “Regional Transportation Plan - 2006 Update”. The 2006 Update summarized the elements of the Regional Transportation Plan (as previously adopted), provided revised revenue estimates, and included life cycle programs for freeways/highways, arterial streets, and transit. Inclusion of the life cycle programs replaced the project phasing designations and funding levels originally identified in the RTP. In a letter dated August 17, 2006, the U.S. Department of Transportation issued a finding of air quality conformity for the MAG RTP, as approved by MAG on July 26, 2006.

On July 25, 2007, the MAG Regional Council approved the “Regional Transportation Plan - 2007 Update”. The 2007 Update was structured to comply with the regional transportation planning requirements of the Federal Safe, Accountable, Flexible, Efficient, Transportation Equity Act - A legacy for Users (SAFETEA-LU). These requirements are effective for any plans adopted after July 1, 2007. To respond to SAFETEA-LU, the 2007 Update addressed several new topics,

including consultation on environmental mitigation and resource conservation, transportation security, and an updated public participation process. In addition, it included revised transportation revenue estimates, and updated life cycle programs for freeways/highways, arterial streets, and transit. In a letter dated August 16, 2007, the U.S. Department of Transportation issued a finding of air quality conformity for the MAG RTP, as approved by MAG on July 25, 2007.

On July 28, 2010, the MAG Regional Council approved the ‘Regional Transportation Plan - 2010 Update’. The 2010 Update of the RTP addressed both capital improvements and operational activities on the regional transportation system in the MAG area. The 2010 Update, as well as the regional transportation planning process in the MAG area, continued to fully comply with SAFETEA-LU, Arizona House Bill 2292, and Arizona Revised Statute 28-6354. A major focus of the 2010 update process was maintaining the balance between program costs and reasonably available revenues expected over the period covered by the plan. In a letter dated August 25, 2010, the U.S. Department of Transportation issued a finding of air quality conformity for the MAG RTP, as approved by MAG on July 28, 2010.

On January 29, 2014 the MAG Regional Council approved the “MAG 2035 Regional Transportation Plan”. The 2035 RTP included cost/revenue-balanced, long-range programs for freeways, transit, and arterials. These balanced programs were the result of a multi-year process to review and assess future transportation costs and revenues, and adjust implementation programs to accommodate lower transportation revenue forecasts. The 2035 RTP was developed consistent with the regional transportation planning requirements of the Federal Safe, Accountable, Flexible, Efficient, Transportation Equity Act - A legacy for Users (SAFETEA-LU). Although new federal transportation legislation (Moving Ahead for Progress in the 21st Century Act, or MAP-21) was signed into law by President Obama on July 6, 2012, it was clear that new federal planning regulations implementing MAP-21 would not be available in time to apply them to the development of the 2035 RTP. Using SAFETEA-LU regulations under these circumstances was confirmed with representatives of the Federal Highway Administration and the Federal Transit Administration. In a letter dated February 12, 2014 the U.S. Department of Transportation issued a finding of air quality conformity for the MAG 2035 RTP, as approved by MAG on January 29, 2014.

2040 Regional Transportation Plan

The “2040 Regional Transportation Plan”, which is contained in the following document, is organized into three major sections:

- **Section One: Planning Process** (Chapters One through Six):

Addresses the approach taken in developing the Plan, including organizational relationships, federal and state planning mandates, public involvement, Title VI and Environmental Justice considerations, consultation efforts, planning goals and objectives, and the regional development outlook.

- Section Two: Transportation Modes (Chapters Seven through Seventeen):

Covers modal investment strategies, including planned transportation facilities, capital investments by mode, programs such as special needs and enhancement activities, and a financial plan.

- Section Three: System Management, Operations and Performance (Chapters Eighteen through Twenty-Four):

Describes programs that monitor and improve the performance of the existing system, including: system management and operations, performance monitoring and assessment, demand and congestion management, and transportation safety and security. Air quality conformity is also covered in Section Three.

Federal Transportation Planning Requirements

On December 4, 2015, the President signed into law the Fixing America's Surface Transportation Act (FAST Act), which provides five years of federal funding for transportation. After numerous extensions of earlier federal legislation, it is the first law enacted in over ten years that provides long-term funding certainty for surface transportation. The FAST Act largely maintains the program structures and planning concepts contained in the previous transportation legislation -- the Moving Ahead for Progress in the 21st Century Act (MAP-21).

The 2040 Regional Transportation Plan has been developed consistent with the regional transportation planning requirements of federal transportation legislation. It addresses the key metropolitan transportation planning concepts identified in federal legislation, including considerations such as: (1) transportation facilities and planning factors, (2) performance measures and targets, (3) system performance reporting, (4) mitigation activities, (5) financial plans, (6) operational and management strategies, (7) capital investment and other strategies, and (8) transportation enhancement activities.

The FAST Act establishes performance-based programs and sets forth requirements for performance goals, outcomes and targets. The Federal Statewide and Metropolitan Planning Rule states that each MPO shall establish performance targets no later than 180 days after the date on which the relevant state and/or provider of public transportation establishes performance targets. At the time of this writing, relevant state and/or transit provider performance targets have not been provided. While awaiting these targets, MAG efforts have proceeded at the technical committee level and proposed system congestion targets for the MAG region have been identified. However, they have not been established or approved by the MAG Regional Council. It is anticipated that when relevant state and/or provider targets become available, and subsequent consideration of targets through the MAG committee process has been completed, the RTP will be revised to include the appropriate performance targets and performance report.

SECTION ONE

PLANNING PROCESS

CHAPTER ONE

REGIONAL TRANSPORTATION PLANNING APPROACH

The Maricopa Association of Governments 2040 Regional Transportation Plan (RTP) covers the period through Fiscal Year (FY) 2040, and addresses all major transportation modes and related transportation activities from a regional perspective. The RTP identifies future transportation facilities, discusses potential environmental mitigation activities, includes operational and capital investment strategies, provides a financial plan for implementation, coordinates with the development of air quality control measures, and has been developed using an extensive public participation process. The regional transportation planning approach has been designed to respond to federal and state mandates directed at the metropolitan transportation planning process. A number of different entities participate in developing, implementing and monitoring the RTP, which includes preparation of long-range plans, identification of programs and projects, construction of projects, and provision of transportation services.

Regional Roles and Responsibilities

A number of regional and state agencies and committees have responsibilities related to the RTP, including coordination, management, planning, oversight and project implementation. A brief description of these agencies and committees, as well as their role in the RTP process, is provided below.

Maricopa Association of Governments

The Maricopa Association of Governments (MAG) was formed in 1967, as the designated Metropolitan Planning Organization (MPO) for transportation planning in the Phoenix metropolitan area. On May 9, 2013, the Governor of Arizona approved an expanded metropolitan planning area (MPA) boundary for MAG (see Figure I-1). As shown in Figure I-1, the MAG MPA boundary now extends significantly into Pinal County. The new MPA boundary is in accordance with federal regulations (§450.312 - Metropolitan Planning Area Boundaries), which require that metropolitan planning areas encompass at least the existing urbanized area and the contiguous area expected to become urbanized within a 20-year forecast. The new MAG MPA boundary was determined using the 2010 Census and the latest long-range population forecasts for the Maricopa and Pinal County areas.

MAG members include the region's 27 incorporated cities and towns, Maricopa County, Pinal County, the Gila River Indian Community, the Fort McDowell Indian Community, the Salt River Pima-Maricopa Indian Community, the Citizens Transportation Oversight Committee, and the Arizona Department of Transportation.

MAG is responsible for the coordination of the following regional planning activities:

- Multi-modal Transportation Planning,

- Air Quality,
- Wastewater,
- Solid Waste,
- Human Services, and
- Socioeconomic Projections.

MAG strives to develop plans that are comprehensive, consistent, and compatible with one another. For example, the RTP must be in conformance with the air quality plans for the metropolitan area. MAG is responsible for the air quality conformity analysis that shows whether the transportation plan complies with the provisions of air quality plans and other air quality standards. MAG is also responsible for the development of the Arterial Street Life Cycle Program. Individual projects in this program are constructed by the cities, towns and Maricopa County.

The MAG Regional Council is the decision-making body of MAG. The Regional Council consists of elected officials from each member agency. The Chairman of Citizens Transportation Oversight Committee (COTC) and the Maricopa County representatives from the State Transportation Board also sit on the Regional Council, but only vote on transportation-related issues. Many policy and technical committees provide analysis and information to the MAG Regional Council.

The MAG Regional Council is the ultimate approving body for the MAG RTP and MAG Transportation Improvement Program (TIP). Any change in the RTP or the projects funded that affect the TIP, including priorities, must be approved by the MAG Regional Council.

Transportation Policy Committee

The MAG Transportation Policy Committee (TPC), which met for the first time in September 2002, was initially tasked with the responsibility of developing the Regional Transportation Plan (RTP) and recommending the plan for adoption by the MAG Regional Council. The TPC recommended a Plan in September 2003, which was unanimously approved and adopted by the MAG Regional Council on November 25, 2003. That plan has served as the core concept for the MAG RTP, with updates applied periodically to reflect changing conditions and new information. In addition to developing the RTP, the TPC has continuing responsibilities to advise the Regional Council on transportation issues, including, but not limited to recommendations regarding: the MAG Transportation Improvement Program; the freeway and highway, arterial, and transit Life Cycle Programs; and requested material changes and amendments to the RTP.

The TPC is comprised of 23 members and is a public/private partnership. Of the total membership, six are members representing business interests and 17 are from the membership of MAG. The MAG members include 13 representatives from a geographic cross-section of MAG cities and towns, as well as one representative each from the Citizens Transportation Oversight Committee, the ADOT State Transportation Board, the County Board of Supervisors

and the Native American Indian Communities in the County. The business representatives are from businesses with region-wide interest, including one representing transit interests and a representative from the freight industry. Three of the business representatives are appointed by the Speaker of the Arizona House of Representatives and the other three are appointed by the President of the Arizona State Senate.

Arizona Department of Transportation

The primary role of the Arizona Department of Transportation (ADOT) is to provide a transportation system that meets the needs of the citizens of Arizona. The transportation system includes the State Highway System, which is designed to provide safe and efficient highway travel around the state. The Governor of Arizona appoints the Director of ADOT. The MAG Regional Freeway/Highway Program is part of the State Highway System, and is the responsibility of ADOT. However, ADOT is not responsible for highways, streets, or roads that are not part of the State Highway System, which are owned and maintained by counties, or cities and towns in Arizona.

ADOT is responsible for the overall management of the Regional Freeway/Highway Program. This includes all design, engineering, right-of-way acquisition, and construction and maintenance activities. ADOT develops and maintains the Freeway/Highway Life Cycle Program, making projections of available revenues and developing financing strategies to fund projects.

ADOT also has a role for the arterial streets component of the MAG RTP. Although MAG is responsible for the development of the Arterial Life Cycle Program, in accordance with ARS 28-6303.D.2, ADOT maintains the arterial street fund and issues bonds on behalf of the MAG Arterial Life Cycle Program.

State Transportation Board

The State Transportation Board has statutory authority over the State Highway System. The State Transportation Board also sets priorities for the State Highway System (except the MAG Regional Freeway/Highway Program), establishes a five-year construction program for individual airport and highway projects, awards construction contracts, issues bonds and sets policy. The Board consists of seven members appointed by the Governor representing six geographic regions of the state. Two members are appointed from Maricopa County. Each member serves a six-year term.

Each year, the Board approves the ADOT Five-Year Highway Construction Program for statewide projects and the Life Cycle Program for the MAG Freeway/Highway System. The Life Cycle Program incorporates the priorities set by the MAG Regional Council. ADOT and MAG cooperatively develop the program for the MAG area. The State Transportation Board cannot approve projects within the MAG area that are not consistent with the MAG RTP and the MAG

TIP. This limitation provides for the participation of local governments in project selection and to ensure conformity with air quality standards.

The State Transportation Board adopts policies that affect the MAG Regional Freeway/Highway Program. The Board has the authority to issue bonds supported by both the Regional Area Road Fund and the Highway User Revenue Fund, and issue other forms of debt. Issuance of these bonds allows for significant acceleration of the MAG Regional Freeway/Highway Program, opposed to what would be possible on a “pay-as-you-go” basis.

Regional Public Transportation Authority/Valley Metro

The Regional Public Transportation Authority (RPTA)/Valley Metro is a political subdivision of the State of Arizona, and is overseen by a board of elected officials. Membership is open to all municipalities in Maricopa County and to the county government. In 1993, the RPTA Board adopted Valley Metro as the identity for the regional transit system. The (RPTA)/Valley Metro Board of Directors helps guide the agency by providing transportation leadership to best serve the region and their communities. Members are represented by an elected official who is appointed by their Mayor, Councilmembers or Board of Supervisors. Currently the Board includes Avondale, Buckeye, Chandler, El Mirage, Gilbert, Glendale, Goodyear, Maricopa County, Mesa, Peoria, Phoenix, Scottsdale, Surprise, Tempe, and Tolleson, and Wickenburg. The RPTA Board cannot approve projects and programs within the MAG area that are not consistent with the MAG RTP and the MAG TIP.

The primary goal of RPTA/Valley Metro is to ensure that a viable public transportation system is provided for regional mobility, and to ease the traffic congestion and improve air quality. The RPTA is responsible for distributing public information for transit, for the management and operation of regional bus and dial-a-ride services, the Regional Ridesharing program, a regional vanpool program, and elements of the countywide Trip Reduction Program and Clean Air Campaign. The RPTA is also responsible for maintaining the Transit Life Cycle Program.

In November of 2004, the passage of Proposition 400 increased the amount of funding for public transit from the current amount of approximately two percent of total half-cent sales tax revenues (\$5 million annually inflated), to a figure of over 33 percent, which began on January 1, 2006. These monies will be deposited in the Public Transportation Fund (PTF), which was created as part of the Proposition 400 legislation. The RPTA is charged with the responsibility of administering monies in the PTF for use on transit projects, including light rail transit projects, as identified in the MAG RTP. The RPTA Board must separately account for monies allocated to: 1) light rail transit, 2) capital costs for other transit, and 3) operation and maintenance costs for other transit. In addition to Proposition 400 funding, the RPTA will utilize major blocks of federal transit funding for capital expenditures on transit in the region.

Valley Metro Rail

Valley Metro Rail is a non-profit, public corporation overseeing the design, construction, and operation of the light rail starter segment, as well as extensions to the project. The Valley Metro Rail Board of Directors includes members that are represented by an elected official who is appointed by their Mayor, Councilmembers or Board of Supervisors. Currently the Board includes Chandler, Glendale, Mesa, Phoenix, and Tempe.

The Valley Metro Rail Board of Directors establishes procedures for the administration and oversight of the design, construction and operation of light rail. It also receives and disburses funds and grants from federal, state, local and other funding sources. The Valley Metro Rail Board has the authority to enter into contracts for light rail design and construction, hire or contract for staff for the Light Rail Project, and undertake extensions to the system. The Valley Metro Rail Board cannot approve projects and programs within the MAG area that are not consistent with the MAG RTP and the MAG TIP.

In March 2012, a decision was made to employ a single Chief Executive Officer (CEO) for both RPTA/Valley Metro (Bus) and Valley Metro Rail. Subsequently, the staffs of the two agencies were integrated into a single organization under the direction of the CEO. The combined staff organization will address all administrative, planning and operational functions for both agencies, including: (1) communications and marketing, (2) planning and development, (3) design and construction, (4) operations and maintenance, (5) finance, (6) administrative and organizational development, (7) legal, and (8) intergovernmental relations. The legal structure and Boards of the two agencies will not be affected.

Citizens Transportation Oversight Committee

ARS 28-6356 provides for the establishment of a Citizens Transportation Oversight Committee (CTOC) in a county that has a transportation sales tax such as Maricopa County. CTOC consists of seven persons - one member appointed from each of the five supervisory districts in Maricopa County. The Governor appoints an at-large member and the Chair of the committee. Members serve three-year terms. ADOT designates a special assistant to provide staff support to the CTOC, and to assist in coordination among CTOC, ADOT, MAG, RPTA and local jurisdictions.

The CTOC plays a number of important roles in the regional transportation process. It reviews and advises MAG, RPTA and the State Transportation Board on matters relating to the RTP, the TIP, the ADOT 5-year Construction Program and the life cycle management programs. This includes making recommendations on any proposed major amendment of the RTP, on criteria for establishing priorities, and on the five-year performance audit of the RTP. The CTOC is charged with annually contracting for a financial compliance audit of expenditures from the Regional Area Road Fund and the Public Transportation Fund, as well as setting parameters for periodic performance audits of the administration of those funds (life cycle programs).

The CTOC also holds public hearings and issues reports as appropriate, receives written complaints from citizens regarding adverse impacts of transportation projects funded in the

RTP, receives complaints from citizens relating to regional planning agency responsibilities, and makes recommendations regarding transportation projects and public transportation systems funded in the RTP.

Regional Transportation Plan Partners

Key agencies in the region have formed an ad hoc group, the “RTP Partners,” aimed at coordinating the effort to implement Proposition 400 and the projects in the MAG RTP. The agencies include the Maricopa Association of Governments; the Arizona Department of Transportation; the Regional Public Transportation Authority; and Valley Metro Rail. These agencies meet periodically to ensure overall coordination of transportation planning and implementation activities. Specific goals of the group are to: prepare uniform revenue forecasts; to establish consistent life cycle programming procedures; to maintain an integrated approach to the long-term development of transportation corridors and services; and to provide clear, concise information to the public and receive their input on issues connected with the implementation of Proposition 400.

U.S. Department of Transportation – Code of Federal Regulations (CFR)

The RTP fully complies with U.S. Department of Transportation metropolitan transportation planning requirements described in 23 CFR/Part 450 and 49 CFR/Part 613.100. Final rule-making pertaining to these regulations was jointly issued by the Federal Highway Administration and Federal Transit Administration on May 27, 2016. The major requirements of “23 CFR/Part 450/Section 324 - Development and Content of the Metropolitan Transportation Plan “ are summarized below, and the approach of the RTP to each subject area is discussed.

The transportation plan shall address no less that a 20-year horizon and consider the planning factors in 23 CFR Part 450.306. (See 23 CFR Part 450.324(a).)

- The transportation planning process shall address at least a 20-year planning horizon. The RTP covers a period of at least a 20-year period from the effective date of the Plan. The effective date of the Plan is defined in 23 CFR Part 450.322 as the date of a conformity determination by the Federal Highway Administration and the Federal Transit Administration. This determination has typically been received within two months of the approval of the Plan by MAG. (See Introduction and Chapter 1.)
- The transportation plan shall consider the planning factors in 23 CFR Part 450.306. The RTP addresses the planning factors covered in 23 CFR Part 450.306 as described below.
 - Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency. The RTP addresses this issue directly. Two of the major objectives identified for the Plan are as follows: 1) maintain an acceptable Level Of Service (LOS) on transportation and mobility systems serving the region, taking into account performance by mode and facility type; and 2) provide

residents of the region with access to jobs, shopping, educational, cultural and recreational opportunities, and to provide employers with reasonable access to the workforce in the region. The RTP addresses economic vitality through projects and programs to reduce congestion and increase system efficiency, by the effective management of system operations and development of transportation facility capacity improvements. In addition, MAG has been highly active in promoting economic development activities within the metropolitan planning area, as well as the larger central Arizona/Sun Corridor region. The activities of the MAG Economic Development Committee are described in Chapter 3. (See Chapters 2, 3 and 17).

- Increase the safety of the transportation system for motorized and non-motorized users. Safety is a critical element of each mode of transportation and the RTP specifically addresses safety issues in a separate chapter. Safety has been identified as a major focus, with one of the Plan objectives being: provide a safe and secure environment for the traveling public, addressing roadway hazards, pedestrian and bicycle safety, and transit security. The RTP process includes a safety planning program that enables safety issues to be addressed as part of the regional transportation planning process. MAG has a standing committee for safety planning and pursues both safety planning and implementation issues. This includes efforts such as developing and updating the MAG Strategic Transportation Safety Plan, maintaining safety information management systems, and conducting safety workshops. (See Chapter 21.)

- Increase the security of the transportation system for motorized and non-motorized users. Transportation security is covered specifically in a separate chapter of the RTP. To address this issue, an inventory of ongoing security activities and programs in the MAG area was conducted and documented. This information was assessed to gain insights into the type of role the metropolitan organization might play to advance and facilitate effective application of security measures to transportation systems in the region. MAG already participates in the area of security through its role in the implementation of 9-1-1 and the Community Emergency Notification System. (See Chapter 22.)

- Increase the accessibility and mobility of people and freight. The RTP identifies three objectives related to mobility options, which are as follows: 1) maintain a reasonable and reliable travel time for moving freight into, through and within the region, as well as provide high-quality access between intercity freight transportation corridors and freight terminal locations, including intermodal facilities for air, rail and truck cargo; 2) provide the people of the region with transportation modal options necessary to carry out their essential daily activities and support equitable access to the region's opportunities; and 3) address the needs of the elderly and other population groups that may have special transportation needs, such as non-drivers or those with disabilities. The RTP increases accessibility and mobility options by calling for significant investments in freeways, highways,

streets, bus service, high capacity transit facilities, bicycle and pedestrian facilities, and airports. The Plan also provides the planning foundations for freight and special needs transportation. (See Chapter 2 and Chapters 9-16.)

- Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns. Early in the RTP process, the need to sustain the environment was recognized as a major factor. RTP objectives related to this issue include the following: 1) identify and encourage implementation of mitigation measures that will reduce noise, and visual and traffic impacts of transportation projects on existing neighborhoods; 2) encourage programs and land use planning that advance efficient trip-making patterns in the region; and 3) make transportation decisions that are compatible with air quality conformity and water quality standards, the sustainable preservation of key regional ecosystems, and desired lifestyles.

The RTP includes a discussion of types of potential environmental mitigation activities that may have the greatest potential to address the environmental functions affected by the Plan. Air quality issues are extensively addressed in the separate conformity analysis document prepared for the RTP. Reductions in transportation energy use in the region are closely tied to air quality goals. In addition, the RTP identifies regional funding for environmental concerns such as freeway landscaping and litter pickup.

The need to promote consistency between transportation improvements and state and local planned growth and economic development patterns was addressed in a number of ways in the planning process. As part of the transportation planning process, MAG consults with state and local agencies responsible for land use management, natural resources, environmental protection, conservation and historic preservation. Also, the process to develop long-range population and employment forecasts, which provides the foundation for the transportation planning effort, starts with local and state land use plans and forecasts. (See Chapter 2 and Chapters 9-16.)

- Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight. One of the major objectives of the RTP is to maintain a reasonable and reliable travel time for moving freight into, through, and within the region; as well as to provide high-quality access between intercity freight transportation corridors and freight terminal locations, including intermodal facilities for air, rail and truck cargo. The broad range of multi-modal improvements in the RTP will facilitate the movement of people and goods, as well as enhance system connectivity throughout the region. The inclusion of chapters on airports and freight in the RTP helps recognize the importance of developing an integrated approach to planning for passenger and freight movement. In addition, MAG

employs a multi-modal, integrated process for forecasting and analyzing travel demand. (See Chapters 2,7,12 and 14.)

- Promote efficient system management and operation. Minimizing congestion and resulting delays is a central theme in all modal elements of the RTP. As one of its objectives, the RTP calls for maintaining an acceptable and reliable level of service on transportation and mobility systems serving the region, taking into account performance by mode and facility type. The analysis of traffic congestion is addressed throughout the MAG planning process, including use of the MAG transportation models to analyze future traffic demand and levels of service. Projects funded from regional sources are rated by an air quality rating system and a congestion management rating system. System operations and management are addressed specifically in the RTP, including chapters that identify strategies and describe ongoing planning efforts in the areas of: System Management and Operations, Demand Management, Congestion Management Process, Transportation Safety, Transportation Security, and System Performance Monitoring and Targets. (See Chapter 2 and Chapters 18 -23.)
- Emphasize the preservation of the existing transportation system. The RTP process recognizes the high importance of maintaining the regional transportation infrastructure. The RTP identifies maintenance as a critical Plan element, with the following objective: provide for the continuing preservation and maintenance needs of transportation facilities and services in the region, eliminating maintenance backlogs. The high level of importance placed on preservation is reflected by the allocation of major blocks of regional-level funding in the RTP to improving the existing roadway network and conducting various aspects of the maintenance function. In addition, the RTP discusses ongoing operations and maintenance efforts at the state and local levels. (See Chapter 2 and Chapters 9-11.)
- Improve the resiliency and reliability of the transportation system and reduce or mitigate storm water impacts of surface transportation. System operations and management are addressed in Chapter 18, which includes efforts to improve the resiliency and reliability of the transportation system. Resiliency and reliability are also major concerns of studies described in Chapter 16, including the “MAG Managed Lanes Development Strategy” and the “Interstate 10/Interstate 17 Corridor Master Plan Study”. Storm water runoff and other water resource concerns are addressed in the RTP in Chapter 6 and Appendix B, as part of consultation with environmental and resource agencies. (See Chapters 6, 16, 18 and Appendix B.)
- Enhance travel and tourism. MAG has been highly active in promoting economic development activities within the metropolitan planning area, as well as the larger central Arizona/Sun Corridor region. These activities encompass travel and tourism activities. The efforts of the MAG Economic Development Committee are described in Chapter 3. (See Chapter 3.)

The transportation plan shall include both long-range and short-range strategies that lead to an integrated multimodal transportation system. (See 23 CFR Part 450.324(b).)

The RTP contains both long and short range concepts and covers the full range of transportation modes. For example, the RTP contains a project-specific listing of improvements for the entire planning period for all the major transportation modes. This is used as a blueprint to develop the MAG five-year transportation improvement program, as well as a guide for the scheduling of longer range facility development studies, such as corridor, area and design concept reports. In addition to covering the major transportation modes, the RTP addresses bicycle/pedestrian facilities, airports, and special needs transportation, as well as transportation system operations and demand management. (See Chapters 9-16 and Chapters 18-20.)

The metropolitan planning organization shall review and update the transportation plan at least every four years in nonattainment areas. (See 23 CFR Part 450.324(c).)

The most recent update of the RTP was approved by MAG in January 2014 and received a finding of air quality conformity from the Federal Highway Administration and the Federal Transit Administration in February 2014. (See Chapter 24.)

The metropolitan planning organization shall coordinate the development of the regional transportation plan with the transportation control measures (TCMs) in the State Implementation Plan (SIP). (See 23 CFR Part 450.324(d).)

As the regional air quality planning agency, MAG maintains an extensive air quality planning process through which TCMs are identified, selected and implemented as part of the SIP. The MAG regional air quality plans are developed through a cooperative effort among the Arizona Department of Environmental Quality, Arizona Department of Transportation, Maricopa County and MAG. Collectively, these agencies generate information on emissions inventories, air quality modeling, and the description, assumptions and cost effectiveness of TCMs. (See Chapter 24.)

The metropolitan planning organization shall base updates on the latest available estimates for population, land use, travel, employment, congestion, and economic activity. (See 23 CFR Part 450.324(e).)

The RTP is based on the most recently available set of population and employment projections for the region. According to Executive Order 2011-04, the Arizona Department of Administration (ADOA) is responsible for preparing an official set of population projections for Arizona and each of its counties. ADOA prepared a set of residential population projections for Maricopa County and Pinal County consistent with the 2010 Census. MAG is responsible for developing a set of sub-regional projections for communities within Maricopa County, and CAG is responsible for developing a set of sub-regional projections for communities within Pinal

County. These projection figures, which take into account recent population and employment information, were produced in early 2016 and were approved for Maricopa County by the MAG Regional Council on June 22, 2016 and for Pinal County by the CAG Regional Council on June 17, 2016 (See Chapter 3.)

The metropolitan transportation plan shall, at a minimum, include the following: (See 23 CFR Part 450.324(f).)

- The transportation plan shall include current and projected transportation demand of persons and goods in the metropolitan planning area over the period of the transportation plan. The MAG transportation planning process includes an extensive travel modeling component that provides estimates of future travel, associated with the demand for person and goods movement in the region. This covers travel by all the major modes including autos, trucks, bus transit, and light rail transit for the full period covered by the RTP. The travel modeling process is based on the most recently available population and employment forecasts, which are consistent with the horizon year of the Plan. A separate chapter on the transportation demand of persons and goods, which addresses current and future travel demand, is included in the RTP. (See Chapter 7.)
- The transportation plan shall include existing and proposed transportation facilities that should function as an integrated system. The RTP identifies the network of existing and planned transportation facilities that function as an integrated system to serve the travel demand of the region. This includes the major modal components represented by the freeway/highway system, the arterial street network, and public transit operations and facilities. In addition, other modal programs are addressed in the RTP, such as airports, bicycle and pedestrian facilities, freight, and special needs programs. The RTP depicts the location and connectivity of regional transportation networks by mode, as well as the phasing of future improvements to the transportation system. The major modal systems are inventoried and analyzed using an integrated travel demand modeling system. (See Chapters 9-15.)
- The transportation plan shall include a description of the performance measures and targets used in assessing the performance of the transportation system. The RTP dedicates Chapter 23 to transportation system performance measures, performance targets, and performance monitoring. In this chapter, the status of performance monitoring procedures, as well as the process to establish performance measures and targets, is reviewed. Title 23 CFR Part 450.306(d)(3) states that: “Each MPO shall establish the performance targets under paragraph (d)(2) of this section not later than 180 days after the date on which the relevant state or provider of public transportation establishes the performance targets”. At the time of this writing, relevant state and/or transit provider performance targets are not available. While proposed system congestion targets for the MAG region have been identified at the technical committee level, they have not been established or approved by the MAG Regional Council. It is anticipated that when relevant state and/or provider targets become available, and

subsequent consideration of targets through the MAG committee process has been completed, the RTP will be revised to include the appropriate performance targets. (See Chapter 23).

- The transportation plan shall include a transportation system performance report and subsequent report updates evaluating the condition and performance of the transportation system with respect to the performance targets described in 450.306(d). As described above, at the time of this writing, relevant state and/or transit provider targets are not available. Therefore, a transportation system performance report that evaluates the condition and performance of the transportation system with respect to those performance targets has not been prepared. It is anticipated that when relevant state and/or transit provider targets become available, and subsequent consideration of targets through the MAG committee process is completed, the RTP will be revised to include a performance report.
- The transportation plan shall include operational and management strategies to improve the performance of existing transportation facilities. The RTP addresses operational and management strategies to improve transportation system performance, relieve congestion, and enhance safety and mobility through a wide range of planning efforts. An entire section of the RTP is dedicated to system management, operations and performance. This section includes chapters that identify strategies and describe ongoing planning efforts in the areas of: system management and operations, demand management, congestion management process, transportation safety, transportation security, and performance targets and system performance report. (See Chapters 18 - 23).
- The transportation plan shall consider the results of the congestion management process. MAG has developed a congestion management process (CMP) that is designed to be an integral part of the planning and programming activities. This effort included identification of best practices, development of a performance measurement framework, and preparation of a CMP project assessment tool. The CMP provides a mechanism for considering the congestion management impacts of projects and project packages, providing input to the development of the transportation improvement program. In addition, periodic facility congestion and level of service surveys are conducted, providing an assessment of current congestion issues and a basis for modeling future congestion. MAG has also established an ongoing performance monitoring program, which is a key component of the congestion management process. The performance monitoring program formalizes the data collection effort and refines the process for periodic assessment of the effectiveness of congestion management strategies. Both the congestion management process and the performance monitoring program are addressed in individual chapters in the RTP. (See Chapters 20 and 23).
- The transportation plan shall include an assessment of capital investment and other strategies to preserve the existing system and provide for multimodal capacity

increases. The RTP covers capital investment strategies to preserve existing transportation infrastructure and provide for multi-modal capacity increases based on regional priorities. For the major modal components, the RTP includes detailed twenty-year programs for improvements to the existing system, as well as the development of new facilities. In addition, potential needs in other modal programs, such as airports, bicycle and pedestrian facilities, freight, and special needs programs are addressed in the RTP. The RTP process recognizes the high importance of maintaining the regional transportation infrastructure, which is reflected by the allocation of major blocks of regional-level funding in the RTP to improving the existing roadway network and conducting various aspects of the maintenance function. (See Chapters 9-15.)

- The transportation plan shall include transportation and transit enhancement activities. MAG has participated in a transportation enhancement program that was administered by the Arizona Department of Transportation and involved the development of project proposals by the councils of governments and metropolitan planning organizations around the state. With the passage of MAP-21, procedures for enhancement projects are being altered consistent with federal planning regulations. A chapter on enhancement projects has been included in the RTP and will be updated as the detailed procedures for enhancement projects under MAP-21 are developed and projects are programmed. (See Chapter 16.)
- The transportation plan shall include descriptions of all existing and proposed transportation facilities in sufficient detail for conformity determinations. As part of its regional travel demand modeling process, MAG maintains multimodal transportation networks of existing and proposed facilities that are described in sufficient detail to be utilized as input to the air quality conformity process required by 40 CFR 93 (EPA's transportation conformity rule). The scope and cost of these networks is described in the RTP, including all facilities regardless of funding source. (See Chapters 9-15.)
- The transportation plan shall include a discussion of potential environmental mitigation activities to restore and maintain environmental functions affected by the transportation plan. The RTP includes a discussion of types of potential environmental mitigation activities that may have the greatest potential to address the environmental functions affected by the Plan. This effort was approached by consulting with a broad range of federal, state, and tribal agencies that deal with wildlife, land management and regulatory matters. The transportation planning process and its future environmental implications were addressed in a series of discussions with these agencies, and concepts for potential environmental mitigation activities were identified. The primary goal of the RTP consultation effort is to gain insights regarding environmental concerns that may potentially involve future planning efforts and future Plan elements. (See Chapter 6.)
- The transportation plan shall include a financial plan that demonstrates how the adopted transportation plan can be implemented. The RTP provides a financial plan by

mode that identifies specific funding to carry out the improvements and programs included under that transportation mode. All funding sources are considered to be reasonably available throughout the planning period, having had a long history of providing funding for the RTP. This includes sources such as the half-cent sales tax, which was originally approved in 1985 and extended in 2004; the Arizona Highway Users Revenue Fund, which has been a major and continuing funding source for transportation in Arizona since 1974; federal highway and transit funding programs, which represent a national commitment to transportation; and local government and private funding, which proceed in parallel with the residential and commercial development process. Estimates of future federal, state and regional funds that would be available to the region were developed cooperatively by MAG, RPTA and ADOT. In addition, Arizona State Statutes require the major transportation implementing agencies in the MAG area to develop and maintain life cycle programs that ensure transportation program costs can be met by future revenues. These life cycle programs are also reflected in the RTP. (See Chapter 8.)

- The transportation plan shall include pedestrian walkway and bicycle transportation facilities. MAG has maintained an active role in promoting the establishment of improved travel opportunities for bicyclists and pedestrians for many years. The MAG Regional Bicycle Task Force, which was responsible for assisting in the development of the original MAG Bicycle Plan in 1992, has maintained an active role in promoting improved travel opportunities for bicyclists. In 1994, MAG formed the Pedestrian Working Group to promote increased awareness of walking as an alternative mode of travel and to improve facilities for people who walk. Pedestrian walkway and bicycle transportation facilities are addressed in a separate chapter in the RTP. (See Chapter 13.)

The metropolitan planning organization shall consult with state and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation regarding development of the transportation plan. (See 23 CFR Part 450.324(g).)

As part of the development of the 2040 RTP, MAG consulted with state and local agencies responsible for land use management, natural resources, environmental protection, conservation and historic preservation. An important part of this process included the identification of key databases, conservation maps, inventories of natural or historic resources, and other information sources to utilize in the regional transportation planning process. As noted under mitigation activities, since previously adopted projects in the RTP undergo extensive environmental and resource assessment by the implementing agencies, the primary goal of the consultation effort was to gain insights regarding concerns that may potentially involve future planning efforts and future Plan elements. A chapter in the RTP is dedicated to describing the consultation process and a discussion of potential environmental mitigation activities. (See Chapter 6.)

The transportation plan should integrate priorities in safety plans, as well as disaster preparedness plans that support homeland security and personal security of users. (See 23 CFR Part 450.324(h).)

The RTP addresses safety in a separate chapter, which covers the MAG safety planning program, enabling safety issues to be addressed as part of the regional transportation planning process. MAG has a standing committee for safety planning, has developed a safety information management system, and conducts safety workshops. MAG maintains a Strategic Transportation Safety Plan (STSP), which is coordinated with the state's 2014 Strategic Highway Safety Plan (SHSP) that was released at the end of October 2014 by the Arizona Department of Transportation (ADOT). On-going coordination between MAG and ADOT planning efforts will lead to the establishment of road safety performance goals and targets for the MAG region that are in compliance with similar goals and targets established for the state. This would also meet the requirements outlined in the U.S. Department of Transportation proposed rule-making related to MAP-21 safety performance measures. The STSP identifies several areas in which road safety can be explicitly considered during the MAG Transportation Improvement Program (TIP) process. This approach for main-streaming safety in the planning process has been accepted at a conceptual level by several MAG technical committees, and is planned to be implemented during the next TIP programming cycle. The RTP also has a separate chapter on security. To address this issue, an inventory of ongoing security activities and programs in the MAG area was conducted and documented. This information was assessed to gain insights into the type of role the metropolitan organization might play to advance and facilitate effective application of security measures to transportation systems in the region. **(See Chapter 21 and 22.)**

The metropolitan planning organization may voluntarily elect to develop multiple scenarios for consideration as part of the development of the metropolitan transportation plan. (See 23 CFR Part 450.324(i).)

MAG has elected not to undertake an extensive scenario identification and evaluation effort, as part of the current plan update. However, scenario concepts are being utilized in the process of establishing and evaluating transportation system performance measures and targets. (See Chapter 23.) Also, it should be noted that the core elements of the 2040 RTP are based on previous planning efforts, which included the performance evaluation of a series of long-range plan scenarios. In addition, a chapter is included in the 2040 RTP describing MAG studies that address future transportation demand and the need for additional or improved facilities and services. (See Chapter 17). Topics in this chapter include inter-regional cooperation and coordination, modal and area transportation studies, and illustrative corridors/projects.

The Metropolitan Planning Organization shall provide interested parties with a reasonable opportunity to comment on the transportation plan. (See 23 CFR Part 450.324(j).)

Throughout the RTP process, interested parties are provided extensive opportunity to comment on any and all aspects of the RTP, as well as potential future additions to the transportation

plan. This is accomplished through a specific participation plan that was closely adhered to and was structured to maximize input opportunities for all interested individuals and groups. The development of the participation plan, itself, also included extensive consultation with interested citizens, citizen interest groups, public agencies, and private transportation providers. In addition, MAG recognizes the significance of transportation to all residents of the metropolitan area and the importance of Title VI/Environmental considerations in the transportation planning process. As a result, an environmental justice analysis of the RTP has been prepared. Public involvement activities are described in a separate chapter. (See Chapters 4 and 5.)

The metropolitan transportation plan shall be published or otherwise made readily available for public review. (See 23 CFR Part 450.324(k).)

The RTP is made available for public review through both printed and electronic media. In addition, a variety of methods are employed to promote public education and obtain comments on the RTP, including outreach efforts, accessible meetings and workshops, graphical visualization techniques, and “World Wide Web” postings. The “World Wide Web” is employed extensively as a means of providing the public with broad access to planning information for review and input. The Web is employed, not only for the posting of the RTP and other planning reports, but also is utilized for the dissemination of preliminary planning information, progress reports, and meeting and workshop notices. (See Chapter 4.)

The Metropolitan Planning Organization shall not be required to select any project from the illustrative list of additional projects included in the financial plan. (See 23 CFR Part 450.324(l).)

The RTP identifies illustrative projects in a separated chapter, recognizing that such projects that could potentially be included in the plan, if additional resources beyond the reasonably available financial resources identified in the plan were available. They are discussed in the RTP for illustrative purposes only, and are not included in the financial plan or air quality conformity determination. There is no requirement to select any project from an illustrative list of projects in a metropolitan transportation plan at some future date, when funding might become available. In addition, no priorities are stated or implied by inclusion as an illustrative corridor. (See Chapter 17.)

The metropolitan planning organization must make a conformity determination on any updated or amended transportation plan in accordance with transportation conformity regulations. (See 23 CFR Part 450.324(m).)

MAG conducts appropriate air quality conformity analyses of the RTP to comply with air quality conformity regulations. Any approvals of updates or amendments to the by MAG Plan first undergo this conformity analysis and are contingent upon a finding of conformity by the Federal Highway Administration and the Federal Transit Administration. (See Chapter 24.)

Arizona Revised Statutes (A.R.S.)

Arizona state legislation establishes guidelines and sets forth factors to be considered during the development of the RTP. Arizona Revised Statute 28-6308, in part, identifies features required in the regional transportation plan and addresses a range of planning considerations, such as a twenty-year planning horizon, the use of a performance-based planning approach, the allocation of funds between highways and transit, and priorities for expenditures. The relevant requirements of A.R.S.28-6308 are summarized below, and the approach of the RTP to each subject area is discussed.

Through the regional planning agency, the transportation policy committee shall recommend a twenty-year, comprehensive, performance-based, multimodal and coordinated regional transportation plan, including transportation corridors by priority and a construction schedule. (See A.R.S. 28-6308.B.1.)

- Cover a twenty-year term. The RTP covers at least a 20-year planning horizon. In addition, the Plan addresses some issues that extend beyond this planning period.
- Be comprehensive, performance based, multimodal and coordinated. The RTP is comprehensive in scope, taking into account future land uses and growth throughout the region. It is multi-modal, including freeways, highways, streets, bus service, high capacity transit, and other transit services, as well as modes such as airports, bicycles and pedestrians. The approach used in developing the RTP is distinguished by the use of performance-based planning and the application of performance measures in the evaluation of system operations. The RTP closely coordinates the functions of each mode through regional modeling, construction phasing, and financial planning. The transportation analysis area used to develop the RTP includes the Indian Communities, and the portions of contiguous counties that are forecasted to develop during the planning period. This means that the growth projected for these areas and their impacts on transportation demand are taken into account in the planning process.
- Include a transportation corridor prioritization and construction schedule. The RTP includes modal life cycle project program schedules, identifying when projects are programmed for construction during the planning period. This schedule is based on a number of factors, including traffic volumes and level of service, project readiness and cash flow availability.

The transportation policy plan shall include the following mode classifications (freeways, major arterials streets, public transportation) with a revenue allocation to each classification. (See A.R.S. 28-6308.C.1.)

- Include the following mode classifications: freeways, major arterial streets, public transportation. The RTP directly addresses each of the listed modes (freeways, major arterial streets, public transportation), dedicating a chapter in the report to each

mode. An in depth description of the regional networks and planned improvements for each mode is provided, as well as project costs and schedules.

- Include a revenue allocation to each modal classification. The RTP includes a financial plan for each of the listed modal elements (freeways, major arterial streets, public transportation) that allocates funding among and across modes by funding source. This allocation is projected through the horizon year of the RTP.

Costs and Revenue Estimates

Throughout the transportation planning process, it has been recognized that periodic adjustments and updating of the RTP will be needed to respond to changing conditions and new information. In particular, cost estimates are subject to changes in prices for right-of-way, materials, equipment and personnel, and facility design requirements. Similarly, current revenue collections, as well as the outlook for long-term revenue receipts, may be affected by changes in local and national economic conditions.

Proposition 400 legislation acknowledged the necessity of responding to changing conditions and new information during the course of implementing a long-range plan. The legislation calls for five-year performance audits of the RTP; specifies consultation steps for any major amendments to the RTP; and requires life cycle programs for highways, streets, and transit to ensure that the cost of projects programmed for construction can be completed within available revenues.

Cost and revenues in the 2040 RTP have been updated to reflect the most recent estimates available. However, the long term outlook regarding construction and right-of-way costs, as well as transportation revenues will be subject to continued adjustments in the future. Maintaining a balance between program costs and revenues under these circumstances will be an ongoing challenge.

It should be noted that in response to federal planning requirements (23 CFR Part 450.324(f)(11)(iv), in the body of the RTP report, costs and revenues are expressed in “Year of Expenditure” (YOE) dollars. Therefore, revenue and funding forecasts reflect the actual number of dollars projected to be available, while project cost estimates incorporate the potential effects of future price inflation and represent the actual number of dollars that would be expended. The detailed project listings in the appendix of the report are expressed in 2016 dollars.

RTP Planning Period

The planning period for the 2040 RTP covers FY 2018 through FY 2040, with fiscal years (FYs) ending on June 30th. To facilitate the discussion of plan concepts and project priorities, three project groupings associated with intervals in the overall planning period have been identified:

- Group 1 (FY 2018 - FY 2022): Corresponds to the period covered by the MAG FY 2018 - FY 2022 Transportation Improvement Program (TIP). Corridor discussions may also refer to construction that is underway during this period but may have been programmed earlier.
- Group 2 (FY 2023 - FY 2026): Corresponds to the period beyond the TIP but within the Life Cycle Programs (LCPs), which extends through FY 2026.
- Group 3 (FY 2027 - FY 2040): Corresponds to the period beyond the LCPs but within the RTP planning period, which extends through FY 2040.

For highway projects, these groups are used to indicate the period in which funds are programmed for construction work. For example, a highway project labeled as a “Group 3” would be funded for construction during FY 2027 - FY 2040, but may have funding for design activities and/or right-of-way acquisition in earlier periods. For arterial projects, these groups are used to indicate the period in which a project is anticipated to be completed. Reimbursements from regional funding sources for arterial projects may occur in later periods. For transit capital expenditures, the group designation indicates the period when equipment or other capital items are acquired, or when construction of facilities is funded. For bus operations, the group designations represents the first period in which at least some funding was provided for the route from regional sources. Funding continues during subsequent periods, and service improvements on certain routes may also be initiated in a later period. For light rail transit/high capacity transit (LRT/HCT) operations, the group designation indicates the period when service is initiated. No regional funding is provided for LRT/HCT operating expenses.

Future Updates of the 2040 RTP

Changing conditions and new information continually arise during the course of implementing a long-range transportation plan. Certain planned projects may no longer respond to evolving travel patterns, or may no longer be consistent with available funding. Revenue sources may not provide the funding levels that were initially forecasted, or may be structured differently than originally anticipated. Public attitudes regarding transportation issues may shift and new concerns may emerge. These and other factors potentially require new strategies and revised priorities.

The 2040 RTP provides a detailed view of future transportation projects and programs in the region, as well as the financial resources needed to implement planned improvements. It is intended to serve as a blueprint to guide transportation investments in the region through FY 2040. However, this does not preclude future major reevaluation of all strategies, projects and programs in the plan, as part of the regional transportation planning process. Factors such as

system development strategies, project selection priorities, and modal revenue allocations are subject to change. In future updates of the 2040 RTP, plan and program goals may be updated and new long-range transportation strategies defined. The allocation of revenues among modes and projects may be altered and new modal emphasis areas identified. Any changes to the RTP will include public involvement and will be accomplished through the MAG committee process, with final approval by the MAG Regional Council.

CHAPTER TWO

GOALS, OBJECTIVES AND PRIORITY CRITERIA

Regional goals and objectives provide the planning process with a basis for identifying options, evaluating alternatives and making decisions on future transportation investments. The MAG Transportation Policy Committee has identified a total of four goals and 15 objectives, which were approved on February 19, 2003. In addition, Arizona Revised Statute 28-6354.B directs MAG to develop criteria to establish the priority of corridors, corridor segments, and other transportation projects. As part of the regional transportation planning process, MAG applied various priority criteria for the development of the Regional Transportation Plan (RTP).

Goals and Objectives

A goal is a general statement of purpose that represents a long-term desired end to a specific state of affairs. It is generally measurable by qualitative means. By identifying broad goals that are both visionary and practical, and which respond to the values of the region, the focus of the planning process can be more readily communicated to the public. The goals, in turn, can be defined in greater detail by specifying multiple objectives for each goal.

An objective is very similar to a goal, as it represents a desired end to a specific state of affairs. However, an objective is an intermediate result that must be realized to reach a goal. The definition of an objective is usually more focused than that of a goal and is typically more subject to being measured. Objectives can be further assessed through performance measures that are identified for each objective.

Certain goals and objectives are related to the way in which the regional transportation system is performing overall. Others may be used to evaluate individual components of the overall transportation system or to evaluate proposed projects. They can also serve as the basis to monitor how the transportation system performs as the RTP is implemented. In addition, goals and objectives relate to the planning process, and the importance of accountability during the development and implementation of the plan. Individual goals with their supporting objectives are listed below.

Goal 1: System Preservation and Safety

Transportation infrastructure that is properly maintained and safe, preserving past investments for the future.

- **Objective 1A:** Provide for the continuing preservation and maintenance needs of transportation facilities and services in the region, eliminating maintenance backlogs.
- **Objective 1B:** Provide a safe and secure environment for the traveling public, addressing roadway hazards, pedestrian and bicycle safety, and transit security.

Goal 2: Access and Mobility

Transportation systems and services that provide accessibility, mobility and modal choices for residents, businesses and the economic development of the region.

- Objective 2A: Maintain an acceptable and reliable level of service on transportation and mobility systems serving the region, taking into account performance by mode and facility type.
- Objective 2B: Provide residents of the region with access to jobs, shopping, educational, cultural, and recreational opportunities and provide employers with reasonable access to the workforce in the region.
- Objective 2C: Maintain a reasonable and reliable travel time for moving freight into, through and within the region, as well as provide high-quality access between intercity freight transportation corridors and freight terminal locations, including intermodal facilities for air, rail and truck cargo.
- Objective 2D: Provide the people of the region with transportation modal options necessary to carry out their essential daily activities and support equitable access to the region's opportunities.
- Objective 2E: Address the needs of the elderly and other population groups that may have special transportation needs, such as non-drivers or those with disabilities.

Goal 3: Sustaining the Environment

Transportation improvements that help sustain our environment and quality of life.

- Objective 3A: Identify and encourage implementation of mitigation measures that will reduce noise, visual and traffic impacts of transportation projects on existing neighborhoods.
- Objective 3B: Encourage programs and land use planning that advance efficient trip-making patterns in the region.
- Objective 3C: Make transportation decisions that are compatible with air quality conformity and water quality standards, the sustainable preservation of key regional ecosystems and desired lifestyles.

Goal 4: Accountability and Planning

Transportation decisions that result in effective and efficient use of public resources and strong public support.

- **Objective 4A:** Make transportation investment decisions that use public resources effectively and efficiently, using performance-based planning.
- **Objective 4B:** Establish revenue sources and mechanisms that provide consistent funding for regional transportation and mobility needs.
- **Objective 4C:** Develop a regionally balanced plan that provides geographic equity in the distribution of investments.
- **Objective 4D:** Recognize previously authorized corridors that are currently in the adopted MAG Long-Range Transportation Plan; i.e., Loop 303 and the South Mountain Corridor.
- **Objective 4E:** Achieve broad public support for needed investments in transportation infrastructure and resources for continuing operations of transportation and mobility services.

Priority Criteria

Arizona Revised Statute 28-6354.B directs MAG to develop criteria to establish the priority of corridors, corridor segments, and other transportation projects. These criteria include public and private funding participation; the consideration of social and community impacts; the establishment of a complete transportation system for the region; the construction of projects to serve regional transportation needs; the construction of segments to provide connectivity on the regional system; and other relevant criteria for regional transportation.

As part of the regional transportation planning process, MAG has applied these kinds of criteria, both for the development and the implementation of the Regional Transportation Plan (RTP). The RTP was developed through a performance-base process that evaluated alternatives relative to a range of performance measures. Also, specific criteria were considered as part of the process to schedule the implementation of transportation projects throughout the duration of the planning period. The discussion below describes how the criteria applied in the RTP planning process correspond to the categories included in ARS 28-6354.B.

Extent of Local Public and Private Funding Participation

A higher level of local public and private funding participation in the RTP benefits the region by leveraging regional revenues and helping ensure local government commitment to the success of the regional program. The extent of local public and private funding participation is addressed in a number of ways in the MAG transportation planning process.

- Project Matching Requirements - In developing funding allocations among the various RTP components and project types, local matching requirements have been established. The local matching requirements in the RTP are:
 - 30 percent major street projects, including ITS elements.
 - 30 percent bicycle and pedestrian projects.
 - For air quality and transit projects involving federal funds, minimum federal match requirements were assumed. Depending on the specific project funding mix, this match may be provided from regional revenue sources.
- Private Funding Participation - As part of the policies and procedures developed for the Arterial Street Life Cycle Program, private funding participation is recognized as applicable local match for half-cent funds for street and intersections projects. This policy helps free local monies that may then be applied to additional transportation improvements.
- Local Government Incentives - In the Arterial Street Life Cycle Program, incentives to make efficient use of regional funds have been established by ensuring that project savings by local governments may be applied to new projects in the jurisdiction that achieved those savings.

Social and Community Impacts

Regional transportation improvements can have both beneficial and negative social and community impacts. It is important to conduct a thorough assessment of these impacts, to ensure that they are taken into account in the decision-making process. The MAG planning effort assesses social and community impacts at each key stage of the transportation planning and programming process. In addition, it should be noted that similar efforts are carried out by the agencies implementing specific transportation improvement projects.

- Public Participation and Community Outreach - An aggressive citizen participation and outreach program is conducted to obtain public views on the potential community and social impacts of transportation improvements. In particular, input is sought regarding the possible impacts of specific transportation alternatives on the community's social values and physical structure.
- Social Impact Assessment - The social impact of transportation options is evaluated as part of the Title VI/Environmental Justice assessment. In this assessment, potential transportation impacts are evaluated for key communities of concern, including minority populations, low-income populations, aged populations, mobility disability populations, and female head of household populations. In addition, community goals are taken into account by basing future travel demand estimates, on local land use plans.

- Corridor and Community Impact Assessment - Corridor-level analyses are conducted, which assess the possible social and community impacts of alternative facility alignments based on neighborhood factors such as noise, air quality and land use. Community impacts of transportation facilities are further analyzed by assessing air quality effects through the emissions analysis of plan alternatives, as well as conducting a federally required air quality conformity analysis of the RTP. In addition, the process for annually updating the Regional Transportation Improvement Program includes project air quality scores, which reflect the potential community impacts of the projects.

Establishment of a Complete Transportation System for the Region

The RTP calls for major investments in all elements of the regional transportation system over the next several decades. It is critical that these expenditures result in a complete and integrated transportation network for the region. The MAG planning process responds directly to this need by conducting transportation planning at the system level, giving priority to segments that can lead to a complete transportation system as quickly as possible, and maintaining a life cycle programming process for all the major modes.

- System Level Planning Approach - The regional planning effort is conducted at the system level, taking into account all transportation modes in all parts of the MAG geographic area. This systems level approach is applied in identifying and analyzing alternatives, as well as specifying the final RTP. In this way, the complete transportation needs of the region, as a whole, are identified and addressed in the planning process.
- Project Development Process and Project Readiness - The implementation of regional transportation projects requires a complex development process. This process involves extensive corridor assessments, environmental studies, and engineering concept analyses. This is followed by right-of-way acquisition and final design work, before actual construction may begin. For a variety of reasons, certain projects may progress through this process more rapidly than others. By moving forward, where possible, on those projects with the highest level of readiness for construction, important transportation improvements can be delivered as quickly as possible.
- Progress on Multiple Projects - Major needs for transportation improvements exist throughout the MAG area. The scheduling of projects is aimed at proceeding with improvements to the transportation network throughout the planning period in all areas of the region. This will lead toward a complete and functioning regional transportation system that benefits all parts of the MAG area.
- Revenues, Expenditures and Life Cycle Programming - Cash flow patterns from revenue sources limit the amount of work that can be accomplished within a given period of time. Project expenditures need to be scheduled to accommodate these cash flows. Life cycle programs have been established that take these conditions into account and

implement the projects in the RTP for the major transportation modes: freeways/highways, arterial streets, and transit. The life cycle programs provide a budget process that ensures that the estimated cost of the program of improvements does not exceed the total amount of revenues available. This ensures that a complete transportation system for the region will be developed within available revenues.

As part of the life cycle programming process, consideration is given to bonding a portion of cash flows to implement projects that provide critical connections earlier than might otherwise be possible. This has to be weighed against the reduction in total revenues available for constructing projects, which results from interest costs.

Construction of Projects to Serve Regional Transportation Needs

The resources to implement the RTP are drawn from regional revenue sources and should address regional transportation needs. Transportation projects that serve broad regional needs should have a higher priority than those that primarily only serve a local area. At the same time, the nature of regional transportation needs varies across the MAG area, and the same type of transportation solution does not apply everywhere in the region. Enhancing the arterial network may represent the most pressing regional need in one part of the region, whereas adding new freeway corridors may be the key need in another; and expanding transit capacity may represent the best approach in yet another area. The process to develop the RTP recognized that this was the nature of regional transportation needs in the MAG area. As a result, the RTP is structured to respond to different types of needs in different parts of the MAG area.

Although the modal emphasis of the transportation improvements identified in the RTP varies from area to area within the region, the effects of these improvements can be assessed using common measures of system performance and regional mobility. Example measures that can be utilized for this purpose are described below. These criteria can be used to evaluate alternatives and establish implementation priorities. They can also be applied to evaluate potential adjustments to the priority of corridors, corridor segments, and other transportation projects and services.

- Facility/Service Performance Measures - Facility performance measures focus on the amount of travel on specific facilities, the usage of transportation services, the degree of congestion, and other indicators of the level of service as provided:
 - Accident rate per million miles of passenger travel.
 - Travel time between selected origins and destinations.
 - Peak period delay by facility type and geographic location.
 - Peak hour speed by facility type and geographic location.
 - Number of major intersections at level of service "E" or worse.
 - Miles of freeways with level of service "E" or worse during peak period.
 - Average Daily Traffic on freeways/highways and arterials

- Total transit ridership by route and transit mode.
- Cost effectiveness: trips served per dollar invested.
- **Mobility Measures** - Mobility measures focus on the availability of transportation facilities and services, as well as the range of service options as provided:
 - Percentage of persons within 30 minutes travel time of employment by mode.
 - Jobs and housing within one-quarter mile distance of transit service.
 - Percentage of workforce that can reach their workplace by transit within one hour with no more than one transfer.
 - Per Capita Vehicle Miles of Travel (VMT) by facility type and mode.
 - Households within one-quarter mile of transit.
 - Transit share of travel (by transit sub-mode).
 - Households within five miles of park-and-ride lots or major transit centers

Construction of Segments that Provide Connectivity with other Elements of the Regional Transportation System

The phasing of the development of the transportation network should be done in a logical sequence, so that maximum possible system continuity, connectivity and efficiency are maintained. In the RTP, Appropriately located transportation facilities around the region enhance the general mobility throughout the region. To the extent possible, facility construction and transportation service should be sequenced to result in a continuous and coherent network and to avoid gaps and isolated segments, bottlenecks and dead-end routes. Segments that allow for the connection of existing portions of the transportation system should be given a higher priority than segments that do not provide connectivity.

Other relevant criteria developed by the regional planning agency

As part of the RTP, a series of objectives for the regional transportation network were identified. Two key objectives were to achieve broad public support for the needed investments, and to develop a regionally balanced plan that provides geographic equity in the distribution of investments. Specific criteria related to these objectives are:

- Transportation decisions that result in effective and efficient use of public resources and strong public support.
- Geographic distribution of transportation investments.
- Inclusion of committed corridors.

CHAPTER THREE

REGIONAL DEVELOPMENT OVERVIEW

The MAG Metropolitan Planning Organization (MPO) is geographically situated in the south-central region of the State of Arizona, and encompasses an area of 10,654 square miles. The MAG MPO contains 27 incorporated cities and towns, three Native American Indian Communities and a large area of unincorporated land in both Maricopa County and Pinal County. The region is located in the Sonoran Desert with elevations generally ranging from 500 to 2,500 feet above sea level. In 2010, the MAG MPO contained approximately 63 percent of the population in Arizona, as well as nine of the ten cities in Arizona with populations greater than 100,000 people.

According to data compiled by MAG in 2016, 29.4 percent of all land within the MAG MPO was under private ownership; 26.9 percent of lands were under the direct ownership of the Bureau of Land Management; 10.7 percent of lands were under the jurisdiction of the U.S. Military; 12.4 percent of lands were held within state trust; 10.4 percent of lands were under the direct ownership of the U.S Forest Service; 8 percent of land was comprised of Indian Communities; and the remaining 2.1 percent of lands were classified as “other” public lands.

Census 2010 and 2015 Population Update

In April 2010 the US Census Bureau conducted Census 2010. The Census found an April 1, 2010 population for the MAG MPO at 4,055,276 people. This represented an increase of 864,874 people, or about 28 percent since Census 2000 found an April 1, 2000 population of 3,160,402. The Census also determined the population for each city or town within the MAG MPO. MAG has updated the population count to provide population estimates that correspond to a mid-2015 timeframe. Table 3-1 lists the population numbers by jurisdiction for April 1, 2000 and July 1, 2015. During this time period, many of the fastest-growing cities in the MAG MPO showed percentage increases greater than 15 percent. The Town of Queen Creek had the highest percentage increase of 28.9 percent, followed by the City of Buckeye (20.2%), City of Goodyear (19.2%), and the Town of Gilbert (16.7%) The City of Phoenix had the largest net increase in population, with the addition of 80,381 residents.

Population Forecasting

For the past several decades, the MAG MPO Region has been one of the fastest growing metropolitan areas in the United States, among those with populations of more than one million people. In April of 2010, the MAG MPO had a resident population of 4,055,276. This was a population growth of approximately 28 percent, or 864,874 people in the decade from 2000 to 2010. MAG and Central Arizona Governments (CAG) Socioeconomic Projections indicate that this high growth rate is expected to continue.

**TABLE 3-1
TOTAL RESIDENT POPULATION BY JURISDICTION
CENSUS 2010 AND JULY 1, 2015 UPDATE**

Jurisdiction	Total Population			Percent Growth		Share	
	April 1, 2010	July 1, 2015	Change	Overall	Annual	Share of Growth	Share of Region
Apache Junction	35,800	38,400	2,600	7.25%	1.45%	0.92%	0.89%
Avondale	76,200	78,900	2,700	3.47%	0.69%	0.94%	1.82%
Buckeye	50,900	61,200	10,300	20.24%	4.05%	3.66%	1.41%
Carefree	3,400	3,500	100	4.82%	0.96%	0.06%	0.08%
Cave Creek	5,000	5,400	400	8.26%	1.65%	0.15%	0.13%
Chandler	236,300	255,100	18,800	7.93%	1.59%	6.66%	5.88%
El Mirage	31,800	33,300	1,500	4.85%	0.97%	0.55%	0.77%
Florence	25,500	26,400	900	3.42%	0.68%	0.31%	0.61%
Fort McDowell	1,000	1,000	0	2.88%	0.58%	0.01%	0.02%
Fountain Hills	22,500	23,300	800	3.81%	0.76%	0.30%	0.54%
Gila Bend	1,900	2,000	100	2.86%	0.57%	0.02%	0.05%
Gila River	11,700	11,900	200	1.60%	0.32%	0.07%	0.27%
Gilbert	208,400	242,900	34,500	16.56%	3.31%	12.25%	5.60%
Glendale	226,700	234,800	8,100	3.59%	0.72%	2.89%	5.42%
Goodyear	65,300	77,800	12,500	19.15%	3.83%	4.44%	1.79%
Guadalupe	5,500	6,100	600	11.08%	2.22%	0.22%	0.14%
Litchfield Park	5,500	6,000	500	9.92%	1.98%	0.19%	0.14%
Maricopa	43,500	48,400	4,900	11.25%	2.25%	1.74%	1.12%
Mesa	439,000	460,900	21,900	4.99%	1.00%	7.78%	10.63%
Paradise Valley	12,800	13,700	900	6.65%	1.33%	0.30%	0.32%
Peoria	154,100	167,500	13,400	8.75%	1.75%	4.79%	3.86%
Phoenix	1,447,100	1,527,500	80,400	5.55%	1.11%	28.54%	35.22%
Queen Creek	26,400	34,000	7,600	28.85%	5.77%	2.70%	0.78%
Salt River	6,300	6,600	300	5.60%	1.12%	0.12%	0.15%
Scottsdale	217,400	231,200	13,800	6.36%	1.27%	4.91%	5.33%
Surprise	117,500	125,600	8,100	6.90%	1.38%	2.88%	2.90%
Tempe	161,700	172,000	10,300	6.37%	1.27%	3.66%	3.97%
Tolleson	6,500	6,800	300	4.46%	0.89%	0.10%	0.16%
Wickenburg	6,400	6,700	300	4.68%	0.94%	0.11%	0.15%
Youngtown	6,200	6,500	300	5.05%	1.01%	0.11%	0.15%
Unincorp Maricopa Co	272,600	283,200	10,600	3.89%	0.78%	3.76%	6.53%
Unincorp Pinal Co	124,400	138,100	13,700	11.03%	2.21%	4.87%	3.19%
Total MAG MPO	4,055,300	4,336,700	281,400	6.94%	1.39%	100.00%	100.00%

Sources: U.S. Bureau of the Census, Census 2010, Arizona Department of Administration, Maricopa Association of Governments, Central Arizona Governments; rounded to the nearest 100

Population Forecasting Process

According to Executive Order 2011-04, the Arizona Department of Administration (ADOA) is responsible for preparing an official set of population projections for Arizona and each of its counties. ADOA has prepared a set of residential population projections for Maricopa County and Pinal County consistent with the 2010 Census. MAG is responsible for developing a set of sub-regional projections for communities within Maricopa County, and CAG is responsible for developing a set of sub-regional projections for communities within Pinal County. These projection figures, which take into account recent population and employment information, were produced in early 2016 and were approved for Maricopa County by the MAG Regional Council on June 22, 2016 and for Pinal County by the CAG Regional Council on June 17, 2016.

Population Projections

As calculated by the 2016 MAG and CAG Socioeconomic Projections, by 2040, the MAG MPO is projected to increase its population by more than 51 percent over the 2015 base population, with an anticipated total of 6.5 million people. This means that the region will experience a growth of nearly 88,000 people annually through 2040.

Table 3-2 shows the total resident population for Municipal Planning Areas (MPAs) from July 1, 2015, to July 1, 2040. Total resident population includes the resident population in households, and the resident population in group quarters (dorms, nursing homes, prisons and military establishments). Over the 25-year period (2015-2040), six MPAs are projected to grow by more than 100,000 persons: Phoenix, Buckeye, Surprise, Mesa, Peoria, and Goodyear. Another seven MPAs are projected to experience population growth greater than 50,000 persons: Glendale, Gilbert, Florence, Scottsdale, Maricopa, Chandler, and Tempe.

Currently, there are six MPAs within the MAG Region with populations of over 200,000 persons: Phoenix, Mesa, Glendale, Chandler, Scottsdale, and Gilbert. By 2020, Peoria will surpass 200,000 in population. By 2040, the largest Municipal Planning Area, Phoenix, will contain over two million persons, followed by Mesa at over 660,000, Surprise at over 362,000, Chandler at over 327,000, and Glendale at over 323,000. Figures 3-1 and 3-2 are maps that display the population concentrations for 2010 and 2040. By definition, the population concentration measures the average population within a one-mile radius. This analysis helps in smoothing out differences in geographies and in identifying underlying spatial patterns in the data. The pattern of population concentrations illustrates the shape of urban form as it is projected to evolve according to local land use plans and densities.

Employment Forecasting

By 2040 the MAG MPO is projected to increase its reported 2015 employment total by nearly fifty percent. This means that employment within the region will grow by an average of more than 40,000 jobs per year through 2040. It should be noted that the employment projections are by place of work, and not by place of residence as reported by the Census Bureau.

Community Job Centers

TABLE 3-2
TOTAL RESIDENT POPULATION BY MPA, 2016 MAG & CAG PROJECTIONS
JULY 1, 2015 and PROJECTIONS JULY 1, 2020 to JULY 1, 2040

MPA	Total Resident Population 2015	Total Resident Population 2020	Total Resident Population 2030	Total Resident Population 2040
Apache Junction	55,100	58,100	68,500	95,900
Avondale	80,500	86,800	95,600	112,400
Buckeye	72,900	87,700	147,600	310,800
Carefree	3,600	4,100	5,000	5,300
Cave Creek	5,600	6,400	7,400	8,800
Chandler	263,100	286,000	312,300	327,700
El Mirage	33,300	35,300	35,700	38,200
Florence	71,200	82,300	106,000	134,300
Fort McDowell	1,000	1,000	1,000	1,100
Fountain Hills	23,300	26,000	28,300	30,400
Gila Bend	2,400	2,900	3,500	4,500
Gila River	11,900	12,100	12,200	12,200
Gilbert	246,300	260,800	286,200	299,800
Glendale	262,600	282,800	305,600	323,900
Goodyear	80,200	98,600	154,200	207,400
Guadalupe	6,100	6,500	6,700	6,800
Litchfield Park	12,600	14,000	14,200	15,000
Maricopa	56,500	74,700	102,600	127,400
Mesa	505,200	555,000	620,100	661,200
Paradise Valley	13,700	14,200	14,900	15,100
Peoria *1	177,400	200,900	271,200	309,800
Phoenix	1,579,700	1,731,300	1,988,800	2,160,200
Queen Creek	45,500	57,500	83,000	92,700
Salt River	6,700	6,800	7,100	7,600
Scottsdale	231,300	255,000	290,800	308,700
Surprise	136,400	148,000	239,000	362,200
Tempe	172,100	188,100	222,800	255,500
Tolleson	6,800	7,600	10,800	14,000
Wickenburg *1	9,500	12,700	23,000	28,100
Youngtown	6,500	6,800	7,100	7,600
Unincorp Maricopa Co	96,200	105,100	115,000	141,800
Unincorp Pinal Co	60,700	64,300	75,500	97,800
TOTAL	4,335,900	4,779,400	5,661,700	6,524,200

Notes: Rounded to the nearest 100

*1 Maricopa County portion only.

Total resident population includes resident population in households and resident population in group quarters

For complete notation on this series please refer to Caveats for Socioeconomic Projections 2016.

Sources: Maricopa Association of Governments, Central Arizona Governments

2040 Regional Transportation Plan

Fig. 3-1

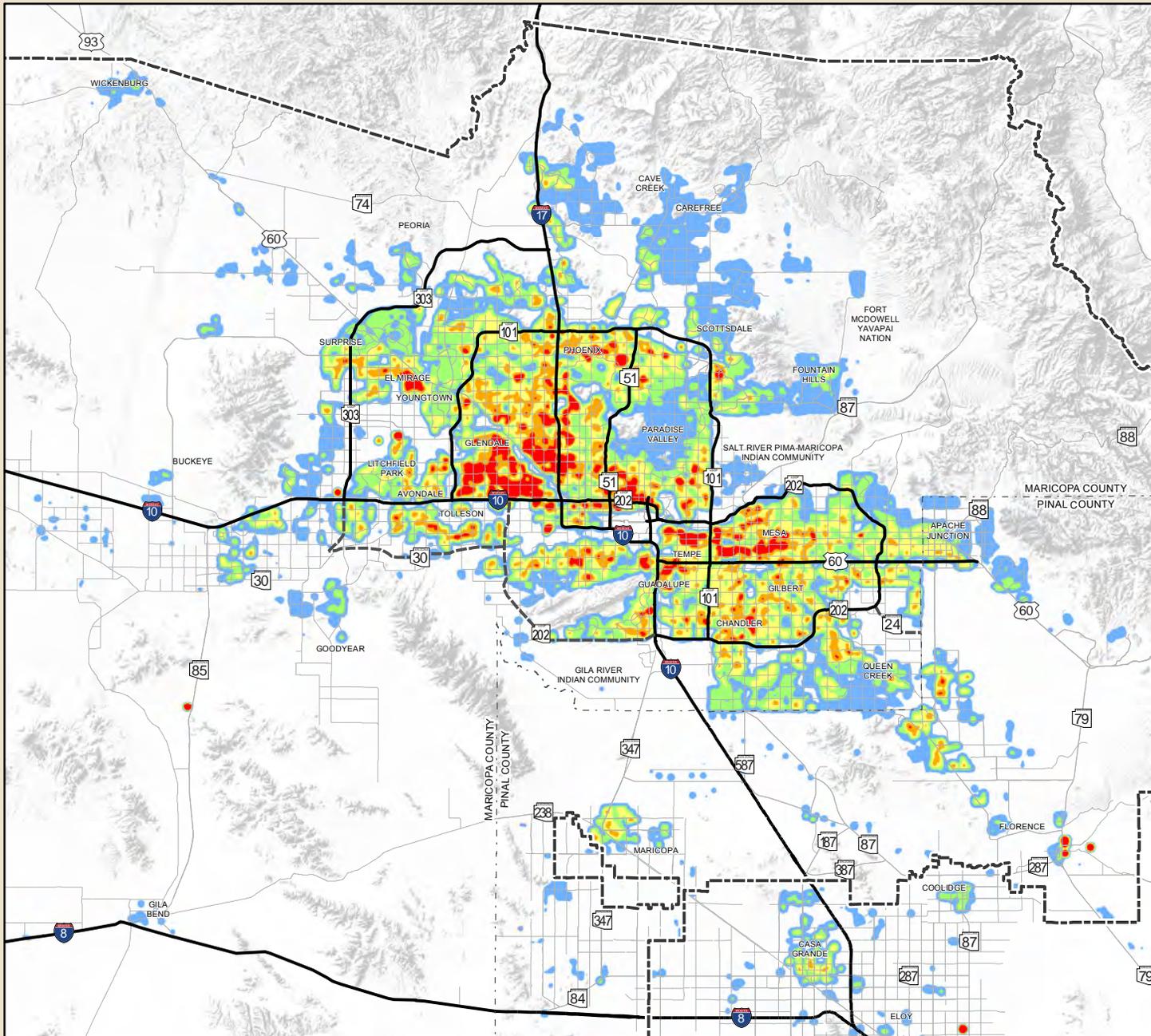


2015 Population Concentration

Persons per Square Mile

- Less than 250
- 250 to 2000
- 2000 to 4000
- 4000 to 6000
- 6000 to 8000
- More than 8000

- Metropolitan Planning Area Boundary
- County Boundary
- Freeway
- Planned Freeway
- Major Roads



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2040 Regional Transportation Plan

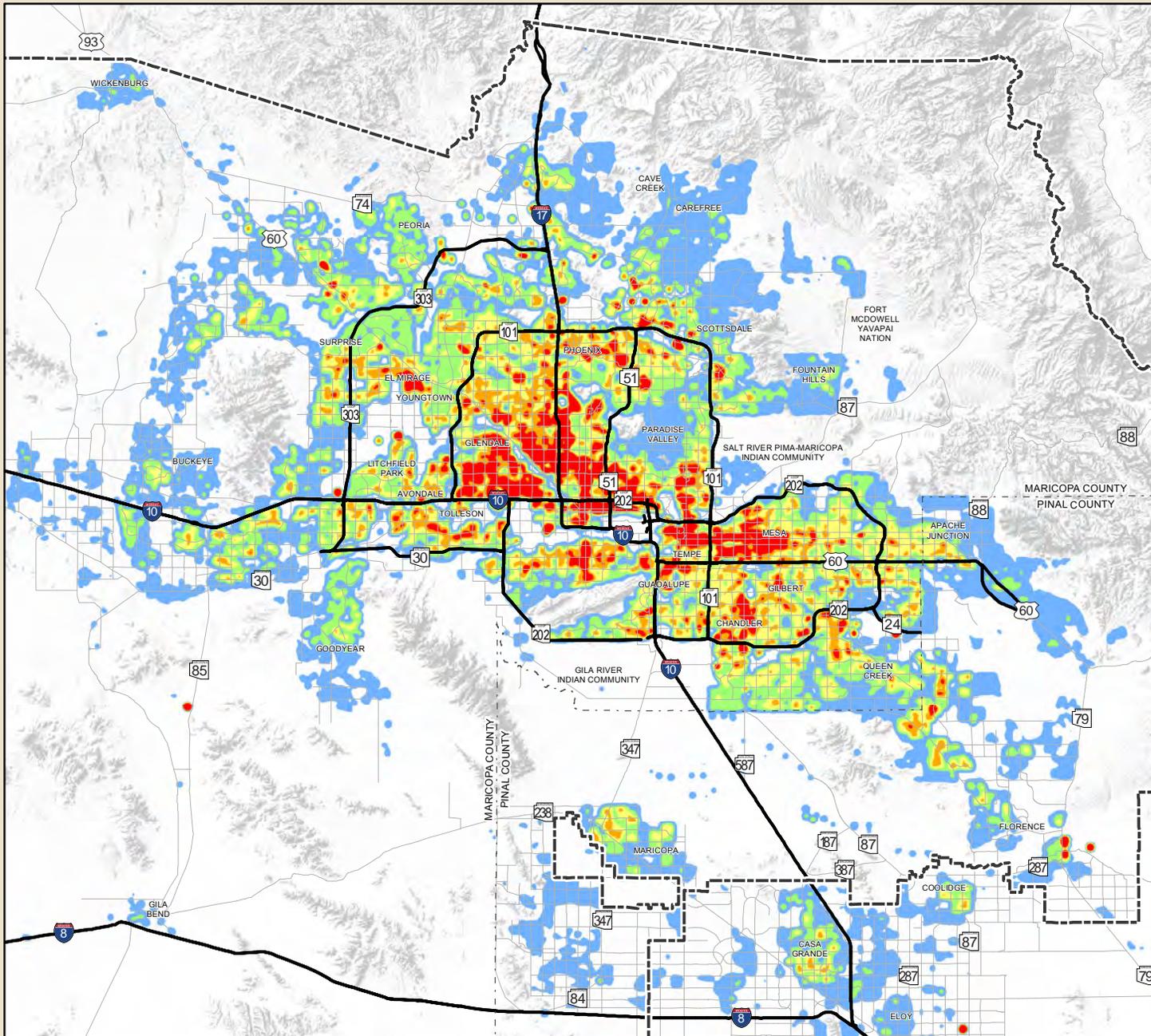
Fig. 3-2



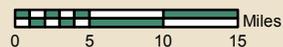
2040 Population Concentration

Persons per Square Mile

- Less than 250
- 251 to 2,000
- 2,001 to 4,000
- 4,001 to 6,000
- 6,001 to 8,000
- More than 8,000
- Metropolitan Planning Area Boundary
- County Boundary
- Freeways
- Major Roads



While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.



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Source: MAG, CAG Projections 2012

Community Job Centers are areas that are comprised of an identifiable concentration of employment activities and land uses that are entirely, or predominantly of a non-residential nature. Delineated Community Job Centers consist of concentrated, or mixed, areas of industrial, office, retail, airport, and government land uses and employment activities.

Job center information assists in the transportation planning process by providing valuable information on each of the following items: employment types at each job center; demographic data; existing and anticipated employment totals; floor area and total square footage of locations; existing acreage; and the total build out of each identified job center. Due to their significant commercial and industrial base, many of these areas have a tendency to generate a higher level of vehicular trips and trips associated with freight-related activities.

In 2014, MAG coordinated efforts with municipal planning and economic development directors throughout the region in an attempt to identify and effectively inventory existing and future job centers. A total of 160 job centers within the MAG MPO were identified. These job centers include just over 23,000 employers, or nearly 53 percent of the employers in the MAG MPO with five or more employees. Almost 1 million employees work in these job centers, which accounts for 66 percent of the total number of employees in the Region.

Job center information assists in the transportation planning process by providing valuable information on each of the following items: employment types at each job center; demographic data; existing and anticipated employment totals; floor area and total square footage of locations; existing acreage; and the total build out of each identified job center. Due to their significant commercial and industrial base, many of these areas have a tendency to generate a higher level of vehicular trips and trips associated with freight-related activities.

Employment Forecasts

Table 3-3 displays the projected regional employment totals by MPA as calculated for the 2016 MAG and CAG Socioeconomic Projections, which is reported by total employment from July 1, 2015, to July 1, 2040. Total employment categories also include individuals that work at home, and all construction employment. Since construction employment typically follows development, the projected employment numbers may in fact show declines in future years for certain MPAs when the MPA growth has slowed down.

Regional Land Use Patterns

MAG maintains Geographic Information System regional databases of existing and future land uses for all MAG Member Agencies. The existing land use data set depicts the current status of land as it is built presently. The future land use data set is created using the current adopted General Plans and known developments from all MAG Member Agencies. Since these data sets are instrumental in developing socioeconomic projections, the data sets are updated on a regular basis. Also, these data sets are reviewed by MAG Member Agency staff to check for any errors or omissions.

TABLE 3-3
TOTAL EMPLOYMENT BY MPA, 2013 MAG & CAG PROJECTIONS
JULY 1, 2010 and PROJECTIONS JULY 1, 2020 to JULY 1, 2035

MPA	Total Employment 2015	Total Employment 2020	Total Employment 2030	Total Employment 2040
Apache Junction	10,000	11,300	17,000	26,500
Avondale	17,700	22,100	25,400	33,500
Buckeye	13,700	18,900	35,500	78,300
Carefree	1,800	2,000	2,300	2,600
Cave Creek	2,300	2,600	3,200	3,700
Chandler	132,400	150,700	176,200	193,700
El Mirage	4,300	5,000	6,400	7,900
Florence	12,200	14,400	20,700	30,600
Fountain Hills	7,800	8,500	9,500	10,600
Fort McDowell	1,900	1,900	2,000	2,100
Gila Bend	900	1,100	1,900	2,300
Gila River	9,700	12,100	17,100	18,400
Gilbert	91,900	101,600	126,100	143,800
Glendale	92,700	110,700	137,000	178,200
Goodyear	31,500	40,300	54,600	75,800
Guadalupe	1,200	1,400	1,500	1,500
Litchfield Park	2,400	2,500	2,800	2,900
Maricopa	6,100	7,500	14,900	26,400
Mesa	175,400	202,600	226,600	318,200
Paradise Valley	5,300	5,400	6,200	6,700
Peoria*1	49,500	55,700	72,600	89,400
Phoenix	816,100	910,500	990,900	1,069,800
Queen Creek	9,600	12,200	16,400	20,600
Salt River	17,800	20,300	26,700	32,900
Scottsdale	184,500	199,000	224,000	235,400
Surprise	26,500	32,200	55,300	87,900
Tempe	184,000	199,300	222,300	231,700
Tolleson	14,000	15,500	17,500	18,400
Wickenburg*1	4,100	4,400	4,900	5,400
Youngtown	1,800	2,100	2,200	2,300
Unincorp Maricopa Co	25,600	282,00	30,200	33,800
Unincorp Pinal Co	5,200	6,100	9,100	13,400
TOTAL	1,959,900	2,208,100	2,559,000	3,004,700

Notes: Rounded to the nearest 100

*1 Maricopa County portion only.

Employment projections may show declines in future years because construction employment follows development.

For complete notation on this series please refer to Caveats for Socioeconomic Projections 2016.

Sources: Maricopa Association of Governments, Central Arizona Governments

Table 3-4 displays the existing and future land use data for the MAG MPO. MAG also tracks known development projects in the MAG MPO. Currently, the MAG development database has 3,685 known development projects that have not yet reached the completion stage. These projects include active, entitled and conceptual developments. These developments cover over 659,000 acres and could add approximately 1.1 million housing units to the MAG MPO.

**TABLE 3-4
MAG MPO REGION EXISTING AND FUTURE LAND USE**

Land Use	Existing Land Use (Sq. Mi.)	% Developed Land (Existing)	Future Land Use (Sq. Mi.)	% Developed Land (Future)
Residential	802	7.5%	3,861	36.2%
Commercial	59	0.6%	124	1.2%
Industrial	55	0.5%	107	1.0%
Office	14	0.1%	20	0.2%
Other/Public/Transportation	357	3.4%	527	4.9%
Open Space	5,176	48.6%	5,571	52.3%
Mixed Use	0.04	0.0%	381	3.6%
Vacant	3,599	33.8%	0	0.0%
Agriculture	592	5.6%	63	0.6%

Note: This analysis is for the MAG MPO only and does not include the Yavapai County parts of Peoria and Wickenburg.

Source: Maricopa Association of Governments

Consistency with State and Local Planned Growth Patterns

The regional transportation planning process maintains consistency with state and local planned growth patterns by: (1) incorporating them into the socioeconomic forecasting process, which provides the basis for travel demand modeling, and (2) taking them into account directly in subregional and corridor transportation studies.

Socioeconomic Forecasting

The primary purpose of the population and socioeconomic projections developed by MAG is for input into the MAG transportation and air quality models. However, they are also used for a wide variety of regional planning programs such as human services, regional development and by MAG member agencies in developing their plans. Important objectives of the modeling process are to: (1) establish a linkage between transportation, land use and air quality models, (2) test various policy alternatives and land use scenarios, and (3) incorporate a Geographic Information System (GIS) into the process for better data sharing and review with member agencies and for maintaining an innovative approach to land use planning. The process for accomplishing each of these objectives takes into account state and local planned growth and economic development patterns.

The land use, population, and socioeconomic modeling process is based on a three tier modeling approach. The first tier is a demographic model, specifically a cohort-component model, which is used to produce county level control totals of population by characteristics such as sex, age, and race. The model attempts to take into account such factors as the state's interaction with the rest of the country, long term trends affecting birth, death, and migration rates, and short-term economic conditions. The demographic model is operated by the Arizona State Demographer within the Arizona Department of Administration (ADOA) and projects population out to 2050.

The second and third tier models are heavily customized versions of the UrbanSim modeling system, which is used worldwide by many organizations conducting socioeconomic modeling. The second tier involves a set of models using the county level population control totals, matching a set of employment control totals to them, and allocating the population and employment to sub-regions or "market areas" defined within the county. This allocation is based on regional trends in home building, employment, and transportation infrastructure. The results of the allocation by market area are used by the third tier models as refined control totals at the smaller, market area geography. The third tier models are a set of sophisticated regression and multinomial logit "choice" models that predict the location behavior of individual household and employment records to built space records that are tied to neighborhood level polygons. The third tier models also simulate the demand for and supply of built space by the household and employment occupants. The models will build and redevelop land polygons as predicted by the choice models while respecting the local development plans, land use plans, and policies of MAG member agencies. The results of the third tier models are able to be aggregated to traffic analysis zones (along with many other geographies) to be used in other modeling, planning, or analysis as needed.

The existing land use coverage is important to the projections process because it establishes areas that have already been developed or are not suitable for further development. The developed areas become ineligible for the allocation of population and employment growth, except where the area is planned for redevelopment. Non-developable areas include open space or environmentally sensitive lands, or areas where the relief makes construction infeasible. The existing land use database is digitized based on input from MAG member agencies and then circulated to the agencies for review and verification. Changes are made based on comments provided.

The future land use coverage is also important in the forecasting process. The future land use database is based upon the plans of MAG member agencies and identifies both the type of development that is anticipated to occur in the future and the density of that development. The Future Plan Land Use database also allows for the direct comparison between existing and planned land use. The difference between the existing and planned land use databases helps determine where development may take place.

Subregional and Corridor Transportation Studies

Area and corridor transportation planning studies are the foundation of the MAG regional transportation planning process. These studies assess transportation conditions within a

specified geographic area or modal facility system, and evaluate potential new facilities and services, as well as improvements to existing elements. Travel demand and facility interactions over the entire region are recognized as part of this process, to ensure that compatible system improvements are being proposed.

One of the major steps in the area/corridor study process covers the inventory of land use and economic development factors. Data on existing and planned future conditions is assembled through consultation with state and local agencies. This process also includes the identification of potential land use and economic issues affecting the area or corridor under study. The information on existing and potential future conditions is a major input for identification of alternatives. Land use and economic development data and issues are also utilized as input for the development of evaluation criteria and the assessment of alternatives. This evaluation process provides insights regarding the possible land use and economic effects and helps take these factors into account in future decisions on proposed new transportation corridors or improvements to existing facilities and services.

MAG Economic Development Program

The 2008-2009 economic downturn caused a significant decline in the *Maricopa County Transportation Excise Tax* (half-cent sales tax), which is a major source of funding for the Regional Transportation Plan (RTP). This resulted in the need to reprogram a broad range of freeway, transit and arterial street projects in the RTP. The reduction in sales tax funds, plus the fact that the downturn also resulted in nearly 64,000 pending and foreclosed homes in the region, led MAG to form the Economic Development Committee (EDC) in October of 2010. This action was also consistent with the federal requirement to tie economic development into the transportation planning process.

The role of the Economic Development Committee is to develop opportunity-specific and action-oriented initiatives that foster and advance infrastructure in the MAG region, especially transportation infrastructure that would further economic development opportunities. This effort is conducted in concert with the MAP-21 (and more recently FAST Act) federal transportation legislation that supports the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency. The EDC consists of 35 members appointed by the MAG Regional Council and includes 20 MAG member agency elected officials and 15 business representatives. MAG member agency representatives include the Central City, Maricopa and Pinal Counties, eight West Valley and eight East Valley representatives, and one representative from the Arizona Department of Transportation.

Goals of the EDC focus on increasing job opportunities, strengthening Arizona's capability to compete in the global economy, and planning for the development and improvement in Arizona's infrastructure to make the region more economically competitive. Specific objectives recently have included efforts to enhance communications and work cooperatively with the state and economic development agencies, such as the Greater Phoenix Economic Development Council, the Arizona Commerce Authority, and the Arizona Mexico Commission.

MAG continues to move forward with a Shopping and Tourism Initiative to extend the border zone to include all of Arizona. A resolution of support to extend the border zone of the Border Crossing Card from its current 75-mile zone to the entire state, and to streamline the Mexican visa process at the land ports of entry, is currently being supported by regional planning agencies throughout Arizona. This would allow pre-vetted Mexican travelers who hold a border crossing card to travel throughout the entire state of Arizona. As part of this project, MAG requested that the University of Arizona conduct an economic impact analysis of Mexican spending resulting from extending the border zone. The report concluded that extending the zone statewide could generate up to \$181 million in additional estimated spending and 2,179 additional jobs in 2016. MAG received letters of support for the Shopping and Tourism Initiative from the Arizona Chamber of Commerce, as well as two bipartisan letters of support from a majority of the Arizona Congressional Delegation. These letters were sent to the Department of Homeland Security requesting the rule making change.

MAG also continues to work with Arizona border towns, such as the Cities of Nogales and San Luis, to assist in improving the border crossings to be more competitive and to improve the traffic flow and rail crossings at the border. Arizona greatly benefits from border traffic with approximately \$20 billion in two-way trade flow through the Nogales Port of Entry alone. In addition, MAG and Arizona's other regional planning agencies support working cooperatively to jointly advocate to the Arizona Department of Transportation, the Federal Highway Administration, the State Transportation Board, Arizona's Congressional Delegation, the Arizona Legislature, and other public and private stakeholders, the exploration of additional funding, creative financing, and additional statutory flexibility to advance the construction of the preferred build alternative for State Route (SR)-189 into the ADOT Five-Year Transportation Facilities Construction Program, while holding harmless those projects currently programmed. Mexico is the largest bilateral trading partner with Arizona, accounting for an estimated \$30 million in two-way trade each day. State Route 189 serves as a bypass route for commercial truck traffic to and from Mexico and provides a critical international commerce connection from the Mariposa Port of Entry (POE) to Interstate 19. The regional planning agencies in Arizona believe that to effectively enhance and facilitate the flow of international commerce, it is necessary to advance the improvements to SR-189 leading to and from the Mariposa POE to support import and export trade.

MAG will also be finalizing its efforts on The Strategic Highway Research Program Expediting Project Delivery Grant. This grant was awarded by the Federal Highway Administration (FHWA) to MAG on behalf of the Intermountain West (IMW) region. The grant enables MAG to work with other agencies in the IMW to conduct outreach and develop strategies for information sharing, with the ultimate goal of expediting key global transportation projects in the IMW. The purpose of the grant is to work with other key agencies in the IMW region to conduct outreach to transportation management areas and state departments of transportation in the Intermountain West to identify needs and potential gaps in transportation and data resources. Metropolitan planning organizations and department of transportation agencies across the IMW have been participating in webinars to showcase agencies' data tools. A regional Story Map was created to showcase this data. A final report and risk register will be submitted to FHWA in September 2016.

Through the Economic Development program, MAG continues its Mexico initiatives, including the Ari-Son Megaregion, an effort to build a globally competitive “megaregion.” The Ari-Son Megaregion Council was formally recognized as an affiliate group of the League of Arizona Cities and Towns at its annual conference in August 2016. MAG staff worked collaboratively with representatives from Sonora’s Secretary of the Economy and Sonora Arizona Commission to invite elected officials, economic development directors, and sister city representatives from 20 sister cities located in Arizona and Sonora to the annual Arizona League conference. Events included Ari-Son-related meetings, including a Sister Cities Brainstorming and Ari-Son Megaregion Council meeting. At the Council meeting, the Ari-Son Megaregion Council unanimously passed a letter of support to extend the Tourism and Shopping zone to the entire State of Arizona.

CHAPTER FOUR

PUBLIC INVOLVEMENT

The transportation planning process for the development of the Regional Transportation Plan (RTP) benefits greatly by incorporating broad-based public input, which is received as the result of an extensive public involvement process. During the comprehensive update of the RTP in 2002 and 2003, MAG talked to thousands of people in an effort to identify public issues and concerns regarding future transportation needs. As part of this process, MAG held 150 public input opportunities, 173 stakeholder opportunities, and 117 agency meetings to solicit input from the public, community groups, business associations, transportation stakeholders, elected and appointed leaders, city planners, municipal technical staffs, transportation councils, and the region's Native American Indian Communities. In addition to these efforts, MAG pursues its continuing public involvement process throughout the year, which is described below.

Development of the Public Participation Plan

In response to requirements included in the federal transportation legislation known as the Safe, Accountable, Flexible, Efficient Transportation Equity Act: a Legacy for Users (SAFETEA-LU), in 2006 MAG adopted a new Public Participation Plan as outlined in Section 450.31: Interested parties, participation, and consultation. MAG's previous public involvement process was adopted in 1994 and enhanced in 1998, and was pivotal in obtaining ongoing input to the regional transportation planning process.

The Public Participation Plan was developed in consultation with all interested parties, and a public comment period of 45 days was provided for review before adoption. The approach to the public involvement process laid out in the MAG Public Participation Plan is described below. On May 28, 2014, the MAG Regional Council approved an update to the Public Participation Plan to reflect advancements in the public participation process and updates to plan development timelines, and included language required under new federal transportation legislation known as Moving Ahead for Progress in the 21st Century Act (MAP-21). This plan also conforms to guidelines delineated in the most recent transportation legislation, Fixing America's Surface Transportation (FAST) Act. MAG continually reviews the plan to ensure it remains viable for the public and compliant with all federal regulations. Any changes made will follow the federal protocols.

As required under federal guidelines, the purpose of the MAG Public Participation Plan is to "define a process for providing citizens, affected public agencies, representatives of public transportation employees, freight shippers, providers of freight transportation services, private providers of transportation, representatives of users of public transportation, representatives of users of pedestrian walkways and bicycle transportation facilities, representatives of the disabled, agencies or entities responsible for safety/security operations, providers of non-emergency transportation services receiving financial assistance from a source other than Title

49, United States Code (U.S.C), Chapter 53, and other interested parties with reasonable opportunities to be involved in the transportation metropolitan planning process.”

MAG Public Involvement Process

In developing the MAG Regional Transportation Plan (RTP or Plan) and the Transportation Improvement Program (TIP), MAG’s public involvement process is divided into four phases: Early Phase, Mid-Phase, Final Phase and Continuous Involvement. The FY 2017 public input process is discussed later in this chapter.

Early Phase: The Early Phase ensures early involvement of the public in the initial development of the TIP and Plan. During this phase, residents are encouraged to provide input with specific reference to upcoming issues and work topics. Events during this phase vary and may include meetings, open houses, information booths at special events, small group presentations, and regular comment opportunities at MAG meetings. Comments received are summarized and presented to MAG policy committees for review and consideration in the form of an Early Phase Input Opportunity Report. Because projects are not yet programmed, in many ways the Early Phase represents the best opportunity for members of the public to suggest projects for inclusion in the TIP or Plan.

Mid-Phase: This phase allows for input on the updated draft TIP and Plan. Various public outreach methods are used during this phase, including a transportation public hearing hosted by MAG, which may include representatives from the Arizona Department of Transportation (ADOT), Regional Public Transportation Authority (Valley Metro), Valley Metro Rail (METRO) and the City of Phoenix Public Transit Department. The hearing is advertised with a formal public notice and draft reports are available for 30 days for public review. Comments are documented by a court reporter and summarized in the Mid-Phase Input Opportunity Report, along with a written response to all comments. The report is provided to MAG policy committees for review and consideration prior to action on the TIP or Plan.

Final Phase: The Final Phase provides an opportunity for final comment on the TIP, Plan, and Air Quality Conformity Analysis. Several forums are used to obtain input during this phase, including a formal public hearing. The Final Phase includes a transportation public hearing on the final drafts of the updates to the TIP and Plan. The hearing is advertised with a formal public notice and draft reports are available for 30 days for public review. Comments are documented by a court reporter and summarized in the Final Phase Input Opportunity Report, along with a written response to all comments. The report is provided to MAG policy committees for review and consideration prior to action on the TIP or Plan.

Continuous Involvement: MAG continually seeks public input and comment beyond the three structured phases above. Outreach is conducted throughout the annual update process. It includes activities such as providing presentations to community and civic groups, participating in special events, hosting booths at community events, distributing press releases and newsletters, and coordinating with partnering agencies such as the Arizona Department of

Transportation (ADOT), Regional Public Transportation Authority (Valley Metro), Valley Metro Rail (METRO) and the City of Phoenix Public Transit Department.

Additional activities may include:

- Coordination with the Citizens Transportation Oversight Committee (CTOC): In 1996, MAG expanded membership of the Regional Council to include the chair of CTOC as an ex-officio member on matters relating to the Regional Freeway System. Providing CTOC membership on the Regional Council provides citizen representation and ensures citizen involvement on important matters relating to the MAG freeway plan.
- Public Presentations: MAG staff provides speakers upon request to make presentations to community and civic groups.
- Communities of Concern: Through its public involvement process, MAG seeks to provide Title VI communities and Environmental Justice populations—including 11 protected classes—full and fair participation in the transportation decision-making process. MAG recognizes that environmental justice is more than a set of legal and regulatory obligations. Following environmental justice principles and procedures will improve all levels of transportation decision-making. In addition, through Valley Metro and the MAG Elderly and Persons with Disabilities Transportation Program Committee, the needs of elderly and people with disabilities are addressed under the Human Services Coordination Transportation Plan. In addition, MAG seeks and considers the needs of those traditionally underserved by existing transportation systems by collaborating with the human services planning staff at MAG, which plans for services for low-income, elderly and disabled populations. Additional information about MAG’s Title VI and Environmental Justice Program can be found in Chapter 5, or on the MAG website at www.azmag.gov.
- Open Meetings: MAG conducts meetings in accordance with open meeting laws. Meetings of technical committees, working groups, and policy committees are open to the public.
- Public Comment Opportunities: Citizens are provided opportunities to speak at all technical and policy committee meetings, including Regional Council. The first opportunity is during a Call to the Audience, in which members of the public can comment on items not on the agenda that fall under MAG’s jurisdiction, or on items that are on the agenda but are not scheduled for action. Citizens also are given an opportunity to comment on Consent Items, as well as on any Action Item. Citizens have three minutes to comment during each opportunity, but may exceed three minutes at the discretion of the Chair. MAG meetings are typically held at the MAG Offices, 302 N. First Avenue, Phoenix. For a comprehensive list of MAG meetings, please refer to the MAG website.

- MAG Website: MAG maintains a website that includes information about MAG, its planning activities, committee meetings, input opportunities, press releases, events, datasets and publications, as well as agendas and minutes for all policy committee meetings, proposal requests, employment notices, and electronic versions of MAG documents, including, plans, studies, and agenda-related materials and resources. The Internet address of the MAG website is www.azmaq.gov.
- Newsletters and Publications: MAG produces a number of communication materials, including electronic and printed newsletters. Newsletters report information of general interest on events and programs at MAG, as well as on specific items such as the RTP and the TIP. MAG produces a quarterly newsletter, MAGAZine, that summarizes MAG activities and includes a calendar of meetings and input opportunities.
- Press Releases: Press releases are prepared and distributed to local media in conjunction with periodic news events. All press releases are posted to the MAG website.
- Meeting Notices and Advertisements in Principal Newspapers: All formal public hearings and public involvement opportunities are announced with public notices and/or display advertisements in the largest circulation newspaper and in minority-oriented newspapers. Where appropriate, information is provided in a bilingual format.
- Direct Mailing: MAG maintains a current mailing list that includes interested citizens, affected transportation agencies and other public agencies, representatives of environmental and resource agencies, private providers of transportation, advocates for Title VI and Environmental Justice populations, and representatives of community groups with an interest in transportation. This mailing list is used to announce meetings, distribute newsletters, and for other opportunities for public involvement. Interested individuals are added to the mailing list upon request.
- Staff Contacts: The name of an appropriate staff contact is published in the RTP, the TIP and other transportation documents, as well as on project pages of the MAG website.
- Public Records Requests: MAG accommodates all public records requests as appropriate.
- Other Input Opportunities: MAG hosts and participates in many other input opportunities for the public, such as public meetings and hearings, and a variety of other special events throughout the year. Before the completion of plans and programs, draft documents are available to the public for review and comment, so that public concerns can be considered and reflected in the final documents. Upon completion, draft studies, plans, programs and reports are presented to the Management Committee, Transportation Policy Committee and Regional Council for review and action and are

available for public review. Historical reference files of all documents are maintained. These reports also are available for public review. MAG has a diverse committee structure that involves technical professionals, administrative personnel, elected officials, business interests and citizen volunteers, representing every jurisdiction and many professions and interest groups. The meetings of the committees follow the policy described above under “Open Meetings.”

Visualization Techniques

With the help of communications, graphics, web, and Information Services staff, MAG utilizes many innovative techniques to help residents better understand what transportation investments are included in its transportation plans and TIPs, and to help them visually conceive what the plans will look like when completed. Examples include project-specific maps and graphs, digital photography, high-resolution graphic displays, Geographical Information Systems, map overlays, PowerPoint presentations, aerial photography, photo simulations, technical drawings, charts and graphs. Alternative scenarios, including visual depictions of scenarios, are presented to demonstrate differences among solutions or approaches.

In 2008, the Federal Highway Administration (FHWA) cited MAG’s description of visualization techniques in its Public Participation Plan as a notable best practice for Metropolitan Planning Organizations throughout the nation. MAG’s techniques are highlighted in the FHWA’s *Public Involvement/Public Participation Transportation Planning Process Resource Guide*.

Fiscal Year 2017 Public Involvement Program

The FY 2017 public involvement program encompasses a coordinated process to solicit input during development of the Draft MAG 2040 Regional Transportation Plan and Draft MAG FY 2018-2022 Transportation Improvement Program. Below is a description of events to date and anticipated activities.

FY 2017 Early Phase Input Opportunity

The fiscal year (FY) 2017 Early Phase input opportunity was conducted from August 1 to 31, 2016, and provided the public and stakeholders with an opportunity to provide feedback and input on the transportation planning and programming effort, as well as project suggestions in areas in which funding was available. All of the project suggestions received were forwarded to the appropriate MAG member agency for review and possible inclusion into a draft listing of projects that will eventually comprise the Draft FY 2018-2022 Transportation Improvement Program (TIP) and the Draft 2040 Regional Transportation Plan (RTP).

On August 11, 2016, MAG hosted an open house for members of the public. MAG staff presented information on MAG’s public involvement process, transportation planning and programming processes and the rebalancing efforts related to the regional Freeway and Highway program. On August 22, 2016, MAG held a Stakeholder Agency meeting to facilitate

information sharing among agencies and solicit feedback on future transportation plans. New to the Early Phase process this planning cycle was the creation of an online comment form, which allows individuals the opportunity to go online to azmag.gov/comment and submit comments. Feedback also is welcomed at all MAG policy and technical committees. As a result of a direct mailing to the MAG public involvement mail list and regional libraries, MAG also received comments via telephone, mail and e-mail correspondence.

All feedback received during the Early Phase Input Opportunity is compiled into the Draft FY 2017 MAG Early Phase Input Opportunity Report. The report is presented to policymakers for review and consideration during the MAG transportation planning and programming process, to provide public input prior to committee action. In addition, the MAG public involvement team conducted other types of outreach as follows:

- Continued Input Opportunities During the Early Phase - Other input opportunities during the Early Phase included special events, small and large group presentations, as well as telephone and website correspondence. MAG participated in several special events, including the Martin Luther King Day Festival, Independent Living Summit, Arizona Disability Expo, National Federation of the Blind of Arizona Statewide Conference, Tempe Tardeada, and the Governor's Highway Safety Days at the Arizona State Fair. The MAG public involvement staff presented to more than 10 different disability groups throughout the Valley, from north Phoenix to Avondale to east Mesa. Groups included senior and healthcare groups; brain injury and spinal injury groups; blind and vision-impaired groups; and recovery groups.
- Public Comment Periods at MAG Committee Meetings: All MAG technical and policy committee meetings include public comment periods. For comments received during the FY 2017 Early Phase Input Opportunity, please refer to the FY 2017 Early Phase Input Opportunity Report.

FY 2017 Mid-Phase Input Opportunity

The FY 2017 Mid-Phase Input Opportunity is anticipated to be held in early spring. This phase is used to solicit public input on transportation issues, concerns and priorities, and to provide the public an opportunity to respond to the draft TIP and Plan. The phase will follow the process outlined under the MAG Public Involvement Process section, above. It will include a public hearing in which comments will be documented and written responses provided. Comments/suggestions/concerns received at the public hearing will be included in the FY 2017 Mid-Phase Input Opportunity Report. This report will be provided to the Management Committee, Transportation Policy Committee and Regional Council for review and consideration in the decision-making process.

FY 2017 Final Phase Input Opportunity

The FY 2017 Final Phase Input Opportunity is anticipated to be conducted from in mid to late spring. The Final Phase is conducted in conjunction with the air quality conformity analysis of the TIP and RTP. The phase will follow the process outlined under the MAG Public Involvement Process section, above. This phase will encompass a variety of input opportunities, including a Public Hearing on the Draft FY 2018-2022 TIP, Draft 2040 RTP, and Draft Air Quality Conformity Analysis. At the public hearing, staff from MAG, ADOT, Valley Metro, METRO and the City of Phoenix Public Transit Department will be on hand to hear public comment. A court reporter will document comments. All comments/suggestions/concerns received at the public hearing will subsequently receive a formal response, which will be included in the FY 2017 Final Phase Input Opportunity Report. This report will be provided to the Management Committee, Transportation Policy Committee and Regional Council for review and consideration in the decision-making process.

Continuous Involvement

During the FY 2017 public input process, MAG will provide continuous outreach as outlined under the MAG Public Involvement Process section, above.

CHAPTER FIVE

TITLE VI AND ENVIRONMENTAL JUSTICE

The consideration of vulnerable populations plays a vital role in regional planning at the Maricopa Association of Governments (MAG). It is the policy of the agency to assure full compliance with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, Executive Order 12898 on Environmental Justice, and related statutes and regulations in all programs and activities. Title VI requires that no person in the United States of America shall, on the grounds of race, color, or national origin, be excluded from the participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which MAG receives federal financial assistance. Additional protections are provided in other federal and state statutes for religion, sex, disability, and age. MAG strives to ensure nondiscrimination in all of its programs and activities, whether those programs and activities are federally funded or not. As part of this effort, MAG has prepared a Title VI and Environmental Justice Program to help integrate the needs of vulnerable populations into MAG's planning activities. The Title VI and Environmental Justice (Title VI/EJ) Program serves as an important element in the regional transportation planning process.

The Title VI/EJ process includes the development of a demographic profile identifying the locations of Title VI and EJ groups and an analytical process that identifies the effects of transportation system investments on different socioeconomic groups. The goals of these activities are as follows:

- Comply with the public involvement and environmental justice requirements of the federal and state regulations.
- Avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
- Provide specific opportunities for the public and community-based organizations to discuss their views and provide input on the subject areas addressed in the planning activities of MAG.
- Ensure full and fair participation by all potentially affected communities in the transportation decision-making process.
- Inform members of the public about ongoing MAG planning activities, and their potential role in those activities.

MAG Title VI and Environmental Justice Program

On June 22, 2016, the MAG Regional Council approved the MAG Title VI and Environmental Justice Program. This program reflects activities that fulfill the responsibilities set forth by the Federal Transit Administration, the Federal Highway Administration, and the U.S. Department of Justice. The program is reviewed annually, updated as needed, and is developed at least every three years in accordance with federal regulations. Each new program is offered to the MAG Regional Council for approval. MAG has been actively engaged in Title VI and Environmental Justice activities as a sub-recipient of federal funding. The prior program received approval by the MAG Regional Council on May 28, 2014.

MAG has reached out to thousands of people in all corners of the region to ensure the planning process at MAG reflects the voices and visions of our diverse population. Title VI and Environmental Justice activities are pursued to ensure that people of all races, income levels, ages, and abilities have an equal voice in the planning process and receive equal benefit from the results of such planning.

The MAG Title VI and Environmental Justice Program describes the planning process to support Title VI activities. Communities of concern describe populations that have been determined by the federal government or the MPO as benefiting from protections to ensure their meaningful involvement in planning and services. To assist with the identification of Title VI neighborhoods, the presence of Title VI populations is compared against the regional threshold for each community of concern. Linguistic isolation follows federal guidance at five percent within a census block or 1,000 people or more within a neighborhood. Demographic profiles are developed, identifying the locations of Title VI and Environmental Justice groups, as well as a planning process that identifies the transportation needs of communities of concern. An analytical process is included that identifies the benefits and burdens of transportation system investments for different communities of concern, identifies imbalances, and responds to the analysis produced. The various agency roles are identified in regard to communities of concern and the outreach needed to fully engage vulnerable populations in the regional planning process, including complaint procedures and forms.

Compliance with Title VI and MAG's nondiscrimination policies is an ongoing effort to ensure that each division reviews its work to ensure communities of concern have equal access. MAG provides an assurance to comply with all applicable provisions governing records, accounts, documents, information, facilities, or compliance reviews, and/or complaint investigations.

Public Involvement Process for Title VI/EJ Communities

Regardless of the audience, the need for transportation commonly arises as a key concern. People rely on a range of transportation services to earn a living, secure education, and access medical care. Limited access to safe, affordable, reliable transportation options significantly impairs one's ability to live independently. Vulnerable populations are more deeply affected due to scarcity of alternatives and the depth of need for assistance. MAG addresses Title VI/EJ

Communities in a number of ways, including numerous public outreach activities targeted to both specific minority groups and the general public as a whole.

The general public, as well as Title VI, EJ, and Limited English Proficiency (LEP) populations, are engaged in the planning process through ongoing public outreach activities. More intensive tools such as focus groups are used to identify Title VI transportation needs for specific planning activities that may impact Title VI populations. Other tools are used on a consistent basis to facilitate an exchange of information and to fully engage communities of concern. Vital materials are translated into Spanish. Additional materials are translated and offered in alternative formats upon request. MAG maintains a contract with a disability associate to advise on issues related to people with disabilities and perform outreach to the disability community.

In federal planning regulations, visualization techniques in public involvement programs are considered essential to assisting public understanding of transportation plans and programs. MAG's description of visualization techniques in its Public Participation Plan was cited by the Federal Highway Administration (FHWA) as a notable practice among Metropolitan Planning Organizations (MPOs) throughout the nation. Key public involvement activities are discussed below.

- Events - It is a priority to engage communities of concern in public, openly accessible events. Going to where people are instead of requiring them to attend meetings at MAG increases the level of participation and the diversity of people offering feedback. MAG public involvement staff routinely participates in multiple events each year that are relevant to Title VI populations.
- Public Hearings - MAG conducts three public meetings/hearings, in conjunction with updating the Transportation Improvement Program and Regional Transportation Plan. The first meeting/hearing affords residents an opportunity to offer their input on specific projects, programs, or other transportation issues of concern. The second meeting/hearing provides residents an opportunity to comment on initial draft plans and programs. The third meeting/hearing provides residents the opportunity to comment on final draft plans and programs prior to adoption by MAG policy committees. After each public meeting/hearing, an input opportunity report is compiled and distributed to MAG policy committee members for review and consideration prior to taking any action.
- Surveys - MAG staff distributes awareness surveys at a variety of events in order to gauge public awareness of MAG and its plans and programs. The results from the awareness survey are a positive indicator of MAG's efforts to pursue public awareness and involvement in the transportation planning process. The survey also asks respondents about their transportation priorities and participation in the MAG planning process. Additional surveys are administered as part of projects to determine the needs of specific populations, such as people with disabilities, low incomes, or older adults.

The results of these surveys provide a deeper understanding of the current and projected transportation needs among communities of concern.

- Focus Groups and Stakeholder Group Meetings - Focus groups and stakeholder group meetings offer opportunities for small groups of communities of concern to offer detailed feedback on specific topics. Focus groups are conducted with various vulnerable populations to gauge emerging needs, including those related to transportation. Meetings are held with communities of concern and the agencies serving them to inform planning activities as they move forward. Feedback from the communities of concern is provided to the appropriate MAG Committees.
- Newsletters - The MAGazine newsletter, MAG Regional Council Activity Report, MAG Transportation Policy Committee newsletter, and MAG Human Services newsletters are produced and distributed via print and direct mailing, resulting in greater awareness by subscribers of MAG's responsibilities and activities. Residents also benefit from timely notice of MAG events and a better understanding of how to participate in planning activities. The MAG Human Services Division also releases an electronic newsletter with a distribution list of more than 1,200 nonprofit agencies, faith-based organizations, and community groups serving communities of concern.
- Social Media and Video Outreach - MAG manages a social media program that engages members of the public through platforms such as Twitter, Facebook, and YouTube. MAG also implements a video outreach program in which project-specific videos are produced to inform the public about MAG activities and programs. These videos are distributed to public access channels throughout the region, and are posted on MAG's website and on YouTube.
- MAG Transportation Ambassador Program (TAP) - The MAG Transportation Ambassador Program (TAP) offers training, information, and networking opportunities to communities of concern and the agencies that serve them. Training is held on a quarterly basis for more than 620 participants in mainstream venues such as libraries and community centers. This training also is an extremely valuable source of feedback. Participants provide the information needed to complete the gaps-analysis required in the MAG Human Services Coordination Transportation Plans. Strategies to address the gaps-analysis are provided with each plan and implemented with the support of the TAP participants and communities of concern.
- LEP Four-Factor Analysis - In order to ensure the public receives and understands information vital to participation in the planning process, a four-factor analysis is used to identify the needs of people with Limited English Proficiency (LEP). Section Five of the U.S. Department of Transportation guidance on LEP prescribes a four-factor analysis to determine the need for translation services in order to fully engage LEP populations in the planning process. On the basis of this four-factor analysis, MAG maintains vital materials about the agency in Spanish and will translate into other languages upon

request. Spanish-speaking staff is available at policy committee meetings and as needed for other public meetings to interpret for LEP populations. Additional materials and interpreters will be made available for areas with high concentrations of linguistically-isolated individuals. Resources to translate materials and interpret for individuals are available but finite. The investment is made to translate vital materials. MAG maintains a standing offer to translate materials into other languages and provide alternative formats such as Braille or large print.

Communities of Concern

Communities of concern describe populations that have been determined by the federal government or the MPO as benefiting from protections to ensure their meaningful involvement in planning and services. These vulnerable populations have been identified through the Civil Rights Act of 1964, Executive Order 12898, and Executive Order 13166 and related statutes and regulations to end discrimination and ensure equal access to all federally funded services. To assist with the identification of Title VI neighborhoods, the presence of Title VI populations is compared against the regional threshold for each community of concern.

Based on the most recently available census data, the threshold for each mandated community of concern is as follows (see Table 5-1):

- Minority population: 41.0 percent of population or higher.
- Age: 60+ 17.1 percent of population or higher.
65+ 12.1 percent of population or higher.
75+ 5.4 percent of population or higher.
- Population in poverty: 17.0 percent of population or higher.
- Population with a disability: 10.3 percent of population or higher.
- Limited English proficiency persons: 5.0 percent of households or higher. (Consistent with Federal guidance, 5.0 percent is used instead of the county average of 9.5 percent. See footnote (d) Table 5-1.)

The U.S. Census Bureau is the source of data used for determining the environmental justice communities of concern, and the units of analysis are census tracts. Census tracts are small, relatively permanent statistical subdivisions of a county that are updated by local participants prior to each decennial census, in accordance with guidelines through the Census Bureau's Participant Statistical Areas Program. Because local participants work with the Census Bureau to create and update the census boundaries, the boundaries are more likely to reflect the community's view of where one neighborhood ends and another begins. The primary purpose of census tracts is to provide a stable set of geographic units for presentation of statistical data. Census tracts generally have a population size between 1,200 and 8,000 people, with an optimum size of 4,000 people. Census tract boundaries are delineated with the intention of being maintained over a long time so that statistical comparisons can be made from census to census. Census tracts occasionally are split due to population growth or merged as a result of substantial population decline.

**TABLE 5-1
COMMUNITIES OF CONCERN IN THE MAG MPA**

Category	Population and Households		Census Tracts (e)			
	MPA		Number of Tracts ≥ MPA Average	% Tracts	Affected Population (f)	% of Affected Population Captured in Census Tracts
	Total	Percent				
Population Base	4,056,518	100.0%	960	100.0%	--	--
Household Base	1,489,355	100.0%	960	100.0%	--	--
Minority Population (a)	1,663,899	41.0%	376	39.0%	1,090,132	65.5%
Age 60+ Population	693,538	17.1%	318	33.0%	410,364	59.2%
Age 65+ Population	490,944	12.1%	289	30.0%	298,626	60.8%
Age 75+ Population	217,253	5.4%	277	29.0%	145,553	67.0%
Population below Poverty Level (b)	702,859	17.0%	361	38.0%	496,821	70.7%
Population with a Disability (c)	428,167	10.3%	406	42.0%	224,435	52.4%
Limited English Proficiency Persons (d)	369,536	9.5%	516	54.0%	325,186	88.0%

Source: U.S. Census Bureau, 2010-2014 American Community Survey (ACS) 5-Year Estimates and 2010 Decennial Census. (ACS data are based on a sample and are subject to sampling variability.)

- (a) Minority includes total population minus White (Non-Hispanic). Data for minority and population groups by age are from 2010 Census data.
- (b) Percent of the population for whom poverty status is determined does not include institutionalized persons or persons under 5 years of age. Total population in the census defined MPA area for whom poverty status is determined is 4,131,314. Data from 2014 ACS 5-Year estimates (Table B17001).
- (c) Disability status from the 2014 ACS 5-year estimates. All percentages are based on census tracts that match as close as possible to the MPA area, or 960 tracts. Disability status is determined for the civilian noninstitutionalized population based on six types of difficulty: hearing, vision, cognitive, ambulatory, self-care, and independent living difficulty (Table B18101).
- (d) For Limited English proficient (LEP) persons, the Federal guidance (Federal Transit Administration Circular 4702.1B) notes that DOT has adopted the DOJ's Safe Harbor Provision. This provision stipulates that the targeted minimum number of recipients regarding the translation of written materials for LEP populations is five percent or 1,000 persons, whichever is less, of the total population of persons eligible to be served. Thus for determining the number of affected census tracts and affected population, five percent is used as the guideline rather than the MPA percentage of 9.5 percent. The guidance for limited English proficiency for DOT recipients refers to persons age five years and over who speak English less than "very well." See http://www.lep.gov/guidance/guidance_Fed_Guidance.html Data from 2014 ACS 5-Year estimates (Table B16005). 2014 estimate of total persons age 5 years and over for the defined census geography is 3,905,588.
- (e) The census tracts used in this analysis include all 916 census tracts within Maricopa County, plus 44 census tracts in Pinal County. Within Pinal County the Metropolitan Planning Area (MPA) boundary does not follow census geography; however, the best match using full census tracts was used where the majority of the population was within the MPA. The base numbers for all values in this table are for this census-based defined area. Total census tracts = 960.
- (f) Affected population is the total of people or households (depending on the data "universe") that fall into the specified category for all census tracts that have greater than or equal to the percentage for the MPA area (as defined by the census geography) or as designated for LEP populations.

Due to the expansion of the census-defined Urbanized Area Boundary based on the 2010 Census, the Metropolitan Planning Area (MPA) boundary for the MAG region was recently expanded in the southeast into portions of Pinal County. The new boundary follows the planning area boundaries for the municipalities that fall into this new area; however, this boundary does not precisely line up with census geography. A spatial analysis was performed in order to determine the best geographic match based on the distribution of population within census tracts along the expanded portion of the MPA boundary within Pinal County.

The census tracts used in this analysis include all 916 census tracts within Maricopa County, plus 44 census tracts in Pinal County. Within Pinal County, the Metropolitan Planning Area (MPA) boundary does not follow census geography; however, the best match using full census tracts was used where the majority of the population was within the MPA. The base numbers for all values are for this census-based defined area, with the total number of census tracts equal to 960.

Communities of concern are identified as those census tracts where the identified group represents a percentage of the population equal to or greater than that of the MPA threshold. For Limited English proficient (LEP) persons, the federal guidance (Federal Transit Administration Circular 4702.1B) notes that the targeted minimum number of recipients regarding the translation of written materials for LEP populations is five percent or 1,000 persons, whichever is less, of the total population of persons eligible to be served. As a result, for determining the number of affected census tracts and affected population, five percent is used as the guideline rather than the MPA percentage of 9.5 percent. Table 5-1 indicates the number of people represented by the census tracts identified as communities of concern and the percentage they represent of the total population for that community of concern in the region.

Environmental Justice Analysis

The Maricopa Association of Governments (MAG) is committed to ensuring that no person is discriminated against on the grounds of color, race, or national origin as provided by Title VI of the Civil Rights Act of 1964 and related legislation. Specifically, Title VI asserts that, “No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.” Additional protections are provided in other federal and state statutes for religion, sex, disability, and age. MAG strives to ensure nondiscrimination in all of its programs and activities, whether those programs and activities are federally funded or not. Environmental justice is a planning consideration based on Title VI of the 1964 Civil Rights Act, and Executive Order 12898 of 1994 (*Federal Actions to Address Environmental Justice in Minority and Low Income Populations*), which aims to ensure that all groups may benefit equally from the transportation system without shouldering a disproportionate share of its burdens.

In order to assess the effects of the Regional Transportation Plan, an overlay analysis of the communities of concern identified above was conducted. What one population group may perceive as an adverse effect of a transportation facility or service, another group may perceive as a benefit. It is also possible that, even within the same population group, a transportation facility or service may be perceived by some as having an adverse effect, while others within the group may view it as a benefit. Given the difficulty of meaningfully identifying the split of opinion in this regard across all population groups for a vast multimodal transportation network, it was decided that an overlay analysis relying on proximity to transportation facilities and services represented the most reasonable way to assess the equity of the transportation planning process. In order to gauge the relative effects of the transportation system among population groups, the degree to which existing and planned transportation facilities or services are present within the geographical areas of the communities of concern was determined and compared to their presence in those areas that are not classified as communities of concern.

Based on this approach, each of the three major components of the RTP (freeways/highways, transit and arterial streets) were analyzed separately to assess the geographic distribution of facilities and services included within the RTP. This analysis determined the percentage of census tracts in each community of concern that is served by the long-range freeway/highway, transit and arterial networks in the RTP. The percentage of census tracts covering areas that are not considered communities of concern was also determined. These percentages were then compared to assess the relative distribution of benefits and burdens. It should be noted that due to the ubiquitous nature of the arterial system, (i.e., all census tracts are served), for arterials the analysis is based only on new or improved segments in the network.

Minority Populations

In 1998, the Federal Highway Administration (FHWA) published actions to address EJ in minority populations and low-income populations. Figure 5-1 indicates the location and density of minority households in the MAG region. FHWA guidance defined minority as the following: Black (having origins in any of the black racial groups of Africa); Hispanic (of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race); Asian American (having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands); American Indian and Alaskan Native (having origins in any of the original people of North America and who maintain cultural identification through tribal affiliation or community recognition). In addition, MAG includes the following groups as defined by the U.S. Census : Hispanic or Latino; Black or African American alone (not Hispanic or Latino); American Indian and Alaska Native alone (not Hispanic or Latino); Asian alone (not Hispanic or Latino); Native Hawaiian and Other Pacific Islander alone (not Hispanic or Latino); Some other race alone (not Hispanic or Latino); and Persons of two or more races (not Hispanic or Latino).

Minorities represent 41 percent of the population in MAG's planning region. There are 376 census tracts with minority population equal to or greater than this percentage, which is 39 percent of the 960 tracts in the region. Within these 376 tracts, 66 percent of the minority

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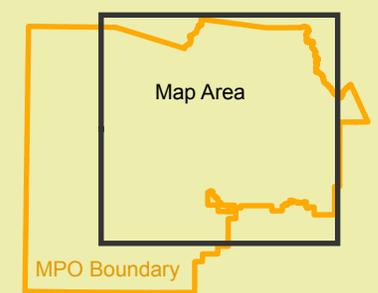
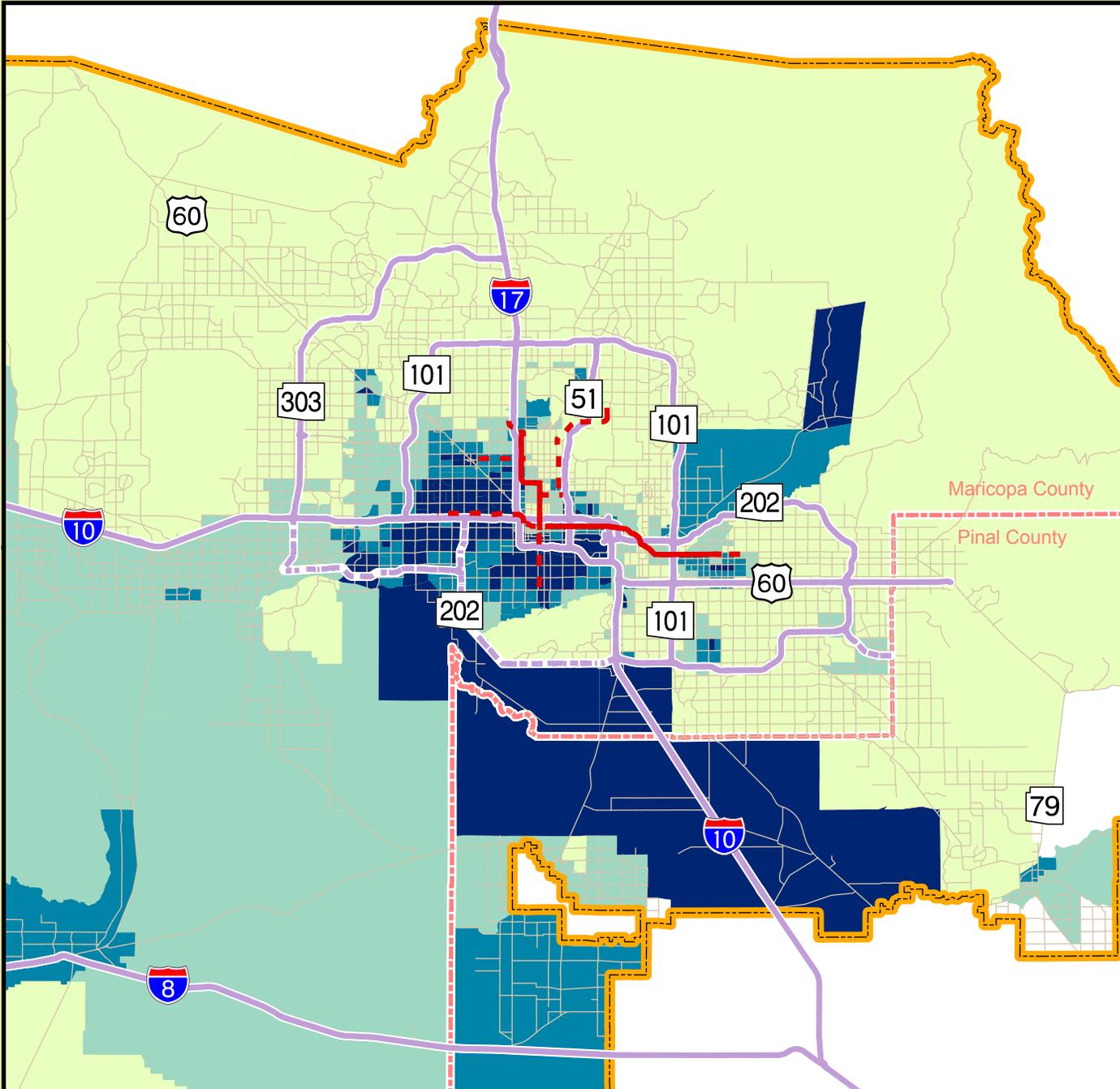
Figure 5-1



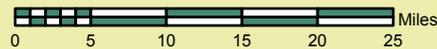
Minority Population (Census 2010)

Percent Minority Population

- 0% - 41%
- 41.1% - 60%
- 60.1% - 80%
- More than 80%
- Light Rail
- Planned Light Rail
- Freeway
- Planned Freeway
- Metropolitan Planning Organization
- County Boundaries



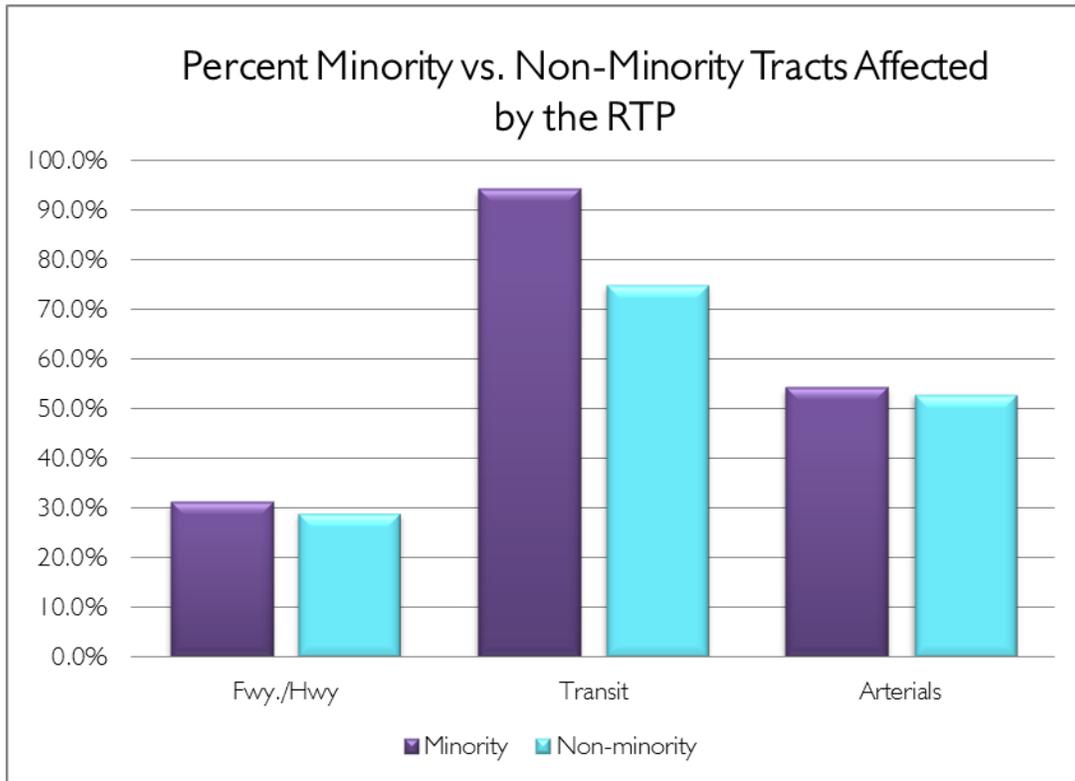
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population in the MPA is found. The areas with a higher concentration of minorities (i.e. greater than 60 percent) are the central and south-central areas of the region, as well as the sovereign nations of the Gila River Indian Community (GRIC), the Salt River Pima-Maricopa Indian Community (SRPMIC), the San Lucy District of the Tohono O'Odham Nation, and the Fort McDowell Yavapai Nation.

The transportation needs of minority populations are generally the same as society as a whole (not including economic status, which is considered in the next section). Thus, transportation facilities in minority communities should be the same as those in non-minority communities. Using census tracts as the measure, Figure 5-2 presents a comparison of the service provided by freeways/highways, transit and arterials in both minority and non-minority census tracts.

**FIGURE 5-2
PERCENT MINORITY vs. NON-MINORITY CENSUS TRACTS AFFECTED BY THE RTP**



The percentage of the minority census tracts served by the freeway/highway system (31 percent) is somewhat higher than that of non-minority census tracts (29 percent). Transit routes serve 94 percent of minority census tracts and 75 percent of non-minority tracts. Arterial street projects serve 54 percent of the minority tracts compared to 53 percent for non-minority. Based on the review of freeway/highway, transit and arterial improvements, it is concluded that the RTP provides equal or better benefits to minority communities without causing disproportionately high adverse impacts.

Age

Age is another population characteristic defining a community of concern. In the MAG metropolitan planning area (MPA), individuals 60 years of age or older represent 17.1 percent of the population. There are 318 census tracts with 60 or older population equal to or greater than this percentage, which is 33 percent of the 960 tracts in the county. Within these 318 tracts, 59 percent of the population in this age group in the MPA is found. In the MPA, individuals 65 years of age or older represent 12.1 percent of the population. There are 289 census tracts with 65 or older population equal to or greater than this percentage, which is 30 percent of the 960 tracts in the county. Within these 289 tracts, 61 percent of the population in this age group in the MPA is found. In the MPA, individuals 75 years of age or older represent 5.4 percent of the population. There are 277 census tracts with 75 or older population equal to or greater than this percentage, which is 29 percent of the 960 tracts in the county. Within these 277 tracts, 67 percent of the population in this age group in the MPA is found. As representative of all the age groups, Figure 5-3 indicates the location and density of individuals 65 and over in the MPA. The areas with a higher concentration of individuals 65 and over (i.e. greater than 50 percent) tend to be located in the Sun City/Surprise area, as well as sections of the East Valley.

Transportation needs of older residents may not be entirely the same as those of the general population. Commuting needs may not be as great and there may potentially be a greater need for transit or specialized mobility services. Figure 5-4 presents a comparison of the service provided by freeways/highways, transit and arterials in both 65 or older areas and the remaining census tracts. The percentage of the 65 or older census tracts served by the freeway/highway system (18 percent) is lower than that of the remaining census tracts (38 percent). Transit routes serve 59 percent of 65 or older census tracts and 98 percent of the remaining tracts. Arterial street projects serve 35 percent of the 65 or older tracts compared to 65 percent for the remaining census tracts.

Based on the review of freeway/highway, transit and arterial improvements, it is concluded that 65 or older communities generally do not have the same level of proximity to transportation services as other groups covered in the analysis. However, it should be noted that approximately 61 percent of the population in this group is captured in only 30 percent of the census tracts in the region. These census tracts tend to be concentrated in outer areas of the region and contain retirement communities that are removed from major transportation facilities. The resulting pattern of proximity to transportation may have occurred to some degree by the choice of the members of this community. At the same time, elderly mobility has been a continuing concern at MAG, with efforts such as the MAG Elderly and Persons with Disabilities Transportation Program and the MAG Safety and Elderly Mobility Sign Project. Also, it should be noted that the level of transit service for 65 or older communities is enhanced by the paratransit system in the region. The service area of paratransit covers 71 percent of the census tracts included in the 65 or older group, which compares to 77 percent coverage for the region as a whole.

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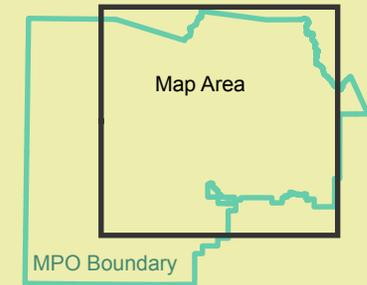
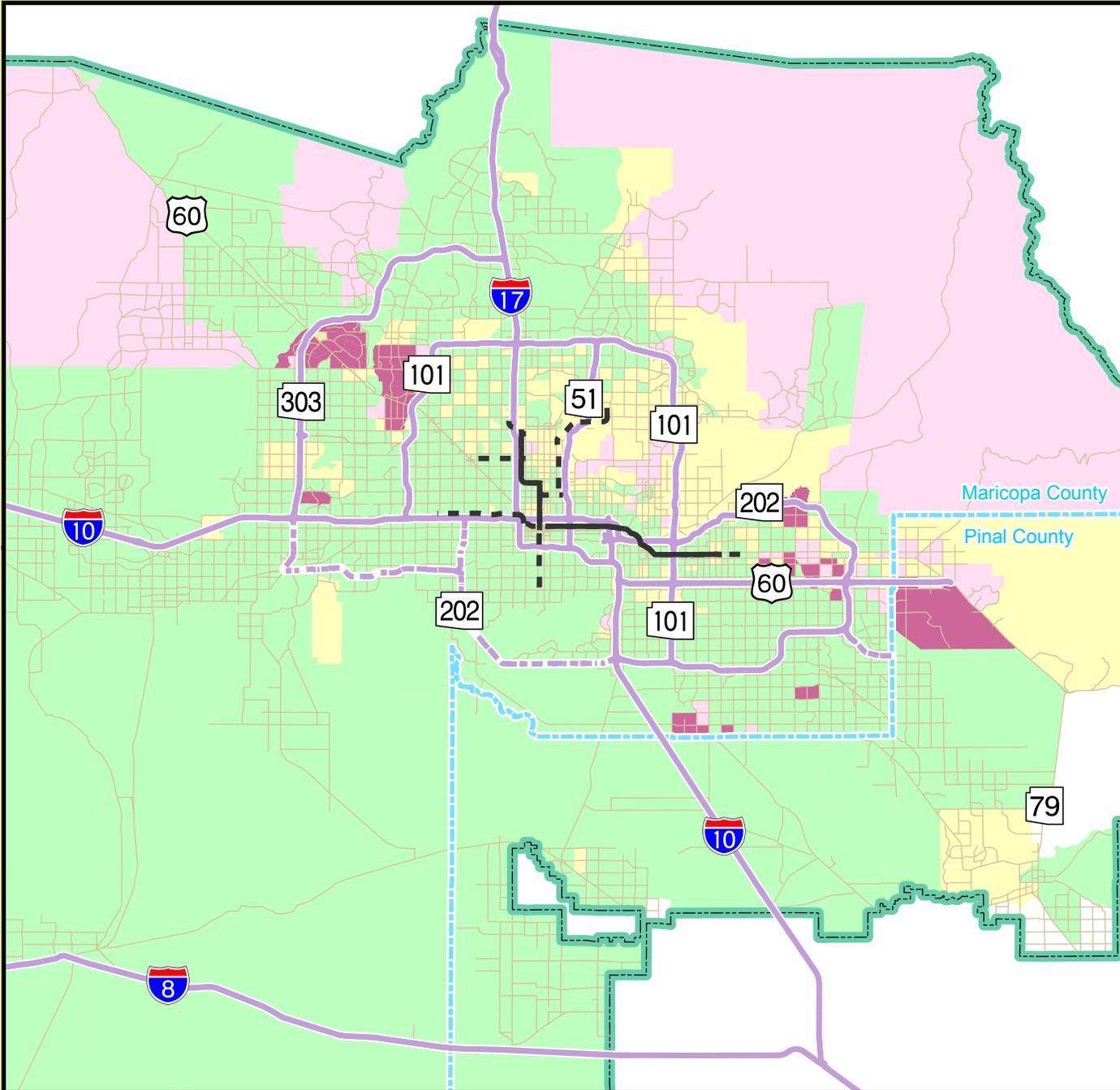
Figure 5-3



Persons Age 65 and Older (Census 2010)

Percent Persons 65 and Older

- 0% - 12.1%
- 12.2% - 25%
- 25.1% - 50%
- More than 50%
- Light Rail
- Planned Light Rail
- Freeway
- Planned Freeway
- Metropolitan Planning Organization
- County Boundaries



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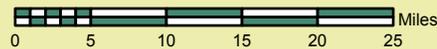
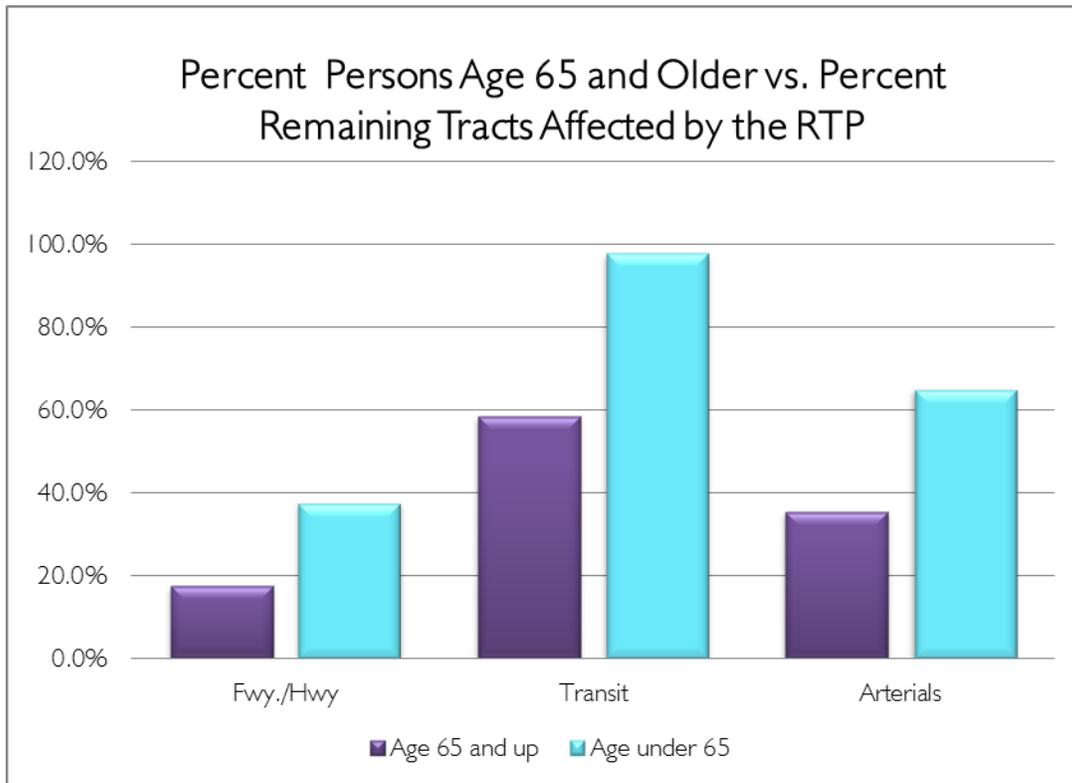


FIGURE 5-4
PERCENT AGE 65 or OLDER vs. REMAINING CENSUS TRACTS AFFECTED BY THE RTP



Poverty Status

Poverty status is determined by comparing annual income to a set of dollar values called thresholds that vary by family size, number of children, and age of householder. If a family's before-tax income is less than the dollar value of their threshold, then that family and every individual in it are considered to be in poverty. For people not living in families, poverty status is determined by comparing the individual's income to his or her threshold. The poverty thresholds are updated annually by the U.S. Department of Health and Human Services to allow for changes in the cost of living using the price index for all urban consumers (CPI-U). It is important to note that the poverty thresholds are the same for all parts of the country. They are not adjusted for regional, state or local variations in the cost of living.

Figure 5-5 indicates the location and density within the region of persons with income below the federal poverty threshold. To some extent, areas that contain a higher percentage of people living in poverty are coincident with the areas of higher minority populations. Areas where poverty is above the MPA threshold, but minority populations are not, include the northwestern portion of the Maricopa County and areas of Mesa, Buckeye and North Phoenix. Generally, the transportation needs of poverty communities would be met by more transit service than what would be important to the general population.

2040 Regional Transportation Plan

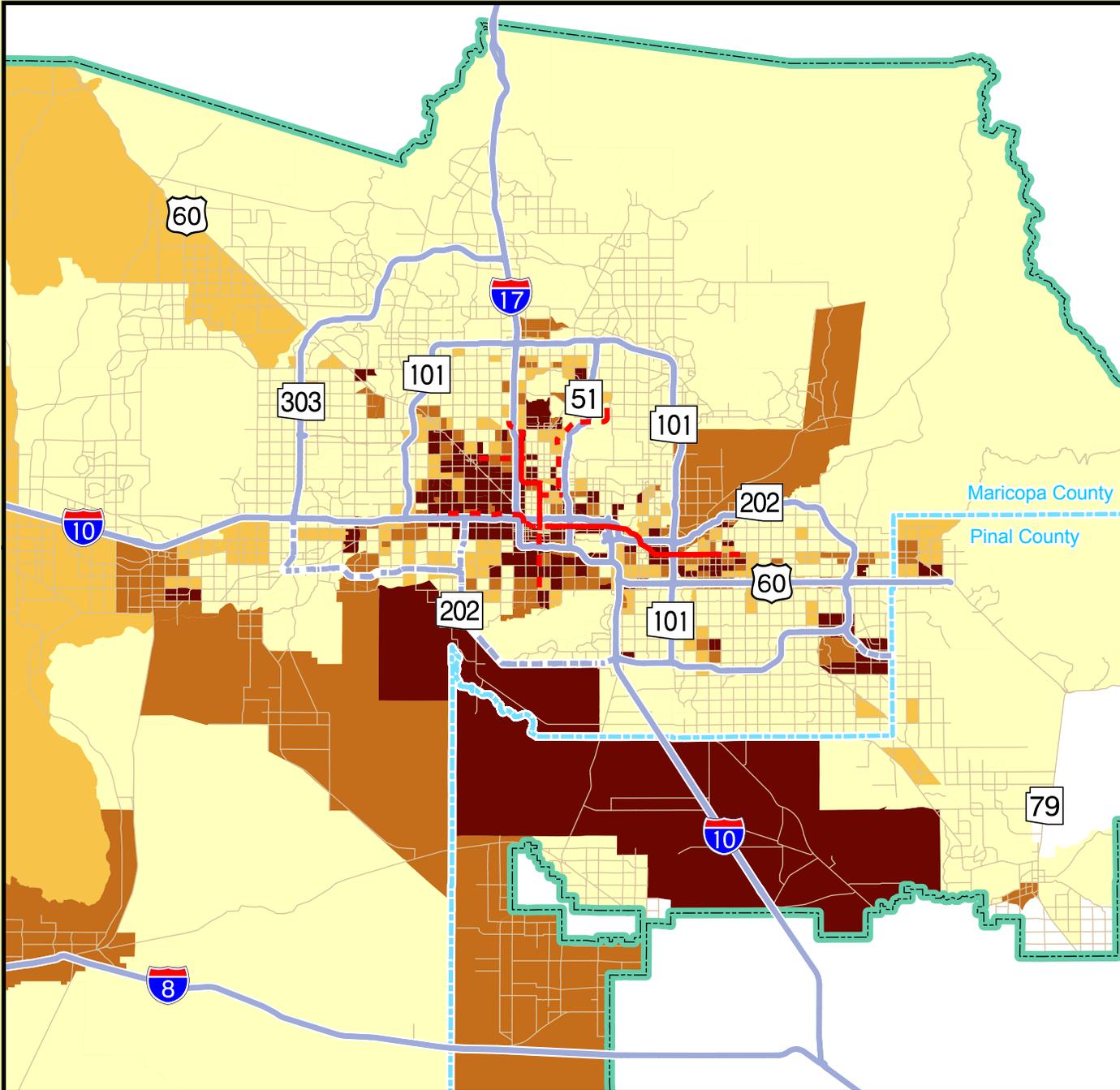
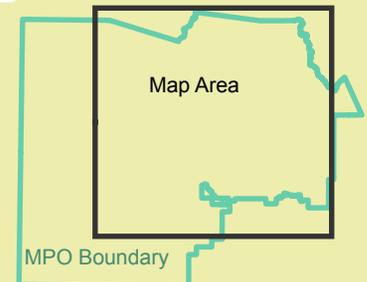
Figure 5-5



Persons Age 5 and Over Living in Poverty (ACS 2010-2014)

Percent Persons in Poverty

- 0% - 17%
- 17.1% - 25%
- 25.1% - 35%
- More than 35%
- Light Rail
- Planned Light Rail
- Freeway
- Planned Freeway
- Metropolitan Planning Organization
- County Boundaries



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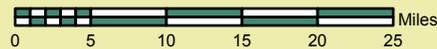
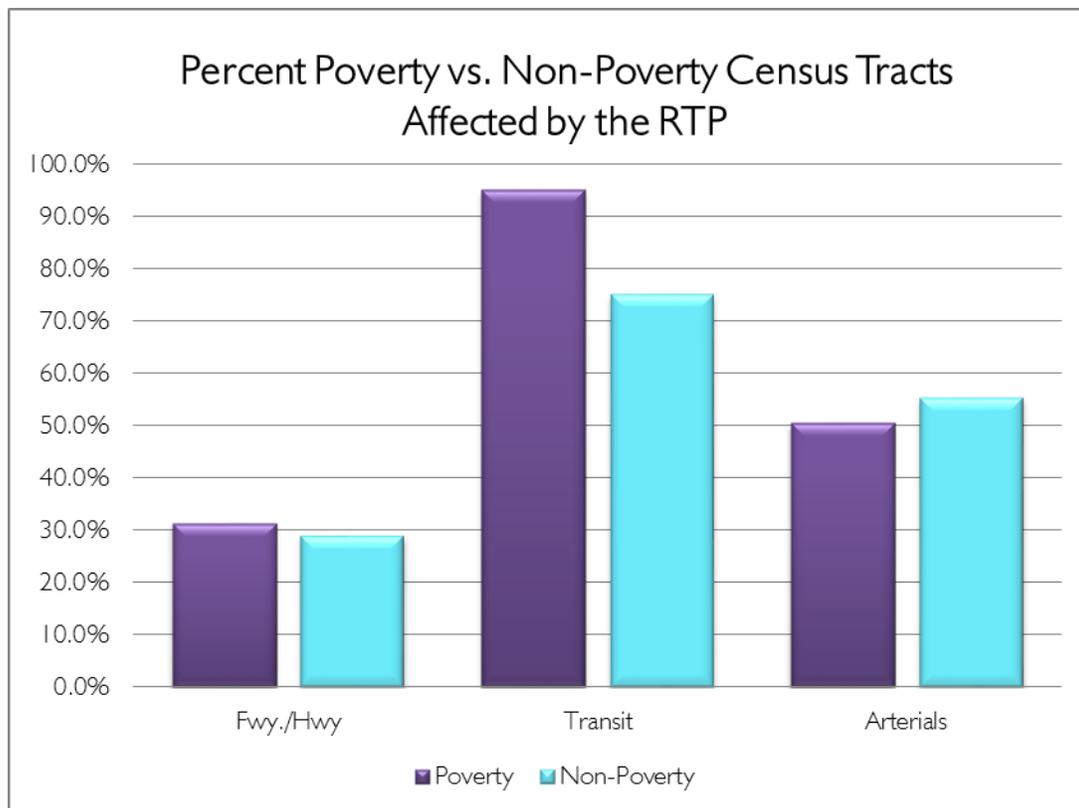


Figure 5-6 presents a comparison of the service provided by freeways/highways, transit and arterials in both poverty and non-poverty communities. The portion of poverty census tracts served by the freeway/highway system (30 percent) is the same as that for non-poverty communities (29 percent). Transit routes serve nearly all of the census tracts identified as poverty tracts (95 percent) but a smaller portion (75 percent) of the non-poverty areas. Arterial street projects serve approximately 50 percent of the poverty areas compared to 55 percent for non-poverty. The analysis of the plan improvements demonstrates that poverty populations generally benefit from the RTP at the same level as census tracts not identified as poverty, with transit services being provided at a higher level. The higher level of transit service is consistent with the needs of this community of concern.

**FIGURE 5-6
PERCENT POVERTY vs. NON-POVERTY CENSUS TRACTS AFFECTED BY THE RTP**



Disability Populations

People with disabilities: In 2008, section 42 U.S.C. § 12102 of the Americans with Disabilities Act of 1990 was amended to define disability in the following way: (1) a physical or mental impairment that substantially limits one or more major life activities of such individual, (2) a record of such an impairment, (3) being regarded as having such an impairment. Disabilities may be physical or cognitive. Figure 5-7 indicates the location and density within the region of

2040 Regional Transportation Plan

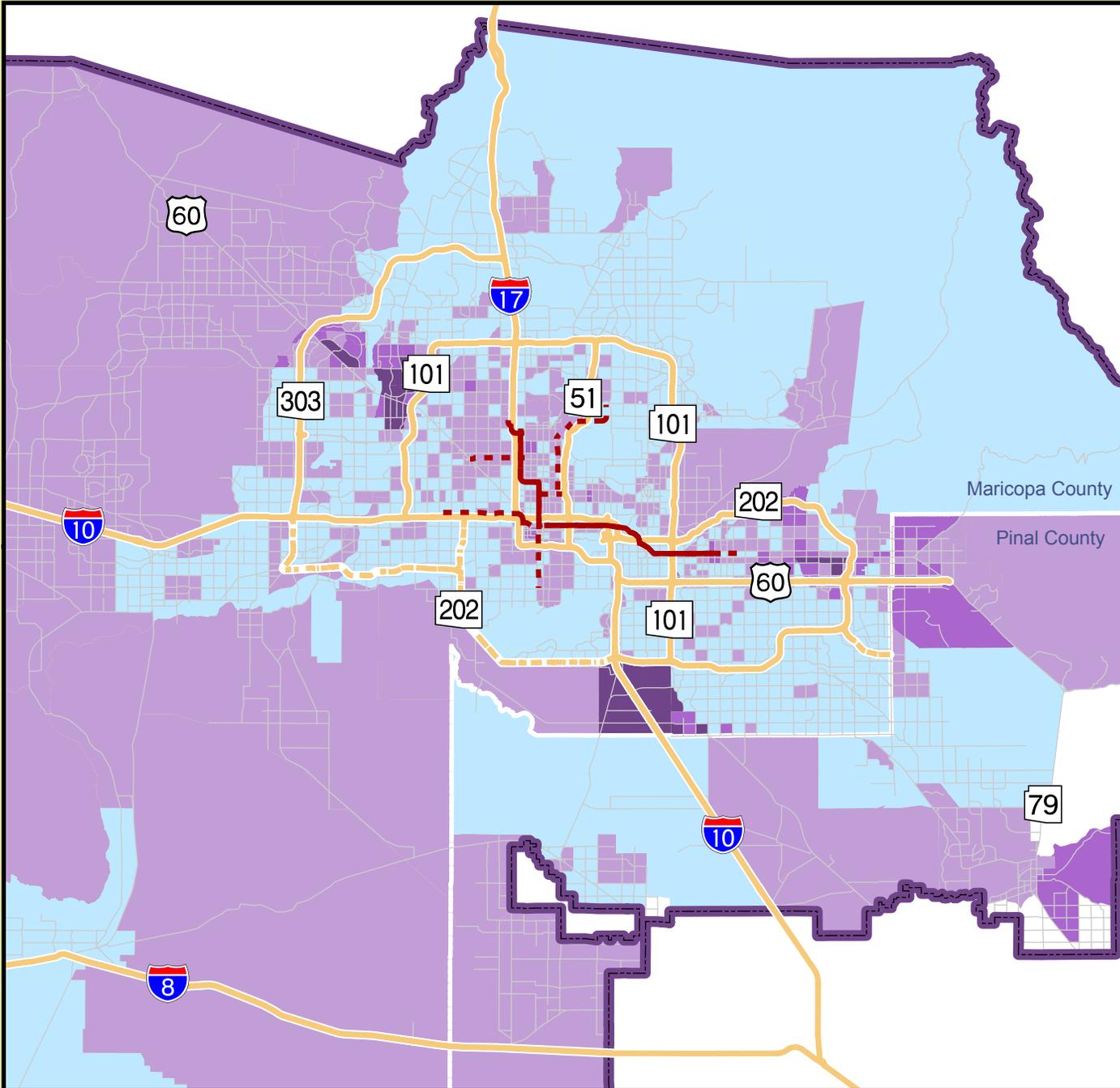
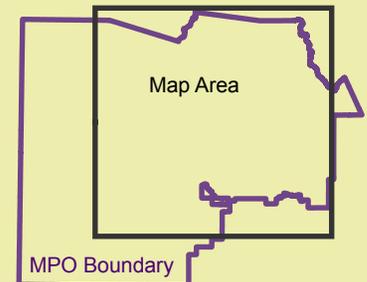
Figure 5-7



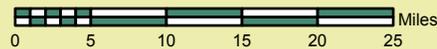
Non-Institutionalized Persons with Disability (ACS 2010-2014)

Percent Persons with a Disability

- Less than 10.3%
- 10.4% to 20%
- 20.1% to 30%
- More than 30%
- Light Rail
- Planned Light Rail
- Freeway
- Planned freeway
- Metropolitan Planning Organization
- County Boundaries



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persons age 5 years and over with a disability. The U.S. Census Bureau further defines disability as: “A long-lasting physical, mental, or emotional condition. This condition can make it difficult for a person to do activities such as walking, climbing stairs, dressing, bathing, learning, or remembering. This condition can also impede a person from being able to go outside the home alone or to work at a job or business.” Census tracts with an above threshold percentage of people who reported a disability are widely scattered throughout Maricopa County, with notable concentrations in the northwest area of the Valley, and southeast Mesa. Transportation needs of residents who reported a disability are not the same as those of the general population. People who reported a disability may require special apparatus for vehicular transportation. For this and other reasons, people who reported a disability may be more reliant on the transit system or paratransit services to meet their transportation needs.

Figure 5-8 presents a comparison of the service provided by freeways/highways, transit and arterials in areas with and without high concentrations of persons with a disability. The portion of census tracts with a high percentage of persons who reported having a disability and are served by the freeway/highway system (24 percent) is somewhat lower than that for those areas with a lower amount of disabled persons (34 percent). Transit routes serve the vast majority of the census tracts identified as disability (82 percent), which is the same percentage (83 percent) for non-disability areas. Arterial street projects serve approximately 47 percent of the disability areas, which is somewhat lower than the percentage for areas identified as non-disability (58 percent). The analysis of the plan improvements shows that populations of persons who reported having a disability generally benefit from the RTP at the same level as census tracts not identified with this characteristic.

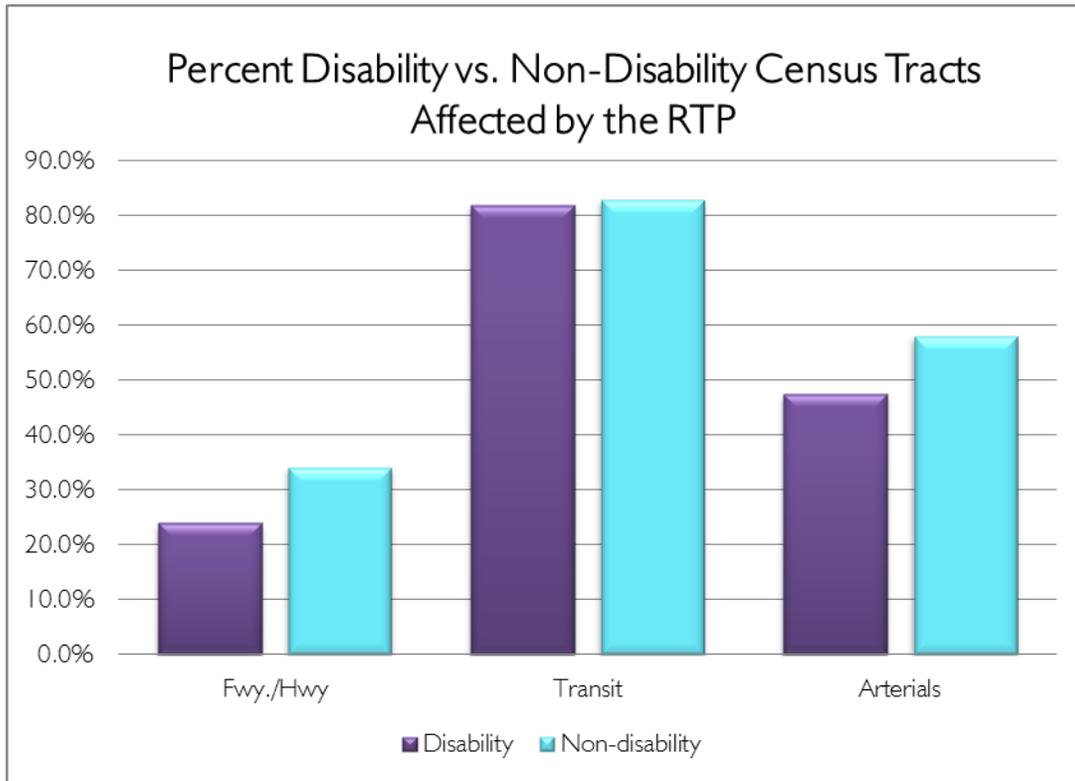
It should be noted that the level of transit service is enhanced by the paratransit system in the region. This includes paratransit service mandated by the Americans with Disabilities Act (ADA), as well as paratransit services beyond ADA requirements provided by number of jurisdictions in the region. Recently, paratransit services in the region were fully coordinated so that any transfer requirements across jurisdictional boundaries were eliminated.

Limited English Proficiency

The federal guidance defining limited English proficiency (LEP) refers to persons age five years and over who speak English less than “very well”. Data from the 2014 American Community Survey/Five-Year Estimates was used to identify the census tracts corresponding to this community of concern. Figure 5-9 indicates the location and density of LEP persons in the region. To a great extent, the census tracts of higher-than-threshold LEPs are coincident with the tracts that contain a higher-than-threshold percentage of minorities.

Figure 5-10 presents a comparison of the service provided by freeways/highways, transit and arterials in both LEP and non-LEP census tracts. The portion of LEP tracts served by the freeway/highway system (31 percent) is essentially the same as tracts identified as non-LEP (29 percent). Transit routes serve essentially all of the census tracts identified as LEP (94 percent), while 70 percent of the non-LEP tracts are served. Arterial street projects serve approximately

FIGURE 5-8
PERCENT DISABILITY vs. NON-DISABILITY CENSUS TRACTS AFFECTED BY THE RTP



while 70 percent of the non-LEP tracts are served. Arterial street projects serve approximately 53 percent of the LEP tracts, compared to 55 percent for non-LEP. The analysis of the RTP improvements demonstrates that, overall, LEP populations benefit from the RTP at about the same level that the census tracts not identified as LEP.

Conclusion

MAG endeavors to incorporate environmental justice into regional transportation planning as a continuing effort. Reaching out to disadvantaged communities and assessing their needs and interests is paramount to ensuring the continued quality of life of all residents in the metropolitan area. MAG has prepared a Title VI and Environmental Justice Plan to fully integrate the needs of these vulnerable populations as part of MAG’s activities. The MAG Title VI and Environmental Justice Plan serves as an important element in the regional transportation planning process.

MAG has demonstrated a commitment to listening to residents through continuous outreach efforts, and numerous events and activities have been held. To be effective, these efforts must

2040 Regional Transportation Plan

Figure 5-9

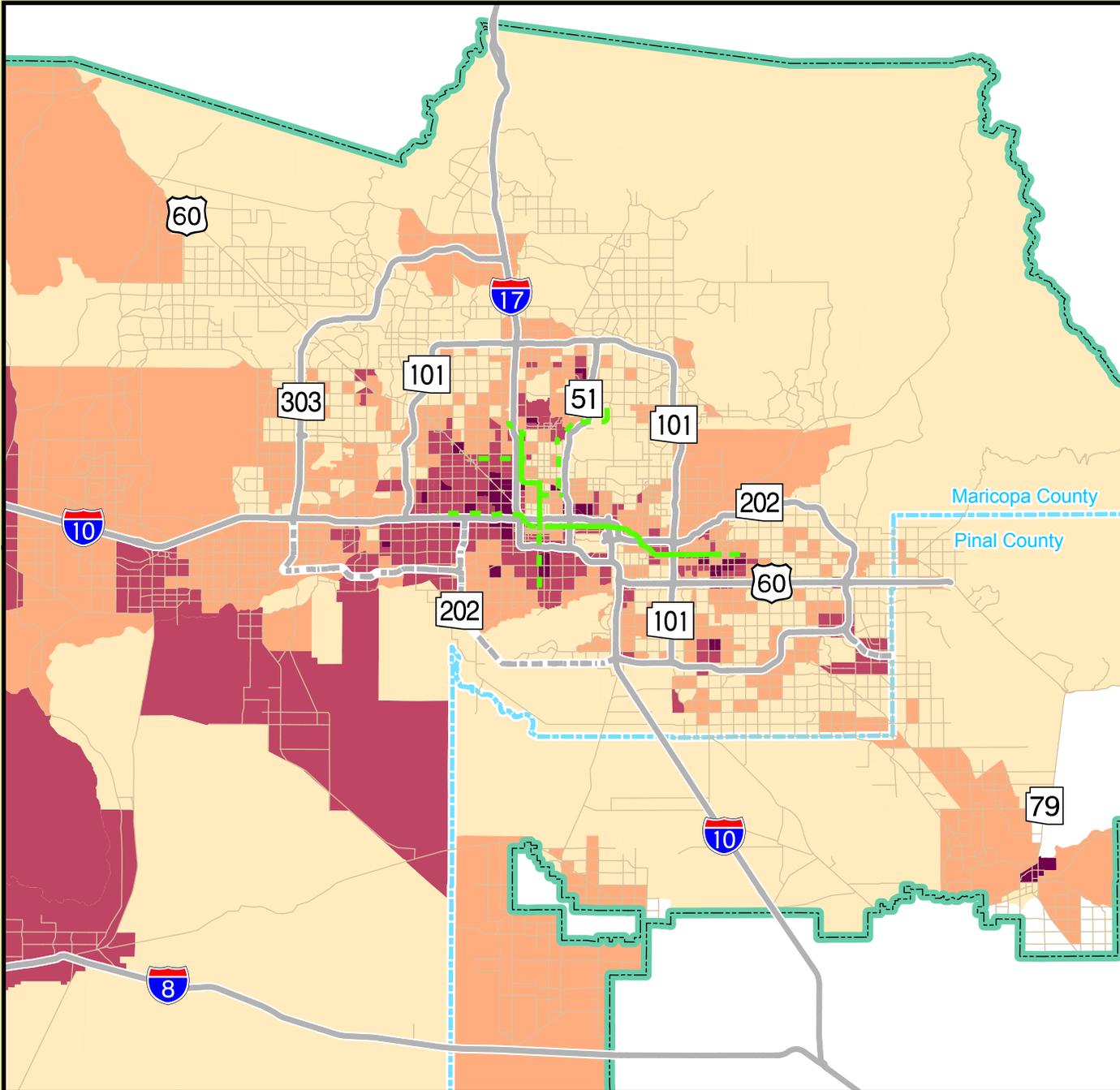
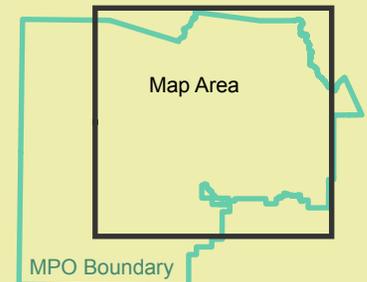


Persons Age 5 and Older With Limited English Proficiency (ACS 2010-2014)

Percent with Limited English

- 0% - 5%
- 6% - 15%
- 16% - 30%
- More than 30%

- Light Rail
- Planned Light Rail
- Freeway
- Planned Freeway
- Metropolitan Planning Organization
- County Boundaries



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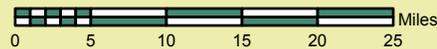
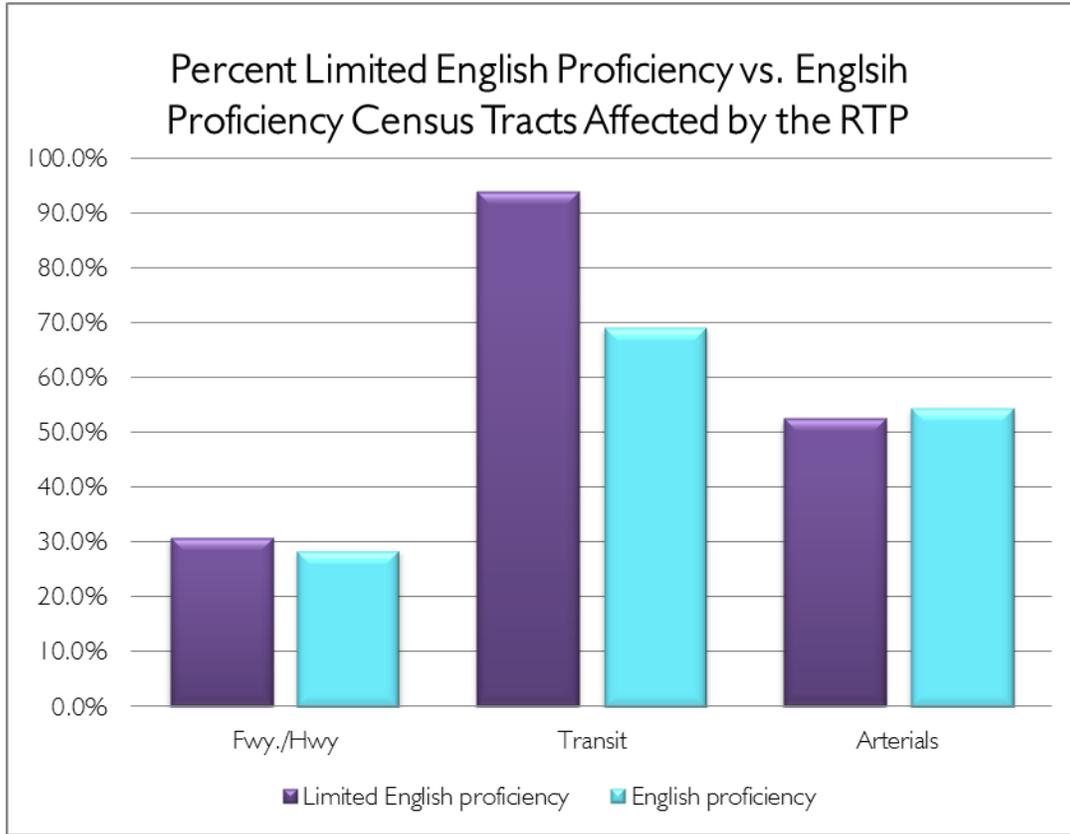


FIGURE 5-10
PERCENT LIMITED ENGLISH PROFICIENT vs. NON-LEP CENSUS TRACTS AFFECTED BY THE RTP



be sustained, and the updating and expansion of contacts ongoing. Through the continued expression of this outreach effort, transportation planning for the region can equitably address the needs of all residents. Responding to public input during development of the Regional Transportation Plan (RTP), the RTP increases funding for transit to 33 percent of the sales tax extension from the approximate two percent in the prior sales tax, demonstrating a growing commitment to provide transportation options for all residents of Maricopa County.

As described in the above sections of this chapter, MAG conducted an environmental justice overlay analysis to assess the effects of the RTP on the communities of concern. The analysis of the plan improvements demonstrated that the communities of concern generally benefit from the RTP at the same level as census tracts not identified as communities of concern. In addition, the RTP provides a high level of transit service to the communities of concern, which is consistent with the transportation needs of these groups. The plan also regionally funds ADA complimentary paratransit service, which is another important factor in providing mobility for communities of concern.

This result corresponds to an analysis contained in the MAG Title VI and Environmental Justice Program, June 22, 2016. Maps representing the current bus and capital transportation investments included in the *FY 2017-2021 MAG Transportation Improvement Plan* were prepared. The maps include population concentrations of people with disabilities, people with limited English proficiency, minorities, and people living in poverty. Analysis of the maps concluded that communities of concern receive equal benefit from the investments and that they do not shoulder a disproportionate burden. (See Appendix A)

It should be noted that the environmental justice analysis found that 65 or older communities generally do not have the same level of proximity to transportation services as other groups covered in the analysis. However, the census tracts associated with this community tend to be concentrated in outer areas of the region and contain retirement communities that are removed from major transportation facilities. The resulting pattern of proximity to transportation may have occurred to some degree by the choice of the members of this community. At the same time, elderly mobility has been a continuing concern at MAG, with efforts such as the MAG Elderly and Persons with Disabilities Transportation Program and the MAG Safety and Elderly Mobility Sign Project. Also, the level of transit service is enhanced by the paratransit system in the region.

Proximity to transportation is an important issue; however, it is only one of many issues related to transportation equity that MAG pursues. MAG addresses and considers the needs of underserved populations throughout its planning and programming process, and provides outreach in a variety of ways, including the Title VI Community Outreach Program, Geographic Information System (GIS) mapping, the Human Services division of MAG, and through programs run by the Regional Public Transportation Authority (RPTA) using MAG funds. Through the Community Outreach Program, MAG's Community Outreach Specialist coordinates with minority communities to solicit input and to serve as a liaison between MAG and the communities. In addition to minority communities, MAG targets and solicits input from persons with disabilities. Through RPTA's Complementary Paratransit Plan, the needs of the elderly and people with disabilities are served.

In addition, a MAG committee reviews and prioritizes applications for federal assistance under the Elderly and Persons with Disabilities Transportation Fund, which provides capital investments to programs serving the elderly and people with disabilities. MAG transportation plans and programs are also submitted to the Human Services Coordinating Committee for review. Additionally, MAG provides multimodal transportation information for review and comment to the Human Services planning process. The needs of older adults are further being addressed through a number of projects related to aging services planning such as the City Leaders Institute on Aging in Place and the Enhancing Age-Friendly Cities Initiative. These projects address the changing mobility options that are needed as people age.

CHAPTER SIX

CONSULTATION ON ENVIRONMENTAL MITIGATION AND RESOURCE CONSERVATION

The MAG long range transportation planning process is structured to make planning decisions and prepare planning products that are sensitive to environmental mitigation and resource conservation considerations. These activities are consistent with federal metropolitan transportation planning requirements for consultation with state and local agencies regarding inventories of natural or historic resources, as well as consultation with federal, state, tribal, wildlife, and regulatory agencies on potential environmental mitigation activities.

Environmental and Resource Factors in MAG Transportation Planning

The process to develop transportation improvements to meet the travel demands of a growing metropolitan area, such as the MAG Region, must address a variety of concerns related to resource conservation and environmental mitigation. A major element in this effort is consultation with environmental and resource agencies, conducted as part of the periodic updating of the Regional Transportation Plan. Another environmental aspect of the MAG transportation planning process is contained in area and corridor transportation studies. As a part of these studies, environmental and resource factors are assessed, and agencies are solicited for early input, so that environmental mitigation and resource conservation considerations are taken into account at all key stages of the planning effort.

Air quality conformity analysis of the MAG TIP and the RTP is also an important environmental factor in the MAG transportation planning process. For a finding of conformity, the air quality analysis must demonstrate that the TIP and RTP are in conformance with regional air quality plans and will not contribute to air quality violations. The conformity analysis must also demonstrate that the criteria specified in the federal transportation conformity rule for a conformity determination are satisfied by the TIP and RTP. A description of the conformity tests and results of the conformity analysis is provided in Chapter 24.

Agency Consultation Process

As part of the planning process for the update of the Regional Transportation Plan (RTP), MAG reaches out to federal, state, tribal, regional, and local agencies to consult on environmental and resource issues and concerns. Specific topics of interest include: land use management, wildlife, natural resources, environmental protection, conservation, historic preservation, and potential environmental mitigation activities. The primary goal of this consultation effort is to make transportation planning decisions and prepare planning products that are sensitive to environmental mitigation and resource conservation considerations. It should also be noted that all of the cities and towns in Maricopa County, and the Arizona Department of

Transportation (ADOT) are routinely involved in the RTP and its development, as members of MAG.

An important consideration in the consultation process is the recognition that previously adopted projects in the RTP undergo extensive environmental and resource impact assessment by the implementing agencies, such as the ADOT, the Regional Public Transportation Authority (RPTA), cities, towns and Maricopa County. With these processes already well established, which include requirements for input on mitigation and resource issues, the primary goal of the RTP consultation effort is to gain insight regarding concerns that may potentially involve future transportation planning efforts and future Plan elements. This approach avoids duplicating work efforts and burdening agencies with multiple requests for the same information.

Environmental and Resource Agency Involvement

The overall approach to the consultation process includes three types of activities: agency workshops, individual agency meetings, and participation in the MAG public involvement process.

- Agency Workshops - The consultation effort includes workshops held for the agencies involved in environmental and resource issues in the MAG Region. A comprehensive listing of the agencies that are invited to attend workshops is provided in Table 6-1. The purpose of the workshops is to receive input from the environmental and resource agencies, regarding the application of environmental mitigation and resource conservation concepts in the transportation planning process.
- Individual Agency Meetings - In addition to the workshops, separate meetings with individual agencies to discuss resource conservation and environmental mitigation issues are held, as may be appropriate. These meetings provide the opportunity to have detailed discussions on concerns and issues, as well as identify available data and information resources in depth.
- MAG Public Involvement Process - As part of the overall consultation process, the environmental and resource agencies are included in the MAG public involvement process. The MAG public involvement process is divided into four phases: early phase, mid-phase, final phase and continuous involvement.

FY 2017 Agency Workshop

The 2035 Regional Transportation Plan (RTP) was approved in January 2014. Federal regulations require an update of the Plan within four years of its last approval. The target for MAG approval of the next RTP update, the 2040 RTP, is June 2017. It is anticipated that the 2040 RTP will be a transitional plan that largely maintains existing modal program structure. In addition, the 2040 RTP will document progress on the development of federally required

**TABLE 6-1
ENVIRONMENTAL AND RESOURCE AGENCIES**

Federal	Native American Indian Communities
Army Corp of Engineers	Fort McDowell Yavapai Nation
Bureau of Indian Affairs	Gila River Indian Community
Bureau of Land Management	Salt River Pima-Maricopa Indian Community
Environmental Protection Agency	Tohono O'Odham Nation
Federal Aviation Administration	
Federal Highway Administration	
Federal Transit Administration	Maricopa County
Fish and Wildlife Service	Air Quality Department
Luke Air Force Base	Environmental Services
National Forest Service	Department of Transportation
National Park Service	Flood Control District
State	COG and Other
Department of Environmental Qual.	Arizona Municipal Water Users Association
Department of Transportation	Central Arizona Governments
Department of Water Resources	Central Arizona Projects
Game and Fish Department	Salt River Project
Geological Survey	Sun Corridor Metropolitan Planning Organization
State Historic Preservation Office	
State Land Department	
State Parks	

performance measures and performance targets. During FY 2017, technical work for preparation of the 2040 MAG Regional Transportation Plan will be finalized, building on the background information developed in FY 2016. This effort will address plan components such as: (1) transportation modal systems, (2) financial resources, (3) system management and operations, (4) transportation performance measures and targets, (5) travel demand and system capacity, (6) public involvement and agency consultation, (7) population and employment forecasts, and (8) special needs transportation. In addition, supporting activities such as transportation network modeling, air quality analysis, and public participation will be conducted to meet all federal planning requirements.

A stakeholder workshop to obtain input on the RTP update process was held on August 22, 2016. The agencies listed in Table 6-1 were invited to attend. In addition, MAG member agencies were notified of the workshop. Since the update of the RTP is not anticipated to consider any new corridors, the workshop focused on the project programming process, as well

as refinements to the existing life-cycle freeway/highway program. The meeting began with presentations from MAG staff related to the public involvement process, transportation planning and programming, and current rebalancing efforts of the regional freeway and highway program. The presentations concluded with an overview of upcoming important dates to help stakeholders in understanding the MAG planning and programming efforts, and facilitate future input to the process. Following the presentations, a stakeholder discussion was held where agency representatives were encouraged to share information, ask questions, or discuss future projects.

A summary of the discussion at the August 22, 2016 Workshop is provided in Appendix B.

FY 2013 Agency Workshop

An update of the Regional Transportation Plan (RTP) was not conducted during FY 2011. Beginning in FY 2012 and continuing into FY 2013, work proceeded on the preparation of the 2035 RTP, which was targeted for adoption in the summer of 2013. In conjunction with the development of the 2035 RTP, an agency workshop was held on November 6, 2012 to receive input from environmental and resource agencies, regarding the application of environmental mitigation and resource conservation concepts in the transportation planning process. As at previous workshops, the agencies listed in Table 6-1 were invited to participate.

The emphasis at the November 2012 workshop was on work MAG has been conducting in the areas of: (1) sustainable transportation and land use integration, (2) complete streets guidelines, and (3) bicycle and pedestrian planning. In addition, an overview of the approach to developing the 2035 RTP was provided, which covered background on the contents of the current plan, new factors to be considered in preparing the updated plan, and future opportunities for comment on the planning process. Agencies were encouraged to provide input, either at the workshop or through later correspondence, regarding any experiences, insights, or concerns from their agency perspective on the studies MAG has been conducting, as well as the overall regional transportation planning process.

Key comments received as a result of the November 6, 2012 Workshop are summarized in Appendix B.

FY 2010 Agency Workshop

The development of the 2010 Update of the Regional Transportation Plan (RTP) continued through calendar year 2009, and an additional agency workshop was held on November 9, 2009 to receive input from environmental and resource agencies, regarding the application of environmental mitigation and resource conservation concepts in the transportation planning process. The agencies listed in Table 6-1 were invited to participate.

The emphasis at the November 2009 workshop was on proposed legislation at the federal level that may have an effect on the transportation planning process. In this regard, considerable

activity had been occurring at the federal level in the areas of clean energy, climate change, and national funding for transportation. Many of the concepts in this proposed legislation address issues affecting the environmental and resource conservation aspects of transportation planning. The goal of the workshop was to discuss pending legislation, and develop insights and draw conclusions about the potential future direction of the regional transportation planning process.

Key comments at the November 9, 2009 Workshop are summarized in Appendix B.

FY 2009 Agency Workshop

As in prior years, MAG reached out to federal, state, tribal, regional, and local agencies to consult on environmental mitigation and resource conservation issues and concerns, during the development of the 2010 Update of the Regional Transportation Plan (RTP). As part of this effort, an agency workshop was held on November 13, 2008 to review MAG studies and receive input from environmental and resource agencies, regarding the application of environmental mitigation and resource conservation concepts in the transportation planning process. The agencies listed in Table 6-1 were invited to participate.

Three studies were discussed at the workshop, including the I-10/Hassayampa Valley Transportation Framework Study, the I-8/I-10/ Hidden Valley Transportation Framework Study, and the Regional Transit Framework Study. Preliminary information from the first two of these studies was presented at the FY 2008 Workshop, and the FY 2009 Workshop provided an opportunity to discuss the studies in greater detail. In addition, preliminary information from the MAG Regional Transit Framework Study was presented, which evaluates future transit needs beyond those contained in the RTP.

Key comments at the November 13, 2008 Workshop are summarized in Appendix B.

FY 2008 Agency Workshop

MAG has generally updated the RTP annually, even though federal regulations allow metropolitan transportation plans to be updated only every four years. However, during FY 2008, a decision was made to postpone the update of the RTP until FY 2009. This was due to uncertainties regarding federal policies for programming CMAQ funds and the completion date of a cost review of the Freeway/Highway Life Cycle Program.

Although the RTP was not updated during FY 2008, an agency workshop was held on November 6, 2007 to obtain input on ongoing MAG transportation studies. The agencies listed in Table 6-1 were invited to participate. The main purpose of the workshop was to receive input on two MAG studies that assess transportation needs in developing areas of the region. These studies were the I-10/Hassayampa Valley Transportation Framework Study, and the I-8 and I-10/Hidden Valley Transportation Framework Study.

Key comments at the November 6, 2007 Workshop are summarized in Appendix B.

FY 2007 Agency Workshop

As part of the process to prepare the 2007 Update of the RTP, MAG conducted an extensive outreach program to obtain input from environmental and resource agencies. This effort was initiated with an agency workshop, which was held on August 17, 2006. The workshop provided an opportunity to familiarize the agencies with MAG's organization and planning responsibilities, as well the goals of the consultation process. Most importantly, agency input was obtained on environmental mitigation and resource conservation issues, available databases and other information resources, and future steps in the planning process.

Following the workshop, MAG staff held additional individual meetings with thirteen key environmental and resource agencies during September/October 2006. These meetings afforded the opportunity to conduct in depth discussions regarding concerns specific to those agencies. In addition, it provided a means to gain excellent insight into environmental mitigation and resource conservation methods that would have potential application to the transportation planning process.

Following the workshop, MAG staff held additional individual meetings with thirteen key environmental and resource agencies during September/October 2007. These meetings afforded the opportunity to conduct in-depth discussions regarding concerns specific to those agencies. In addition, it provided a means to gain excellent insights into environmental mitigation and resource conservation methods that would have potential application to the transportation planning process.

Also during FY 2007, environmental and resource agencies were invited to participate in the MAG public involvement process. The agency workshop was held in conjunction with the early phase of this process. As part of the mid-phase of the public involvement process, which includes a public hearing on regional transportation issues, the agencies received a copy of the Draft 2007 RTP Update and were invited to submit written comments. Lastly, as part of the final phase of the process, which provides an opportunity for final comment on the RTP, TIP and Air Quality Conformity Analysis, agencies were given notice of the hearing and invited to comment.

Key comments at the August 17, 2006 Workshop and follow-up individual agency meetings are summarized in Appendix B.

Discussion of Environmental Mitigation, Natural and Historic Resource Conservation, and Planning Process Considerations

A broad range of federal, state, and tribal agencies that specifically address wildlife, land management and regulatory matters were consulted regarding potential environmental mitigation activities that may have the greatest potential to address the environmental

functions affected by the Plan. The transportation planning process and its future environmental implications were discussed, and concepts for potential environmental mitigation activities were identified. Since previously adopted projects in the RTP undergo extensive environmental and resource assessment by the implementing agencies through the NEPA process, the primary goal of the consultation effort was to gain insights regarding issues that may potentially involve future planning efforts and future Plan elements.

In addition, state and local agencies were consulted regarding transportation planning issues affecting land use management, natural resources, environmental protection, conservation and historic preservation. These discussions also included the identification of conservation maps, inventories of natural or historic resources, and other information sources to utilize in the regional transportation planning process. Similar to the environmental mitigation discussions, this consultation effort was aimed primarily at identifying resource and conservation concerns that address future planning efforts and future Plan elements.

During the meetings with key agencies, the discussions often led into the area of transportation planning, in general, and how environmental and resource concerns can be effectively integrated into the planning process. Also, discussions included the identification of key databases, conservation maps, inventories of natural or historic resources, and other information sources to utilize in the regional transportation planning process.

Appendix B documents the input provided through the environmental and resource conservation consultation effort, representing a valuable resource for the ongoing transportation planning process. The points listed are not intended to represent MAG policies, but rather, are factors for consideration in the transportation planning process.

Consultation for Area and Corridor Transportation Planning Studies

Area and corridor transportation planning studies play a vital role in the overall MAG transportation planning process. These studies assess evolving transportation needs not covered by the adopted MAG RTP. They provide the opportunity to review transportation conditions in detail within a specified geographic area or modal facility system, identifying potential new RTP elements for consideration in the decision-making process. The area/corridor studies are conducted within the context of the entire regional system, so that travel demand and facility interactions throughout the region are recognized.

One of the major steps in the area/corridor study process covers the inventory of environmental and resource factors. Environmental and resource agencies are solicited for input early in the process, so that data on existing conditions can be assembled thoroughly and accurately. In addition to data collection, the process includes the identification of potential environmental, cultural and natural resource issues affecting the area or corridor under study. The information on existing conditions and potential issues provides one of the key inputs for identification of alternatives. Once alternatives have been identified, environmental and resource data and issues identified in the inventory phase are utilized as input for the

development of evaluation criteria and the assessment of alternatives. This evaluation process provides valuable information on possible environmental and resource impacts and helps identify mitigation considerations connected with potential future decisions on proposed new transportation corridors or improvements to existing facilities.

Specific modal and area transportation planning studies that have been completed, or are ongoing, are discussed in “Chapter 17 - Extended Planning Outlook”. The findings and recommendations from these studies identify potential new corridors or other transportation improvements that may be considered in future updates of the RTP. In several cases, illustrative projects/corridors have been identified as a result of the studies and included in the RTP (see Chapter 17). Illustrative corridors and projects are provided for in the federal transportation planning regulations to allow identification of plan elements that would potentially be included in the Plan, if funding were available. One of the major benefits of identifying illustrative corridors is that it facilitates early and thorough vetting of potential environmental mitigation and resource conservation issues. In addition, the status of study results as illustrative plan elements also provides a continuing opportunity to assess their potential environmental and resource conservation effects, so that they may be taken into account throughout the decision-making process.

SECTION TWO

TRANSPORTATION MODES

CHAPTER SEVEN

TRANSPORTATION DEMAND OF PERSONS AND GOODS

Transportation system analysis and forecasting are critical components in the regional transportation planning process, laying the foundation for identifying future transportation solutions, evaluating alternatives, and making infrastructure investment decisions. Regional household travel surveys are periodically conducted by MAG in order to collect information necessary for travel model development and transportation system analysis. As a part of the system analysis effort, MAG also continuously monitors and analyses travel patterns in the region. In addition, MAG develops and maintains state-of-the-practice and state-of-the-art transportation demand modeling tools.

Transportation Data Collection and Transportation Modeling

Transportation system analysis and forecasting relies on an extensive set of data and modeling tools designed and developed to evaluate current trends and project future conditions of the regional transportation system. Numerous transportation data sets and modeling tools are utilized for the development of future year projections and evaluation of current travel patterns. Observed transportation data forms the foundation for developing transportation models. Transportation models are subsequently used to develop quantitative projections of the future demand for moving people and goods on the regional road and transit networks. Figure 7-1 depicts the relationships among various data sources, modeling tools, and transportation planning applications.

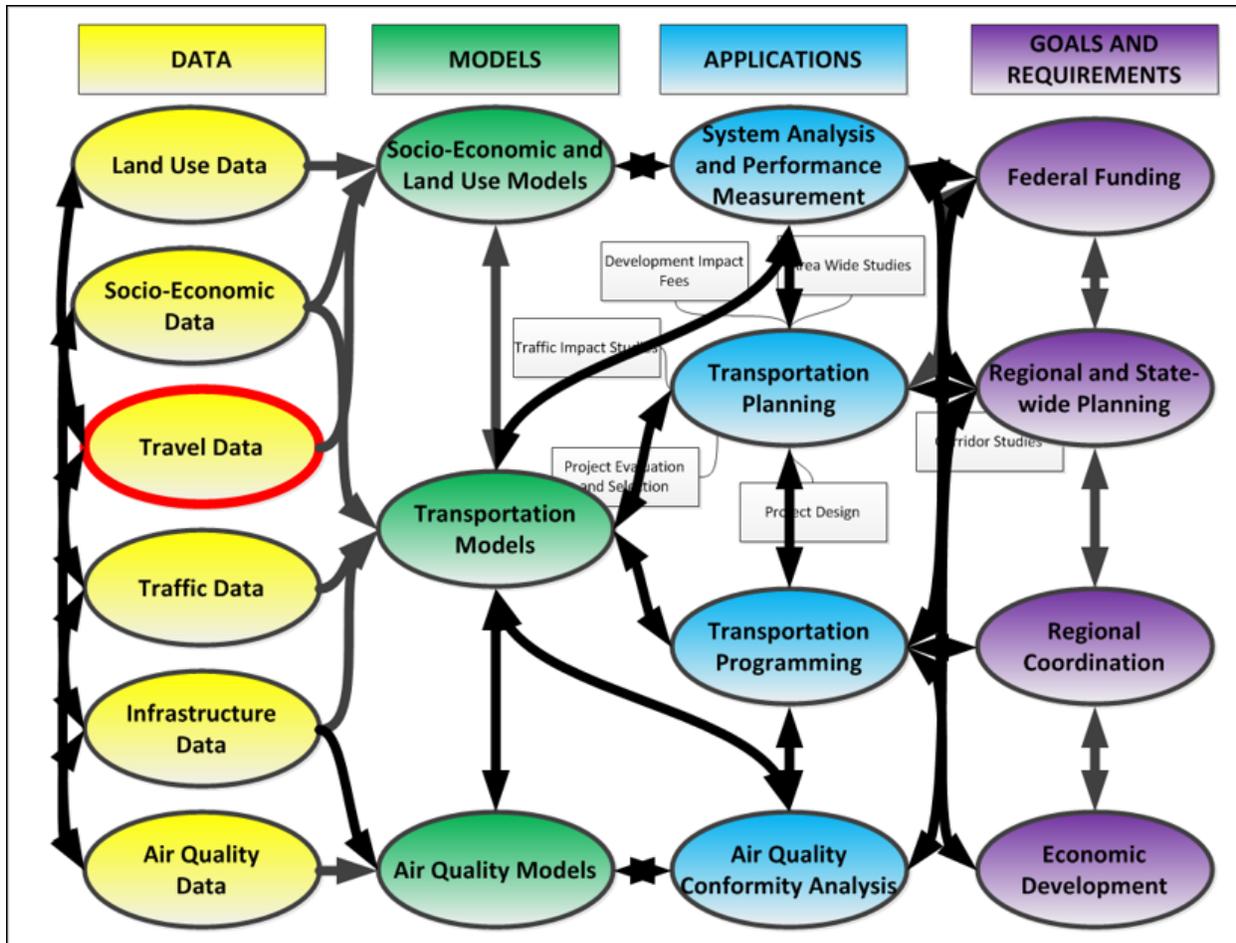
Transportation Data Collection

The major data sets that are currently utilized in the system analysis and forecasting process can be classified as follows: (1) travel data, (2) traffic data, (3) infrastructure data, and (4) other modeling inputs.

- **Travel Data** - Travel data includes passenger travel data and goods movement data. Passenger travel data covers temporal and spatial information about people's travel, including trip purpose, trip origins and destinations, how trips are linked together, mode of travel, time of travel, and numerous other travel characteristics. Travel information characterizes travel demand in the region for both passenger and goods movement. Travel information is normally complemented by information about socio-economic characteristics of travelers, such as household composition, car ownership, age, income, employment status, and number of workers.

Economic data about establishments is also collected, including industry classification, size, location and a number of other characteristics. Simultaneous collection of socio-economic and travel data during travel surveys is necessary for the development of regional travel demand forecasting models that estimate travel of different

**FIGURE 7-1
TRANSPORTATION DATA, MODELING AND PLANING RELATIONSHIPS**



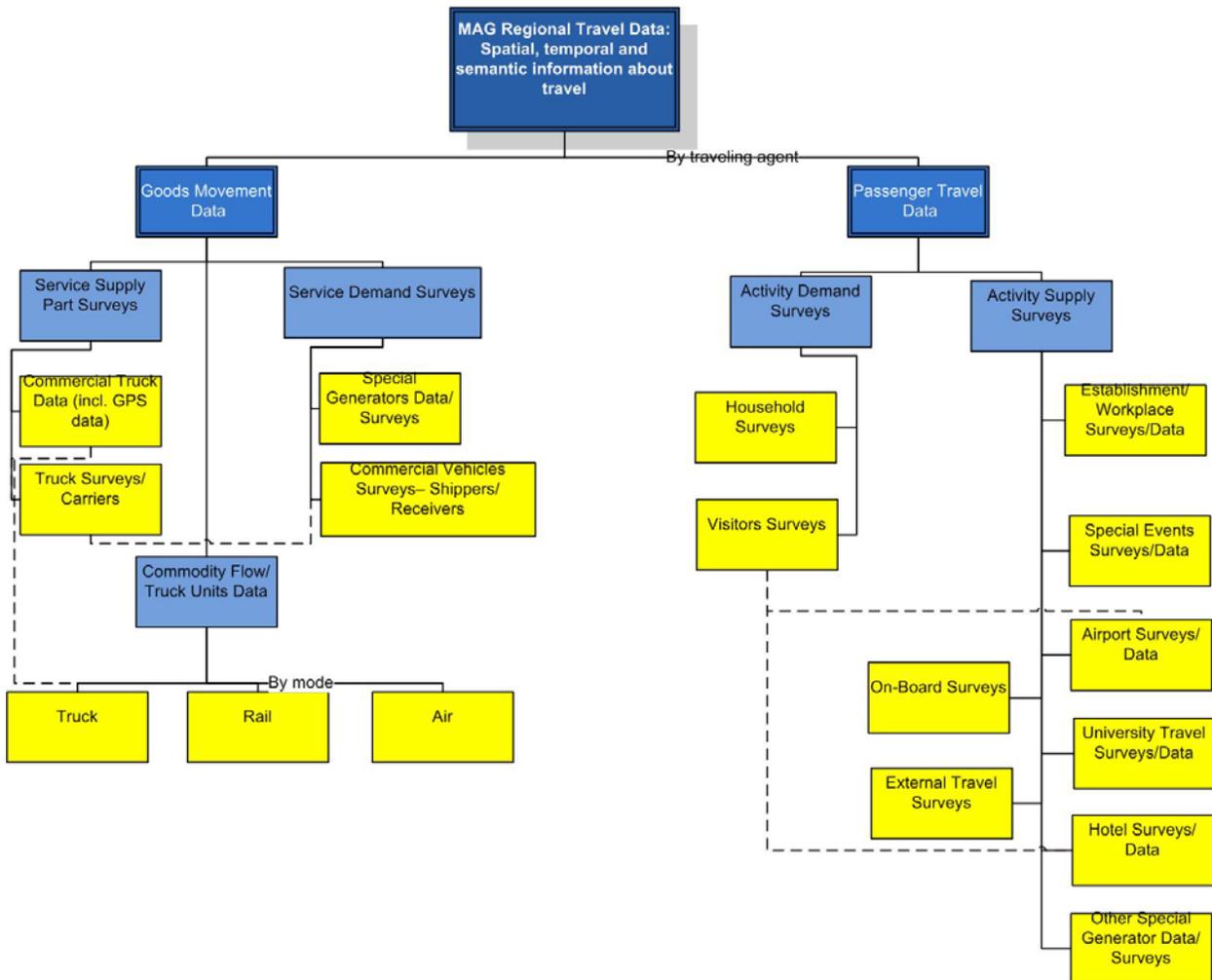
socio-economic groups of people and travel demand generated by different types of establishments.

MAG acquires and collects travel data from a variety of data sources (see Figure 7-2). Regional household travel surveys are periodically conducted by MAG in order to collect information necessary for travel model development and transportation system analysis. Household travel surveys collect information about passenger travel such as trips by residents to work, shopping and other purposes. MAG participated in the FHWA National Household Travel Survey in 2008/2009.

At the writing of this report, MAG is conducting a new 2016/2017 household survey based on innovative technologies. The ongoing survey is based on a 100 percent GPS sample collected through a smart phone application or a GPS logger. MAG previously

completed additional surveys, including: (1) truck survey in 2007, (2) external travel survey in 2008, (3) planned special events survey in 2009-2010, and (4) special generators surveys, including ASU and regional airports surveys, in 2012. MAG is currently conducting a regional establishment survey that includes a commercial vehicle survey, truck GPS data collection, various commercial data acquisitions, and a number of other relevant efforts. Some of the surveys are complemented by commercial data purchases, such as truck GPS data.

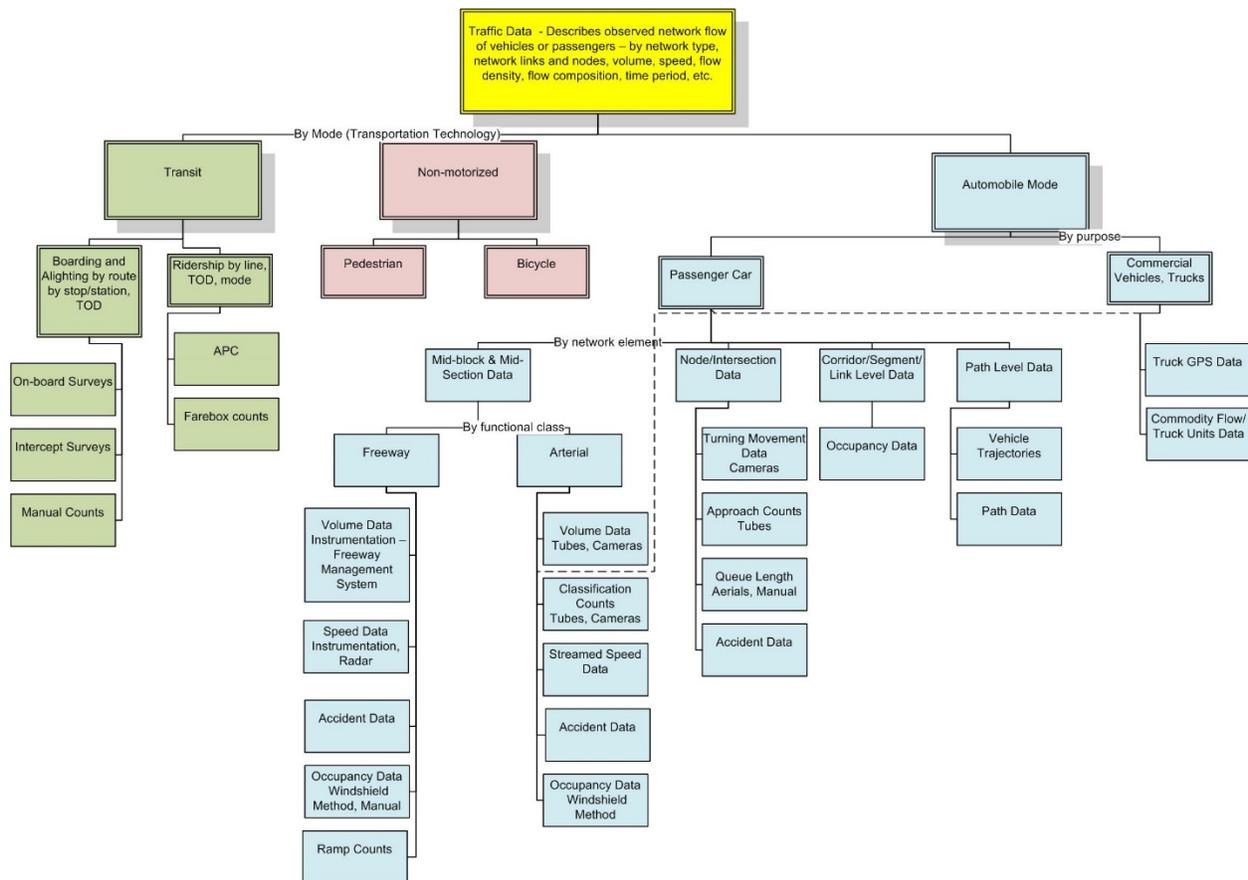
**FIGURE 7-2
TRAVEL DATA SOURCES**



- **Traffic Data** - Traffic data provides information about vehicles or passengers flows in relation to various network characteristics, such as facility type, time periods, and trip end locations. Key traffic data characteristics include: speed data, classification and volume counts, truck GPS datasets, vehicles traces and trajectories, turning movements, queue lengths, bottleneck information, and other datasets describing traffic flow. Traffic

data can be linked to safety data, meteorological data and include records of accidents linked to the specific networks elements. MAG traffic data is compiled into a number of databases. Main components of the traffic data are reflected in Figure 7-3. Similar to travel data, surveys that collect traffic data are increasingly replaced by data acquisitions from commercial data providers. For example, commercial speed data and travel time data have replaced individual travel time and speed studies. Newly available “Big Data” sources often provide larger samples of data, with better quality and at a reduced cost, compared to transportation studies conducted before.

**FIGURE 7-3
TRAFFIC DATA SOURCES**



Recent region-wide traffic data collections included: (1) regional traffic counts in 2007 and 2008, (2) regional intersection turning movements and approach counts in 2010, (3) regional traffic volume and classification screen lines counts in 2011, (4) unpaved roads and complementary volume counts in 2012 and 2013, and (5) regional traffic volume and classification counts in 2014-2015. The traffic counts taken by MAG member agencies were also processed and used in the count database and count maps. Access to

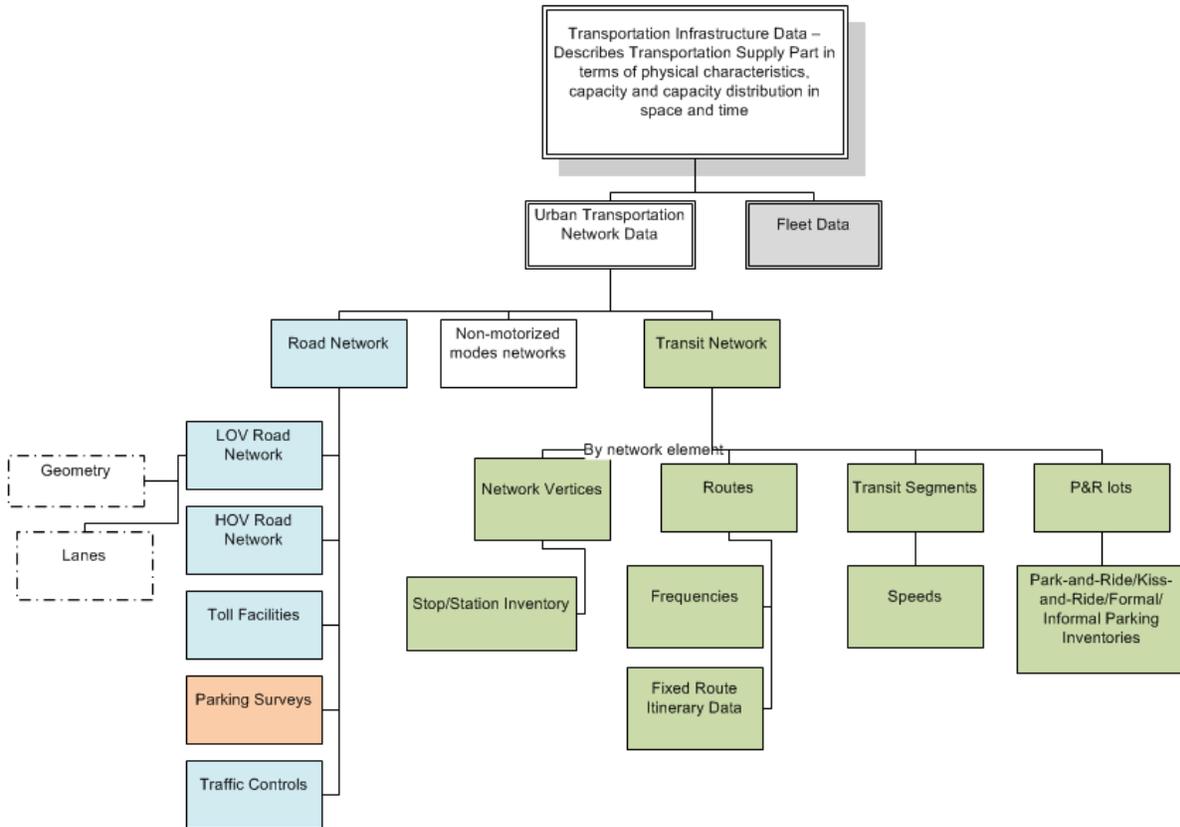
MAG traffic counts data is publicly available at www.magtrans.org. MAG purchases speed data on annual basis and utilizes National Performance Management Research Data Set made available to MPOs by the FHWA.

There are about 30,000 traffic counts in the database available through the MAG traffic counts data portal, which is available to the public through the MAG web site. Distribution of the some of the data is limited by corresponding data license agreements with the vendors.

MAG periodically conducts regional bottleneck studies that identify, rank, and analyze regionally-significant traffic bottlenecks. The collected information is used at the micro-level to plan specific corridor improvements, as well as at the macro-level to provide broad quantitative datasets for large regional planning studies. A 2015-2016 regional bottleneck study is nearing completion. The study used speed data and unique aerial photography data collection techniques that allowed the processing of ground truth information about individual vehicle trajectories. This information is a key source of information for traffic operational improvements and for calibration of MAG traffic microsimulation models. Detailed reports of the completed traffic studies are available from MAG website.

- Infrastructure Data - Infrastructure data for the MAG region includes descriptions of road systems, transit networks, bicycle routes, street intersections, freeway interchanges, and various other network elements. MAG collects and manages information about road and transit facilities of regional significance. The network information, including current network conditions and future projects is stored in a number of databases (see Figure 7-4). A TransCAD geodatabase includes detailed information about freeways and arterial roads, including various network elements and their attributes. TransCAD transportation modeling networks provide details about various network elements, covering intersections, road and transit segments, area type, facility type, network topology, number of lanes, transit route itineraries and frequencies, and other network characteristics.
- Other Modeling Inputs - Other important inputs to the transportation modeling and forecasting process include:
 - Socio-economic Data: Socio-economic data provides information about social, demographic and economic characteristics of the regional population and businesses. Some of the data, as was mentioned above, is normally collected during travel surveys, while other relevant datasets are acquired from a variety of governmental and private data-providers. Projections of the socio-economic data on various geographic levels are a primary input into travel demand forecasting.

**FIGURE 7-4
TRANSPORTATION INFRASTRUCTURE DATA**



These projections are developed at MAG using socio-economic models maintained in-house. Population data include information about residential, transient and seasonal populations, as well as household and personal level information for base and future years. Business and establishment data include economic characteristics, such as industry type and size. Socio-economic information is collected from a variety of sources, including commercially available databases, data from various governmental resources, information from surveys, and statistics from other data sources.

- **Land Use Data:** Land use data is another important component of the data inputs into transportation models. Land use data includes information about various land use types at different levels of geography, covering residential, industrial, retirement, and other land use characteristics. Land use data is collected from local jurisdictions, county accessor’s files, and other data sources, and is regularly updated.

- Air Quality Data: Air quality data (for example, meteorological data and emissions data) are used for air quality modeling. Transportation models provide inputs for air quality models.

Transportation Modeling

MAG develops and maintains state-of-the-practice and state-of-the-art modeling tools. Main large scale models include:

- Regional four step trip-based transportation forecasting model.
- Mega-regional activity-based model.
- Regional microsimulation model.
- Mega-regional behavioral agent-based freight model.
- Truck models.
- Special events model.
- Various other specialized modeling tools.

Each modeling tool has a range of applications to the various stages of the regional transportation planning process. The MAG regional travel demand forecasting model incorporates an area of 16,080 square miles (Fig. 7-5). Included are the entire areas of Maricopa and Pinal Counties as well as portions of Gila and Yavapai Counties. For the purposes of travel demand modeling, the base year estimates and future year projections of population, employment, and land use require spatial allocation to smaller geographical areas within the modeling area. This permits the modeling of trips from origins to destinations throughout the planning area.

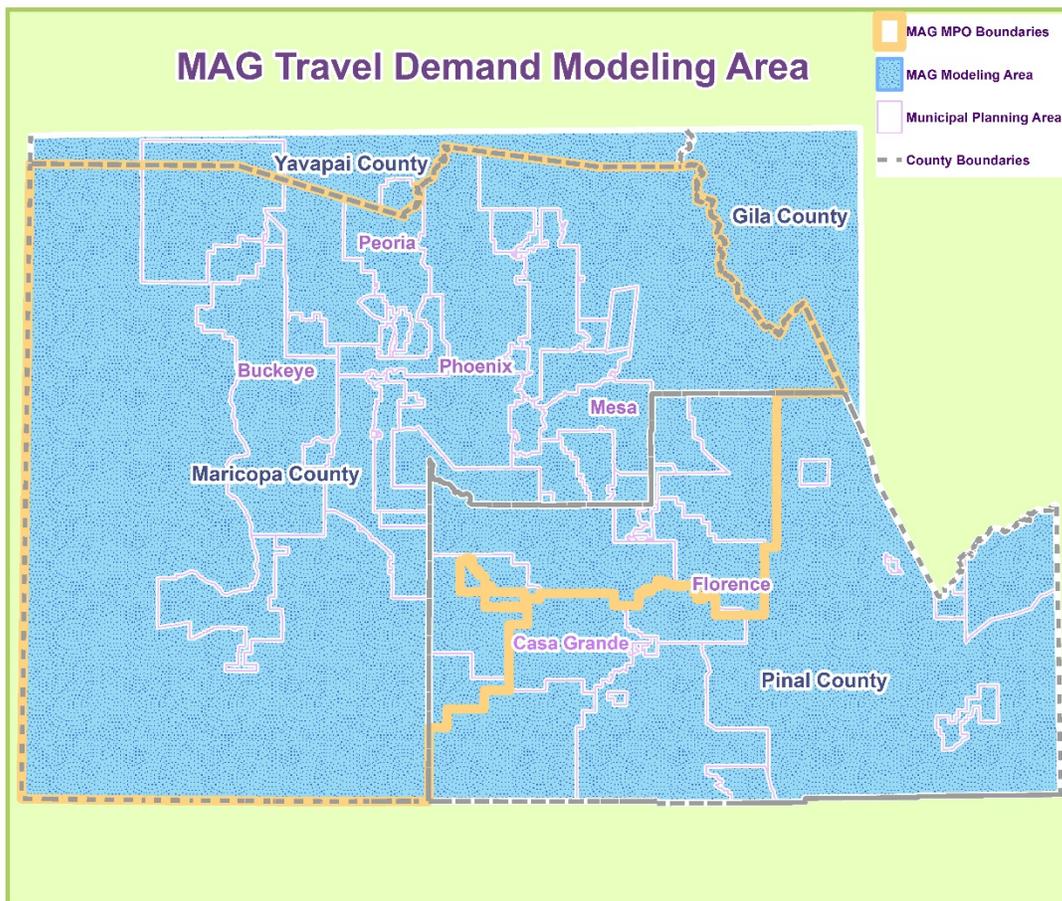
The regional four-step based transportation forecasting model produces estimates of traffic volumes and speeds for four different time periods, including morning peak period, mid-day, afternoon peak period, and night. Estimates also cover five different vehicle classes, addressing high and low occupancy passenger vehicles, light, medium, and heavy trucks. The activity-based travel demand forecasting model is capable of producing traffic demand projections on a continuous timeline. Modeling networks maintained at MAG represent freeway and major arterial roads. The forecasting models output includes projections of link-level traffic volumes, with links normally one-half to one mile in length. Models also estimate the future level of service on the regional network.

The movement of goods in the MAG region plays a vital role in our local, regional and state economy. MAG has established a significant freight modeling capability, and has purchased and developed several data sets to assist the regional freight planning efforts.

It should be noted that new transportation technologies can significantly, if not drastically, alter the interplay between transportation supply and demand. New technologies in both passenger

and freight transportation, such as autonomous vehicles and ride-sharing, are positioned to change the ways people and goods move in the future. MAG is working on developing tools and methods that will facilitate planning efforts addressing these changes in the way transportation is provided. The activity-based travel demand forecasting model and agent-based freight model that MAG has recently developed will be major tools for developing and quantifying planning scenarios that cannot be adequately evaluated with the previous generation of forecasting tools and methods.

**FIGURE 7-5
MAG REGIONAL MODELING AREA**



Current Travel Patterns and Travel Forecasts

MAG continuously monitors and analyses travel patterns in the region. In addition, forecasts of future person trips and goods movement, based on the latest socio-economic projections, are developed and updated on a regular basis. This data on current travel patterns and future

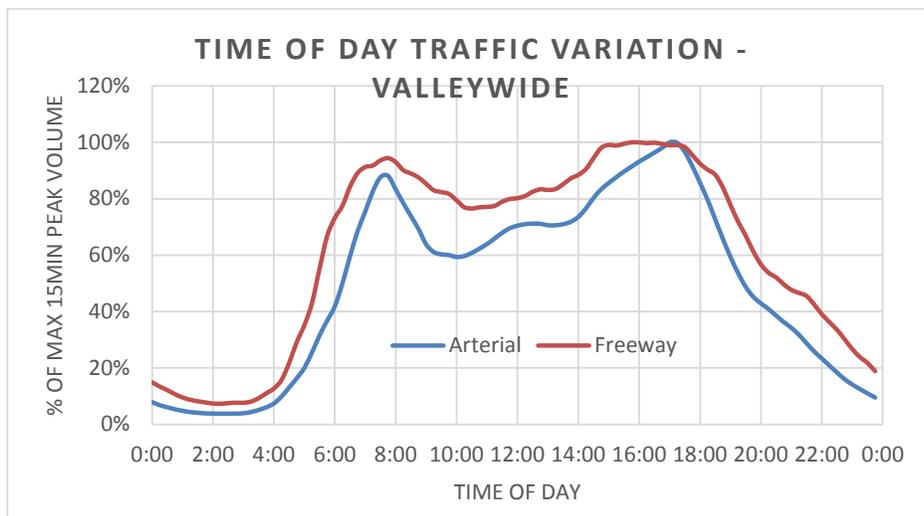
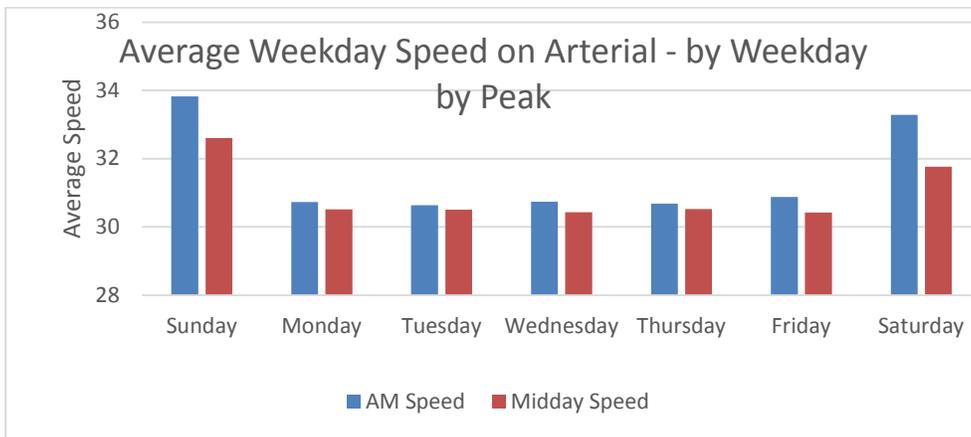
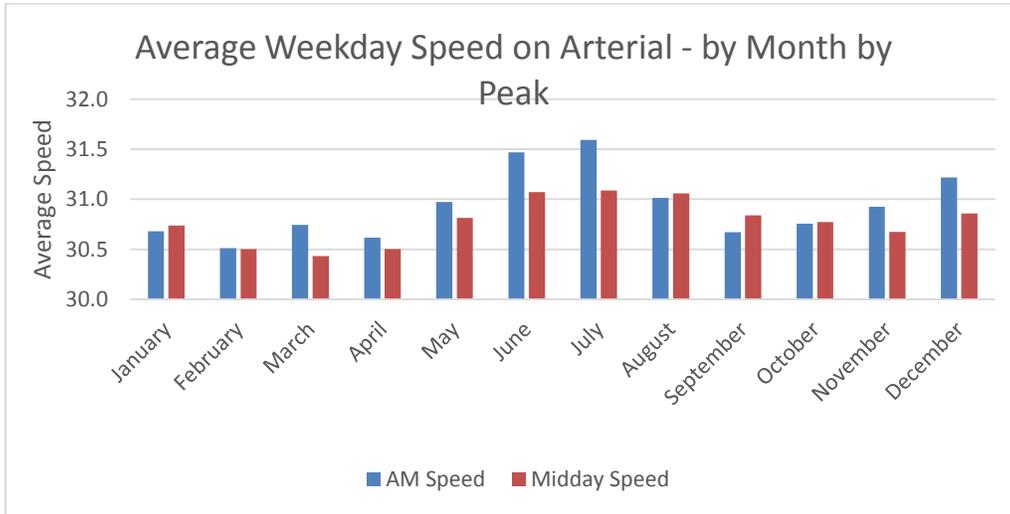
travel demand is critical for understanding trends in the MAG region, providing a solid foundation for the regional transportation planning process.

Current Travel Patterns

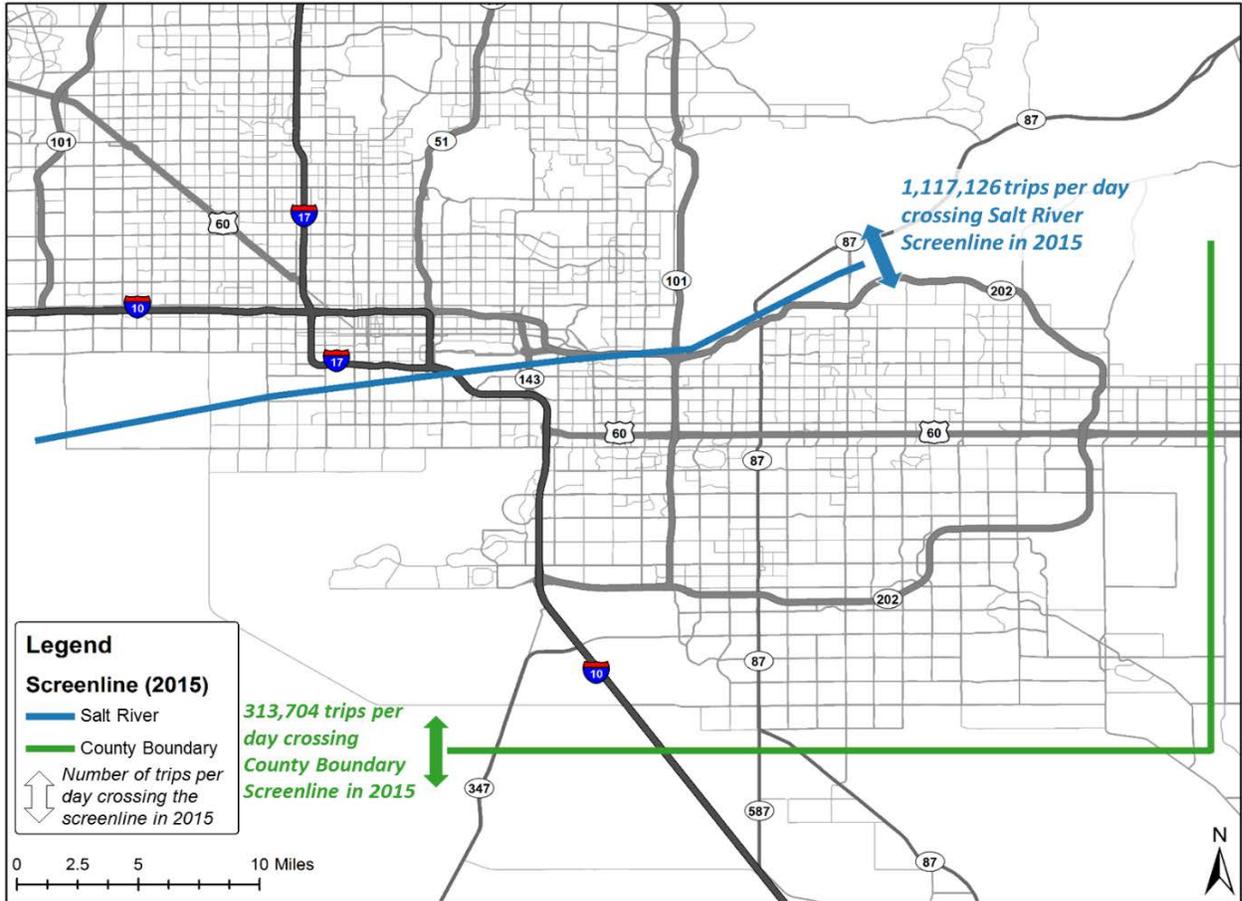
As a part of system analysis effort, MAG continuously monitors and analyses travel patterns in the region. Analysis of the current travel patterns is mostly based on the observed data described in previous sections. Temporal, spatial and semantic aspects of the travel trends and characteristics are compared with outputs from MAG models in order to ensure strict validation procedures and improve accuracy of the regional travel forecast.

- Temporal Travel Patterns - Various seasonal, daily and weekly patterns are typical for traffic in large urban areas (see Figure 7-6). Seasonal specifics of the MAG region manifest themselves in noticeably reduced traffic volumes during hot summer months with schools closed, resulting in higher traffic speeds. Weekly trends expectedly indicate traffic peaking on weekdays with the highest average speeds on Saturday and Sunday. Daily temporal trends and patterns in traffic volumes reveal peaking of the regional traffic volumes during peak periods. This pattern is characteristic for large growing regions. The afternoon peak has become more pronounced and increased in duration, which is also a typical phenomenon in the congestion patterns of large regions due to a broader range of trip purposes and departure times compared to the morning peak period. Both arterial and freeway regional traffic patterns exhibit similar time-of-day patterns.
- Spatial Travel Patterns - Spatial distribution of regional travel is often monitored through traffic counts stations aligned along major screen lines – imaginary lines that cross the region to monitor traffic movements between different sub-areas. Figure 7-7 shows an example of some of the major screen lines demonstrating large traffic volumes moving between Maricopa and Pinal Counties and from the Southeast Valley to the other parts of the region. More detailed analysis of the spatial distribution of regional travel is conducted with the activity-based model and travel surveys data that help to identify regional patterns by trip purpose, time of day, and mode of travel. Overall travel demand and average spatial travel demand patterns can be analyzed using a variety modeling tools. So called “spider networks” show size and direction of desired travel without detailing exact path that the travelers can take to get from origins of their trips to destinations. Figure 7-8 shows 2015 travel demand patterns.
- Goods Movement - MAG staff has completed several freight planning projects in the past and is currently developing the MAG Freight Plan, the Strategic Highway Research Plan (SHRP2) Freight model for the region and the Arizona Sun Corridor. As part of the freight planning projects and modeling requirements, MAG has purchased and developed several data sets to assist in the transportation planning and more specifically the regional freight planning efforts.

**FIGURE 7-6
TEMPORAL TRAVEL PATTERNS - 2015**

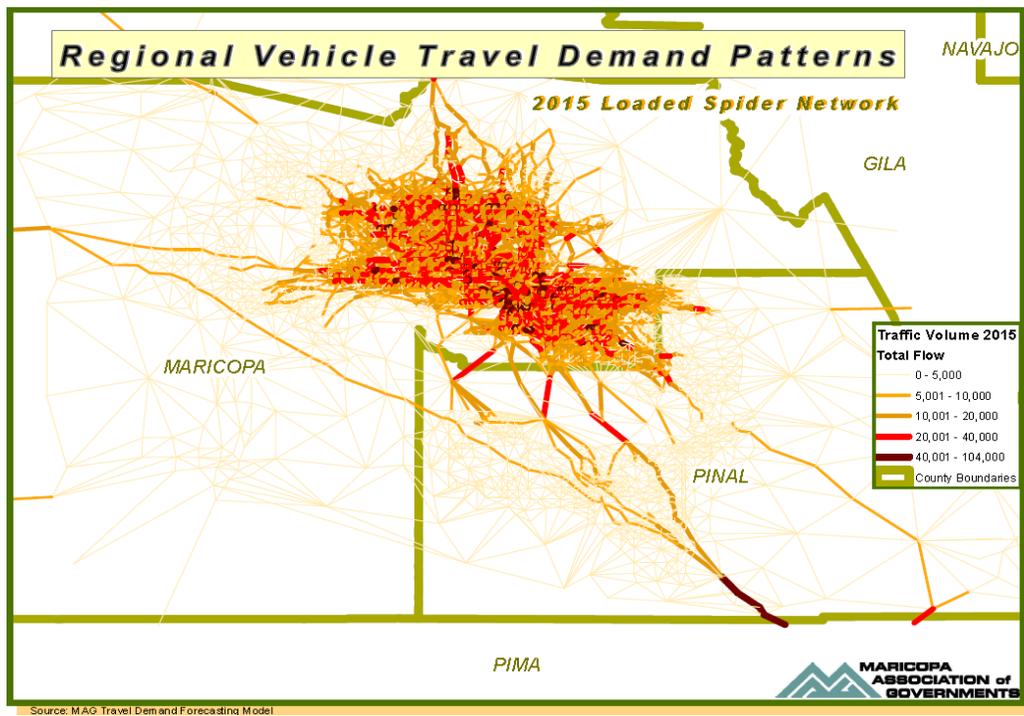


**FIGURE 7-7
SPATIAL TRAVEL PATTERNS IN THE MAG REGION - 2015**

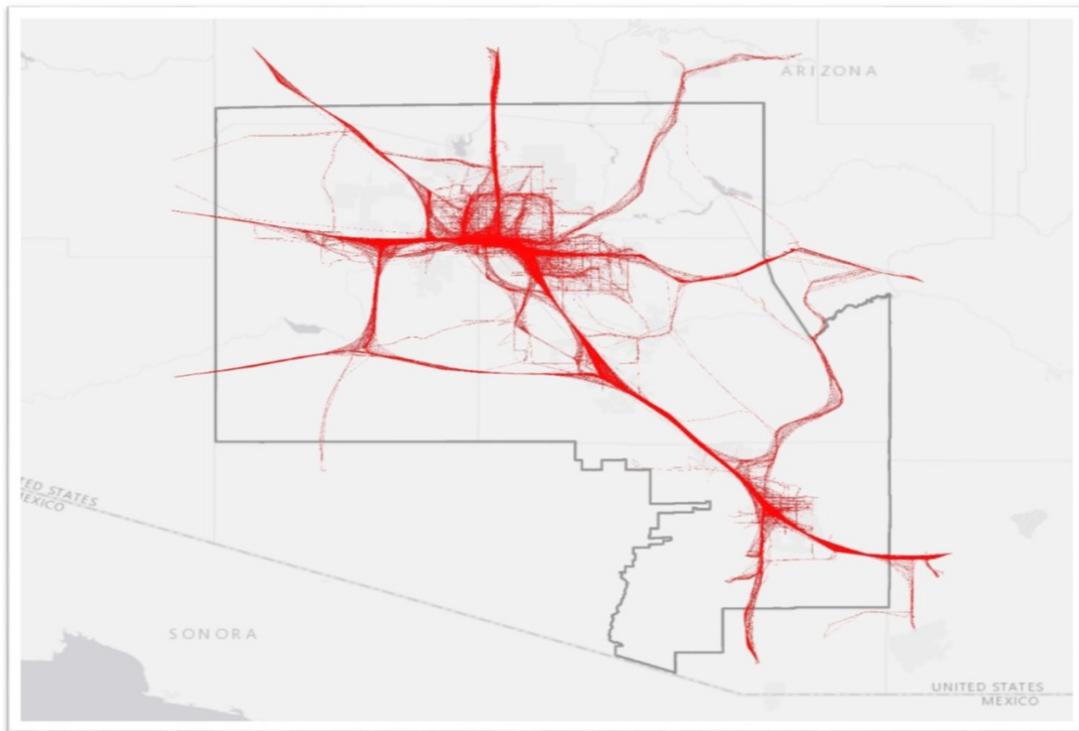


Existing freight clusters were identified and analyzed in the region with the goal of identifying critical urban freight corridors, including heavy, medium, and light trucks. As part of the freight planning process, MAG staff analyzed this data to identify freight corridors that provide access between the existing freight clusters and national intercity corridors. As shown in Figure 7-9, MAG staff used the commercial vehicle truck GPS data from the American Trucking Research Institute (ATRI) to illustrate the major truck corridors (national highway freight system) in the Arizona Sun Corridor (Phoenix – Tucson). This data is assisting MAG staff on identifying critical urban and rural freight corridors that will connect to the national highway freight network and ultimately assist in developing the MAG freight network.

**FIGURE 7-8
REGIONAL VEHICLE TRAVEL DEMAND PATTERNS - 2015**



**FIGURE 7-9
HEAVY TRUCK MOVEMENT IN THE MAG REGION - 2015**



Travel Forecasts

Forecasts of the future travel demand in the region are an essential element of the transportation planning process, helping to guide decision-making regarding the need for operational and capital improvements to the transportation infrastructure in the region. Forecasts of travel on the roadway and transit system are developed through the use of computer simulations of the future transportation network. These simulations are based on assumptions regarding potential future improvements to the transportation system, projections of future population levels, and other critical factors such as land use densities and patterns. The use of computer simulations allows the testing of various network options to determine how future system performance is affected by alternative investment strategies. The data presented below corresponds to the transportation facilities and socio-economic forecasts included in the 2040 RTP. In addition to forecasts, baseline statistics for 2015 are listed, which serve as the starting point for the forecasting process.

- Roadway Infrastructure** – The transportation modeling networks provide details about various network elements, including intersections, road and transit segments, area type, facility type, network topology, number of lanes, transit route itineraries and frequencies, and other network characteristics. Aggregate characteristics of the modeled regional network covering the MAG metropolitan planning area are provided in Table 7-1. These values may be different from on-the-ground measurements and do not represent all road mileage in the region. In addition, facility types do not correspond directly to federal functional classification systems. However, the data does largely represent the nature of the roadway system in the MAG region. As indicated, the total number of roadway lane miles in the region increases by 38 percent from 2015 to 2040, while the split among facility types remains relatively constant.

**TABLE 7-1
ROADWAY SYSTEM MODELING NETWORK - LANE MILES**

Facility Type	Year							
	2015	%	2020	%	2030	%	2040	%
Freeway (1)	3,051	16.9	3,302	17.6	3,751	15.4	3,847	15.4
HOV (2)	396	2.2	448	2.4	525	2.2	528	2.1
Expressway	825	4.6	808	4.3	892	3.7	957	3.8
Arterial (3)	13,829	76.4	14,189	75.7	19,246	78.8	19,573	78.6
Total	18,101	100.0	18,747	100.0	24,415	100.0	24,906	100.0

(1) Includes: Ramps and CD roads. (2) Includes: HOV-GP connectors. (3) Includes: Collectors, 6-leg arterials, and unpaved roads.

- Person Trips - Forecast of the future person trips and goods movement is based on the socio-economic projections that MAG develops and updates on a regular basis (see Chapter 3). The projected growth in population and employment results in growth in travel. This data determines future travel demand and is critical for understanding trends in travel demand patterns. Table 7-2 shows the pattern of future person trips in the region, with person trips projected to increase by over 51 percent between 2015 and 2040. Also, the percent of trips on transit (mode split) is forecasted to increase by 43 percent from 1.4 percent in 2015 to 2.0 percent in 2040. The auto occupancy rate is anticipated to remain in the range of 1.3 to 1.4 persons per vehicle.

**TABLE 7-2
PERSON TRIPS BY MODE (in thousands)**

Mode	2015	2020	2030	2040
Bus Person Trips	166.1	203.3	254.0	278.4
Light Rail Person Trips	38.5	70.8	127.5	165.1
Total Transit Person Trips	204.6	274.1	381.5	443.5
Total Vehicle Person Trips	14,747.8	16,079.4	19,083.6	22,181.3
Total Person Trips	14,952.4	16,353.5	19,465.1	22,624.8
Mode Split (% Transit)	1.4	1.7	2.0	2.0
Vehicle Occupancy Rate	1.3	1.3	1.4	1.4

- Vehicle Miles of Travel - Another important measure of travel activity is vehicle miles of travel (VMT). As the term indicates, it provides a gauge of the vehicle travel demand placed on the region’s roadway facilities and can be aggregated in various categories. Table 7-3 shows the anticipated growth in VMT and how it is distributed by facility type. Total VMT is expected to increase by 59 percent between 2015 and 2040, while the share of VMT carried by the freeway system, including HOV lanes, remains at approximately 41 percent.
- Freight Demand - Future freight demand in terms of vehicle-miles traveled and truck traffic volumes on road segments is estimated in MAG truck and freight models. Global Insight Transearch commodity flow data purchased by ADOT and MAG provides commodity flow estimates and served as an input in the development of the MAG behavioral freight model. Vehicle miles traveled by trucks is also included in Table 7-3 and forecasted to increase by 68 percent between 2015 and 2040.

**TABLE 7-3
VEHICLE MILES OF TRAVEL BY FACILITY TYPE (in millions)**

Facility Type	Year							
	2015	%	2020	%	2030	%	2040	%
Freeway (1)	38.3	36.9	43.4	37.8	52.6	37.7	61.3	37.1
HOV (2)	4.7	4.5	5.2	4.6	6.4	4.6	6.9	4.2
Expressway	3.1	3.0	3.4	3.0	4.5	3.2	5.6	3.4
Arterial/Local (3)	57.7	55.6	62.8	54.7	76.2	54.6	91.4	55.3
Total	103.8	100.0	114.9	100.0	139.6	100.0	165.2	100.0
Auto VMT	97.0	93.5	107.2	93.3	130.3	93.3	153.8	93.1
Truck VMT	6.8	6.5	7.7	6.7	9.3	6.7	11.4	6.9
Total	103.8	100.0	114.9	100.0	139.6	100.0	165.2	100.0

(1) Includes: General purpose (GP) lanes, ramps, and collector-distributor roads. (2) Includes: HOV lanes and HOV-GP connectors.

(3) Includes: Arterials, collectors, 6-leg arterials, unpaved roads and centroid connectors.

- Level of Service** - The transportation modeling process estimates future level of service on the regional roadway network. Level of service (LOS) is often represented by one of six levels from A to F, with A being the highest level and F being the lowest. Level of service A indicates average speeds at the posted speed level or higher. Level of service F indicates severe congestion, with break-downs in traffic flow caused by stop-and-go movement of traffic. Table 7-4 below shows changes in the level of service on the region's roads with and without the RTP projects coded in the future networks. For example, in 2040 if all planned projects are built, 31.2 percent of VMT will be traveled under LOS A and 16.4 percent under LOS F. Without the planned improvements, VMT under LOS A falls to 20.4 percent and that under LOS F increases to 26.2 percent.

**TABLE 7-4
PERCENT VMT BY LEVEL OF SERVICE - BUILD vs. NO-BUILD**

Year	Build		No-Build	
	LOS A	LOS F	LOS A	LOS F
2015	39.2	11.1	N.A.	N.A.
2020	36.1	11.4	34.4	14
2030	34.6	11.7	25.4	20.1
2040	31.2	16.4	20.4	26.2

CHAPTER EIGHT

FINANCIAL PLAN

The major regional funding sources for the Regional Transportation Plan (RTP) include: (1) a regional half-cent sales tax for transportation, (2) Arizona Department of Transportation (ADOT) Funds, and (3) MAG Area Federal Transportation Funds. In addition to the regional level sources, the implementation of the RTP is accomplished through local funds and other state revenues. Since local funds and other state revenue sources generally are program-specific, they are identified in the individual modal chapters.

The RTP revenue sources are considered to be reasonably available throughout the duration of the planning period, and have had a long history of funding availability for the RTP in the past. It should also be noted that revenue projections are expressed in “Year of Expenditure” (YOE) dollars, which reflect the actual number of dollars collected in a given year. In the individual modal chapters that follow, costs are also presented in terms of YOE dollars, which reflect the estimated effects of future price inflation and represent that actual number of dollars expended.

Half-Cent Sales Tax

On November 2, 2004, the voters of Maricopa County passed Proposition 400, which authorized the continuation of the existing half-cent sales tax for transportation in the region (also known as the *Maricopa County Transportation Excise Tax*). This action provides a 20-year extension of the half-cent sales tax through calendar year 2025 to implement projects and programs identified in the MAG RTP. The previous half-cent sales tax for transportation was approved by the voters of Maricopa County in 1985 through Proposition 300, and expired on December 31, 2005. The current half-cent sales tax extension approved through Proposition 400 went into affect on January 1, 2006.

The revenues collected from the half-cent sales tax are deposited into the Regional Area Road Fund (RARF), and allocated between freeway/highway and arterial street projects; and into the Public Transportation Fund (PTF) for public transit programs and projects. These monies must be applied to projects and programs consistent with the MAG RTP. As specified in ARS 42-6105.E, 56.2 percent of all sales tax collections will be distributed to freeways and highways (RARF); 10.5 percent will be distributed to arterial street improvements (RARF); and 33.3 percent of all collections will be distributed to transit (PTF).

Table 8-1 displays the distribution of projected revenues to the RARF and the PTF, including the sub-allocation of the RARF to freeway/highway and arterial street uses. As displayed in this table, total half-cent revenues from FY 2018 through FY 2040 are projected to be approximately \$17.2 billion (YOE \$’s). Of this total, \$9.7 billion will be allocated to freeway/highway projects;

\$1.8 billion to arterial street improvements; and \$5.7 billion to transit projects and programs. It is important to note that these figures assume renewal of the tax in January 2026.

**TABLE 8-1
MARICOPA COUNTY TRANSPORTATION EXCISE TAX: FY 2018-2040
(Year of Expenditure Dollars in Millions)**

Fiscal Year	Regional Area Road Fund (RARF)		Public Transportation Fund (PTF) (33.3%)	Total
	Freeways (56.2%)	Arterial Streets (10.5%)		
2018	245.2	45.8	145.3	436.3
2019	259.1	48.4	153.5	461.1
2020	273.6	51.1	162.1	486.9
2021	288.0	53.8	170.7	512.5
2022	302.3	56.5	179.1	537.9
2023	316.3	59.1	187.4	562.8
2024	331.1	61.9	196.2	589.1
2025	345.0	64.4	204.4	613.8
2026	359.4	67.2	213.0	639.5
2027	374.5	70.0	221.9	666.4
2028	390.2	72.9	231.2	694.3
2029	406.6	76.0	240.9	723.4
2030	423.6	79.1	251.0	753.7
2031	441.4	82.5	261.5	785.3
2032	459.9	85.9	272.5	818.3
2033	479.1	89.5	283.9	852.6
2034	499.2	93.3	295.8	888.3
2035	520.2	97.2	308.2	925.6
2036	542.0	101.3	321.1	964.4
2037	564.7	105.5	334.6	1,004.8
2038	588.4	109.9	348.6	1,046.9
2039	613.0	114.5	363.2	1,090.8
2040	638.8	119.3	378.5	1,136.6
Totals	9,661.5	1,805.1	5,724.7	17,191.3

Arizona Department of Transportation Funds

ADOT relies on funding from two primary sources: the Highway User Revenue Fund (HURF) and federal transportation funds. The HURF is comprised of funds from the gasoline and use fuel taxes, a portion of the vehicle license tax, registration fees and other miscellaneous sources.

ADOT Revenues

Of the total HURF funding, approximately 35 percent comes from the gasoline tax and another 15 percent comes from the sale of diesel fuel. The portion of the Vehicle License Tax (VLT) that flows into the HURF accounts for about 30 percent of the total HURF funds. The remaining 20 percent is derived from registration, motor carrier, and operator license fees. According to the Arizona constitution, HURF funds can only be used on highways and streets, therefore, HURF funds cannot be used for transit purposes. For the purposes of revenue forecasting, total HURF funds were estimated based on projected population and economic growth, assuming that there would be no change in tax rates. Total HURF funds were then distributed to ADOT and the other entities based on the current statutory formula and policy.

From the ADOT HURF allocation, state statutes provide that 12.6 percent of the HURF funds flowing to ADOT are earmarked for the MAG Region, and the region comprising the Pima Association of Governments (PAG), which includes metropolitan Tucson, Arizona. In addition, the State Transportation Board has established a policy that another 2.6 percent of ADOT HURF funds would be allocated to the two regions. These funds are divided into 75 percent for the MAG Region and 25 percent for the PAG Region. These funds are referred to as “15 Percent Funds.”

After the deduction of the 15 Percent Funds, ADOT must pay for operations, maintenance, and debt service on outstanding bonds. This includes funds for the Motor Vehicle Division, administration, highway maintenance and additional funding for Department of Public Safety. The remaining HURF funds are then combined with federal highway funds to provide the basis for the ADOT Highway Construction Program. This block of funds is often referred to as “ADOT Discretionary Funds.”

ADOT Funding in the MAG Region

It is projected that a total of \$9.3 billion (YOE \$'s) in ADOT funds will be available for the construction and improvement of freeways and highways in the MAG RTP between FY 2018 and FY 2040. Funding for ADOT expenses for operations and maintenance is drawn from statewide sources and is not included in this estimate.

- 15 Percent Funding - The MAG Region receives annual funding from the Arizona Department of Transportation (ADOT) in the form of ADOT 15 Percent Funds, which are allocated from the Highway User Revenue Fund (HURF). These funds are spent for improvements on limited access facilities on the State Highway System in the MAG area. A total of \$2.7 billion is projected to be available from this source (see Table 8-2).
- Maricopa County Area ADOT Discretionary Funds - A 37 percent share of ADOT Discretionary Funds is targeted to the Maricopa County area of the MAG Region. Arizona Revised Statute 28-304 C.1 states that the percentage of ADOT discretionary monies allocated to the MAG Region in the RTP shall not increase or decrease unless the State Transportation Board, in cooperation with the regional planning agency, agrees to

change the percentage of the discretionary monies. A total of \$5.9 billion is projected to be available from this source (see Table 8-2).

TABLE 8-2
ADOT FUNDING IN MAG AREA: FY 2018-2040
 (Year of Expenditure Dollars in Millions)

Fiscal Year	15% Funds	ADOT Discretionary	Total
2018	79.8	314.1	393.9
2019	81.2	202.9	284.1
2020	84.1	211.0	295.1
2021	87.1	133.5	220.6
2022	90.0	231.2	321.2
2023	93.1	240.5	333.6
2024	96.2	245.6	341.8
2025	99.5	250.8	350.3
2026	102.9	255.9	358.8
2027	106.4	236.4	367.5
2028	110.1	241.2	376.5
2029	113.8	246.1	385.6
2030	117.7	251.2	395.1
2031	121.7	256.3	404.7
2032	125.9	261.5	414.6
2033	130.2	266.8	424.8
2034	134.6	272.2	435.2
2035	139.2	277.7	446.0
2036	144.0	283.4	457.0
2037	148.9	289.2	468.2
2038	154.0	295.0	479.8
2039	159.3	301.0	491.7
2040	164.7	307.2	503.9
Maricopa Co. Area	2,684.4	5,870.8	8,555.2
Pinal Co. Area	N/A	750.1	750.1
Total	2,684.4	6,620.9	9,305.3

- Pinal County Area ADOT Discretionary Funds - A 50 percent share of ADOT Discretionary Funds is targeted to areas other than Maricopa County and Pima County. It is projected that this would amount to \$7.9 billion (YOE \$'s) for the period FY 2018 - FY 2040. Capital projects on state highways in Pinal County within the MAG MPA are estimated to total \$750 million (YOE \$'s), representing only about 9.5 percent of the funding available statewide. On this basis, it was projected that reasonably available funding could be identified for these projects and included in the future ADOT Discretionary Funds for the

MAG area (see Table 8-2.) It should be noted that these projects are not included in the Freeway/Highway Life Cycle Program.

MAG Area Federal Transportation Funds

In addition to the half-cent sales tax revenues and ADOT funding, a number of federal transportation funding sources are available for use in implementing projects in the MAG RTP. These sources are discussed below and summarized in Table 8-3 and Table 8-4. It is projected that a total of \$7.0 billion (YOE \$'s) will be available from these sources for the implementation of projects in the MAG Region between FY 2018 and FY 2040, with approximately \$3.0 billion from Federal Highway Administration sources and \$4.0 billion from Federal Transit Administration sources. Arizona is included in the "Sliding Scale Rates in Public Land States" (Notice N 4540.12), in which some of the federal programs may allow for a higher federal participation rate. Rates notated in the following federal programs may differ based on the FHWA and FTA programs as approved by the oversight agency and are subject to change. Details are noted in the MAG Programming Guidebook.

Federal Highway Administration Funding

The Federal Highway Administration (FHWA) is an agency within the U.S. Department of Transportation that supports state and local governments in the design, construction, and maintenance of the Nation's highway system (Federal Aid Highway Program) and various federally and tribal owned lands (Federal Lands Highway Program). Through financial and technical assistance to state and local governments, the Federal Highway Administration is responsible for ensuring that America's roads and highways continue to be among the safest and most technologically sound in the world. FHWA's role in the Federal-aid Highway Program is to oversee federal funds used for constructing and maintaining the National Highway System (primarily Interstate Highways, U.S. Routes and most State Routes). This funding mostly comes from the federal gasoline tax. FHWA oversees projects using these funds to ensure that federal requirements for project eligibility, contract administration and construction standards are adhered to. The FHWA funding programs applicable to the MAG area are described below.

- Federal Highway (MAG STP) Funds - MAG Surface Transportation Program (STP) funds are the most flexible federal transportation funds and may be used for highways, transit or streets. The statutory match for STP program funding is 94.3 percent federal, 5.7 percent local. Approximately \$1.4 billion (YOE \$'s) will be available from STP funds for projects during the period from FY 2018 through FY 2040.
- Federal Highway (MAG CMAQ) Funds - MAG Congestion Mitigation and Air Quality (CMAQ) funds are available for projects that improve air quality in areas that do not meet clean air standards ("non-attainment" areas). Projects may include a wide variety of highway, transit and alternate mode projects that contribute to improved air quality.

**TABLE 8-3
MAG FHWA TRANSPORTATION FUNDS: FY 2018-2040
(Year of Expenditure Dollars in Millions)**

FY	HSIP	Transp. Alt.	STP			CMAQ					Grand Total	
			Fwy./ Hwy.	Art. Pgm.	Total	Fwy./ Hwy.	Art. & ITS	Transit Pgm.	Bike/ Ped.	Air Qual.		Total
2018	1.8	4.7	0.0	50.3	50.3	9.3	6.5	17.4	8.2	7.8	49.2	105.9
2019	0.0	4.8	0.0	51.8	51.8	9.5	6.7	17.9	8.5	8.0	50.7	107.3
2020	0.0	4.9	0.0	52.5	52.5	9.7	6.8	18.2	8.6	8.2	51.4	108.9
2021	0.0	5.0	0.0	53.4	53.4	9.9	6.9	18.5	8.8	8.3	52.3	110.7
2022	0.0	5.1	0.0	54.1	54.1	10.0	7.0	18.8	8.9	8.4	53.2	112.4
2023	0.0	5.1	0.0	55.1	55.1	10.2	7.2	19.2	9.1	8.6	54.2	114.5
2024	0.0	5.2	0.0	56.2	56.2	10.4	7.3	19.6	9.3	8.8	55.3	116.7
2025	0.0	5.3	0.0	57.2	57.2	10.6	7.4	19.9	9.4	8.9	56.4	118.9
2026	0.0	5.4	0.0	58.3	58.3	10.8	7.6	20.3	9.6	9.1	57.4	121.2
2027	0.0	5.5	0.0	59.5	59.5	11.0	7.7	20.7	9.8	9.3	58.5	123.5
2028	0.0	5.6	0.0	60.6	60.6	11.2	7.9	21.1	10.0	9.5	59.7	125.9
2029	0.0	5.8	0.0	61.8	61.8	11.4	8.0	21.5	10.2	9.6	60.8	128.3
2030	0.0	5.9	0.0	62.9	62.9	11.7	8.2	21.9	10.4	9.8	61.9	130.7
2031	0.0	6.0	0.0	64.2	64.2	11.9	8.3	22.3	10.6	10.0	63.1	133.3
2032	0.0	6.1	0.0	65.4	65.4	12.1	8.5	22.8	10.8	10.2	64.4	135.8
2033	0.0	6.2	0.0	66.6	66.6	12.3	8.7	23.2	11.0	10.4	65.6	138.4
2034	0.0	6.3	0.0	67.9	67.9	12.6	8.8	23.6	11.2	10.6	66.8	141.1
2035	0.0	6.5	0.0	69.2	69.2	12.8	9.0	24.1	11.4	10.8	68.1	143.8
2036	0.0	6.6	0.0	70.5	70.5	13.1	9.2	24.6	11.6	11.0	69.4	146.5
2037	0.0	6.7	0.0	71.9	71.9	13.3	9.3	25.0	11.9	11.2	70.8	149.3
2038	0.0	6.8	0.0	73.3	73.3	13.6	9.5	25.5	12.1	11.4	72.1	152.2
2039	0.0	7.0	0.0	74.7	74.7	13.8	9.7	26.0	12.3	11.6	73.5	155.1
2040	0.0	7.1	0.0	76.1	76.1	14.1	9.9	26.5	12.6	11.9	74.9	158.1
Total	1.8	133.6	0.0	1,433.3	1,433.3	265.3	186.2	498.7	236.2	223.3	1,409.7	2,978.4

**TABLE 8-4
MAG FTA TRANSPORTATION FUNDS: FY 2018-2040
(Year of Expenditure Dollars in Millions)**

FY	5307/ 5340	5310	5337			5339	STP-AZ	5309 New Str.	AVN-GDYR & State	Grand Total
			FGM	Hi Bus	Total					
2018	52.3	3.1	2.3	3.2	5.5	4.9	3.0	8.9	4.4	82.2
2019	53.4	3.2	4.6	3.1	7.7	5.0	3.0	68.6	4.7	145.6
2020	54.6	3.3	4.7	3.2	7.8	5.1	3.0	110.6	4.7	189.1
2021	55.5	3.3	4.8	3.2	8.0	5.1	3.0	134.0	4.8	213.8
2022	56.5	3.4	4.8	3.3	8.1	5.2	3.0	118.5	4.9	199.5
2023	51.8	3.4	4.9	3.3	8.2	4.8	3.0	151.7	5.1	228.0
2024	52.8	3.5	5.0	3.3	8.3	4.8	3.0	61.8	5.1	139.3
2025	53.7	3.5	5.0	3.4	8.4	4.9	3.0	64.4	4.2	142.2
2026	54.6	3.6	5.1	3.5	8.6	5.0	3.0	115.2	4.3	194.2
2027	55.6	3.7	5.2	3.5	8.7	5.1	3.0	48.0	4.3	128.4
2028	56.5	3.7	5.3	3.6	8.8	5.1	3.0	96.1	4.4	177.7
2029	57.5	3.8	5.4	3.6	9.0	5.2	3.0	177.1	4.5	260.1
2030	58.5	3.9	5.4	3.7	9.1	5.3	3.0	232.9	4.6	317.3
2031	59.6	3.9	5.5	3.7	9.2	5.4	3.0	236.1	4.6	321.9
2032	60.6	4.0	5.6	3.8	9.4	5.5	3.0	120.4	4.7	207.6
2033	61.7	4.1	5.7	3.8	9.5	5.5	3.0	128.3	4.8	216.9
2034	62.7	4.1	5.8	3.9	9.6	5.6	3.0	128.3	4.9	218.3
2035	63.8	4.2	5.9	3.9	9.8	5.7	3.0	0.0	5.0	91.5
2036	65.0	4.3	5.9	4.0	9.9	5.8	3.0	0.0	5.1	93.0
2037	66.1	4.4	5.9	4.1	9.9	5.9	3.0	0.0	5.1	94.4
2038	67.3	4.4	5.9	4.1	10.0	6.0	3.0	0.0	5.2	95.8
2039	68.4	4.5	5.9	4.2	10.0	6.1	3.0	0.0	5.3	97.3
2040	69.6	4.6	5.9	4.2	10.1	6.1	3.0	0.0	5.4	98.9
Total	1,358.2	87.9	120.1	83.4	203.5	122.9	69.2	2,000.9	110.0	3,952.7

* CMAQ funding "flexed" to transit shown in Table 8-3.

Due to the high congestion levels and major air quality issues in the region, MAG receives the major share of CMAQ funds coming to Arizona. The statutory match for STP program funding is 94.3 percent federal, 5.7 percent local. Approximately \$1.4 billion will be available from CMAQ funds for projects during the period from FY 2018 through FY 2040.

- Federal Highway (HISP) Funds - The Highway Safety Improvement Program (HSIP) is a core Federal-aid program with the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads, including non-state-owned public roads. Projects are intended to correct or improve a hazardous road location or feature; or address a highway safety problem. Eligibility of specific projects, strategies and activities generally are based on consistency with a state's strategic highway safety plan (SHSP) and data-supported safety performance compliance. The federal share for highway safety improvement projects is 90 percent. This funding source is expected to generate \$2 million for safety projects in FY 2018. ADOT will distribute HISP funding after FY 2018 to jurisdictions throughout the state on a project-by-project basis.
- Federal Highway Transportation Alternatives Funds - The Transportation Alternatives Program (TAP) provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, and environmental mitigation; recreational trail program projects; safe routes to school projects; and projects for the planning, design or construction of boulevards and other roadways largely in the right-of-way of former Interstate System routes or other divided highways. The federal share for TAP projects is generally is 80 percent. This funding source is expected to generate \$134 million for transportation alternatives projects from FY 2018 through FY 2040.

Federal Transit Administration Funding

The Federal Transit Administration (FTA) is an agency within the United States Department of Transportation (DOT) that provides financial and technical assistance to local public transit systems. Public transportation includes buses, subways, light rail, commuter rail, monorail, passenger ferry boats, trolleys, inclined railways, and people movers. The federal government, through the FTA, provides financial assistance to develop new transit systems and improve, maintain, and operate existing systems. The FTA oversees grants to state and local transit providers, primarily through its ten regional offices. Grants are managed by the “governor-approved” Designated Recipient of FTA funds. These grantees are responsible for managing their programs in accordance with federal requirements, and the FTA is responsible for ensuring that grantees follow federal mandates along with statutory and administrative requirements. The FTA funding programs applicable to the MAG area are described below.

- Federal Transit (5307/5340) Funds - The Urbanized Area Formula Funding program (5307/5340) provides funding to Urbanized Areas (UZA) for public transportation

capital, planning, job access and reverse commute projects, as well as operating expenses in certain circumstances. This funding source is expected to generate \$1.4 billion for transit development from FY 2018 through FY 2040. These funds constitute a core investment in the enhancement and revitalization of public transportation systems in the urbanized areas, which depend on public transportation to improve mobility and reduce congestion. Recipients must expend one percent for transportation security projects or certify that it is not necessary to do so. Under the FAST Act, operating costs are eligible up to certain limits, for grantees in areas with populations greater than 200,000 and that operate a maximum of 100 buses in fixed-route service during peak hours (rail fixed guideway excluded). Transit enhancements are removed and replaced by more narrowly defined “associated transportation improvements”, where recipients must expend at least one percent of their 5307 apportionment on these improvements. Funding provided by other government agencies or departments that are eligible to be expended on transportation may be used as local match. Certain expenditures by vanpool operators may be used as local match. The transfer of 5307 transit funds to highway projects is not allowed under the FAST Act.

- Avondale-Goodyear/UZA Funds - These funds are part of the 5307 category and are distributed to the designated recipient for small urbanized areas (UZAs) to provide general transit services and capital improvements, specifically for that area. This funding source is expected to generate \$110 million for transit development from FY 2018 through FY 2040.
- Federal Transit (5309) Funds - Transit 5309 funds are available through discretionary grants from the Federal Transit Administration (FTA), and applications are on a competitive basis. They include grants for new and expanded rail, bus rapid transit, and ferry systems that reflect local priorities to improve transportation options in key corridors. This program defines a new category of eligible projects, known as core capacity projects, which expand capacity by at least 10 percent in existing fixed-guideway transit corridors that are already at or above capacity today, or are expected to be at or above capacity within five years. The program also includes provisions for streamlining aspects of the “New Starts” process to increase efficiency and reduce the time required to meet critical milestones. This discretionary program requires project sponsors to undergo a multi-step, multi-year process to be eligible for funding. Over the planning horizon, it is estimated that \$2.0 billion in 5309 funds for bus and rail transit projects will be made available to the MAG region.
- Federal Transit (5310) Funds - This program is intended to enhance mobility for seniors and persons with disabilities by providing funds for programs to serve the special needs of transit-dependent populations beyond traditional public transportation services and Americans with Disabilities Act (ADA) complementary paratransit services. The Federal share of eligible capital costs may not exceed 80 percent of the net cost of the activity. At least 55 percent of program funds must be used on capital projects that are public transportation projects planned, designed, and carried out to meet the special needs of

seniors and individuals with disabilities when public transportation is insufficient, inappropriate, or unavailable. The remaining 45 percent may be used for public transportation projects that: (1) exceed the requirements of the ADA, (2) improve access to fixed-route service and decrease reliance by individuals with disabilities on complementary paratransit, or (3) provide alternatives to public transportation that assist seniors and individuals with disabilities. In addition, operating assistance is available under this program. The Avondale-Goodyear Urbanized Area and the rural portions of the MAG planning region apply through a statewide competitive process with the Arizona Department of Transportation. Also, the Phoenix-Mesa Urbanized Area receives an annual funding allocation for which projects competitively apply. This funding source is expected to generate \$89 million for transit development from FY 2018 through FY 2040.

- Federal Transit (5337) Funds - This is a formula-based, “State of Good Repair” program that is dedicated to repairing and upgrading the nation’s rail transit systems along with high-intensity motor bus systems that use high-occupancy vehicle (HOV) lanes, including bus rapid transit (BRT). Projects are limited to replacement and rehabilitation or capital projects required to maintain public transportation systems in a state of good repair. . The federal share is 80 percent with a required 20 percent match. The program comprises two separate formula programs: High Intensity Fixed Guideway and High Intensity Motorbus. High-intensity motorbus is defined as public transportation that shares lanes with other HOV vehicles. Projects are limited to replacement, rehabilitation, and capital projects required to maintain public transportation systems in a state of good repair. Projects must be included in a Transit Asset Management Plan. This funding source is expected to generate \$204 million for transit development from FY 2018 through FY 2040.
- Federal Transit (5339) Funds - The objective of this “Bus and Bus Facilities Program” program is to provide capital funding to replace, rehabilitate and purchase buses and related equipment and to construct bus-related facilities. The Federal share is 80 percent with a required 20 percent local match. Under the FAST Act, funds are eligible to be transferred by the state to supplement urban and rural formula grant programs (5307 and 5311, respectively). This funding source is expected to generate \$123 million for transit development from FY 2018 through FY 2040.
- STP-AZ Funds - These are (STP) Flexible Funds that ADOT makes available for transit purposes in urban and rural Arizona. Upon transfer from FHWA, these funds are made available by FTA to the designated recipients and applied for in appropriate grants for applicants that operate general public transit and/or elderly/disabled transit systems. These funds are expected to generate \$69 million for transit development from FY 2018 through FY 2040.

Regional Revenue Summary

Regional revenue sources for the MAG RTP between FY 2018 and FY 2040 are summarized in Table 8-5 (in YOE \$'s) and include: the Proposition 400 half-cent sales tax extension (\$17.2 billion); ADOT funds (\$9.3 billion); Federal Transit funds (\$4.0 billion); Federal Highway Surface Transportation Program (STP) funds (\$1.4 billion); Federal Highway Congestion Mitigation and Air Quality (CMAQ) funds (\$1.4 billion); and other Federal Highway Funding (\$135 million). The total of all these revenue sources is projected to amount to \$33.4 billion between FY 2018 and FY 2040.

Table 8-5 also indicates the distribution of regional revenues among the transportation modes and programs covered by the RTP. This funding is consistent with the allocation of revenues originally adopted by MAG in November 2003, as part of the major plan update that was prepared prior to the vote on Proposition 400. At that time, modal funding levels were established after the facility planning process was completed, and reflected project needs determined through the technical planning process. In addition, the distribution of regional revenues takes into account federal and state restrictions on how individual funding sources may be applied to specific program areas.

As indicated previously, the regional revenue forecasts are presented in terms of “Year of Expenditure” (YOE) dollars. YOE dollars reflect the actual number of dollars collected/expended in a given year, with no correction or discounting for inflation. Specific assumptions regarding bonding or other debt financing are included in the modal chapters.

In addition to the regional level sources summarized in Table 8-5, the implementation of the RTP is accomplished through local funds and other state revenues. Local resources provide funding for capital projects and maintenance/operations in the arterial street and transit programs; and, in the form of transit farebox receipts, contribute significant funding for transit operations. Local and private sources also provide funding for the expansion of street and transit networks throughout the region in parallel with new residential and commercial development. Other state revenues provide funding for the routine maintenance and operation of the regional freeway/highway system, as well as the pavement preservation program. Since local funds and other state revenue sources generally are program-specific, they are identified in the individual modal chapters.

As indicated previously, all revenue sources in the RTP are considered to be reasonably available throughout the planning period, having had a long history of providing funding. This includes sources such as the half-cent sales tax, which was originally approved in 1985 and extended in 2004; the State Highway User Revenue Fund, which includes the state gasoline tax that has been a major and continuing funding source for transportation in Arizona since 1921; federal highway and transit funding programs, which represent a national commitment to

transportation; and local government and private funding, which proceed in parallel with the residential and commercial development process.

MAG recognizes the need to pursue strategies to ensure continuation of future transportation funding. These efforts include: (1) briefings to MAG committees on the long-term revenue outlook and alternatives for addressing future needs; (2) presentations to elected officials, business leaders, other stakeholders, and the general public, concerning future transportation funding issues; (3) polling of the public regarding attitudes and concerns affecting funding for transportation projects and services; and (4) communication with national representatives and involvement with national organizations regarding future transportation needs and funding requirements.

TABLE 8-5
SOURCES AND DISTRIBUTION OF REGIONAL REVENUES: FY 2018-2040
 (Year of Expenditure Dollars in Millions)

Sources	Uses						Total
	Highways/ Freeways	Arterial Streets	Transit	Bicycle/ Ped.	Air Quality	Other Programs	
Proposition 400: Half Cent Sales Tax Extension	9,661.50	1,805.10	5,724.70				17,191.30
ADOT Funds (Includes HURF and Federal Aid)	9,305.3						9,305.3
Federal Transit Funds			3,952.70				3,952.70
Federal Highway (MAG STP)		1,433.30					1,433.30
Federal Highway (MAG CMAQ)	265.3	186.2	498.7	236.2	223.3		1,409.70
Federal Highway (MAG Other)						135.4	135.4
Total	19,567.10	3,424.60	10,176.10	236.2	223.3	135.4	33,427.70

CHAPTER NINE

FREEWAYS AND HIGHWAYS

The freeway/highway system in the MAG area represents one of the major elements in the Regional Transportation Plan (RTP). The RTP calls for new freeway/highway corridors, as well as added travel lanes on existing facilities. In addition, new interchanges with arterial streets on existing freeways, along with direct connections between HOV lanes at freeway-to-freeway interchanges, are included. The RTP also provides regional funding for maintenance on the freeway system, directed at litter pickup and landscaping. The need to keep traffic flowing smoothly is addressed through funding identified for freeway management functions.

Current Freeway/Highway System

The freeway/highway system currently serving the MAG area is shown in Figure 9-1, as modeled for 2017. This system includes routes on the Interstate System, urban freeways and highways, and rural highway mileage. All the facilities in this system are on the State Highway System, which is constructed, maintained and operated by the Arizona Department of Transportation (ADOT). Table 9-1 lists the approximate centerline mileages in this system in the MAG area by route. A total of 867 existing centerline miles are included in the freeway/highway network, and an additional 54 miles are planned for future development during the planning period. This leads to a system totaling 921 centerline miles in the year 2040.

Freeway/Highway Corridor Improvements

The freeway/highway element of the RTP includes both new facilities and improvements to the existing system. Operation and maintenance of the system are also addressed. Projects include new freeway corridors, additional lanes on existing facilities, new interchanges at arterial cross streets, high occupancy vehicle (HOV) ramps at system interchanges, and maintenance and operations programs. The amount identified in the RTP for the planning period (FY 2018 - FY 2040) for development and maintenance of the freeway/highway system totals \$21.1 billion (YOE \$'s). Funding is provided almost entirely by regional sources, except for some state-level funding for maintenance activities.

The projected configuration of the future freeway/highway network in 2040 is depicted in Figure 9-2. The improvements planned for the system, including both new freeway corridors and improvements to existing freeway and highway facilities, are shown in Figure 9-3. Figure 9-4 depicts how projects will be phased over the planning period, with group designations indicating the period in which funds are programmed for construction of a facility. Projects may have funding for design activities and right-of-way acquisition in earlier periods. A detailed listing of the timing and cost of planned improvements and other programs is provided in Appendix C.

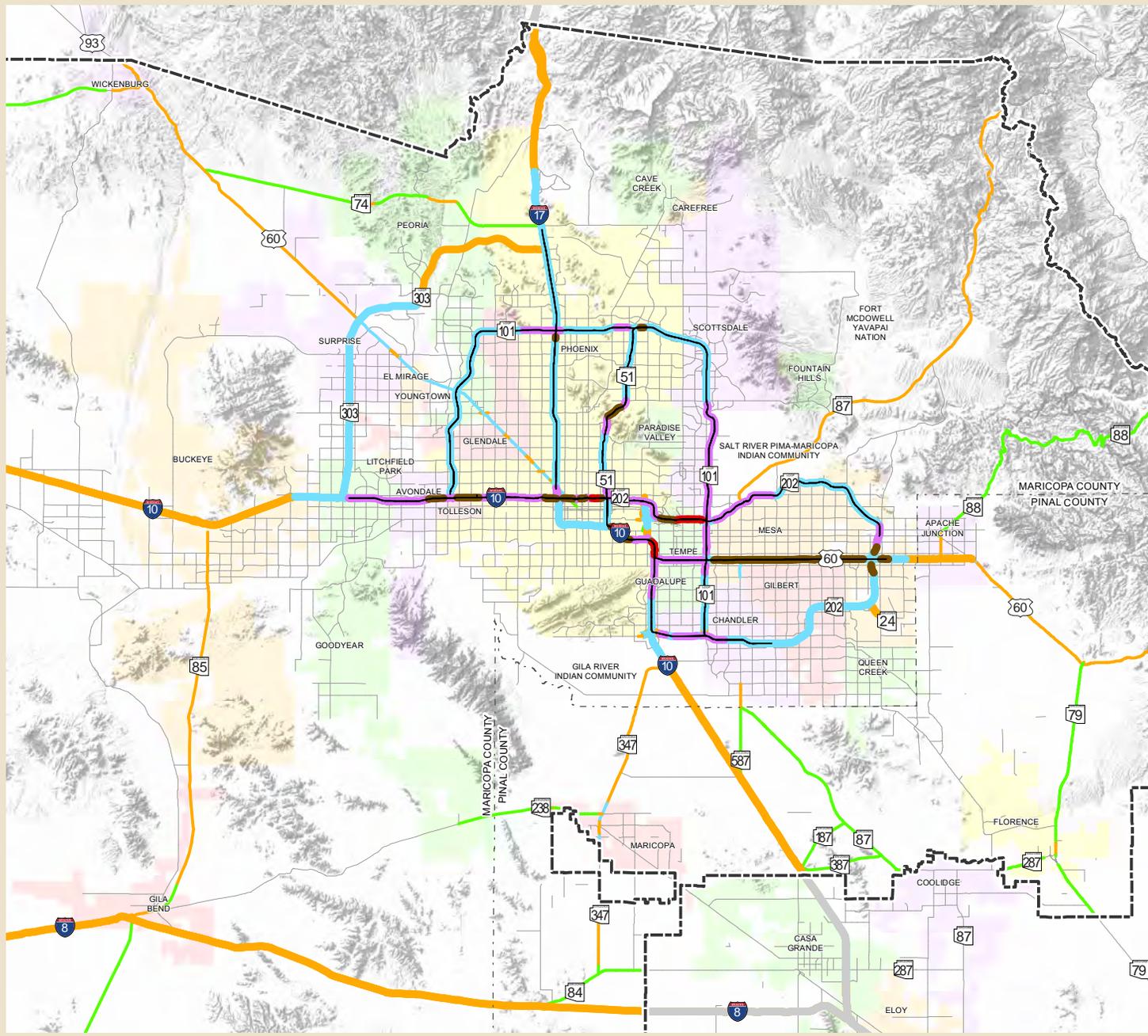
2040 Regional Transportation Plan

Fig. 9-1

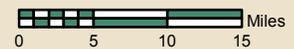


2017 Freeway/Highway System Number of Lanes

- Freeway lanes are represented with thicker lines
- 2 General Use Lanes
 - 4 General Use Lanes
 - 6 General Use Lanes
 - 8 General Use Lanes
 - 10 General Use Lanes
 - 12 General Use Lanes
 - High Occupancy Vehicle (HOV) Lanes*
 - Other Roads
 - Metropolitan Planning Area Boundary
 - County Boundary
- *The HOV line represents 1 lane in each direction



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**TABLE 9-1
FREEWAY/HIGHWAY MILEAGES IN THE MAG AREA (12-30-16)**

Route No.	Facility	Centerline Mileage			Route No.	Facility	Centerline Mileage			
		Existing	Planned	Total			Existing	Planned	Total	
I-8	Yuma-Casa Grande Hwy.				US 60	Grand Avenue				
	Yuma County to SR 85	37	--	37		US 93 to SR 74	10	--	10	
	SR 85 to Pinal Co. Line	31	--	31		SR 74 to 303L	18	--	18	
	Maricopa Co. Line to MPA Bndry.	14		14		303L to 101L (Agua Fria)	10	--	10	
	Sub-total I-8	82	--	82		101L (Agua Fria) to Van Buren St	11	--	11	
					Sub-total Grand	49	--	49		
I-10	Papago/Maricopa Freeway				US 60	Superstition Freeway				
	La Paz Co. Line to SR 85	42	--	42		I-10 to 101L (Price)	5	--	5	
	SR 85 to 303L	12	--	12		101L (Price) to SR 87	4	--	4	
	303L to 101L	11	--	11		SR 87 to 202L (Red Mtn./Santan)	12	--	12	
	101L to I-17	7	--	7		202L (Red Mtn./Santan) to Pinal Co. Line	4	--	4	
	I-17 to SR 51	5	--	5		Maricopa Co. Line to MPA Bndry.	25	--	25	
	SR 51 to I-17	3	--	3		Sub-total Superstition	50	--	50	
	I-17 to US 60	6	--	6						
	US 60 to 202L (Santan)	6	--	6		US 60	Business Route 60			
	202L (Santan) to Pinal Co. Line	7	--	7			Sossaman Rd. to Meridain Rd.	5	--	5
	Maricopa Co. Line to MPA Bndry.	17	--	17			Sub-total Business Route 60	5	--	5
Sub-total I-10	116	--	116							
I-17	Black Canyon Freeway				SR 71	Aguila-Congress Jct. hwy.				
	I-10 (East) to I-10 (West)	7	--	7		US 60 to Yavapai Co. Line	5	--	5	
	I-10 (West) to 101L (Agua Fria/Pima)	14	--	14		Sub-total SR 71	5	--	5	
	101L (Pima) to New River Rd.	17	--	17	SR 74	Morristown-New River Hwy.				
	New River Rd. to Yavapai Co. Line	10	--	10		US 60 (Grand) to 303L	25	--	25	
	Sub-total I-17	48	--	48		303L to I-17	6	--	6	
					Sub-total SR 74	31	--	31		
SR 24	Gateway Freeway				SR 79	Pinal Parkway				
	202L (Santan) to Ellsworth Rd.	2	--	2		US 60 to SR 287	17	--	17	
	Ellsworth Rd. to Pinal Co. Line	--	3	3		SR 287 to MPA Bndry.	7	--	7	
Sub-total SR 24	2	3	5		Sub-total SR 79	24	--	24		
SR 30	I-10 Reliever				SR 84	Gila Bend-Casa Grande Hwy.				
	SR 85 to 303L	--	11	11		I-8 to SR 347	6	--	6	
	303L to 202L/South Mtn.	--	13	13		SR 348 to MPA Bndry.	4	--	4	
Sub-total SR 30	--	24	24		Sub-total SR 84	10	--	10		
SR 51	Piestewa Freeway				SR 85	Gila Bend-Buckeye Hwy.				
	202L (Red Mtn.) to 101L (Pima)	16	--	16		Pima Co. Line to I-8	32	--	32	
	Sub-total SR 51	16	--	16		I-8 to I-10	37	--	37	
US 60	Quartzsite-Wickenburg Hwy.					Sub-total SR 85	69	--	69	
	La Paz County to US 93	31	--	31						
	Sub-total Aguila Hwy.	31	--	31						

Table 9-1 Freeway/Highway Mileages in the MAG Area (Continued)

Route No.	Facility	Centerline Mileage			Route No.	Facility	Centerline Mileage		
		Existing	Planned	Total			Existing	Planned	Total
SR 87	Beeline Highway				202L	Santan Freeway			
	MPA Bndry. To Maricopa Co. Line	19	--	19		US 60 (Superstition) to SR 87	17	--	17
	Pinal Co. Line to Ocotillo Rd.	3	--	3		SR 87 to 101L (Price)	4	--	4
	Elliot Rd. to US 60 (Superstition)	2	--	2		101L (Price) to I-10	4	--	4
	202L (Red Mtn.) to Gila Co. Line	46	--	46		Sub-total Santan	25	--	25
	Sub-total SR 87	70	--	70					
					202L	South Mountain Freeway			
SR 88	Apache Trail					I-10 (East) to SR 30	--	17	17
	U.S. 60 to Gila Co. Line	33	--	33		SR 30 to I-10 (West)	--	5	5
	Sub-total SR 88	33	--	33		Sub-total South Mountain	--	22	22
SR 93	Kingman-Wickenburg Hwy.				SR 238	Mobile Highway			
	Wickenburg Bypass	1	--	1		SR 347 to Mobile	17	--	17
	Wickenburg Bypass to Yavapai Co. Line	3	--	3		Sub-total SR 238	17	--	17
	Sub-total US 93	4	--	4					
					SR 287	Florence-Coolidge Hwy.			
101L	Agua Fria Freeway					SR 79 to MPA Bndry.	4	--	4
	I-10 to US 60 (Grand)	10	--	10		Sub-total SR 287	4	--	4
	US 60 (Grand) to I-17	12	--	12					
	Sub-total Agua Fria	22	--	22	303L	Estrella Freeway			
						SR 30 to I-10	--	5	5
101L	Pima Freeway					I-10 to US 60 (Grand)	15	--	15
	I-17 to SR 51	7	--	7		US 60 (Grand) to I-17	18	--	18
	SR 51 to 202L (Red Mtn.)	21	--	21		Sub-total 303L	33	5	38
	Sub-total Pima	28	--	28					
					SR 347	Maricopa Road			
101L	Price Freeway					I-10 to SR 238	16	--	16
	202L (Red Mtn.) to US 60 (Superstition)	4	--	4		SR 238 to SR 84	13	--	13
	US 60 (Superstition) to 202L (Santan)	6	--	6		Sub-total SR 347	29	--	29
	Sub-total Price	10	--	10					
					SR 387	Casa Grande-Coolidge Hwy.			
SR 143	Hohokam Expressway					I-10 to SR 87	7	--	7
	I-10 to 202L (Red Mtn.)	3	--	3		Sub-total SR 387	7	--	7
	202L (Red Mtn.) to McDowell Rd.	1	--	1					
	Sub-total SR 143	4	--	4	SR 587	I-10 Mesa Hwy.			
						I-10 to SR 87	6	--	6
SR 187	Casa Grande-Olberg Hwy.					Sub-total SR 587	6	--	6
	SR 87 to I-10	6	--	6					
	Sub-total SR 187	6	--	6					
						Regional Totals	867	54	921
202L	Red Mountain Freeway								
	I-10/SR 51 to 101L (Pima)	9	--	9					
	101L (Pima) to US 60 (Superstition)	22	--	22					
	Sub-total Red Mountain	31	--	31					

2040 Regional Transportation Plan

Fig. 9-2

REGIONAL
TRANSPORTATION
PLAN

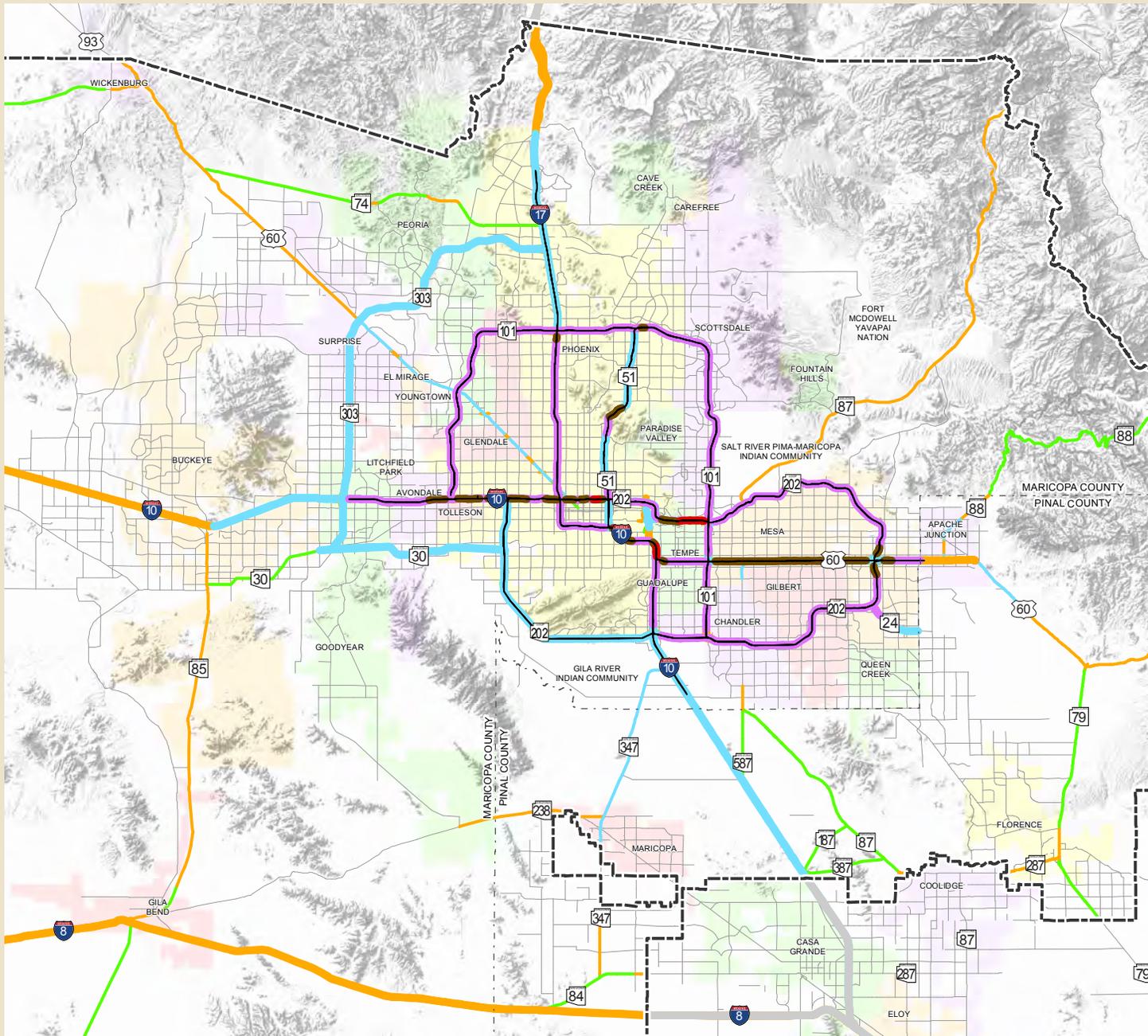


2040 Freeway/Highway System Number of Lanes

Freeway lanes are represented with thicker lines

- 2 General Use Lanes
- 4 General Use Lanes
- 6 General Use Lanes
- 8 General Use Lanes
- 10 General Use Lanes
- 12 General Use Lanes
- High Occupancy Vehicle (HOV) Lanes
- Other Roads
- County Boundary
- Metropolitan Planning Area Boundary

*The HOV line represents 1 lane in each direction



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2040 Regional Transportation Plan

Fig. 9-4



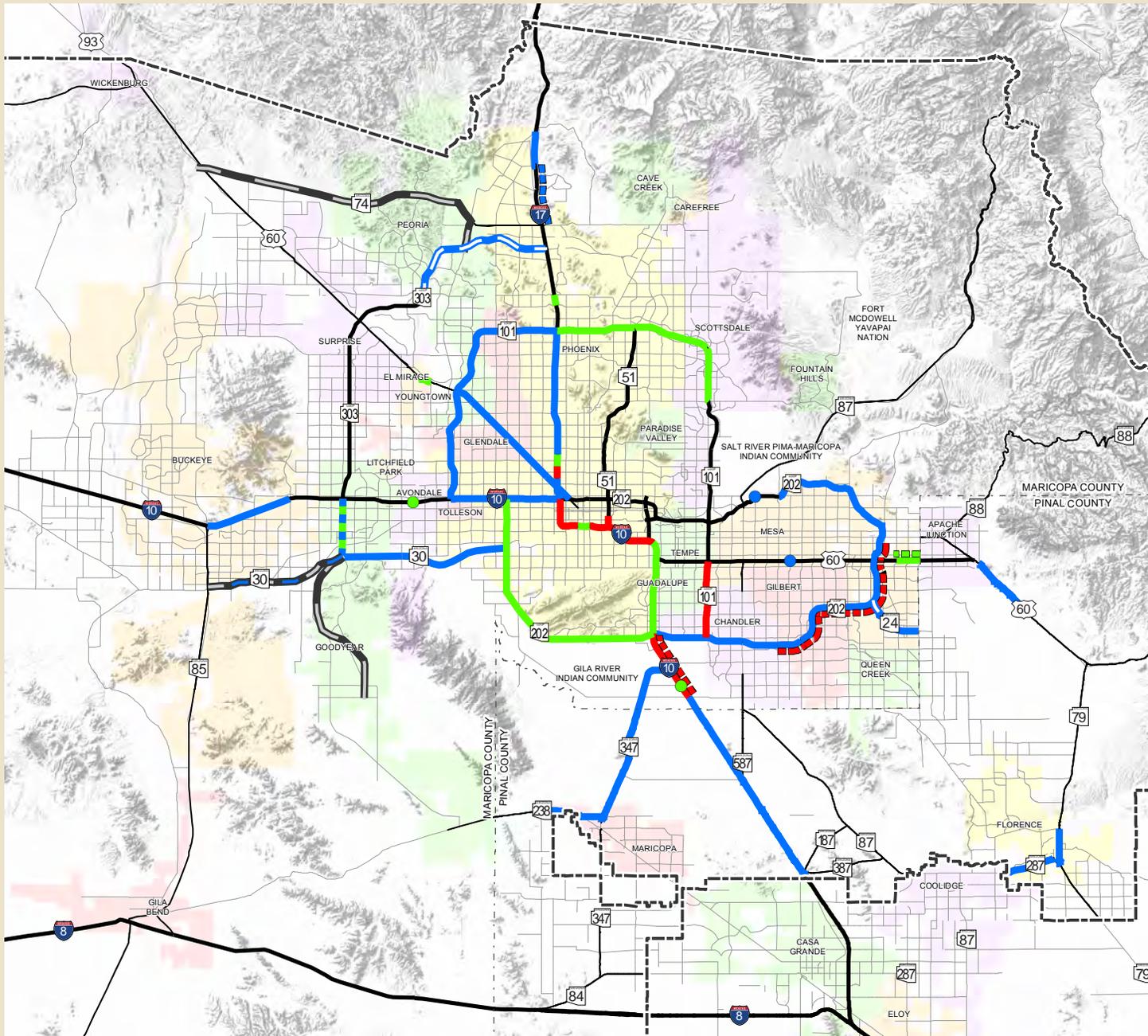
Regional Freeway/Highway Projects Phasing (FY 2018 - FY 2040)

- Group 1 (FY 2018 - FY 2022)
- Group 2 (FY 2023 - FY 2026)
- Group 3 (FY 2027 - FY 2040)

**Broken lines represent HOV lane phasing*

- New Traffic Interchange
- ▬ Upgrade to Full Freeway, Group 3
- ▬ Right of Way Preservation Group 3, Includes Interim Construction
- ▬ Right of Way Preservation Group 3
- ▬ Freeways
- ▬ Other Roads
- Metropolitan Planning Area Boundary
- County Boundary

Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.



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A description of the major freeway/highway corridors and planned improvements included in the RTP is provided below. It should be noted that, in addition to these projects, there is a history of past major improvements to the regional freeway system that have been completed over a number of years. The reader is referred to the series of reports that have been prepared beginning in 2005, which provide detailed information on specific project accomplishments. (See Annual Reports on the Status of the Implementation of Proposition 400, Maricopa Association of Governments.

In the discussion below, the timing of project implementation refers to groupings as follows: (1) Group 1: FY 2018-FY 2022, (2) Group 2: FY 2023 - FY 2026, and (3) Group 3: FY 2027-FY 2040.

Interstate 10/Papago Freeway/Maricopa Freeway

- Corridor Description - The Papago/Maricopa Freeway crosses through the heart of the MAG area, extending 116 miles from the La Paz County border on the west to the MAG metropolitan planning area (MPA) boundary in Pinal County on the east. It traverses highly built-up urban areas within the region, as well as areas in the process of commercial, industrial and residential development, and serves as a vital link to the core of the MAG area. It provides passenger and freight mobility within the region and is also a major national truck route, linking the MAG region to population centers in Southern California and throughout the southwestern U.S.
- Development Outlook -
 - Capacity improvements between SR-143. and Loop 202/Santan have been programmed in Group 1. Also, new interchanges at Fairview Dr. and Chandler Heights Rd. have been identified as a Group 1 projects
 - Further capacity improvements between SR-143 and US-60 have been programmed in Group 2, including traffic interchange reconstruction and modernization. The construction of interchange improvements at the Sky Harbor Airport west access to/from I-10 has also been identified as a Group 2 project. In addition, construction of one general purpose lane and one HOV lane in each direction between Loop 202 and Riggs Rd. is in Group 2.
 - The construction of one general purpose lane in each direction between Verrado Way and SR-85 has been identified as a Group 3 project, as well as further improvements from the I-10/I-17 split to US-60.
 - The addition of one general purpose lane in each direction between Riggs Rd. and the MAG MPA boundary (including interchange improvement/installation at Casa Blanca Rd., Seed Farm Rd., and Pinal Ave.) has been identified for Group 3, but is not a part of the Freeway/Highway Life Cycle Program.

Interstate 17/Black Canyon Freeway

- Corridor Description - The Black Canyon Freeway serves as the north-south backbone of the freeway system, terminating at the junction of I-10 in the center of the urban area. In addition to serving the core of the region, it provides mobility to residential and commercial development in the central and northern parts of the MAG area. This freeway route connects the MAG Region with I-40 to the north, representing a vital link to Northern Arizona and the rest of the Interstate System.
- Development Outlook -
 - Near-term ITS improvements between the I-10 stack interchange and SR-101 are included in Group 1, along with the reconstruction and modernization of interchanges/overpasses at Camelback Rd., Happy Valley Rd., Pinnacle Peak Rd. and Central Ave.
 - The reconstruction of the Indian School interchange and the addition of one lane of managed capacity in each direction between the I-17/I-10 split and Grand Ave., as well as and other interchange and capacity improvements, have been programmed in Group 2.
 - Capacity improvements from Grand Ave. to SR-101 have been included in Group 3. In addition, Group 3 includes the construction of one additional general purpose lane in each direction from New River Rd. to Anthem Way, as well as the conversion of the pavement to concrete and construction of one HOV lane in each direction from Anthem Way to Carefree Highway.

State Route 24/Gateway Freeway

- Corridor Description - The Gateway Freeway is a new freeway corridor extending from Loop 202/Santan south to the Phoenix-Mesa Gateway Airport, and east to the Pinal County line. It has been completed from the Santan Freeway to Ellsworth Rd. – a distance of one mile. It is envisioned that the Pinal County portion of the facility, which is currently not funded as part of the RTP, would extend eastward toward US-60. The Gateway Freeway enhances access to the arterial system in the southeast part of the region. As this area is developed further, SR-24 it will provide access to job centers, commercial areas and residential development in the far East Valley, including the Phoenix-Mesa Gateway Airport, which is a major regional activity center. In addition, expected growth in the MAG portion of Pinal County will benefit from this freeway linkage into to the regional transportation system.
- Development Outlook -

- Group 3 projects have been identified for final construction of the segment from the Santan Freeway to Ellsworth Rd. as a six-lane freeway, and construction of a six-lane freeway from Ellsworth Rd. to Meridian Rd.

State Route 30/I-10 Reliever Freeway

- Overview - State Route 30 is planned as an east-west facility south of I-10 in the vicinity of Southern Ave. connecting the South Mountain Freeway (Loop 202) and SR-85. The route is identified as a freeway between Loop 202 and Loop 303, and as an arterial roadway between Loop 303 and SR-85 (with right-of-way preservation for a future freeway facility). This facility will provide a second major east-west freeway corridor to points west of the central area, relieving traffic on I-10. State Route 30 will provide improved accessibility to the residential, commercial and industrial areas south of I-10, which include truck terminals and other generators of truck traffic.
- Development Outlook -
 - Construction of SR-30 between Loop 202 and Loop 303 as a six-lane freeway, and construction as an express way between Loop 303 and SR-85, have been identified for Group 3.

State Route 51/Piestawa Freeway

- Overview - The Piestawa Freeway extends from the I-10/Loop 202 interchange to Loop 101/Pima. It serves the Phoenix central business core, providing an important commuter route to the north and one of the few means of access through the Phoenix Mountains. It also provides access to the rest of the regional freeway system for these areas, particularly to the Red Mountain Freeway and the Maricopa Freeway.
- Development Outlook -
 - No projects have been identified for the RTP planning period.

US-60/Grand Avenue

- Overview - US-60 extends diagonally on Grand Ave. from the core of the urban area to the northwest corner of the MAG region, providing a direct connection to communities in the northwest area. It also provides important connectivity to regional freeway system elements, including Loop 303, Loop 101, I-17 and I-10. Because Grand Avenue is aligned diagonally across the regional grid and is parallel to an active railroad track, it presents a number of traffic and design engineering challenges.

- Development Outlook -
 - Frontage road improvements from Greenway Rd. to Thompson Ranch Rd. are included in Group 1.
 - Potential grade separation projects between Loop 101/Agua Fria and Van Buren St. have been identified for Group 3.

US-60/ Superstition Freeway

- Overview - The Superstition Freeway is an east-west freeway route, extending through the East Valley of the MAG area, and continuing into Pinal County and eastern Arizona as US-60. It is the spine of the freeway system in the East Valley, directly serving Tempe, Mesa, Gilbert and Apache Junction, and connecting to I-10 on the west and Loop 202 on the east. It provides access to a broad range of residential, commercial, and industrial activities, both in established and developing areas.
- Development Outlook -
 - One HOV lane and one additional general purpose lane in each direction between Crismon Rd. and Meridian Rd., as well as improvements to the freeway management system, have been identified for Group 1.
 - Construction of a half-diamond interchange at Lindsey Rd. has been identified for Group 3. In addition, the upgrading of US-60 between Mountain Rd. and the Renaissance Festival to an Arizona Parkway has been identified as a Group 3 project, but is not a part of the Freeway/Highway Life Cycle Program.

State Route 74

- Overview - State Route 74 travels in an east-west direction in the Northwest Valley, extending from I-17 at Carefree Highway to US-60 at Morristown. The two-lane facility is primarily a rural route, and provides access to the Lake Pleasant recreational area, which is approximately 10 miles west of I-17. It passes through areas that will undergo development in the future, particularly along the eastern third of the route.
- Development Outlook –
 - Right-of-way protection along the SR-74 corridor for a potential future freeway facility has been identified for Group 3.

State Route 85

- Overview - State Route 85 travels in a north-south direction in the Southwest Valley, extending from I-10 in Buckeye to I-8 at Gila Bend. The facility also continues south of I-8 to the Maricopa County Line and eventually to the Mexico border, but experiences relatively low volumes of traffic along that stretch. State Route 85 is a major connector route between I-10 and I-8 and also serves as a by-pass for the metropolitan area for truckers using I-10.
- Development Outlook -
 - A grade-separated crossing at Warner St. is included in Group 1.

State Route 87

- Overview - State Route 87 connects the MAG region to the recreational areas in the eastern mountains, extending east along the Beeline Highway from Country Club Dr. as a four-lane divided facility. It also extends south along Country Club Rd./Arizona Ave. to the Pinal County line and to points further south in Pinal County.
- Development Outlook -
 - No projects have been identified for the RTP planning period.

State Route 88

- Overview - This two-lane highway provides access to Canyon Lake in eastern Maricopa County and eventually to Lake Roosevelt in Gila County.
- Development Outlook -
 - No projects have been identified for the RTP planning period.

US-93

- Overview - US-93 extends northward from US-60 in Wickenburg, continuing to the northwest part of Arizona and providing a link to Las Vegas, Nevada. Proposed Interstate 11 falls along US-93 between the Arizona/Nevada border and Wickenburg.
- Development Outlook -
 - A project to construct two additional lanes from Tegner St. to SR-89 is included in Group 1.

Loop 101/Agua Fria Freeway/Pima Freeway/Price Freeway

- Overview - Loop 101 is a circumferential freeway that loops around the northern part of the MAG area. It is divided into three segments: (1) the Agua Fria Freeway, which extends from I-10 to I-17, (2) the Pima Freeway, which extends from I-17 to Loop 202/Red Mountain, (3) and the Price Freeway, which extends from Loop 202/Red Mountain to Loop 202/Santan. Loop 101 directly links 10 of MAG's 25 cities and towns, plus unincorporated areas of Maricopa County, and provides connectivity among a broad range of key activity centers in the region.
- Development Outlook -
 - Projects to construction one additional general purpose lane in each direction from I-17 to Shea Blvd. on the Pima Freeway are included in Group 1.
 - A project to construction one additional general purpose lane in each direction on the Price Freeway from Baseline Rd. to Loop 202/Santan is included in Group 2.
 - A project to construct one additional general purpose lane in each direction between I-10 and I-17 on the Agua Fria Freeway is included in Group 3.

SR-143/Hohokam Expressway

- Overview - The Hohokam Expressway links I-10 and Loop 202/Red Mountain, and terminates at McDowell Road. It provides access to the Sky Harbor Airport as well as greater connectivity for the freeway network.
- Development Outlook -
 - No projects have been identified for the RTP planning period.

Loop 202/Red Mountain Freeway/Santan Freeway/South Mountain Freeway

- Overview - Loop 202 is a circumferential freeway, serving the southern part of the MAG region. It is divided into three segments: (1) the Red Mountain Freeway, which extends from I-10/Papago to US-60, (2) the Santan Freeway, which extends from US-60 to I-10/Maricopa, and (3) the South Mountain Freeway, which extends from I-10/Maricopa to I-10/Papago. The Red Mountain and Santan freeways loop around Tempe, Mesa, Queen Creek, Gilbert and Chandler, providing connectivity among these jurisdictions and mobility throughout the East Valley area. The Red Mountain Freeway also links the East Valley to Central Phoenix. The South Mountain segment of the Loop 202 is a vital component in the freeway system, linking the southwestern and southeastern areas of the region, and providing an alternative route to the highly congested I-10/Papago Freeway.

- Development Outlook -
 - A project for completion of the Loop 202/South Mountain Freeway with three general purpose lanes and one HOV lane in each direction is included in Group 1. In addition, Group 1 projects have been identified to construct one HOV lane in each direction on Loop 202 between Broadway Rd. (Red Mountain Freeway) and Gilbert Rd. (Santan Freeway).
 - Projects to construction one additional general purpose lane in each direction from Gilbert Rd. on the Red Mountain Freeway to I-10 on the Santan Freeway are included in Group 3. A project to construct an interchange at Mesa Dr. on the Red Mountain Freeway is also included in Group 3, as well as direct HOV ramps at the US-60/Red Mountain/Santan system interchange.

Loop 303 Freeway

- Overview - Loop 303 is planned as a six-lane freeway facility extending west from I-17 at Lone Mountain Rd., swinging southwest to Grand Ave., running south in the vicinity of Cotton Lane to I-10, and then to SR-30. Loop 303 will provide service to a number of West Valley Communities, which collectively represent a large area of growth in the region. Communities in this area will be linked together and tied into the regional freeway network. In addition, the facility will offer an alternative route to I-17 for trips destined to the West Valley. Loop 303 has been completed as a six-lane freeway from I-10 to Happy Valley Rd. and an interim four-lane divided roadway between I-17 and Grand Ave.
- Development Outlook -
 - Group 1 projects have been identified for freeway management system and landscaping improvements at various locations throughout the corridor. In addition, Phase 1 construction of a new freeway facility from Van Buren St. to MC-85 is included in Group 1.
 - A Group 2 project has been identified for final construction on the interchange at Grand Ave.
 - Group 3 projects have been identified for final construction on the segment from Van Buren St. to MC-85, as well as upgrading the segment between Happy Valley Rd. and I-17 to a six-lane freeway. Final construction on the interchange at Northern Parkway is also included in Group 3, as well as right-of-way protection for a future extension of Loop 303 from SR-30 to Riggs Rd.

Pinal County Area Routes

- Overview - The expansion of the MAG metropolitan planning area (MPA) into Pinal County in 2013 resulted in the addition of significant new mileage onto the regional freeway/highway system. This additional mileage corresponds to the Pinal County extensions of routes already in the MAG freeway/highway network, as well as the addition of totally new routes. The added mileage provides service throughout the Pinal County area and is an important element of the regional transportation network. These routes include: I-8, I-10, US-60, SR-79, SR-84, SR-87, SR-187, SR-238, SR-287, SR-387, SR-587, and SR-347.
- Development Outlook - The following improvements to the freeway/highway network are included in the RTP in the Pinal County area of the MAG MPA. None of these projects would be a part of the Freeway/Highway Life Cycle Program.
 - The addition of one general purpose in each direction (including interchange improvement/installation at Casa Blanca Rd., Seed Farm Rd., and Pinal Ave.) on I-10 from Riggs Rd. to the MAG MPA boundary has been identified for Group 3.
 - Additional projects identified for Group 3 include: (1) construction of an Arizona Parkway along US-60 from Mountain Rd. to the Renaissance Festival, (2) addition of one general purpose in each direction on SR-79 from Butte Ave. to the CAP, (3) addition of one general purpose in each direction on SR-238 from SR-347 to Warren Rd., (4) addition of one general purpose in each direction on SR-287 from SR-79 to SR-87, (5) addition of one general purpose in each direction on SR-347 from I-10 to SR-238, and (6) right-of-way protection on the North-South Freeway Corridor (including SR-24).

Program Support and Other Improvements

- Program Support - The overall highway development process involves a number of steps that are necessary to prepare projects for eventual construction. Key elements that are included in this area are as follows: (1) Preliminary Engineering - preparation of preliminary plans defining facility design concepts, right-of-way requirements and environmental factors; (2) Advance Right-of-Way Acquisition - acquisition of right-of-way to respond to development pressures in a corridor; (3) Property Management/Plans and Titles - procedures to acquire property and manage it until needed for construction; and (4) Risk Management - programs to minimize the risk of litigation. Funding is identified throughout the planning period to address these program support areas.
- Other Improvements - In addition, some funding has been projected to be available above and beyond that currently estimated as being required for the freeway/highway projects and programs specifically identified in the RTP. These financial resources would be present in the last few years of the RTP planning period, when uncertainties regarding costs and revenues are at their maximum. In addition, a comprehensive update of the RTP is anticipated within the next few years. In view of these factors,

identifying projects and programs in addition to those already included in the RTP was not pursued as part of the 2040 RTP update process.

System Operations, Maintenance and Preservation

One of the key goals of the RTP is to operate and maintain a high quality transportation network, and to preserve the significant investment that has been made in transportation facilities through the MAG area. For the freeway/highway system, this translates into actions to ensure not only the physical integrity and safety of the system, but also measures to address its visual impacts on motorists and surrounding neighborhoods. The amount identified in the RTP for the planning period (FY 2018 - FY 2040 for operation and maintenance of the freeway/highway system totals \$2.9 billion (YOE \$'s), including, routine roadway and right-of-way maintenance, pavement preservation, quiet pavement rehabilitation, and litter pick-up, sweeping and landscape maintenance.

Regionally Funded Programs

The RTP includes regional funding for maintenance and operation of the regional freeway system in the MAG area. These regional resources are dedicated specific programs, as described below. The goal of this funding is to supplement, not supplant, the state-level revenues that ADOT dedicates to maintenance and preservation in the MAG area. As a result of the regional funding, ADOT is providing improved operations and maintenance on existing freeways in the Valley, and will expand this effort as additional RTP projects are constructed.

The RTP includes number of system-wide programs that are critical to the proper functioning of the regional freeway/highway system. These programs include projects to: (1) help keep traffic flowing as smoothly as possible, (2) pick-up litter and maintain landscaping, and (3) mitigate noise from the freeway system.

- Freeway Management System - Funding for the freeway management system (FMS) has been identified for the MAG area. This includes projects to enhance FMS on existing facilities, as well as to expand the system to new corridors. FMS covers items such as ramp metering, changeable message signs, and other measures to facilitate traffic flow. Funding will be directed to both the development of new FMS projects, as well as preservation and maintenance of existing equipment. A function related to freeway system management, the Freeway Service Patrol, has also been allocated funding in the RTP.
- Litter Pick-up, Sweeping, and Landscaping Maintenance - Regional funding for the freeway system in the MAG area has been dedicated to litter pick-up, litter education, sweeping, landscaping maintenance, and landscaping restoration. The use of MAG regional funds to supplement ADOT funds has allowed ADOT to provide a level of landscaping, litter pick-up, and sweeping maintenance on the freeway system that would not have been possible without this funding.

- Quiet Pavement - A block of funding was previously identified for noise mitigation projects on the freeway system in the MAG area. This funding was used for mitigation projects such as rubberized asphalt overlays on existing freeways (quiet pavement) and noise walls. Group 3 includes projects for future rehabilitation of rubberized asphalt overlays.

Other Operations, Maintenance and Preservation

Operation and maintenance (O&M) of the regional freeway/highway network in the MAG area is accomplished by ADOT through its maintenance districts. These districts are organized to provide services in five key functional areas, addressing roadway maintenance, landscape maintenance, electrical operations, traffic engineering, and administrative services. Funding for these districts is provided through ADOT's annual state budgeting process, which draws from state and federal revenue sources. As noted previously, in the MAG area this funding is supplemented by the regional funds.

Example O&M activities include maintenance of pavement, guard rails and median cable barriers, drainage channels, canals, tunnels, retention basins, and sound walls, as well as maintenance and restoration of landscaping. In addition, traffic operations are addressed, including roadway lighting, traffic signals, signing and striping, and freeway management system support. Other functions cover utility locating services, encroachment permits, crash clearing and repairing damaged safety features.

The ADOT organization also includes a Pavement Management Section, which is charged with the responsibility to develop and provide a cost effective pavement rehabilitation construction program. The pavement preservation program receives a high priority within ADOT, to preserve the investment in the freeway/highway system and enhance transportation safety and efficiency. The program is accomplished by performing a yearly inventory of the pavements in the system, with particular attention to smoothness of ride, amount of cracking, bleeding, patching, ruts, and the friction characteristics. As part of this process, a large relational database is used to help prioritize the work needed to keep the system performing within predetermined service levels.

Freeways/highways constructed from concrete have a longer initial life and overlay life than facilities that are constructed using asphalt. In this regard, the predominance of concrete pavements on MAG urban freeways is a definite advantage. As a result, pavement projects have focused on I-10 to the west, I-17 to the north, and the portion of US-60 falling along Grand Avenue. As noted previously, funding is identified in the RTP for future rehabilitation of rubberized asphalt overlays on freeway facilities.

Funding and Expenditure Summary

Table 9-2 has been prepared to provide an overview of the funding and expenditures for the freeway/highway element of the RTP. This table lists the reasonably available funding sources for the planning period and the uses of those funds. The revenue sources included in Table 9-2 are considered to be reasonably available throughout the planning period, having had a long history of providing funding for the RTP. As indicated in Table 9-2, projected future funding is in balance with estimated future program expenditures, indicating that the freeway/highway element can be accomplished using reasonably available funding sources over the planning period.

Funding Sources

Funding sources shown in Table 9-2 for the freeway/highway element include the half-cent sales tax (\$9.7 billion); MAG area ADOT funds (\$9.3 billion); Federal Highway Congestion Mitigation/Air Quality funds (\$265 million); ADOT statewide funding (\$1.9 billion); other funding (\$811 million); bond proceeds (\$570 million); and an estimated available beginning cash balance of \$584 million. Debt service and other expenses totaling \$2.0 billion are deducted from these sources, yielding a net total of \$21.1 billion (YOE \$'s) for use on freeway/highway construction projects and programs. The above revenue sources have been major funding elements for transportation facilities in the MAG area for decades and are considered to be reasonably available to the region throughout the planning period.

Program Expenditures

Table 9-2 also lists estimated future costs for the freeway/highway element of the RTP, expressed in YOE \$'s. Expected expenditures during the planning period also total \$21.1 billion. This includes: \$4.0 billion for construction of new corridors; \$6.1 billion for construction of additional lanes and new interchanges on existing freeways; and \$570 million for system-wide programs, such as preliminary engineering, right-of-way administration, and freeway system traffic management. A total of \$2.9 billion is identified for roadway operations and maintenance functions, including routine roadway and right-of-way maintenance, pavement preservation, quiet pavement rehabilitation, and litter pick-up, sweeping and landscape maintenance. The remainder of \$7.6 billion in funding was not allocated to additional projects and programs as part of the 2040 RTP update process, since a comprehensive update of the RTP is anticipated within the next few years.

**TABLE 9-2
FREEWAY/HIGHWAY FUNDING PLAN FY 2018 - 2040**

FUNDING (Year of Expenditure \$'s in Millions)		Totals
Regional Funds		
MAG Half-Cent Sales Tax	9,661.5	
MAG Area ADOT Funds	9,305.3	
MAG Federal CMAQ	265.3	
Other Income	810.6	
Beginning Available Cash	583.8	
Bond Proceeds	570.0	
Allowance for Debt Service and Other Expenses	(2,041.50)	
Total Regional Funds		19,155.0
Other Funding		
ADOT Statewide Funding	1,922.1	
Total Other Funding		1,922.1
Total Funding		21,077.1
EXPENDITURES (Year of Expenditure \$'s in Millions)		Totals
Regionally Funded Projects		
New Corridors	3,938.8	
Improvements to Existing Facilities: General Purpose Lanes, HOV Lanes, Interchanges	6,098.6	
Freeway Management System, Freeway Safety Patrol	158.0	
Preliminary Engr., Risk Mgmt., R/W Management, Advance R/W Acquisition	412.0	
Quiet Pavement Rehab.	223.1	
Litter Pick-Up, Sweeping, Landscaping	460.8	
Other Maintenance Programs	272.1	
Other Regionally Funded Projects	7,591.6	
Total Regionally Funded Projects		19,155.0
Other Funded Projects		
System Operation, Maintenance and Preservation		1,922.1
Total Expenditures		21,077.1

CHAPTER TEN

ARTERIAL STREETS

The arterial street grid system is a vital component of the regional transportation system in the MAG area and is a key element of the Regional Transportation Plan (RTP). Development of this system is accomplished through regionally funded projects, as well as projects constructed through a combination of local government and private sources. Local jurisdictions are also responsible for the maintenance of these facilities.

Current Arterial Street System

The arterial street system is a critical element of the regional transportation network and consists primarily of roadways with four or more lanes on a mile grid. This system provides the region with a high level of accessibility and mobility, complementing the regional freeway system and serving automobile traffic, transit, bicycle and pedestrian traffic. The arterial system carries over half of the total vehicle-miles-traveled in the region. Figure 10-1 presents the existing arterial grid system, as modeled for the year 2017.

In addition to the arterial street system, the region is served by non-arterial streets, which include local and collector streets. Non-arterial streets carry a relatively small amount of the total traffic in the region, primarily providing access to businesses and residences. The development of local and collector street mileage is closely associated with the growth in population and employment.

Future Arterial Facilities and Improvements

As the MAG area grows in the future, the continued expansion and improvement of the arterial street system will be vital to the functioning of the regional transportation system. The Regional Transportation Plan identifies a long-range regional arterial grid system that provides for access to existing and newly developing areas in the region. This system is characterized by a one-mile grid network of streets and will be developed through a combination of public and private funding sources.

The future arterial network anticipated in the MAG Region by 2040 is depicted in Figure 10-2. (It should be noted that Figure 10-2, and 10-1, are conceptual and do not represent a formal functional classification of roadways or precise roadway alignments.) This network was determined from the results of sub-regional studies conducted by MAG, along with ongoing consultation with local agencies. Improvements to the system are staged to accommodate growth in traffic, as well as residential and commercial development of surrounding areas. In general, the future arterial network extends the current one-mile arterial grid system concurrent with new development, and also closes gaps and improves connectivity in both developed and developing areas. In addition, considerable existing arterial mileage receives capacity improvements.

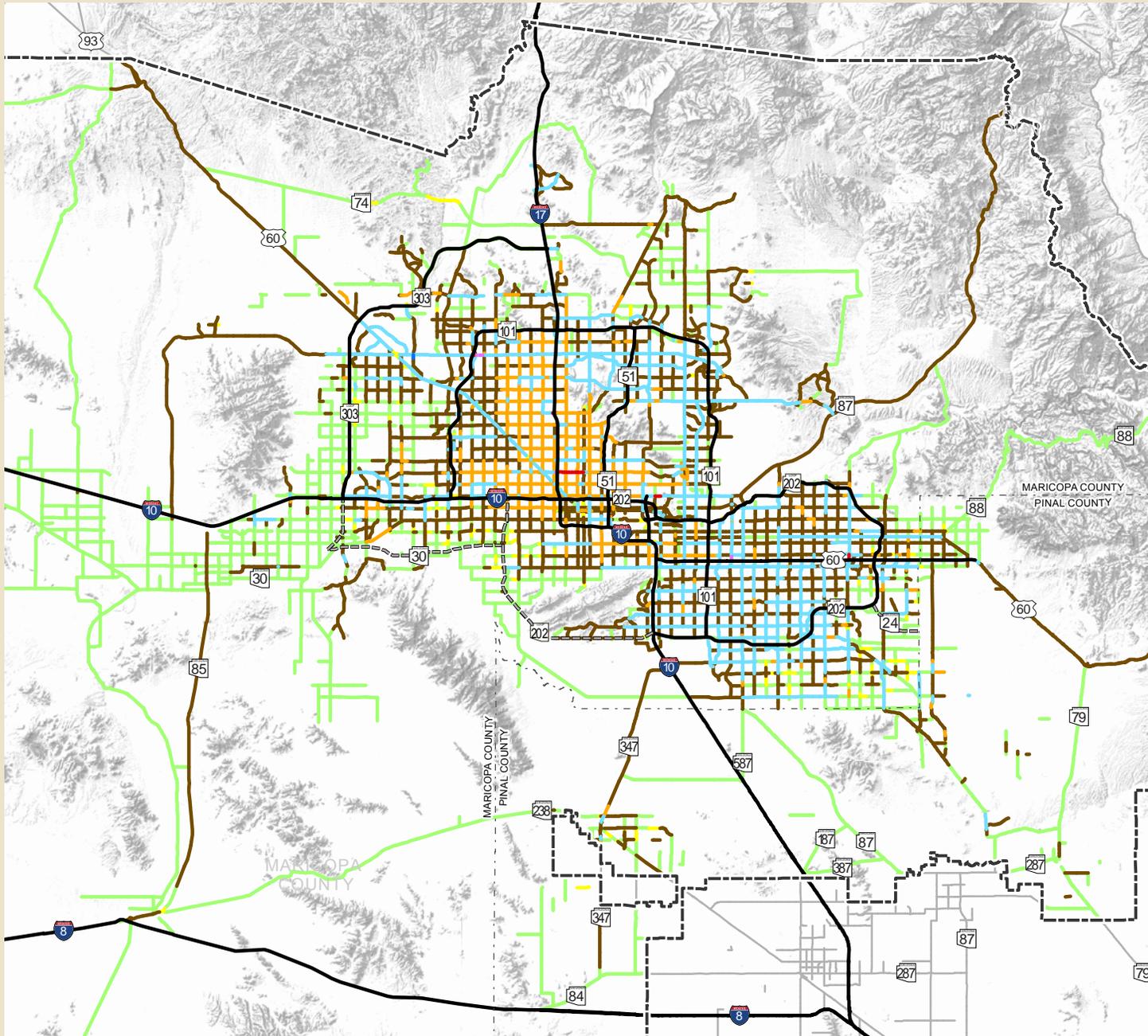
2040 Regional Transportation Plan

Fig. 10-1

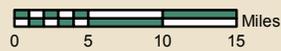


2017 Arterial Street System Total Through Lanes

- 2 Lanes
- 3 Lanes
- 4 Lanes
- 5 Lanes
- 6 Lanes
- 7 Lanes
- 8 Lanes
- 10 Lanes
- Freeways
- Proposed Freeways
- Other Roads
- County Boundary
- Metropolitan Planning Area



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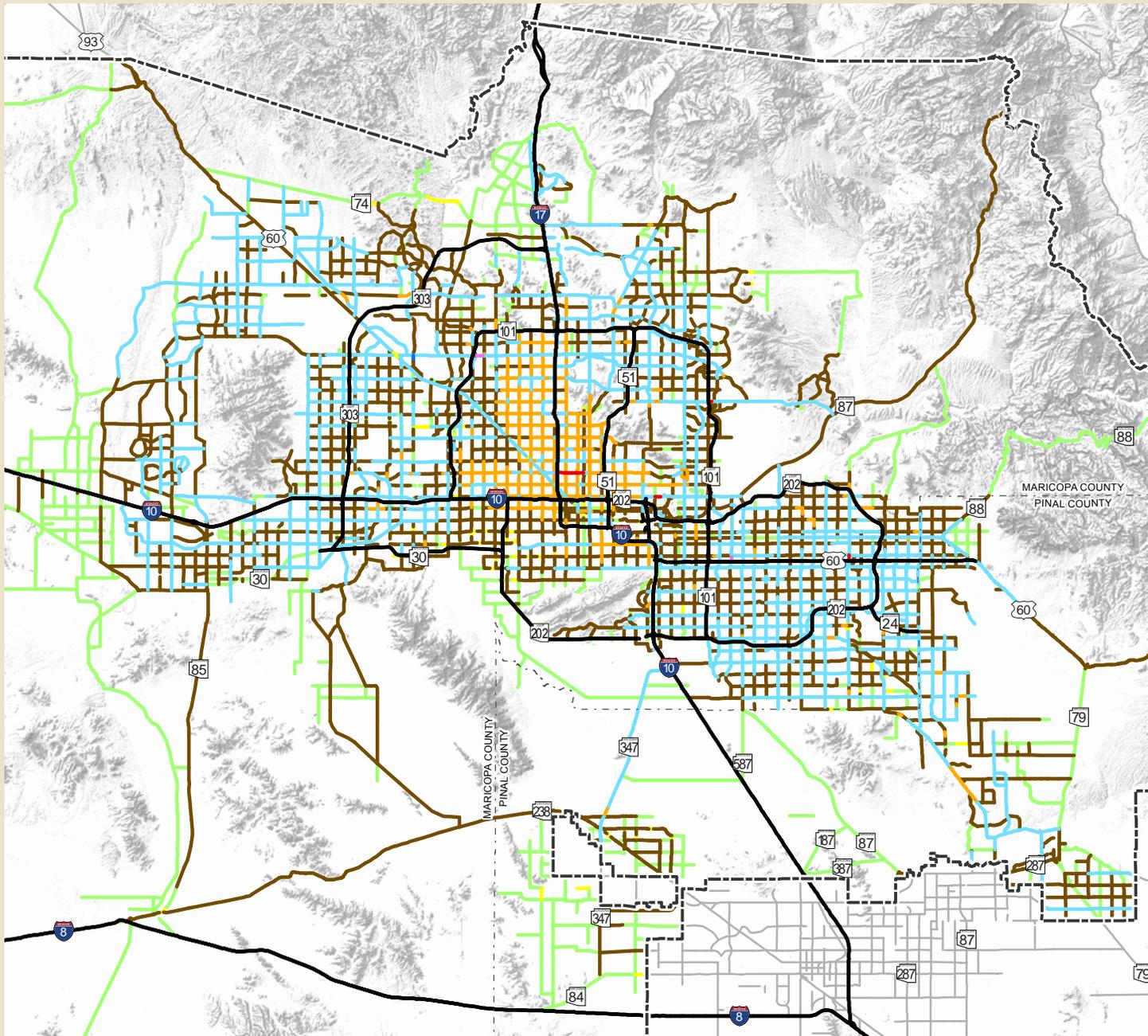
2040
Regional Transportation Plan
Fig. 10-2



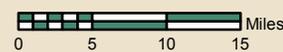
2040 Arterial
Street System
Total Through Lanes

- 2 Lanes
- 3 Lanes
- 4 Lanes
- 5 Lanes
- 6 Lanes
- 7 Lanes
- 8 Lanes
- 10 Lanes
- Freeways
- Other Roads
- County Boundary
- Metropolitan Planning Area Boundary

Regional transportation facilities in Pinal County are planned by the Central Arizona Association of Governments (CAAG). Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.



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It is anticipated that the overall arterial street network will expand by a combination of the construction of new roadway alignments; the upgrading of roads that lie along the mile-arterial grid to arterial street standards; and the widening of existing arterial streets. In some areas, natural features, such as mountains and areas of steep terrain, will preclude the extension of the one-mile arterial grid system.

The amount identified in the RTP for the planning period (FY 2018 - FY 2040) for expansion, widening, and maintenance of the arterial grid system totals \$24.1 billion (YOE \$'s), as indicated in Table 10-1. This includes regionally funded projects, as well as those constructed through local government and privately supported financial resources.

Regional Arterial Street Projects

The package of regional arterial projects provides for the construction of new arterial linkages, widening of existing streets, and improvement of intersections. In addition, implementation of dust control and other air quality control measures and projects on the regional Intelligent Transportation System (ITS) Plan are included. A total of \$3.7 billion (YOE \$'s) in funding is provided by regional sources. An additional \$2.3 billion (YOE \$'s) is added to the projects from local matching funds, for a total of \$6.0 billion (YOE \$'s).

- Arterial Capacity/Intersection Improvements - These improvements vary in nature, including the widening or major upgrading of existing arterial streets, and construction of new facilities on new alignments. Also, improvements at individual intersections are addressed in this category. These improvements are planned for the system through the MAG Arterial Life Cycle Program (ALCP), and are shown in Figure 10-3. Figure 10-4 depicts how regionally funded reimbursements from the ALCP for arterial street projects will be phased over the planning period, with group designations indicating the period in which actual project construction is finished. The total regional funding for these improvements is \$1.0 billion (YOE \$'s). The local match for these projects provides an additional \$1.2 billion (YOE \$'s) for a total of \$2.2 billion (YOE \$'s). A detailed listing of the specific regional arterial projects is provided in Appendix D.
- Intelligent Transportation Systems (ITS) - The RTP allocates funding through the MAG Arterial Life Cycle Program to assist in the implementation of projects identified in the regional ITS Plan. These projects smooth traffic flow and help the transportation system to operate more efficiently. The total funding for these improvements during the planning period (FY 2018 through FY 2019), including local contributions, is \$8 million (YOE \$'s).
- Implementation Studies - As established in the RTP approved in 2003, 3.65 percent of the half-cent funding for arterial streets is allocated to planning implementation studies for the region. These implementation studies are conducted by MAG, with a total

2040 Regional Transportation Plan

Fig. 10-3

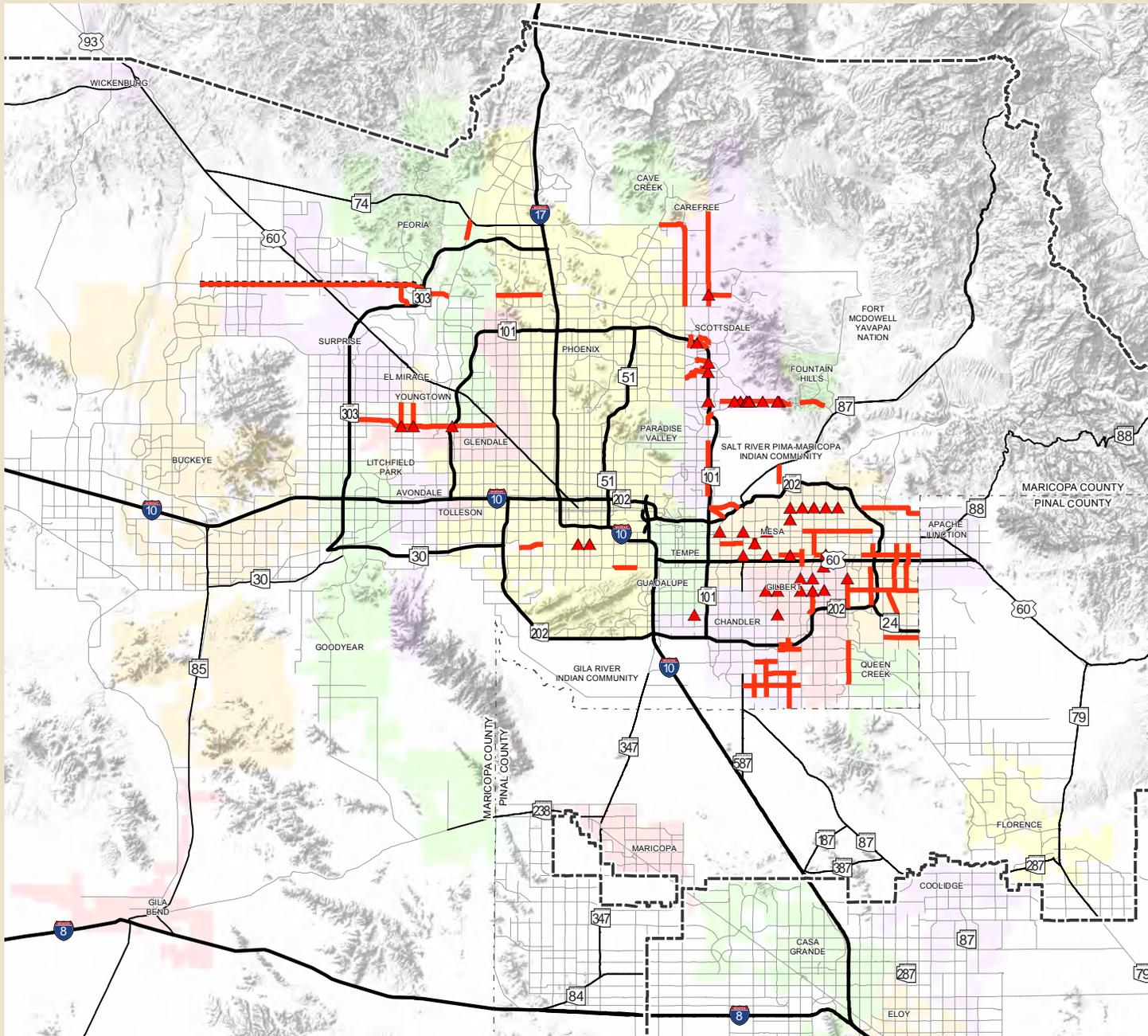
REGIONAL
TRANSPORTATION
PLAN



Regional Arterial Street Projects (FY 2018 - FY 2040)

- Improved Intersections
- New/Improved Arterials
- Right of Way Preservation
- Freeways
- Highways
- Other Roads
- Metropolitan Planning Area Boundary
- County Boundary

Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.



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funding of \$15.6 million (YOE \$'s) for the planning period (FY 2018 through FY 2026). No local match is required for these studies.

- Dust Control and Other Air Quality Control Measures - The RTP incorporates funding for measures to reduce PM-10 emissions generated by vehicle travel. Approximately \$6.0 million (YOE \$'s) in CMAQ funding is programmed to purchase PM-10 certified sweepers in fiscal years 2017 through 2021 of the FY 2017-2021 MAG Transportation Improvement Program (TIP). After FY 2021, it is assumed that local governments will continue to purchase five PM-10 certified sweepers each year to replace older PM-10 certified sweepers, expand the area swept, and increase the frequency of sweeping.

In the RTP, the paving of dirt roads by local jurisdictions reflects a continuation of current commitments to reduce fugitive dust on unpaved roads with high traffic volumes; eliminate dirt roads in areas of new development; and to pave dirt alleys, shoulders, and access points. Consistent with past trends, the RTP assumes that 10 centerline miles of high Average Daily Traffic (ADT) unpaved roads will continue to be paved each year.

The funding and expenditures for purchasing PM-10 certified street sweepers and paving dirt roads are reflected in the FY 2018 to FY 2040 arterial funding estimates. Long-term implementation of these dust control measures will be financed with the resources shown in Table 10-1.

- Other Arterial Street Grid Extensions, Widening and Improvements - It is estimated that an additional \$2.4 billion (YOE \$'s) may be provided from reasonably available regional funding sources not currently identified in terms of specific regional projects in the RTP. These resources would be used to construct additional arterial system improvements or applied to other arterial-related programs. This funding would be matched by \$1.0 billion (YOE \$'s) in local funding for a total of \$3.4 billion (YOE \$'s). In addition, a total of \$223 million (YOE \$'s) in regional CMAQ funding, plus \$14 million (YOE \$'s) in matching monies, is identified for PM-10 and other air quality programs for the FY 2018-2040 planning period.

Local Government and Private Developer Projects

In addition to the regionally funded projects with local match discussed above, other new street or street improvement projects that accompany new development will be funded entirely from local government and private developer sources. It is estimated that these projects represent a total of approximately \$3.4 billion (YOE \$'s) in new street construction and other street improvements. These improvements were identified during the review of future arterial street networks during ongoing consultation with local agencies.

System Operations, Maintenance and Preservation

MAG member agencies seek to maintain and operate the arterial street system in a way that preserves past investments and obtains the maximum capacity from existing facilities. To achieve this goal, agencies apply local funds and their share of State Highway User Revenue Funds to a range of expenditures, including street lighting, street sweeping, landscaping, sign maintenance, lane markings, pavement maintenance, storm drains, the operation of traffic signals, and other recurring costs necessary to maintain the arterial street network. The amount identified in the RTP for the planning period for operation, maintenance and preservation totals \$14.7 billion (YOE \$'s). It should be noted that this estimate includes costs on the arterial system, as well as the associated feeder collector and local streets.

A particularly important part of the maintenance effort involves the application of pavement management systems. Pavement management systems (PMS) are systematic processes that provide information for use in implementing cost-effective pavement reconstruction, rehabilitation, and preventative maintenance programs, which result in pavements capable of accommodating current and forecasted traffic in a safe, durable, and cost-effective manner. MAG member agencies have developed PMS programs for roads within their jurisdictions. Table 10-2 lists key characteristics of existing PMS programs.

Funding and Expenditure Summary

Table 10-1 has been prepared to provide a summary of the funding scenario for the streets element of the RTP. This table lists the reasonably available funding sources for the planning period and the uses of those funds. The balance between the funds that are available and the potential expenditures indicates that the arterial element of the RTP can be accomplished by using reasonably available funding sources over the planning period.

Funding Sources

Regional funding sources for the arterial streets element of the RTP are shown in Table 10-1 in terms of YOE \$'s, and include the half-cent sales tax (\$1.8 billion); Federal Surface Transportation Program funds (\$1.4 billion); Federal Highway Congestion Mitigation/Air Quality funds (\$410 million); and an estimated cash balance of \$17 million in regional funds at the beginning of FY 2018. These regional funds are complemented by local/other sources, which include city/county highway user revenues (\$14.6 billion); other local funding sources (\$3.5 billion); and private funds (\$2.3 billion). This represents a total of \$24.1 billion available for use on arterial street projects and programs. These revenue sources have been major funding elements for transportation facilities in the MAG area for decades and are considered to be reasonably available to the region throughout the planning period.

Program Expenditures

Table 10-1 also lists estimated future costs for the arterial street element of the RTP in terms of YOE \$'s. Estimated expenditures during the planning period total \$24.2 billion. This includes \$6.0 billion for regionally funded arterial street improvements, including the accompanying local match; \$3.4 billion for locally and privately funded improvements and extension of the arterial grid; and \$14.7 billion in local funding for operations, maintenance and preservation.

**TABLE 10-1
ARTERIAL STREET FUNDING PLAN FY 2018 - 2040**

FUNDING (Year of Expenditure \$'s in Millions)	
	Totals
Regional Funds	
MAG Half-Cent Sales Tax	1,805.1
MAG Federal STP	1,433.3
MAG Federal CMAQ (For arterial improvements)	186.2
MAG Federal CMAQ (For PM-10 and other air quality programs)	223.3
Beginning Balance (Regional Funds)	16.5
Total Regional Funds	3,664.4
Local/Other Funds	
City/County Highway User Revenue Funds and County VLT	14,641.2
Local Sources (General Funds, Local Sales Taxes, etc.)	3,459.7
Private Funds (PAD Improvements, Developer Contributions, etc.)	2,295.5
Total Local/Other Funds	20,396.4
Total Funding	24,060.8
EXPENDITURES (Year of Expenditure \$'s in Millions)	
	Totals
Regionally Funded Projects	
Capacity/Intersection Improvements (ALCP)	1,030.2
Intelligent Transportation Systems (ALCP)	7.4
MAG Implementation Studies (ALCP)	15.6
PM-10 and Other Air Quality Programs	223.3
Other Arterial Grid Improvements	2,387.9
Total Regionally Funded Projects	3,664.4
Local/Other Funded Projects	
Match for Regionally Funded Projects	2,299.7
Future Arterial Grid Extensions, Widening and Improvements	3,374.5
System Operation, Maintenance and Preservation	14,722.2
Total Local/Other Funded Projects	20,396.4
Total Expenditures	24,060.8

**TABLE 10-2
PAVEMENT MANAGEMENT SUMMARY**

Agency	Software	Assessment Frequency	Rating System/Approach	Additional Comments
ADOT	Highway Pavement Maintenance Application (HPMA) PECOS	Annual	International Roughness Index (IRI) Present Serviceability Rating (PSR)	Pavement preservation activities are planned five years in advance, based on technical indicators. The effects of new construction and reconstruction projects on pavement preservation requirements are also taken into account in pavement preservation programming. Extensive coordination is maintained to avoid overlapping pavement treatments, such as roads being restriped shortly before a pavement overlay project.
Apache Junction	iWorQ	Annual	Remaining Service Life (RSL)	Five main distresses are measured: fatigue, transverse cracking, longitudinal cracking, patches, and edge of pavement cracking. Raveling and other indices are also monitored. Inspectors use a guide to rate pavement. Software is used to recommend maintenance activities based on ratings. Pavement preservation measures are prioritized and coordinated with crack sealing.
Avondale	iWorQ	2 years	Not Available	Experience has indicated that past patterns of pavement maintenance have had a significant effect on current pavement conditions.
Buckeye	Microsoft Excel	Continuously check, update informally	Pavement Surface Evaluation and Rating (PASER)	The roadway maintenance approach is focused on obtaining grant funding for major arterials, while maintaining the highest traffic volume residential roadways. Pavement maintenance program focuses on keeping the greatest number of residents satisfied.

TABLE 10-2: PAVEMENT MANAGEMENT SUMMARY (CONT'D)

Agency	Software	Assessment Frequency	Rating System/Approach	Additional Comments
Carefree	Microsoft Word & Microsoft Excel	4-5 years	Modified Version of the Transportation Research Board Process	Through field inspection, 10 categories of pavement defects are scored. Defects are weighted based on severity and importance. Unique roadway and pavement conditions are noted. A three step approach to the operations and maintenance program is used; (1) identify defects, (2) prioritize needs, and (3) assess program options versus budget funding.
Cave Creek	No Formal System	Informal-routine	Informal system - Chip seal five miles of roads a year when funding is available. Other improvements are prioritized based upon available funding	Pavement management software is being researched and reviewed. Many of the available packages seem to be too complex to fit the pavement management needs of a small system.
Chandler	Proprietary road matrix software by Stantec	3 years	Pavement Quality Index (PQI)	Developers provide a one year final inspection on new roadways, at which time the developer may be required to apply the first seal coat. Pavement life is targeted at 25-30 years before the first mill and overlay.
El Mirage	Microsoft Excel	Goal – 2 years Current – 4 years	Pavement Surface Evaluation and Rating (PASER)	Projects are planned in order to maximize use of available funding. In order to achieve economies of scale, larger projects are performed, limiting the variety of activities in a given year. For example, one year all available funding may go toward one arterial; the next year, crack sealing and fogging the network.

TABLE 10-2: PAVEMENT MANAGEMENT SUMMARY (CONT'D)

Agency	Software	Assessment Frequency	Rating System/Approach	Additional Comments
Fountain Hills	No Formal System	7 years	Seven Zones-treat one annually	Maintenance is performed on a seven year cycle between seven zones. Each year, one zone is crack and slurry sealed or micro-paved. Roads are typically 40 years old and the majority have never had significant treatments.
Gila Bend	No Formal System	Informal	Informal	Establishment of a formal system is under consideration.
Gilbert	CHEC software switching to GBA	3-4 years	Pavement Condition Index (PCI)	Pavement management program makes extensive use of the Pavement Condition Index. There is an ongoing effort to demonstrate to decision-makers how pavement preservation funding levels affect the Pavement Condition Index.
Glendale	Lucity	5 year goal	Pavement Condition Index (PCI)	Pavement preservation projects are included in the Capital Improvement Program, which utilizes General Obligation funds. The Structural Index (SI) is tracked on arterials to provide a basis for pavement management activities.
Goodyear	Lucity	3 year goal	Pavement Condition Index (PCI)	Because the majority of roads are relatively new, they are typically in good condition, which tends to increase the system average Pavement Condition Index. Recent rapid growth in the size of the roadway system may result in increased future maintenance program funding needs that may not be apparent due to the high current average PCI.
Litchfield Park	Microsoft Excel	5 years	Pavement Condition Index (PCI)	All roads in the network were assessed in 2006 and 10-year maintenance activities recommended. Roadway segments are reviewed annually to determine if recommended treatments are still warranted, or if a roadway's condition has worsened enough that it needs more than the original prescribed level of maintenance.

TABLE 10-2: PAVEMENT MANAGEMENT SUMMARY (CONT'D)

Agency	Software	Assessment Frequency	Rating System/Approach	Additional Comments
MCDOT	Proprietary Software - Roadway Management System (RMS)	Arterials-annual Others-Biannual	Pavement Condition Rating (PCR) and International Roughness Index (IRI)	The pavement management process focuses predominantly on roadways classified as arterials. The roadway maintenance program does not maintain or manage landscape features.
Mesa	Modified MicroPAVER	Annual	Pavement Condition Index (PCI)	An activity-based budget process is used, tying pavement maintenance activities to strategic goals. Roadway operations and maintenance funding is kept separate from the Capital Improvement Program and major pavement projects are prioritized depending on funding levels. Typically a 20-30 year pavement life is experienced.
Paradise Valley	In House Program	4 years	Pavement Condition Rating (PCR)	Maintenance is performed on a 15 year cycle between 15 sections. Each year, one section is milled and overlaid. Roads are typically crack sealed every 7-8 years.
Peoria	Hansen Asset Management Software, Microsoft Excel for pavement condition	Bi-annual	Pavement Condition Index (PCI)	To maximize benefits from available funding, maintenance activities focus on arterial projects with greater or longer term impact. Projects are prioritized to maintain high levels of safety, while some lower rated pavements may not be treated due to funding limitations. Major pavement rehabilitation, when necessary in the future, may face funding issues.
Phoenix	Lucity	Bi-annual	Pavement Condition Index (PCI) and SCI	Specially equipped vans are used in the pavement assessment process to measure and record roadway Pavement Condition Index data. Reconstruction of pavements is not programmed, placing an emphasis on periodic/routine maintenance activities to preserve pavement quality over the long term.

TABLE 10-2: PAVEMENT MANAGEMENT SUMMARY (CONT'D)

Agency	Software	Assessment Frequency	Rating System/Approach	Additional Comments
Queen Creek	MicroPAVER and Microsoft Excel	Goal- 3-5 years 10 year actual	Pavement Condition Index (PCI)	The majority of roads are relatively new, with an average age less than ten years, resulting in a relatively high Pavement Condition Index. The basic approach is to crack seal the roads annually, with a fog seal every three years. Slurry seals are used when there is significant cracking.
Scottsdale	Lucity	4 years	Pavement Condition Index (PCI)	Pavements are rated using the Pavement Condition Index, with intersections assessed separately. Data is recorded and tracked using GIS polygons rather than lane mile units, which is aimed at providing a more precise measurement of pavement areas.
Surprise	Hansen Pavement Management software	4 years	Overall Condition Index (OCI)	While most of the roads in the network are relatively new, efforts are aimed at adequate maintenance to continue high levels of pavement quality in the future. Typically roads are assessed every four years, using the time in between to perform improvements. The pavement management system is continually updated as improvements are performed, but new defects may not be documented until the next periodic assessment.
Tempe	Roadmatrix	3 years	Pavement Quality Index (PQI)	Avoiding a “worst first” repair prioritization approach, pavement maintenance strategies focus on consistent minor maintenance to preserve pavements, deferring the need for major maintenance projects. High standards are targeted, but if a road falls into poor condition, maintenance may be stopped and the road is later reconstructed. Predictable funding sources are being sought to maintain a strong pavement management program, instead of bonding or reliance on State shared revenues.

TABLE 10-2: PAVEMENT MANAGEMENT SUMMARY (CONT'D)

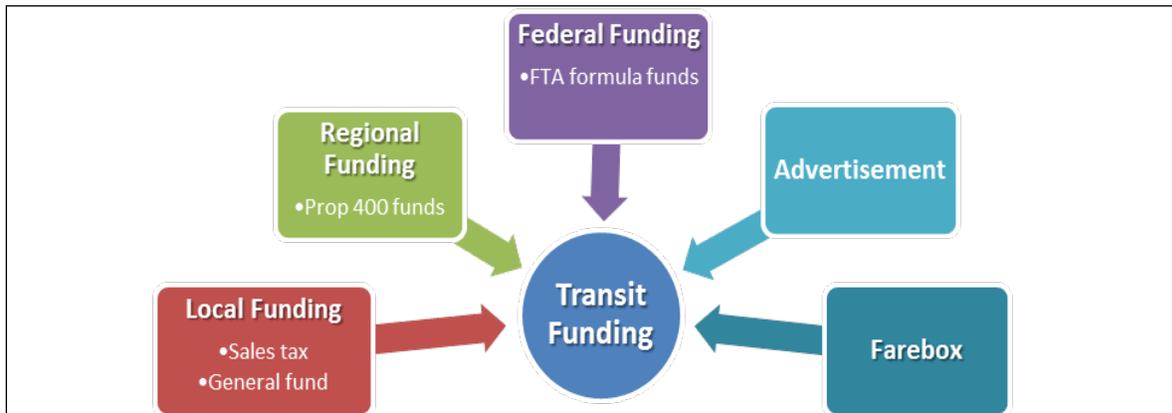
Agency	Software	Assessment Frequency	Rating System/Approach	Additional Comments
Tolleson	Microsoft Excel	Ongoing	Pavement Condition Index (PCI)	An inventory of roadway network conditions is maintained in Microsoft Excel and used to assess which streets need reconstruction, mill and overlay, etc. A ten-year pavement maintenance plan is being formalized, and repairs are beginning on the lowest rated parts of the network.
Wickenburg	No Formal System	Informal	Informal, need based prioritization	Projects are identified through an informal pavement condition assessment. In FY 2010 and 2011, \$100,000 from the Capital Improvement Program was available for roadway maintenance in addition to HURF. The local power grid, which is municipally owned, helps fund the Capital Improvement Program.
Youngtown	No Formal System	Informal	Informal, need based prioritization	A slurry seal was done on all roads in 2004. A specific annual roadway operation and maintenance program is not part of the budget process. Community Development Block Grant funding, or other funding, has been used as it becomes available in the past for roadway maintenance projects. HURF funds typically cover costs to fix vandalism or matching for grants.

CHAPTER ELEVEN

PUBLIC TRANSIT

The 2040 Regional Transportation Plan (RTP) includes a transit network that encompasses various transit modes in the region. The regional transit system is supported by federal, regional, and local funding sources. Federal funds are directed to the transit system in the region via formula and competitive programs from the Federal Transit Administration (FTA) and Federal Highway Administration (FHWA). Regional funding sources include the Public Transportation Fund (PTF), also known as Proposition 400, which dedicates approximately one-third of the regional half-cent sales tax for transportation to mass transit. Local funding sources include dedicated transit or transportation sales taxes, municipal general funds, Arizona Lottery funds, revenue from transit fares, advertisement sales, and other funding sources. Figure 11-1 depicts the primary financial resources for transit in the region.

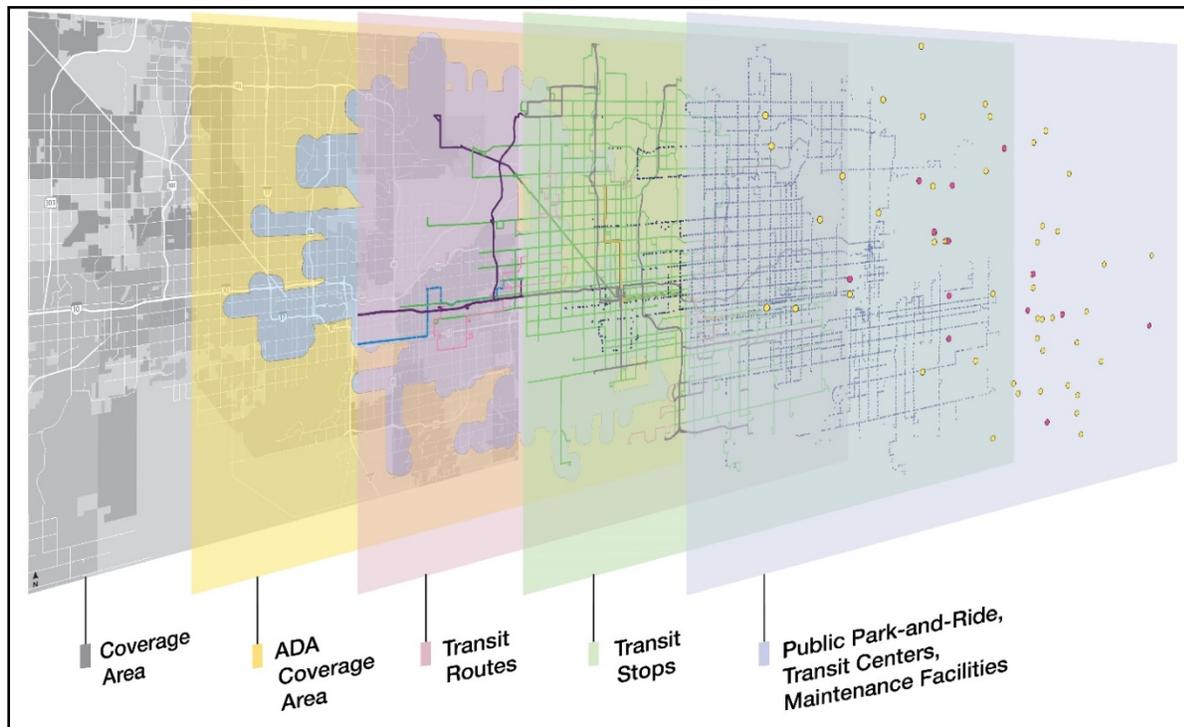
**FIGURE 11-1
TRANSIT SYSTEM FUNDING RESOURCES**



Current Transit Network

The transit network currently serving the MAG region regardless of funding source consists of multiple components, including bus operations, paratransit, and high capacity transit, including light rail transit (LRT). In addition to these services, capital investments (facilities, fleet, and infrastructure) make up the regional transit network. Figure 11-2 shows how these components are layered to make up the total transit network.

**FIGURE 11-2
REGIONAL TRANSIT NETWORK COMPONENTS**



Bus Operations

The region has four bus service operators (three local cities and one regional agency). Currently, the local agencies support approximately 70 percent of the bus transit services provided in Maricopa County. The existing bus network is depicted in Figure 11-3 and consists of local bus service, circulators, RAPID/Express bus, limited and rural bus service (as coded for the April 2017 base network). These services operate on local and arterial streets and in freeway high occupancy vehicle (HOV) lanes. They serve a range of trip needs, including work, shopping, medical appointments and school trips.

The service design emphasis is on system efficiency and effectiveness in order to provide a high level of transit service that is reliable and affordable for users in the region. Service levels on particular routes are dictated by the demand for transit along those routes as well as by availability of funding. Routes typically operate seven days a week, 18-20 hours per day; in some cases, higher levels of service are provided during peak travel hours. Express/RAPID and limited services are oriented around peak periods of demand. The network is complemented with Americans with Disabilities Act (ADA) required paratransit service and, in some local areas, with Non-ADA paratransit service and subsidized taxi programs.

2040 Regional Transportation Plan

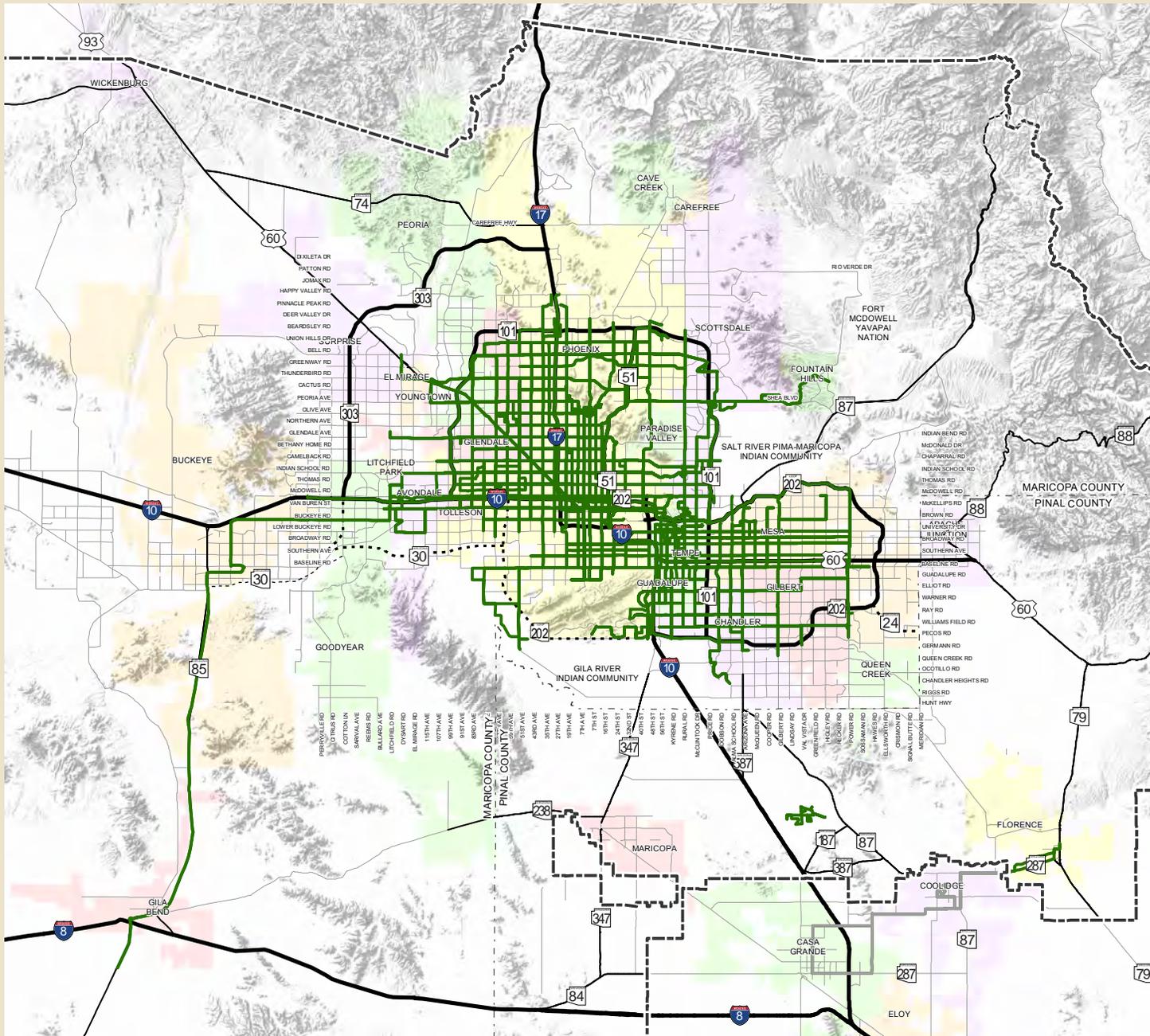
Fig. 11-3



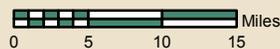
2017 Bus Service Network

- Bus Network
- Existing Freeway
- Planned Freeway/Highway
- Highways
- Other Roads
- Metropolitan Planning Area Boundary
- County Boundary

Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.



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As previously noted, local and regional sales taxes and other revenue sources fund transit services in the region. The regional sales tax helps fund a regional bus network as part of the RTP. This network ensures that reliable service is available on a continuing basis:

- Circulators/Shuttles - Circulator service operates within a specific locale, such as a neighborhood or downtown area, and connects to major traffic corridors. There are currently 18 circulator routes in the region operating in Phoenix, Tempe, Avondale, Tolleson, Goodyear, Scottsdale, Mesa and Glendale.
- Local Routes - Scheduled bus service operates on a fixed route that involves frequent stops and lower travel speeds, the purpose is to deliver and pick up transit passengers close to their destinations or origins. In addition, local routes are transit routes in a city or its immediate vicinity, distinguishing them from regional transit service or interurban lines. Local routes are 100 percent locally funded.
- Regional Super Grid - Regional grid bus routes, which are also commonly referred to as “supergrid routes,” are routes that follow the alignment of major roads of the regional arterial grid network. Regional funding of bus operations along the arterial grid network ensures a degree of consistency in service levels across jurisdictions, which may not otherwise be possible due to varying funding limitations at the local level.
- Rural/Flex Routes - This service type addresses the need to provide connections between the urban and rural communities of the county, serving a range of trip needs including medical, work, shopping, education, and access to various community services. The current bus system identifies one rural/flex route to Gila Bend.
- Limited Routes - Limited route bus service operates on a fixed route, typically major arterials, and provides higher speeds and fewer stops than found on other portions of the bus system or on the same route in local service. There is one limited route in the region: the Grand Avenue Limited.
- RAPID/Express Routes - Express bus provides enhanced-speed, moderate-volume commuter or regional access in the MAG region and is designed to operate primarily on the region’s freeway system, including HOV lanes. Express bus service typically operates from park-and-ride locations to employment centers throughout the region. These routes provide service Monday through Friday during the morning and evening peak time periods. Express bus service usually operates one-way in the peak direction. All RAPID/Express routes have Downtown Phoenix as their final inbound destination. The term RAPID is express service that operates solely within the boundaries of the City of Phoenix.

The Great Recession negatively impacted the region’s ability to provide transit service (e.g. routes, hours of service, frequency, etc.) as originally proposed. During the Great Recession, the system was impacted by service decreases and elimination or postponement of some planned new service. However, recent economic conditions and local tax initiatives have the potential to mitigate some of the previous reductions. The projections for the Transit Life Cycle Program (TLCP) are trending at or above current targets, (although these targets were adjusted downward as a result of the Great Recession).

In August 2015 Phoenix voters approved Proposition 104 - T2050 - a 35-year citywide transportation plan aimed at dramatically expanding investment in Phoenix for bus service, light rail construction and street improvements. The previous transit plan, known as T2000, was a voter-approved tax that primarily funded transit service in Phoenix. Now broader and more comprehensive, the T2050 transit plan entails additional emphasis on street needs, including street maintenance to new pavement, bike lanes, and sidewalks, as well as ADA accessibility to compliment an increase in transit services. The T2050 plan was developed by the Citizens Committee on the Future of Phoenix Transportation.

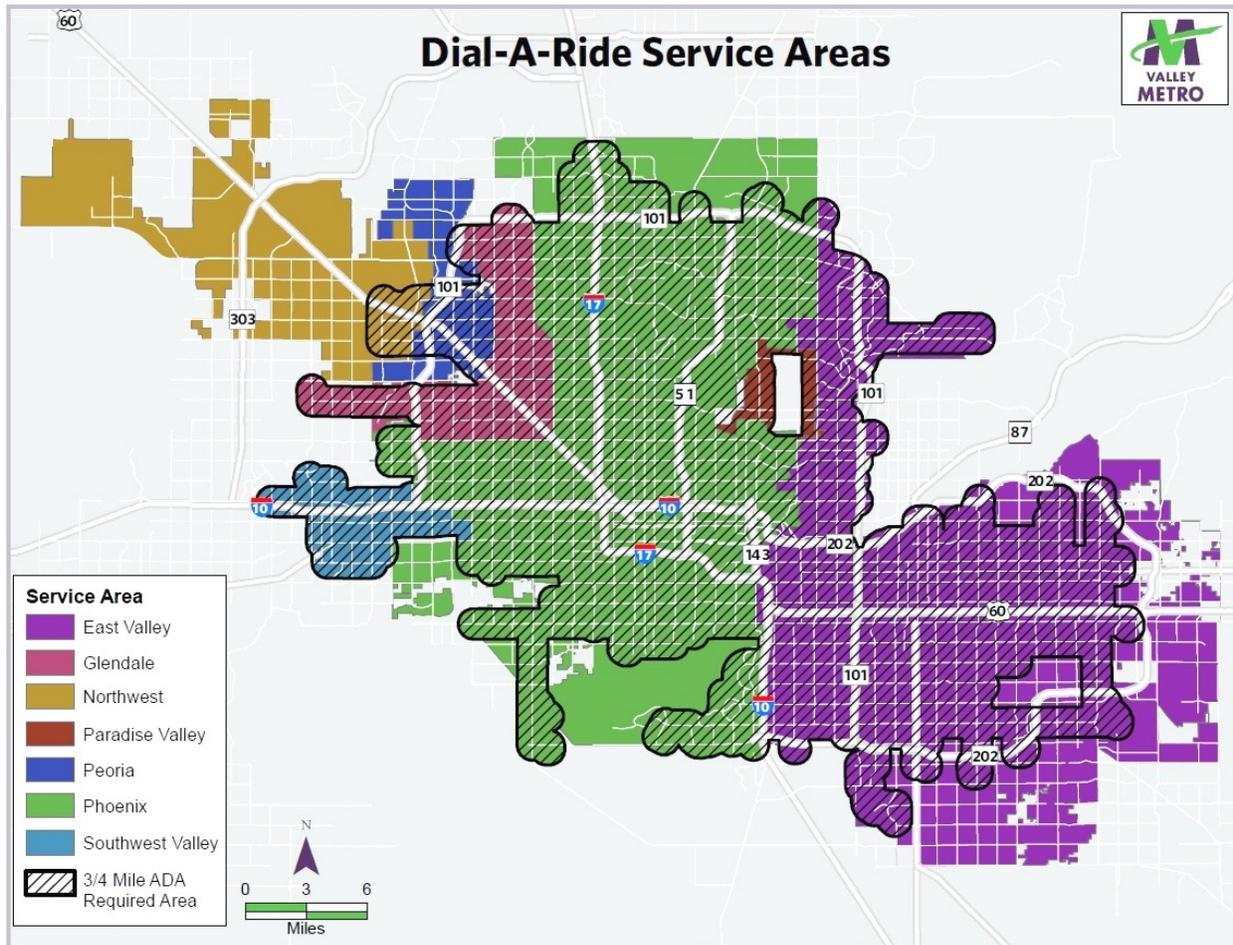
Paratransit

The Americans with Disabilities Act (ADA) requires transit agencies to provide alternative transportation called “paratransit” that mirrors available public transit for people with disabilities who are unable, because of a disability or disabilities, to independently use conventional public transit. Generally, paratransit service includes various types of passenger transportation that is more flexible than conventional fixed-route transit but more structured than the use of private automobiles. Paratransit includes dial-a-ride/demand response transportation services, shared-ride taxis, taxi subsidy programs, car-pooling and vanpooling. Under the RTP, ADA paratransit service is regionally funded, while senior and non-ADA paratransit service continues to be locally funded. Figure 11-4 depicts Dial-a-Ride (DAR) service areas in the MAG region.

In addition to ADA mandated service, several communities offer additional non-ADA paratransit services, including service for seniors, taxi subsidy programs, and service in areas where no public transit exists. The rules for these services vary by community, but most require any person with a disability who is not 65 years of age or greater to obtain ADA certification before using local non-ADA services. Some cities in Maricopa County have elected to provide paratransit services for seniors age 65 and above. Rules for these services vary by community, but most require the completion of an application and proof of age and residency.

- Dial-a-Ride - Dial-a-Ride (DAR) is a regional curb-to-curb or shared-ride origin to destination service that provides transportation for passengers unable to access fixed route local bus service. It is a public transportation service provided for three distinct groups of customers: ADA certified, non-ADA service, and Seniors age 65+. The

**FIGURE 11-4
DIAL-A-RIDE SERVICE AREAS**



ADA/DAR service is that service which is required to be provided according to ADA federal regulations as an alternative form of transit when and where local fixed route bus service is running. The federally mandated service area is three-fourths of a mile adjacent to/on each side of each transit stop. All origins and destinations within that area would be served. A certification process determines a user’s eligibility for ADA/DAR service.

Some cities in the region have elected to provide DAR and other paratransit services beyond the federal requirements. In most cases, passengers may travel within a DAR service area without transferring to another vehicle. In July 2016, Valley Metro began providing ADA paratransit service between the five DAR service areas without transfers.

For a full description of paratransit services offered to seniors and people with disabilities in various jurisdictions in Maricopa County can be found on the Valley Metro website http://www.valleymetro.org/accessibility/service_areas.

- Other Paratransit Programs for seniors and people with disabilities - Several communities provide paratransit programs other than DAR, such as taxi subsidy programs.
- Carpool Matching Service – Valley Metro allows people to register online for carpool matching services through programs such as Share The Ride. Individuals making similar trips are matched up with each other to enable them to form their own private carpools under whatever terms they find mutually agreeable.
- Vanpools - Commuter vanpools allow groups of employees to self-organize and lease a vehicle from Valley Metro to use to operate a carpool service, providing a flexible transit solution for those trips not well served by more conventional fixed route service. The vanpool program is managed by Valley Metro through its complementary rideshare program. In FY 2016, vanpool service logged 1,157,277 boardings. The current fleet is comprised of 435 vehicles and seating capacity per vehicle varies from six to 15 passengers. RPTA is also able to provide a wheelchair-accessible vehicle, if requested.

High Capacity Transit Operations

High Capacity Transit (HCT) is categorized into two categories: HCT/all day and HCT/peak period. HCT/all day provides high-capacity regional access and introduces a time-saving element by operating solely in an exclusive guideway. HCT/peak period provides higher-speed, high-volume commuter or regional access, when compared with express bus. HCT/peak period service can utilize either buses or rail vehicles. HCT service is best complimented by local bus service connections as well as adequate land uses and population/employment densities. The MAG region currently provides only HCT/all day service.

- High Capacity Transit/All Day - HCT/All Day typically operates two-way service, seven days a week. Fixed route bus or rail vehicles (e.g., light rail, streetcar) are used for this service, operating in an exclusive guideway or mixed traffic. Passenger access is available at stations located approximately every half-mile to one mile. Supergrid services in the MAG region generally operate in mixed traffic and lack the time-saving element of an exclusive guideway. In addition to addressing transportation needs, HCT/All Day services have demonstrated the ability to provide significant economic development benefits.
 - *Light Rail Transit (LRT)*: On the weekdays, this service operates approximately 20 hours a day with 12-minute peak and midday service and 20-minute early morning and evening service. On Fridays and Saturdays, this service operates approximately

23 hours a day. Saturday frequency is 15-minute during the peak and midday and 20-minute in early morning and evening. On Sunday, this service operates approximately 19.5 hours a day with 20-minute all day service. Figure 11-9 includes the existing system within the planned LRT system.

- *Arterial Bus Rapid Transit (BRT)*: BRT is a two-way service that operates at higher speeds than local or regional grid bus service by taking advantage of limited stops and other time saving enhancements. BRT typically operates in a separated and dedicated right-of-way for public transit use during peak periods. This type of service is not currently provided in the MAG region.
- *PHX Sky Train*: The PHX Sky Train is a fully automated, nearly 2.5 mile grade-separated transit system that connects several major facilities at Sky Harbor International Airport with the Valley Metro bus and light rail system. The Sky Train operates 24 hours a day and arrives at stations every three to five minutes during peak periods and delivers passengers to their stops within minutes of boarding. The Sky Train is paid for with airport revenues and passenger fees.
- High Capacity Transit/Peak Period - HCT/Peak Period provides higher-speed, high-volume commuter or regional access, when compared with express bus. While express bus sometimes operates in mixed traffic, HCT/Peak Period generally operates in an exclusive guideway, providing service between park-and-ride locations and major employment centers. This service typically operates Monday through Friday during the morning and evening peak time periods traveling in the peak direction using bus or rail vehicles (e.g., conceptual commuter rail). HCT/Peak Period service can utilize either buses or rail vehicles. This type of service is not currently provided in the MAG region.

Facilities, Fleet, and Infrastructure

Transit operations are made possible by the capital facilities, fleet and infrastructure that carry passengers to their destinations. This covers not only the vehicles, tracks, stations, bus terminals, and bus stops that are directly used by passengers, but also includes the support facilities that are needed to facilitate vehicle maintenance, training, and customer service support.

- Facilities - The facilities that support the current transit system include 13 transit centers and 53 park-and-ride lots, one light rail line, and eight feeder bus operations, some of which are publicly owned, while others are in partnership with commercial establishments. Facilities also include eight bus and one light rail operations and maintenance facilities and over 7,300 bus stops. Finally, there is also the Valley Metro Mobility Center in East Phoenix, which houses regional customer service and where the ADA in-person assessments are conducted. These facilities are shown in Figure 11-5.

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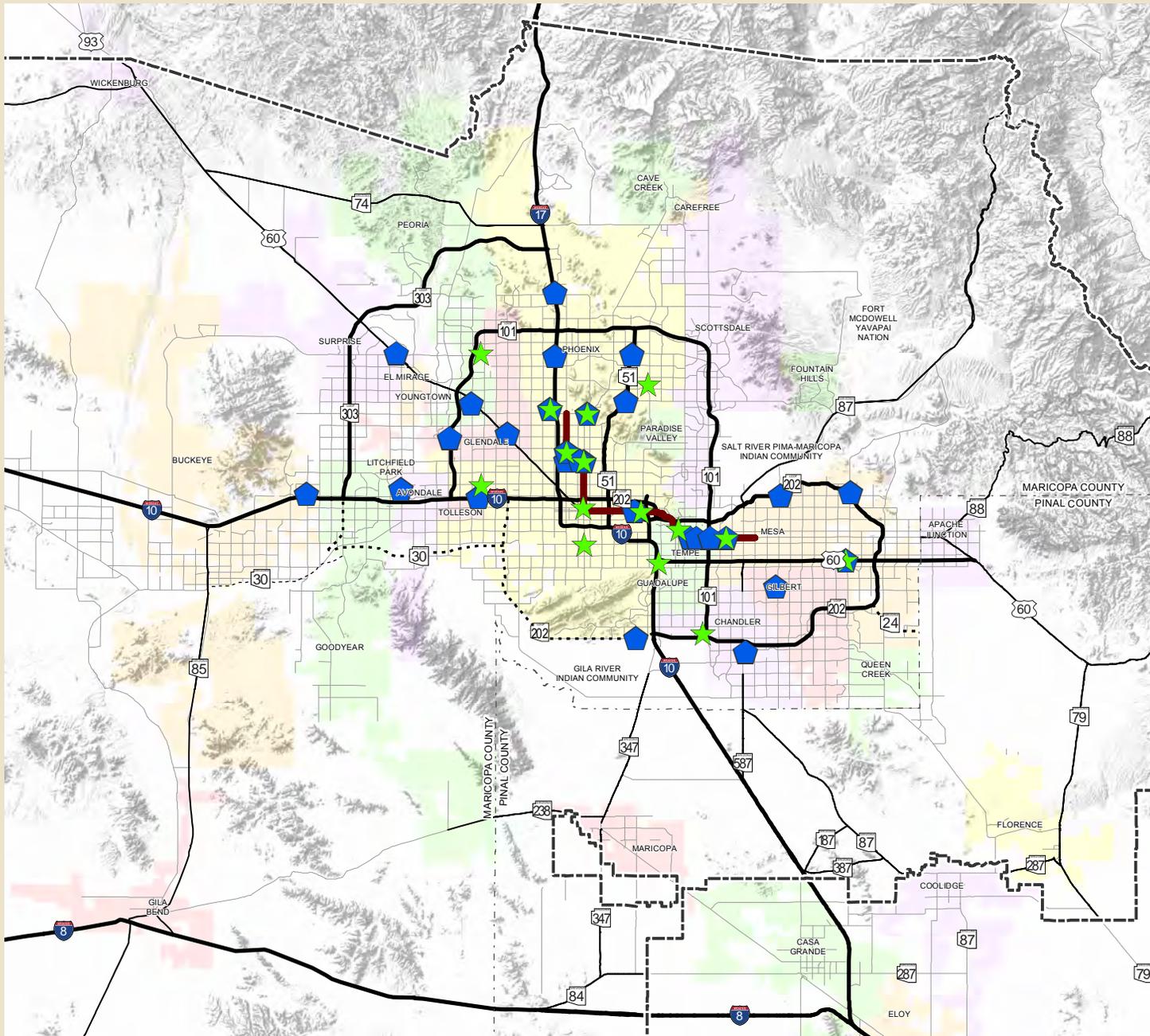
Fig. 11-5



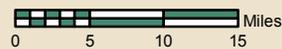
Transit Center and Park-and-Ride Facilities (2017)

-  Transit Centers
-  Park & Ride
-  Completed Minimum Operating LRT
-  Existing Freeway
-  Planned Freeway/Highway
-  Highways
-  Other Roads
-  Metropolitan Planning Area Boundary
-  County Boundary

Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.



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- Fleet - The current fleet in the transit system include: 777 buses, 108 shuttles/circulators, 167 dial-a-ride vehicles, 432 vans, 50 light rail vehicles, and nine regional connectors. These totals do not include the contractor-provided fleet of sedans, vans, and wheelchair-accessible vans, which operate DAR services in the East and Northwest Valley sub-regions and for regional paratransit services.
- Infrastructure - The LRT system has two, bidirectional tracks, light rail trains are comprised of one to three light rail vehicles. Important elements of the LRT system include park-and-ride lots at various locations along the alignment and signal priority strategies that improve speed. Passenger stations are generally located about a mile apart, but closer (1/2 mile apart) in urban centers. Half-cent sales tax funds from Proposition 400, from City of Phoenix' Transit 2000 Plan, and City of Tempe's 1996 Transit Plan along with funds from the City of Mesa were utilized to pay for route construction of the minimum operating segment (MOS)(Montebello Ave. / 19th Ave. in Phoenix to Sycamore / Main St. in Mesa). Funds were also allocated toward certain elements of the support infrastructure (e.g. vehicles, bridges, park-and-rides, and the operations and maintenance facility). In addition to LRT infrastructure, the transit network also utilizes direct HOV ramps and busways to support the Express/Rapid routes.

Future Transit Network

The 2040 Regional Transportation Plan includes a broad vision for future transit facilities and services in the region. Future bus service in the MAG Region will be a critical component of the planned regional transportation network. Paratransit services will also be essential, providing transportation for passengers unable to access conventional transit services. High capacity transit, which typically operates in an exclusive guideway, addresses higher volume transit needs and has demonstrated the ability to provide significant economic development benefits.

In addition, investments in capital facilities, fleet and infrastructure are necessary to provide the vehicles, tracks, stations, bus terminals, and bus stops that are directly used by passengers, as well the support facilities that are needed for vehicle maintenance, provide training, and house customer services.

The emergence of new technologies, such as autonomous vehicles, connected vehicles and Transit Network Companies (TNCs), must also be considered as advancement in such technologies is fast paced with implications sure to impact mobility planning and design.

Planned Bus Service

The future bus service in the MAG Region is an important component of the planned regional transportation network. Over time, new routes will be added to the existing transit system. Helping to guide the addition of new routes to the system is the recently completed Transit Standards and Performance Measures (TSPM) effort, as well as the new Short-Range Transit Program (SRTP) facilitated by Valley Metro.

The importance of a performance-based transportation system is emphasized and required as part of the federal government's Moving Ahead for Progress in the 21st Century Act (MAP-21), and in the subsequent Fixing America's Surface Transportation Act (FAST Act). In addition, the Arizona State Legislature, in its legislation leading to Proposition 400 in 2004, stressed performance based transportation planning and programming, requiring audits every five years to verify operational performance and to address potential changes to the plan to improve performance.

In October 2012, Valley Metro initiated the TSPM effort. Phase I of the TSPM effort established service delivery goals, a definition of service types and associated service standards (days of operation, span, frequency), passenger stop spacing standards, and modifications to the regional transit service change process; it was approved by the Valley Metro Board in November 2013. Phase II included the identification of regional transit performance measures and associated planning tools, transit service performance thresholds, standards for implementing and prioritizing new transit services, and principles for the application of regional transit standards and performance measures; it was approved in December 2014. Phase III included service design standards for local and key local bus routes and a regional fleet prioritization process; it was approved in June 2016

The SRTP identifies transit service improvements needed during the next five years. The SRTP identifies regional and local transit service improvements programmed in the TLCP as well as those local operating budgets. The SRTP is based on input submitted by member agencies as well as concepts developed by Valley Metro in conjunction with TSPM. The SRTP serves as input for the TLCP, Fleet Management Plan, bi-annual service changes and the region's Transportation Improvement Program. Both the TSPM and SRTP processes are completed in close consultation with member agencies.

Funding for the additional transit service will be provided by revenue from federal, Proposition 400, and local sources. Based on the interest to implement transit services, it is reasonable to assume that other cities will also fund transit service beyond what is identified in Proposition 400 and current local sales taxes. Figure 11-6 depicts the 2040 fixed route bus network. This figure covers regionally and locally funded services. The amount identified in the long- range

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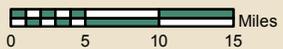
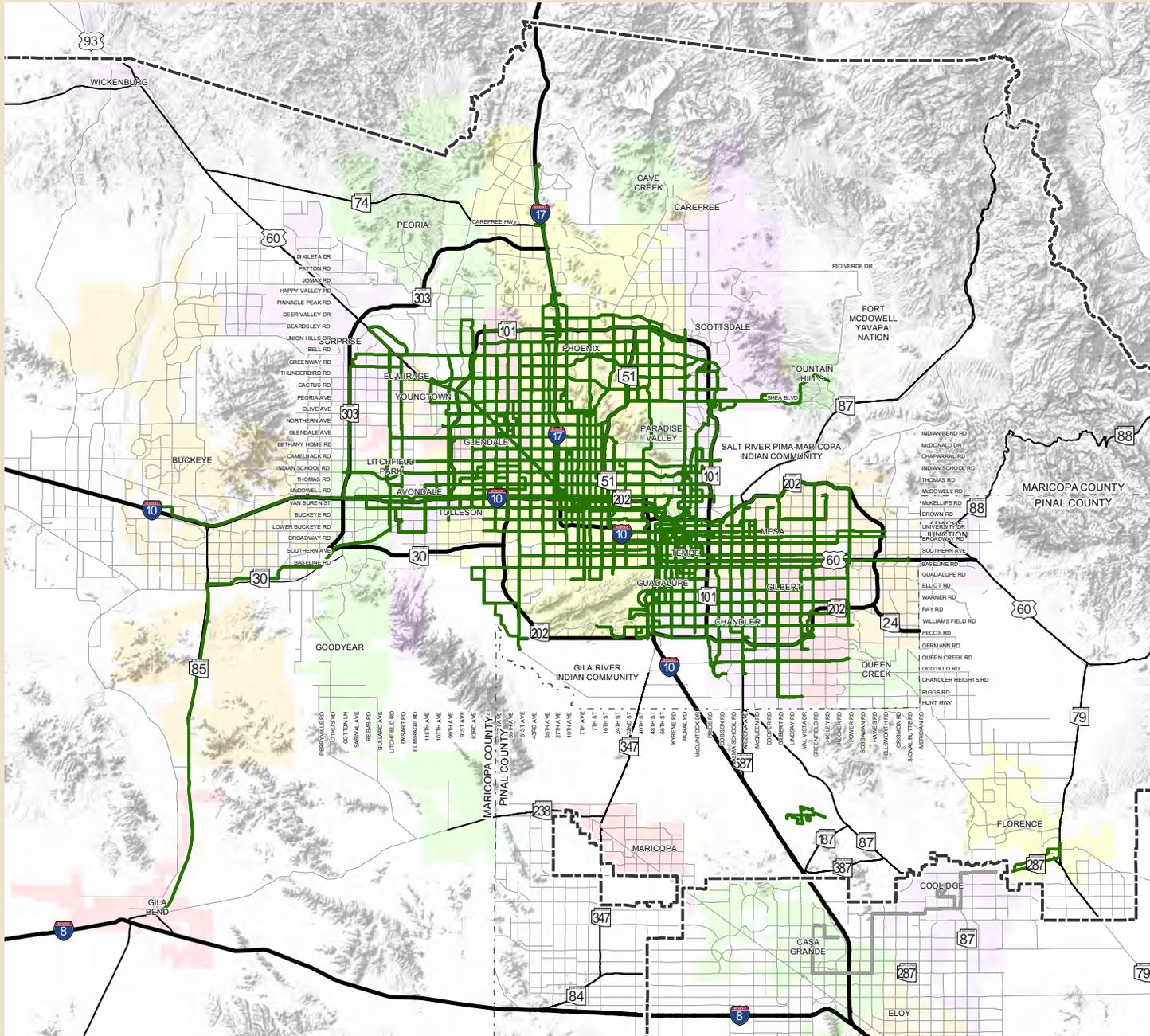
Fig. 11-6



2040 Bus Service Network

-  Bus Network
-  Freeways
-  Highways
-  Other Roads
-  Metropolitan Planning Area Boundary
-  County Boundary

Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.



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plan for bus facilities and services, which also includes vanpool, dial-a-ride, and passenger support services, totals approximately \$13.4 billion (YOE \$'s) from all funding sources.

A detailed listing of the timing and cost of planned bus service and capital improvements that are regionally funded are provided in Appendix E.

- Circulators/Shuttles - It is anticipated that local agencies throughout the region will continue to add local circulators/shuttles to their transit operations in parallel with available resources during the planning period.
- Local Routes - Consistent with population growth and development patterns, it is anticipated that locally funded routes will incrementally be extended to meet demand within individual jurisdictions. Furthermore, current routes are expected to be modified in order to best meet ridership demand and effectively and efficiently use available resources. It is also anticipated that several local routes will transition to regional supergrid routes.
- Regional Super Grid - It is anticipated that by FY 2040, the remaining regionally funded transit routes outlined in the TLCP will be operational. Regionally funded bus routes are phased in during the planning period to allow for the acquisition of transit fleet and the construction of supporting infrastructure (i.e., operations and maintenance facilities, passenger facilities, road improvements, etc.). Figure 11-7 indicates how these services will be phased in over the planning period.
- Rural/Flex Routes - It is anticipated that the Rural/Flex route will continue operating and be regionally funded. Determining whether to develop, reinstate or extend a Rural/Flex route in the future will depend on ridership demand and available funding.
- Limited Routes - It is anticipated that the current limited route on Grand Avenue will continue operating and be regionally funded. Determining whether to reinstate or extend limited routes in the future will depend on ridership demand and available funding.

RAPID/Express Routes - The proposed RAPID/Express routes as identified in the RTP are intended to operate using HOV facilities to connect park-and-ride lots with major activity centers including core downtown areas. Regional funding has been allocated for express operations throughout the RTP planning period. Figure 11-8 indicates how these services will be phased in over the planning period.

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Fig. 11-7



Regional Super Grid Bus System Improvements (FY 2018 - FY 2040)

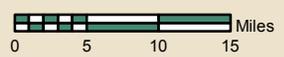
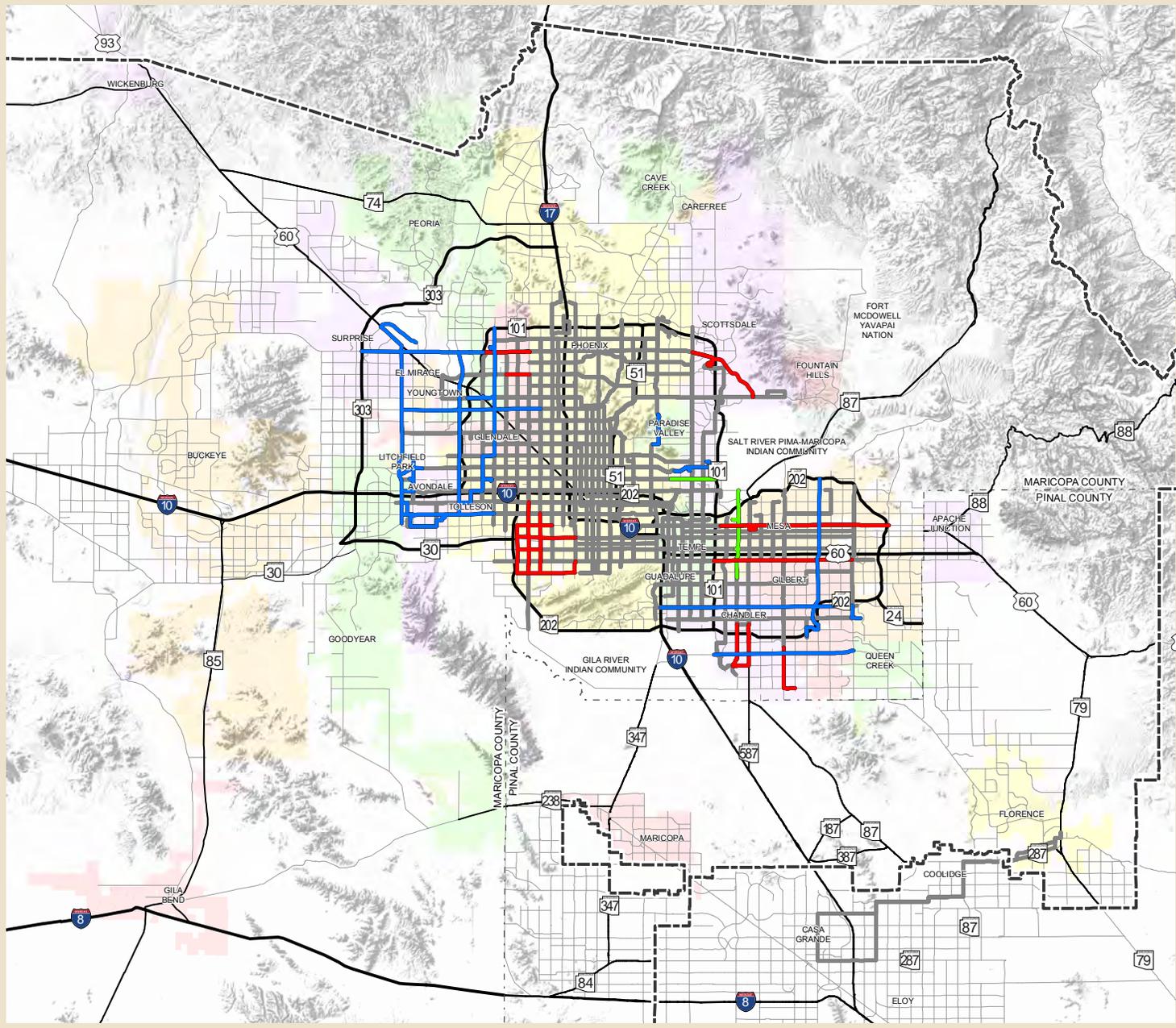
- Existing (In Operation as of 2017)
- Group 1 (FY 2018 - FY 2022)
- Group 2 (FY 2023 - FY 2026)
- Group 3 (FY 2027 - FY 2040)

Other Features

- Freeways
- Highways
- Other Roads
- Metropolitan Planning Area Boundary
- County Boundary

Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.

Local arterial grid network within the City of Phoenix is funded by the City of Phoenix



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2040 Regional Transportation Plan Fig. 11-8



Regional Express/LINK Improvements (FY 2018 - FY 2040)

Service Type

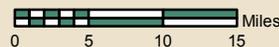
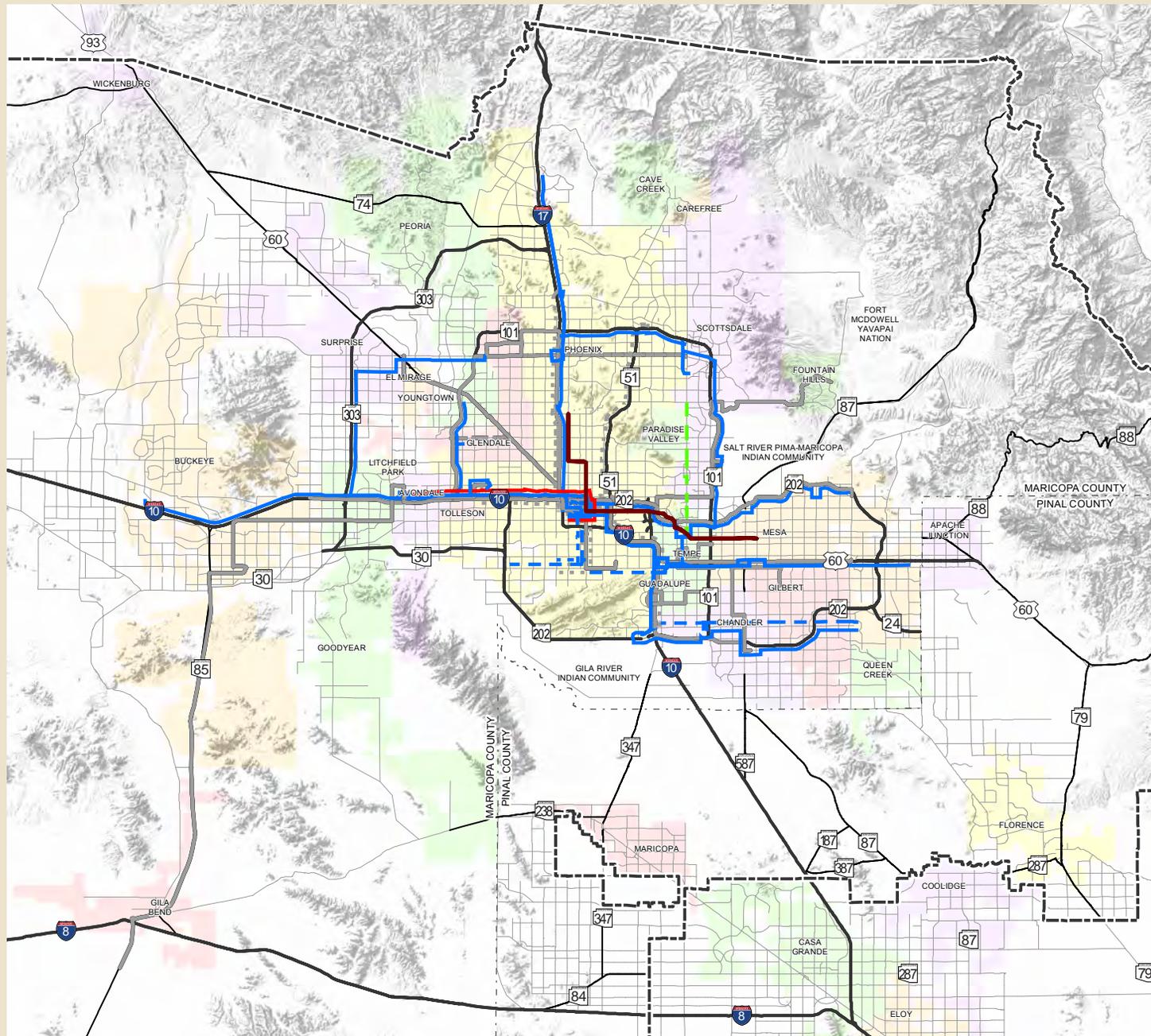
- Express Routes
- - - HCT Routes
- ... RAPID Routes

Phases

- Existing (In Operation as of 2017)
- Group 1 (FY 2018 - FY 2022)
- Group 2 (FY 2023 - FY 2026)
- Group 3 (FY 2027 - FY 2040)
- Highways
- Other Roads
- Completed Minimum Operating LRT
- Metropolitan Planning Area Boundary
- County Boundary

For visualization purposes, current and future services may appear offset from their true alignment.

Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.



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Planned Paratransit Services

Paratransit service includes various types of passenger transportation that offers a shared-ride origin to destination service that provides transportation for passengers unable to access fixed route local bus service. It can also allow groups of employees to self-organize and operate a carpool service, providing a flexible transit solution for those trips not well served by more conventional fixed route service. Paratransit includes dial-a-ride/demand response transportation services, shared-ride taxis, taxi subsidy programs, car-pooling and vanpooling.

- Dial-A-Ride (DAR) - It is anticipated that DAR service facilitated by the Americans with Disabilities Act (ADA) will grow commensurate to the number of fixed route bus miles expanded on per-year basis.
- Other Paratransit Programs for Seniors and People with Disabilities - As taxi subsidy programs and other innovative services prove to be both efficient and effective in serving seniors and people with disabilities, it is anticipated these programs will be introduced and expanded.
- Vanpools - The future of the regional vanpool program is expected to grow due to its level of convenience and ease of customization to meet user's needs. Federal sources fund 100 percent of the capital purchase of the vans, while the operations (e.g., fuel, insurance, maintenance, etc.) for this program are recovered 100 percent from passenger use/fares.

Planned High Capacity Transit

High Capacity Transit/Peak Period - HCT/Peak Period provides higher-speed, high-volume commuter or regional access, when compared with express bus. While express bus sometimes operates in mixed traffic, HCT/Peak Period generally operates in an exclusive guideway, providing service between park-and-ride locations and major employment centers. This service typically operates Monday through Friday during the morning and evening peak time periods traveling in the peak direction using bus or rail vehicles (e.g., conceptual commuter rail). HCT/Peak Period service can utilize either buses or rail vehicles. This type of service is not currently provided in the MAG region. A detailed listing of the timing and cost of planned high capacity service and capital improvements is provided in Appendix E.

- HCT/All Day –Fixed route bus or rail vehicles (e.g., light rail, streetcar) are used for this service, operating solely in an exclusive guideway. Passenger access is available at stations located approximately every half-mile to one mile.
 - *Light Rail Transit/High Capacity Transit (LRT/HCT):* The RTP includes a 66-mile HCT system: the existing 26-mile system and eight planned extensions. The amount identified in the RTP from all funding sources for LRT/HCT expenditures during the

planning period totals \$8.4 billion (YOE \$'s). Proposition 400 half-cent sales tax funding will not be used for operating expenses on any part of the LRT/HCT system. Operating funds, which include farebox receipts, will be provided by participating jurisdictions.

It should also be noted that local sources will provide a significant share of the funding for the extension to downtown Glendale. For this segment, regional funding in the form of federal transit funds may provide approximately one-half of the funding, with local sources providing the remaining half. It is anticipated that a small amount of half-cent funds will be applied to this segment for certain support infrastructure elements.

In addition, provisions are made to fund regional LRT/HCT support infrastructure. Table 11-1 lists the LRT/HCT extensions and attributes. Figure 11-9 indicates how services will be phased in over the 23-year planning period.

**TABLE 11-1
HIGH CAPACITY TRANSIT/LIGHT RAIL - EXTENSIONS**

Extension Route Name (1)	Technology	Length (mi.)	Year Open
Gilbert Rd Ext., Mesa	Light Rail Transit	1.9	2019
Tempe Streetcar, Tempe	Modern Streetcar	3.0	2020
50th St./Wash. St. Station, Phoenix	Light Rail Transit	--	2019
Northwest Phoenix - Phase II, Phoenix	Light Rail Transit	1.7	2023
South Central, Phoenix	Light Rail Transit	5.0	2023
Capitol/I-10 West - Phase I (to 17th Ave./Jefferson), Phoenix	Light Rail Transit	1.4	2023
West Phoenix/Central Glendale, Phoenix and Glendale (2)	Light Rail Transit	5.0	2026
Capitol/I-10 West - Phase II (to 79th Ave./I-10), Phoenix	Light Rail Transit	9.6	2030
Northeast, Phoenix (3)	TBD (3)	12.0	2034

- (1) Projects programmed after calendar year 2026 are outside of the Transit Life Cycle Program. Priority of projects for new future funding is yet to be determined.
- (2) Locally preferred alternative corridor under study.
- (3) Technology to be determined.

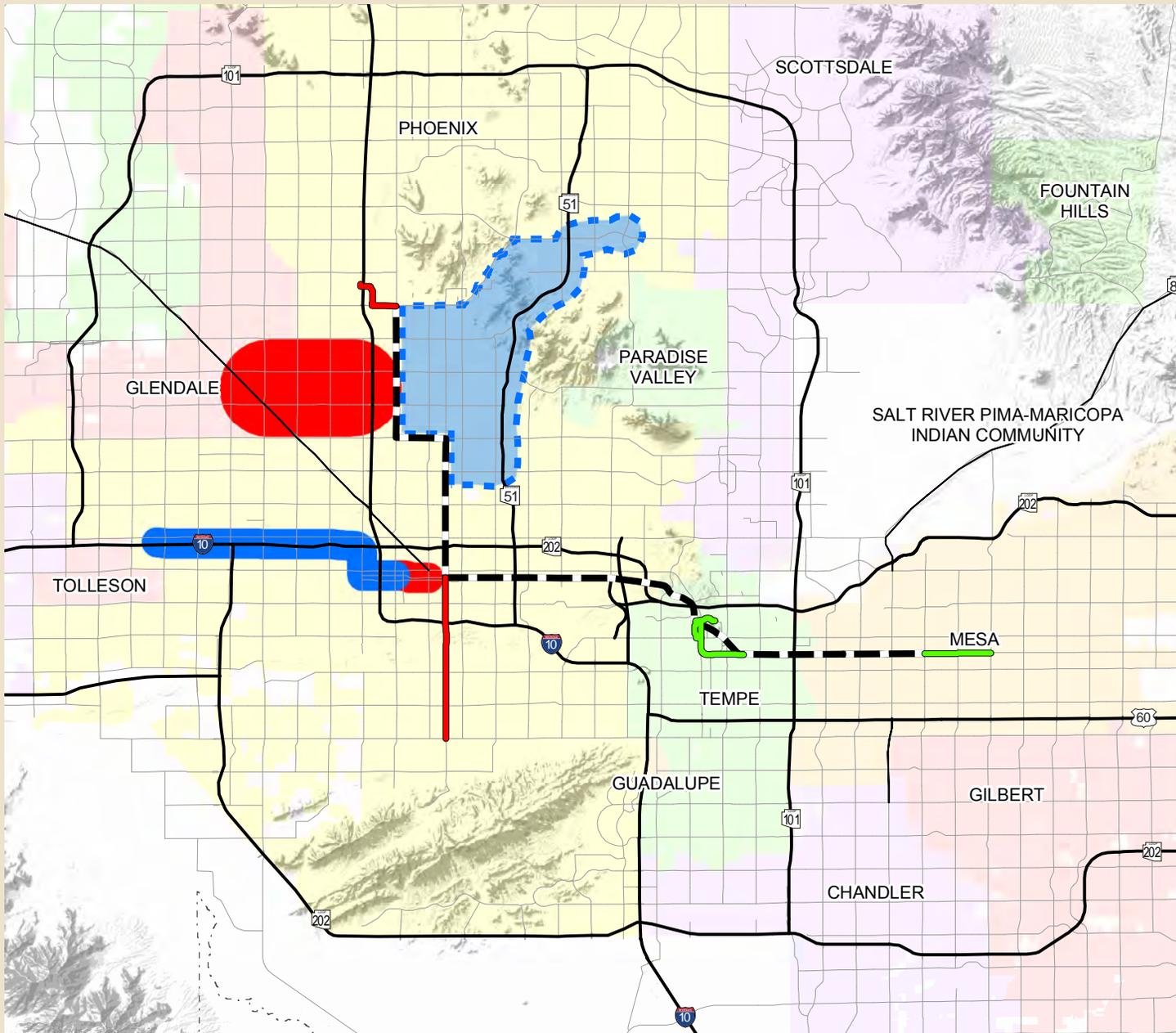
2040 Regional Transportation Plan

Fig. 11-9



Regional Light Rail Transit (LRT)/ High Capacity Transit Extensions (FY 2018 - FY 2040)

- Group 1 (FY 2018 - FY 2022)
- Group 2 (FY 2023 - FY 2026)
- Group 3 (FY 2027 - FY 2040)
- Completed
- Freeways
- Highways
- Other Roads
- Metropolitan Planning Area Boundary
- County Boundary



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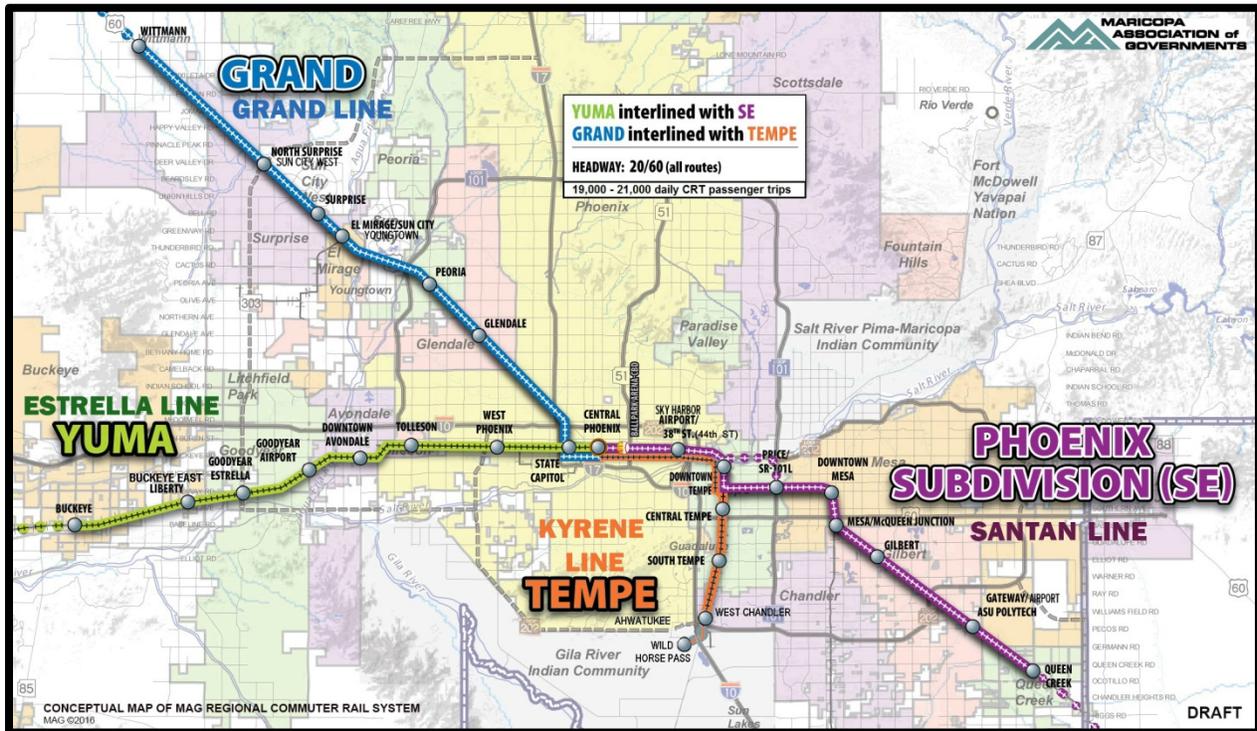


Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.

- *PHX Sky Train*: The PHX Sky Train is a fully automated, nearly 2.5 mile grade-separated transit system that connects several major facilities at Sky Harbor International Airport with the Valley Metro bus and light rail system. On April 22, 2009, the MAG Regional Council approved inclusion of Stage Two as an illustrative project in the RTP, with the City of Phoenix approving full funding in October 2016. Stage Two, will extend the SkyTrain an additional 1.8 miles to serve the Phoenix Sky Harbor Rental Car Center by 2021. The Sky Train is paid for with airport revenues and passenger fees.
- HCT/Peak Period - High Capacity Transit/Peak Period - HCT/Peak Period provides higher-speed, high-volume commuter or regional access, when compared with express bus. While express bus sometimes operates in mixed traffic, HCT/Peak Period generally operates in an exclusive guideway, providing service between park-and-ride locations and major employment centers.
 - *MAG Regional Transit Framework Study*: This transportation framework study identified over 129 miles of potential HCT/Peak Period/commuter rail corridors in the region. The RTP recognizes that these corridors may potentially serve a vital function in addressing future travel needs in the region, and has included them as illustrative corridors (see Chapter 17).
 - *Commuter Rail*: MAG was directed by Regional Council to develop a Commuter Rail Strategic Plan in 2009. Accordingly, also at the direction of member agencies, MAG commissioned three additional planning studies: Systems Study, Grand Avenue Corridor Study and Yuma West Corridor Study. These three studies were completed in spring 2010.

In FY 2017, MAG initiated the Regional Commuter Rail System Study Update. The purpose of the study is to update the data included in the original, 110-mile MAG 2010 Commuter Rail System Study (specifically new regional socioeconomic forecasts, revised ridership, cost estimates, corridor rankings) and information from other relevant passenger rail studies and technical content. Governance and indemnity/liability issues related to passenger rail implementation will be studied, as these elements must be addressed prior to any agreement between the owner railroads and the eventual commuter rail governing/operating agency. Increased mobility to jobs, housing alternatives, and connectivity to downtowns, airports and entertainment centers, travel and tourism options, and traffic mitigation will be evaluated. There are currently no funds identified for implementing commuter rail in the next 23 years (see Figure 11-10).

**FIGURE 11-10
CONCEPT MAP OF REGIONAL COMMUTER RAIL SYSTEM**



Planned Facilities, Fleet, and Infrastructure

Future transit operations will depend on the capital facilities, fleet and infrastructure that are necessary to carry passengers to their destinations. This covers not only the vehicles, tracks, stations, bus terminals, and bus stops that are directly used by passengers, but also includes the support facilities that are needed for vehicle maintenance, provide training, and house customer services. These costs are included in the planning period cost estimates identified previously for bus and light rail/high capacity transit.

- **Facilities** - Associated with the expansion of transit service will be the need for additional maintenance and passenger facilities. The identification of specific locations that will host these facilities will occur as the result of ongoing capital planning efforts. The current Operations and Maintenance Center for LRT will need to be expanded to accommodate future LRT and streetcar extensions by 2023.
- **Fleet** - Over the duration of the planning period, buses and LRT/HCT and streetcar vehicles will be purchased for fixed route networks, and rural routes. Dial-a-Ride (DAR) vans for paratransit purposes and vanpool vans will also be acquired. These procurements reflect both replacement and expansion vehicles.

- Infrastructure - The RTP includes funding toward the completion of support infrastructure affiliated with the LRT/HCT extensions. This includes infrastructure for the rail, right of way purchase, park-and-rides, Intelligent Transportation System (ITS) equipment, etc.

Funding and Expenditure Summary

Table 11-2 has been prepared to provide a summary of the funding profile for the transit element of the RTP. This table lists the reasonably available funding sources for the planning period and the uses of those funds. Sources include a variety of federal, regional, and local funding sources, including farebox receipts, while uses cover both operating and capital costs. The balance between funds available and expenditures indicates that the transit element can be accomplished with reasonably available funding sources over the planning period.

Funding Sources

Regional funding sources for transit in terms of YOE \$'s are shown in Table 11-2 for the period FY 2018-2040. These sources include the half-cent sales tax (\$5.7 billion); federal transit funds (\$4.0 billion) and federal Congestion and Air Quality Mitigation funds (\$499 million); bond proceeds (\$80 million); local/other funding sources, including farebox receipts, (\$11.9 billion); and an estimated cash balance of \$139 million in regional funds at the beginning of FY 2018. Debt service expenses totaling \$606 million are deducted from these sources. This yields a net total of \$21.8 billion (YOE \$'s) for use on transit services and projects. These revenue sources have been major funding elements for transportation facilities in the MAG area for decades and are considered to be reasonably available to the region throughout the planning period.

Local funding contributions to transit services in the region have been significant in the past and, as noted above, are anticipated to continue to play an important funding role in the future. Based on the "MAG Transit Services Inventory Report, February 2013", it was projected that local funding sources had the potential to provide approximately \$8.6 billion for transit services during the planning period, taking into account population growth over the planning period.

Program Expenditures

Table 11-2 also lists estimated future costs for the transit element of the RTP, expressed in YOE \$'s. Expected expenditures during the planning period total \$21.8 billion. This includes: (1) \$11.2 billion for fixed route bus capital and operating, including maintenance facilities and support services, (2) \$2.1 billion for paratransit capital and operating, including vanpools, and (3) \$8.5 billion for light rail transit/high capacity transit capital and operating.

TABLE 11-2: TRANSIT FUNDING PLAN: FY 2018 through FY 2040

SOURCE	
FUNDING (Year of Expenditure \$'s in Millions)	
Regional Funds	
(1) MAG Half-Cent Sales Tax	5,724.7
(2) MAG Federal Transit Funds	3,952.7
(3) MAG Federal CMAQ	498.7
(4) Beginning Balance (Regional Funds)	139.3
(5) Bond Proceeds	79.5
(6) Allowance for Debt Service and Other Expenses	(606.2)
Total Regional Funds	9,788.7
Local / Other	
(7) Fixed Route Bus Fares	1,756.4
(8) Light Rail Transit/High Capacity Transit Fare Collections	1,063.3
(9) Paratransit Vehicle Fares	140.8
(10) Vanpool Fares	29.5
(11) ALF Revenues	335.9
(12) Local Funds	8,661.5
Total Local/Other Funds	11,987.4
Total Funding	21,776.1
EXPENDITURES (Year of Expenditure \$'s in Millions)	
Regionally Funded Projects	
<i>Capital</i>	
(13) Regional Bus Fleet	1,364.6
(14) Bus Maintenance and Passenger Facilities	347.1
(15) Light Rail Transit/High Capacity Transit Regional Infrastructure	590.5
(16) Light Rail Transit/High Capacity Transit Extensions	3,686.5
(17) Paratransit (Americans with Disabilities Act, or ADA, compliant)	104.5
(18) Vanpool	123.3
(19) Rural/Non-Fixed Route Transit	11.3
Total Capital - Regionally Funded Projects	6,227.8
<i>Operating</i>	
(20) Supergrid	1,900.5
(21) Freeway Rapid Bus and Express Bus	299.3
(22) LINK Service	47.3
(23) Regional Passenger Support Services	264.6
(24) Paratransit (ADA-compliant)	1,091.0
(25) Light Rail Transit/High Capacity Transit	0.0
(26) Rural/Non-Fixed Route Transit	12.2
(27) Vanpool	29.5
(28) Planning, Programming and Other Support	129.5
Total Operating - Regionally Funded Projects	3,773.9
(29) FTA Funds Forecast Contingency	(213.0)
Total Regionally Funded Projects	9,788.7
Locally / Other Funded Projects	
<i>Capital</i>	
(30) Fixed Route Bus Service	962.0
(31) Paratransit	90.9
(32) Light Rail Transit/High Capacity Transit	899.5
Total Capital - Locally/Other Funded Projects	1,952.4
<i>Operating Costs</i>	
(33) Fixed Route Bus Service	5,576.0
(34) Paratransit	667.4
(35) Light Rail Transit/High Capacity Transit	3,324.7
(36) Planning, Programming and Other Support	253.9
Total Operating - Locally/Other Funded Projects	9,822.0
(37) FTA Funds Forecast Contingency	213.0
Total Locally/Other Funded Projects	11,987.4
Total Expenditures	21,776.1

CHAPTER TWELVE

AVIATION

The existing airport system consists of 16 airports, including one major commercial facility, Phoenix Sky Harbor International Airport, seven general aviation reliever airports and six additional general aviation airports. One of the airports, Phoenix-Mesa Gateway, is currently classified as a non-hub commercial airport, providing commercial flights around the United States that supplement Phoenix Sky Harbor International Airport. A map of all the airports in the MAG region is shown in Figure 12-1.

In 2006 the MAG Regional Aviation System Plan (RASP) Update and the aviation planning program were completed. The aviation program examined the future air transportation needs of the region with the aim of maximizing the transportation and economic benefits of airports, while minimizing any adverse impacts related to congestion, the environment and airspace. The Federal Aviation Administration (FAA) is the agency responsible for the planning and management of airspace. Because the work on the program was completed, the MAG RASP Policy Committee and the MAG RASP Technical Advisory Committees, which oversaw and guided the preparation of the plan, were eliminated.

An important element of the planning program has been the overall support for Phoenix Sky Harbor, Phoenix-Mesa Gateway Airport, and Luke Air Force Base. Sky Harbor served more than 44 million passengers in 2015, and Phoenix-Mesa Gateway served 1.3 million in 2015, while Luke Air Force Base is the largest F-16 training base in the world. These vital facilities not only fulfill air transportation and national defense needs, but they also contribute billions of dollars annually to the regional economy.

Future planning efforts will focus upon ground access needs to airports in terms of both highway and transit facilities, interacting with the region's airport personnel and exploring opportunities for improving the regional aviation system, and developing an aviation database that will support the MAG airport model that develops air pollutant emissions inventory for airports in Maricopa County.

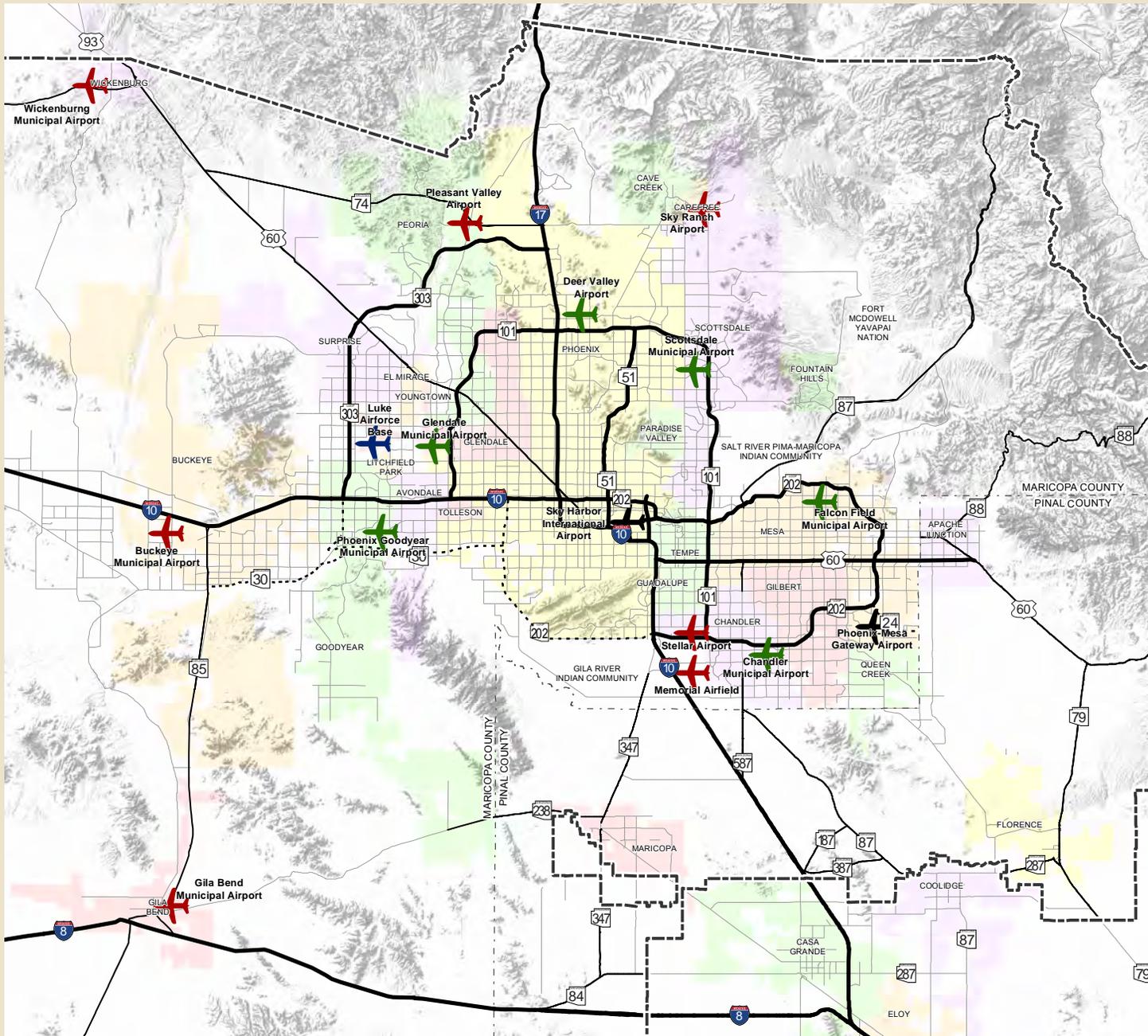
2040 Regional Transportation Plan

Fig. 12-1



Regional Aviation System

-  Commercial Service
-  Military
-  General Aviation Reliever
-  General Aviation
-  Existing Freeway
-  Planned Freeway/Highway
-  Highways
-  Metropolitan Planning Area Boundary
-  County Boundary



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CHAPTER THIRTEEN

BICYCLES AND PEDESTRIANS

Maricopa Association of Governments (MAG) has maintained an active role in promoting the establishment of improved travel opportunities for bicyclists and pedestrians for many years. MAG is also a leader in promoting improvement in the Valley's street-side environments to better accommodate pedestrian travel. Past pedestrian planning efforts conducted by MAG and its member agencies have led to a variety of pedestrian-oriented policies, programs and roadway improvements. The MAG Regional Bicycle Task Force was responsible for assisting in the development of the original MAG Bicycle Plan in 1992. In 1994, MAG formed the Pedestrian Working Group to promote increased awareness of walking as an alternative mode of travel and to improve facilities for people who walk. In 2001, MAG combined the groups to form the MAG Bicycle and Pedestrian Committee.

Regional Bicycle and Pedestrian Plans

MAG's continuing bicycle and pedestrian planning efforts cover a variety of regional planning activities. This has included development of regional bicycle plans, regional pedestrian plans, and multimodal corridor plans. In addition, MAG has developed bicycle and pedestrian design guidelines and design assistance programs.

MAG Regional Bikeway Master Plan

In February 1992, the MAG Regional Council adopted the MAG Regional Bicycle Plan to address the needs and concerns of bicyclists in the region, and to encourage bicycling as a way to alleviate congestion and air pollution. The MAG Regional Council adopted a Bicycle Plan Update in March of 1999. MAG followed the 1999 Bicycle Plan Update with the Regional Off-Street System (ROSS) Plan, which was adopted by the MAG Regional Council in February 2001.

In 2007, MAG developed the MAG Regional Bikeway Master Plan, which incorporated the 1999 MAG Regional Bicycle Plan, the Alternative Solutions to Pedestrian Mid-block Crossings at Canals, and the 2001 ROSS Plan. The goal of the MAG Regional Bikeway Master Plan is to update and integrate all three documents into one master plan, in order to develop an interconnected bikeway system of on-street and off-street facilities. The MAG Regional Bikeway Master Plan provides a guide for the development of a convenient and efficient transportation system where people can bike safely to all destinations. This plan recognizes the growing needs of the bicycling public and seeks to encourage more bicycling for transportation and health reasons. Bicycling, as a transportation mode, improves air quality and reduces traffic congestion and is less costly than operating a motorized vehicle. In addition, bicyclists benefit from improved health and fitness.

Regional Pedestrian Plan

The MAG *Pedestrian Plan 2000* identifies and recommends programs and actions that guide and encourage the development of pedestrian areas and pedestrian facilities. Walking is a viable mode of transportation throughout the region. Everyone is a pedestrian. The update incorporates flexible design tools (Roadside Performance Guidelines) to assist MAG member agencies in creating better walking environments within the existing or new roadway network. A stakeholders group was directly involved in the development of the plan update, which was overseen by the Pedestrian Working Group, and adopted by the MAG Regional Council on December 8, 1999.

The plan contains five goals that are vital to creating a mode shift away from driving and towards pedestrian mobility. The five goals are: land use compatibility, public awareness, funding, design, and intermodal linkages. One of the major regional initiatives reflected throughout the goals and objectives of the *Pedestrian Plan 2000* is to establish performance guidelines for pedestrian facilities within road right-of-ways. Establishing regionwide performance guidelines, as opposed to rigid roadway cross-sections, provide design flexibility to MAG member agencies. Providing this flexibility within performance guidelines, as opposed to prescriptive cross-sectional standards, will ensure that roadways meet the needs of other travel modes while simultaneously encouraging pedestrian travel throughout the MAG Region.

West Valley Multi-Modal Transportation Corridor Plan

The MAG West Valley Multi-Modal Transportation Corridor Plan and accompanying action plan were adopted by the MAG Regional Council on October 3, 2001. The MAG West Valley Multi-Modal Transportation Corridor Plan creates a master plan and action plan to implement a 42-mile trail network for pedestrians, equestrians, bicyclists and other non-motorized trail users for the New River and lower Agua Fria River areas. It provides for regional consistency in the development of non-motorized transportation facilities along the corridor by establishing consistent and uniform design for the development of a safe and comfortable multi-modal trail system. MAG continues to serve on the oversight committee of the West Valley Recreation Corridor Board of Directors.

MAG Pedestrian Policies and Design Guidelines

In 2005, MAG updated the MAG Pedestrian Policies and Design Guidelines, which were originally written in 1995. The Guidelines are intended to provide a source of information and design assistance to support walking as an alternative transportation mode. Through application of the policies and design guidance offered in the document, jurisdictions, neighborhoods, land planners, and other entities will be able to: 1) better recognize opportunities to enhance the built environment for pedestrians; 2) better create and redevelop pedestrian areas throughout the region that integrate facilities for walking with other transportation modes; 3) support the development of areas where walking is the preferred transportation mode; and 4) encourage the development of other independent pedestrian focused transportation facilities. The updated document includes information on elder mobility,

Safe Routes to School, and discusses changes in the Americans with Disabilities Act Accessibility Guidelines (ADAAG). The Guidelines can be downloaded from the MAG website.

Complete Streets Guide

MAG completed a Complete Streets Guide in 2011. The purpose of the Guide is to ensure that bicycle and pedestrian facilities are included in all street designs, to the greatest extent possible, and are ultimately being considered as integral to a street as a fundamental component of community mobility, health, and safety. The Guide contains Complete Streets goals, strategies and a planning process. Complete Streets contribute to the overall capacity of a street, to an increase in property values, health of individuals and create a sense of place.

MAG Regional Bikeways Map

Every three years MAG develops and prints a regional bikeway map indicating bike lanes, shared use paths, off street trails, and canals. The map also presents bike education information including the Arizona State Law and information on taking a bike on the bus and on the light rail. The map also includes photographs of desirable bicycling locations. In 2012, MAG expanded the print version to include an electronic version for the smart phone. The electronic version is updated frequently to ensure the best user experience possible.

Bicycle and Pedestrian Design Assistance Program

The FY 2017 MAG Unified Planning Work Program and Annual Budget, included \$400,000 for the Bicycle and Pedestrian Design Assistance program. The Design programs allow MAG member agencies to apply for funding for the preliminary engineering portion of a bicycle or pedestrian project including shared-use pathways.

The MAG program was initiated in 1996 as the Pedestrian Design Assistance Program to encourage the development of designs for pedestrian facilities according to the MAG *Pedestrian Policies and Design Guidelines*. The intent of the program is to stimulate integration of pedestrian facilities into the planning and design of all types of infrastructure and development. Through the program, the design of pedestrian facilities that are compatible with existing land use and transportation practices is promoted. MAG anticipates that through this program, MAG members and private sector professionals involved in transportation and land use design will become familiar with the *MAG Pedestrian Policies and Design Guidelines* and the opportunities for integrating facilities that support walking into land use and transportation planning. Creating areas where people choose to walk instead of using a private vehicle assists in managing congestion and improving air quality.

The MAG Bicycle Design Assistance Program was introduced in 2006 to assist jurisdictions by providing design assistance for bicycle and shared-use projects. The bicycle and shared-use projects utilize the nationally recognized *AASHTO Guide for the Development of Bicycle Facilities*.

All projects in the Bicycle and Pedestrian Design Assistance Program consider the needs of seniors according to the *Federal Highway Administration: Guidelines and Recommendations To Accommodate Older Drivers and Pedestrians*.

MAG Bicycle Counts Program

In 2013, MAG piloted a regional bicycle counts program, coordinating with member jurisdictions to identify locations for counters. Consultant services were acquired to install and maintain counting equipment, and MAG staff monitored and collected the count data. Data was distributed to cities and towns for review, with the program coming to a close in 2016. All of the data collected during the pilot program is available upon request. The MAG Bicycle and Pedestrian Committee has recommended that the program continue and MAG staff is researching new and more effective tools to continue the bicycle count program.

MAG Regional Active Transportation Plan

The MAG Regional Active Transportation Plan (RATP) will be developed as a comprehensive regional bicycle and pedestrian plan that will feed into the next Regional Transportation Plan as a guide for developing the regional bicycle and pedestrian network and its connections to the regional transit system. It is anticipated that this planning effort will be initiated during FY 2017.

Funding for Bicycle and Pedestrian Projects

The MAG Regional Transportation Plan and MAG Transportation Improvement Program include a strong commitment to implement bicycle facility improvements. Funding specifically for bicycle and pedestrian projects from regional sources totals \$370 million (YOE \$'s). This funding is provided from MAG CMAQ (Congestion Mitigation Air Quality) and TAP (Transportation Alternative Program) funds and requires a 5.7 percent local match.

CHAPTER FOURTEEN

FREIGHT PLANNING

Freight transport involves a complex of networks and users who use a variety of methods, modes, and equipment to move raw materials, and processed goods through regional, national and international markets for the purpose of commerce. The movement of goods is conducted through the utilization of multiple modes of transport, such as air, pipeline, water, truck, rail, or other non-traditional means. Freight issues are very complex and usually are not restrained by a county border or to a state. Supply chains, market demand and competitive transportation corridors are constantly changing, requiring neighboring regions and countries to collaborate and create unified plans for moving freight efficiently and keeping the region globally competitive.

The movement of goods into, within, and out of the region is vital to the regional economy. In 2010, the Maricopa Association of Governments, Central Arizona Association of Governments, and the Pima Association of Governments formed the Joint Planning Advisory Council (JPAC) to look at long range planning efforts for the three contiguous counties. In 2012, MAG completed the Freight Transportation Framework Study in cooperation with the JPAC. Currently (2016), MAG is working on the MAG Freight Transportation Plan to designate a forward-looking core roadway freight network for long-term protection and investment.

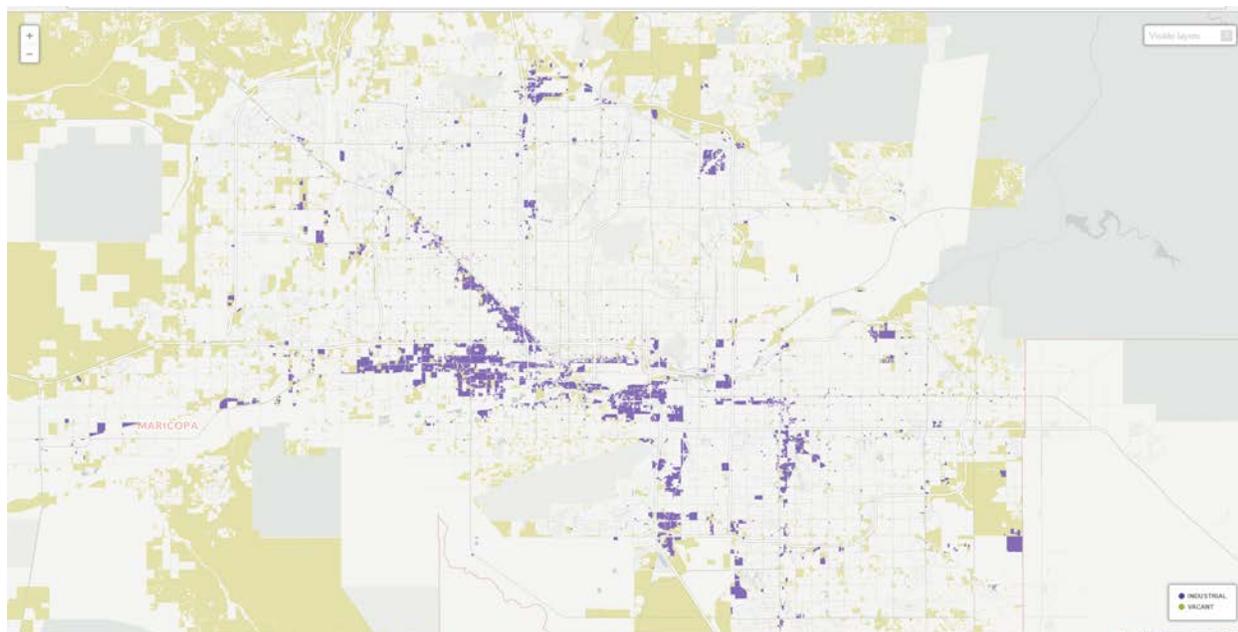
Manufacturing and Logistics Clusters

Robust industrial clusters help drive the economic prosperity of the MAG Region. A cluster is defined as a geographic concentration of industrial and logistics establishments where business is conducted, jobs are located, and freight is generated and consumed. These establishments are engaged in the production and distribution of goods by a variety of means. They account for the principal freight-dependent sectors of the regional economy, with the exception of the retail trade

Underlying the location of industries is an ecosystem of interrelations between firms. It is important to recognize this ecosystem for two reasons: first, because a major function of the freight network is to support the system; and second, because a strong ecosystem tends to attract new firms and create growth. Related firms that co-locate in advantageous areas can leverage embedded strengths in the existing infrastructure, businesses, and services to increase their competitiveness. Often this occurs through regional specializations, where firms pool knowledge and resources to achieve a competitive advantage relative to isolated firms.

Figure 14-1 shows the distribution of industrial land throughout the MAG Region. As shown, industrial uses have overwhelmingly located along key regional highways and interstates. The freight network should prioritize roads that provide access to these industrial lands, particularly the kinds of clusters mentioned above.

**FIGURE 14-1
INDUSTRIAL AREAS IN MAG REGION**



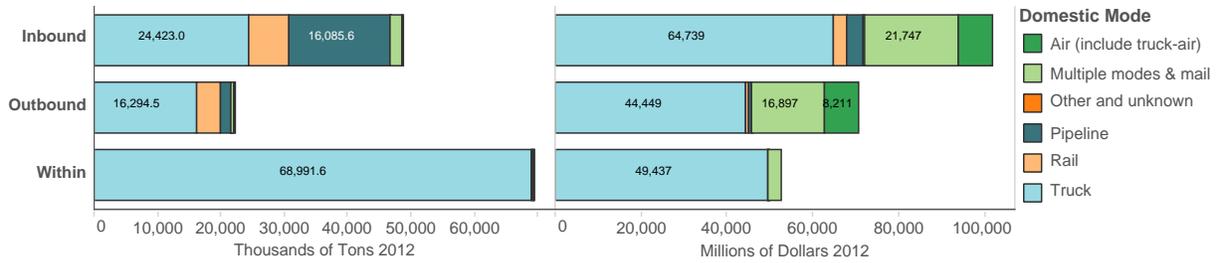
Source: MAG

Commodity Flow Overview

In 2012, the MAG Region originated and received 140.0 million tons of freight valued at \$225.5 billion (see Figure 14-2). As can be seen in Figure 14-3, most of this freight was moved by truck, which accounts for 78.4 percent of tons and 70.3 percent of value. Rail played a specific function in bringing freight to the region, accounting for 6.2 million tons in 2012. As will be seen below, the majority of these tonnages were metallic ores. Rail as a whole was responsible for 7.2 percent of all tonnages and 1.7 percent of value. Even though the air mode did not carry a large quantity of tons, it was used extensively in the movement of higher value commodities that are particularly important to the region.¹ (The air mode in FAF data incorporates both the travel by aircraft and truck drayage on the ground.) Multiple modes and mail accounted for \$41.8 billion, representing 18.6 percent of all value. However, this modal category in FAF includes both rail intermodal shipments and small package shipments (such as UPS and USPS). The pipeline mode is particularly important for the MAG Region, moving 16.1 million tons in the FAF commodity group called coal-nec, which contains primarily liquid energy products.

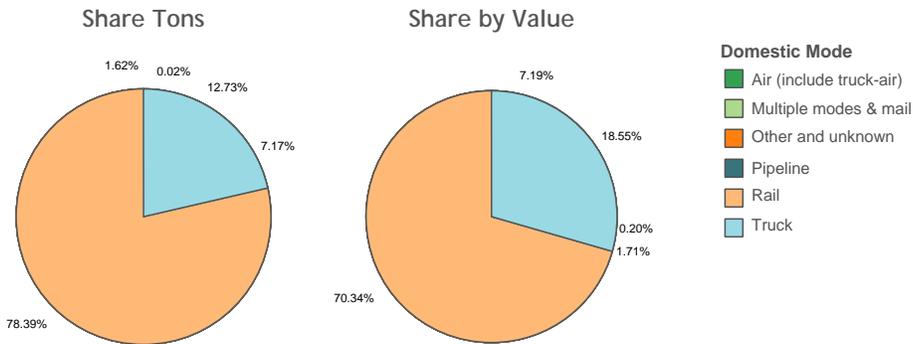
¹ For domestic shipments the air mode considers movements of cargo by air with truck drayage, however for international shipments it considers the air moves separately from truck drays. Truck drays in these shipments are included in the truck mode.

FIGURE 14-2
FREIGHT FLOW OVERVIEW - 2012



Source: BTS and FHWA, Freight Analysis Framework, versions 4.1, 2016.

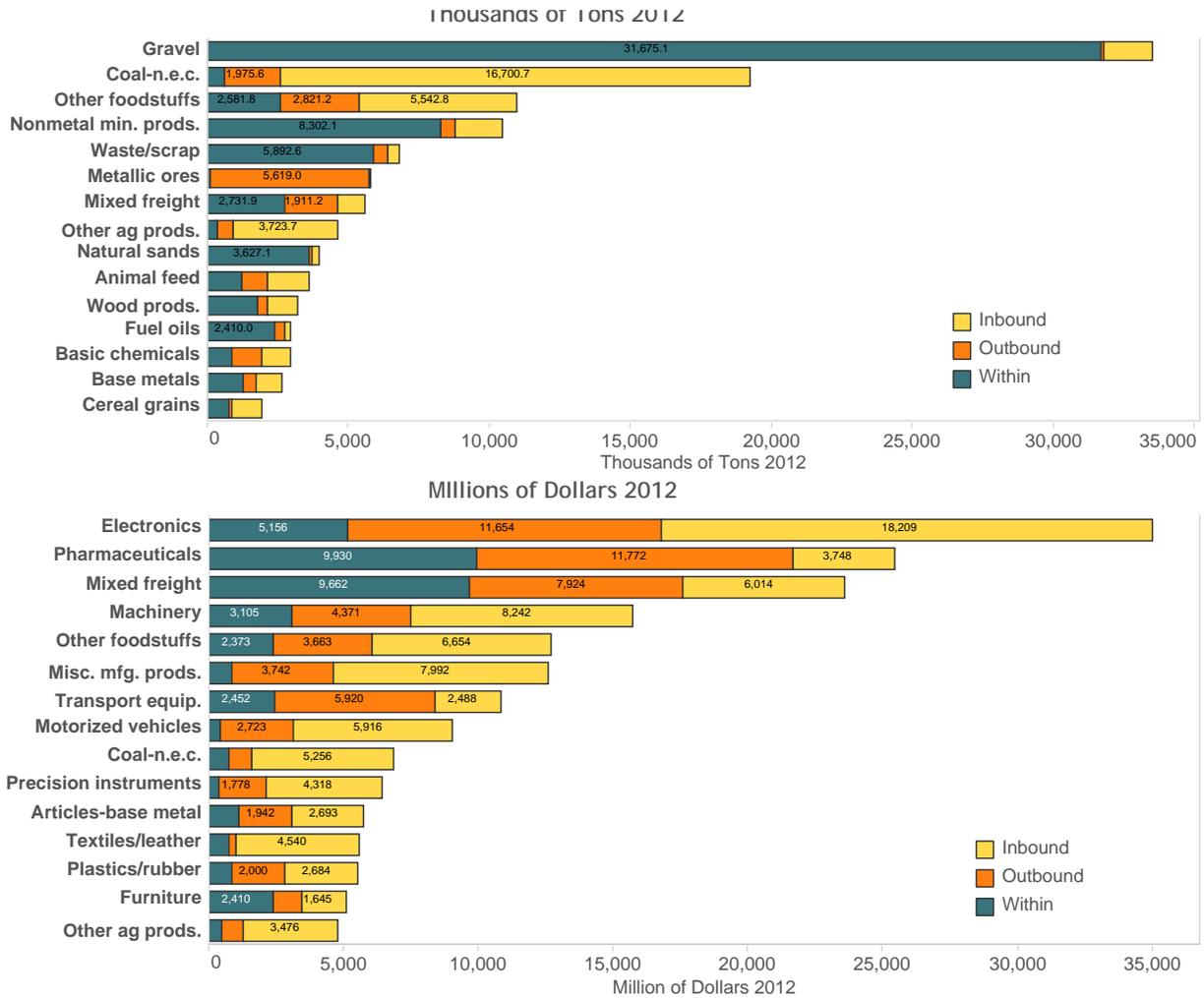
FIGURE 14-3
FREIGHT MODE SHARE - 2012



Source: BTS and FHWA, Freight Analysis Framework, versions 4.1, 2016.

Defining a freight network requires an understating of the main commodities moved on regional roads. A breakdown of the major commodity flows in terms of physical volume (tonnage) is presented in Figure 14-4. The main commodity flows were 31.6 million tons of gravel moving within the MAG Region, 16.7 million tons of coal-nec moving by rail to the MAG Region, 5.5 million tons of other foodstuffs moving within Region, 8.3 million tons of nonmetallic mineral products moving within the region, and 5.9 million tons of waste and scrap moving within the Region. Commodities such as gravel, nonmetallic minerals, waste/scrap, natural sands and fuel oils primarily have origins and destinations within the Region. Coal, other foodstuffs, other agricultural products, and cereal grains were shipped primarily to the Region, while metallic ores were shipped mostly to destinations outside of the Region.

**FIGURE 14-4
TOP 15 COMMODITIES BY FLOW DIRECTION- 2012**

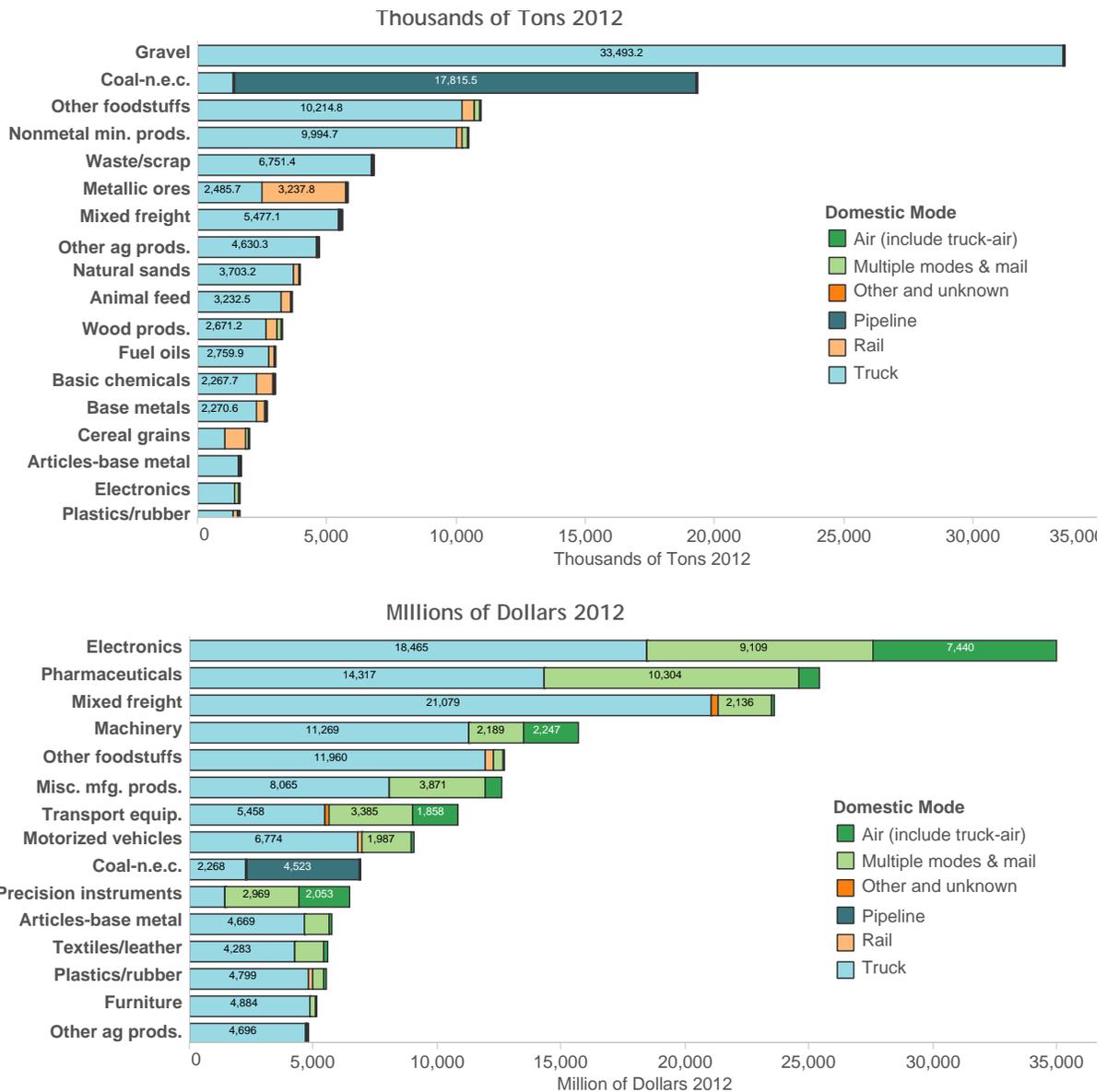


Source: BTS and FHWA, Freight Analysis Framework, versions 4.1, 2016.

As can be seen in Figure 14-4, the MAG Region produces several high-value commodities. Pharmaceuticals and transportation equipment are just some of the commodities for which the Region originated more shipments in value terms than it received. Electronics, machinery, other foodstuffs, miscellaneous manufacturing products, motorized vehicles and precision instruments are some of the commodities that are predominantly delivered to the Region. This information should be taken into account when designating critical routes that connect to industry clusters that might not generate high amounts of tonnage (and therefore truck trips), but nonetheless are responsible for a high proportion of the value shipped. The value of the shipment can be interpreted as relating to the value of the goods to the broader economy and consumers. These shipments in particular are especially costly to encumber with congestion and unreliability in the network.

For the 15 top commodities, Figure 14-5 shows the breakdown of flows by mode. In terms of tonnage, trucking is by far the dominant mode, except for coal-nec (energy liquids) which is transported by pipeline, and metallic ores which are transported by rail. In terms of value, other modes play a greater role. Multiple modes were used extensively in the transportation of pharmaceuticals, electronics, miscellaneous manifesting products, and precision instruments. Air (and its truck drayage) was used primarily for electronics, precision instruments and higher value machinery.

FIGURE 14-5
TOP 15 COMMODITIES BY MODE - 2012



Source: BTS and FHWA, Freight Analysis Framework, versions 4.1, 2016.

The majority of inbound goods movement into the Arizona Sun Corridor (Maricopa, Pinal and Pima Counties) is comprised of mostly domestic cargo. (Not shown in Figure 14-5.) Accounting for 37.5 million tons and an aggregate value of \$107 billion, the major commodities moved are high value manufactured goods, such as transportation equipment, pharmaceuticals and electronics, and food and beverage products. This commodity flow is very typical of a strongly consumer based regional economy.

Arizona has historically served as a conduit for imported goods moving through the Ports of Los Angeles and Long Beach to U.S. destinations. Southern California is a major gateway for international trade, especially trade with China, and much of those imports move through Arizona by rail or truck. Other imports that move from the ports to Southern California's Inland Empire for trans-loading, value added services, or later distribution also largely move through Arizona by rail or truck. These patterns have become more pronounced over the last decade as China's share of imports has increased, and especially as Mexico's share has declined.

While Arizona is not likely to become the new Inland Empire, possible shifts in U.S. sourcing (e.g. back to Mexico) could change the dynamics of value and supply chains for specific industries and products. Mexico is the United States' third biggest trading partner in import value and second in exports. The fact that the Arizona Sun Corridor directly imports less than one-half percent of many consumer oriented goods imported through the Arizona ports of entry from Mexico, offers some indication of potential opportunities for modifying distribution networks, especially if the sourcing of imports into the U.S. from Mexico increases.

Regional Freight Infrastructure

Within the MAG Region, the regional highway network, the regional arterial network, railroads, airports, pipelines, freight terminals, warehouses, and intermodal facilities comprise the region's overall "freight infrastructure." Figure 14-6 displays the current freight infrastructure system that handles the movement goods to, from and within the MAG Region. Warehouses, trucking companies, freight terminals, manufacturers, wholesale facilities, air couriers, and the local postal system represent some of the primary freight generators located throughout the MAG Region. Other freight generators of significance are the region's intermodal facilities and the primary air cargo airports, which are Sky Harbor International Airport and Phoenix-Mesa Gateway Airport.

- There are approximately 55,000 total road miles within Arizona. Interstate Highways comprise 2.1 percent of the total state system mileage, but represent 25.5 percent of the total travel volumes. The highest volumes of truck travel within the state are also on Interstate Highways, specifically Interstates 10, 17, 19, and 40. Interstate 8 is also a significant segment, but has a comparatively lower volume of truck travel. Several factors affect the movement of truck freight on the highway system, including number of roadway lanes, areas of traffic congestion, locations of steep grades and connectivity between major traffic generators (like adjacent metropolitan areas).

2040 Regional Transportation Plan

Fig. 14-6



Regional Freight Infrastructure

Intermodal Facilities

Cargo Airports

Existing Freeway

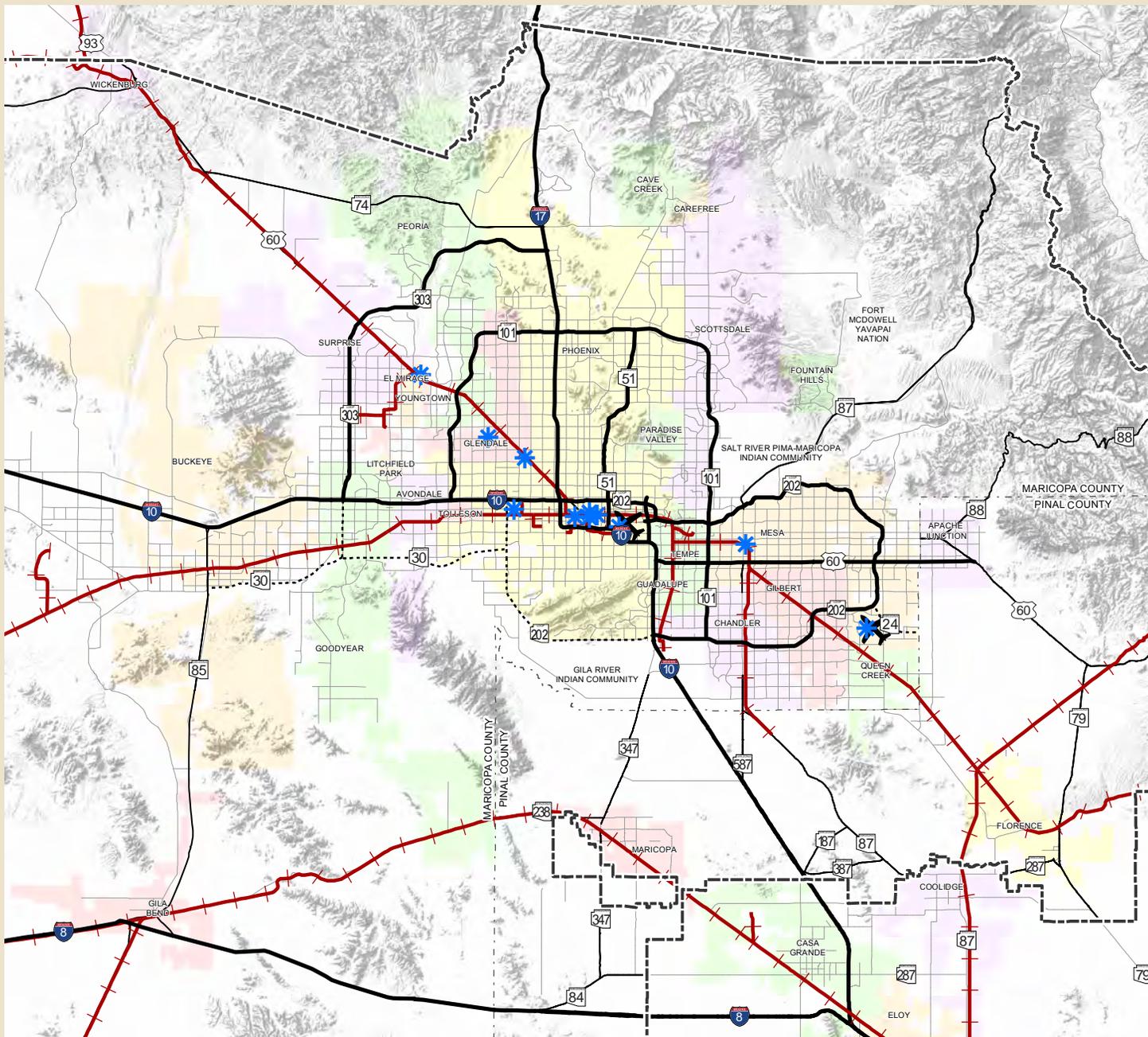
Planned Freeway/Highway

Highways

Railroads

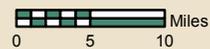
Metropolitan Planning Area Boundary

County Boundary



Source: MAG Regional Freight Assessment

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- Potential Bottlenecks - A study by the American Transportation Research Institute (ATRI) in cooperation with the Federal Highway Administration (FHWA) Office of Freight Management and Operations indicates that three Sun Corridor interchanges ranked among the 100 worst in the nation specifically for goods movement.* These include the I-10 and I-17 interchange, also known as “The Stack”, in Phoenix (ranked 36), I-10 and I-19 interchange in Tucson (ranked 78) and the I-10, SR-51 and SR-202 interchange, also known as “The Mini-Stack”, in Phoenix (ranked 86). Results of the 2007 MAG Travel Time and Travel Speed Study reiterate the ATRI study findings by highlighting the duration of congestion at bottleneck location within the Phoenix metropolitan area. Various locations along I-10 and I-17, in particular, present challenges for reliable goods movement to, from and through Maricopa County and the Sun Corridor.

* Freight Performance Measures, 2009 Bottleneck Analysis of 100 Freight Significant Highway Locations. American Transportation Research Institute (ATRI) and the Federal Highway Administration (FHWA) Office of Freight Management and Operations

Railroads

The railroad industry plays a major part in the national and regional economy, and transports certain types of goods throughout the country that would not be cost-effective or feasible to be hauled by other types of freight modes, such as truck, air or pipeline. Railroads in the United States are essentially transporters of bulk quantity goods, which are usually hauled by multiple train carloads over long distances. Trains are often the mode of choice for low value, bulk commodities that are not extremely time sensitive.

At present, there are a total of three operational railroads in the MAG Region. These railroads include the Burlington Northern and Santa Fe Railway (BNSF), the Union Pacific Railroad (UP), and the Arizona and California Railroad (ARZC). The BNSF and the UP are classified as Class I carriers, whereas the ARZC is considered to be an active Short Line, or Line Haul railroad. As of 2003, the BNSF maintained approximately 70 miles of active track in the MAG Region, the UP maintained a total of approximately 180 miles of active track, and the ARZC maintained a total of about 27 miles of active track.

Train inbound frequencies are higher than outbound frequencies. This imbalance in rail service frequencies reflects MAG region’s economic status as a predominately consumption center. This imbalance also increases the cost of shipping goods to Maricopa County versus from the Maricopa County, because of the additional cost incurred by the railroads to “deadhead” equipment back to the service origins after delivery to Arizona.

- BNSF Rail Network - BNSF’s “Transcon” line moves across the northern part of the State of Arizona connecting Chicago to Los Angeles. This double track route passes through, and serves, Kingman, Williams, Flagstaff, Winslow, Holbrook and other northern Arizona communities. BNSF has access to Phoenix through its Phoenix Subdivision, otherwise known as the Peavine. The Peavine is a 209 mile line that connects with the Transcon at

Williams Junction west of Flagstaff. The line is a single track with a maximum train speed of 49 miles per hour due to the condition of the track. The restricted speed coupled with the single track limits the capacity of the line.

In addition to providing direct service to rail customers in the Phoenix metropolitan region with sidings, BNSF also accesses several modal transfer facilities. As part of this undertaking, BNSF operates an intermodal container and trailer terminal in Glendale with an annual lift capacity of approximately 150,000 units. The terminal principally serves the domestic market with scheduled container and trailer services between Phoenix and Chicago, Kansas City, and Alliance, TX.

- Union Pacific (UP) - UP's "Sunset Corridor" connects Southern California to El Paso, Texas, and on through the State of Texas and Midwest to Chicago. The Sunset Corridor is UP's principal corridor connecting the Los Angeles Basin, including the Ports of Los Angeles and Long Beach with markets in the Midwest and East. The line serves communities and economic centers in the southern part of the State of Arizona. The UP also has direct access to markets in Mexico through its Nogales Subdivision that connects Tucson to Nogales, Mexico. At the US/Mexico border near Nogales, the UP connects with Ferrocarril Mexicano (Ferromex) giving the railroad (and the region) access to the maquiladora industry and Mexico's industrial centers. Ferromex also serves the Port of Guaymas. Despite the crossing location at Nogales, currently, the majority of UP's Mexico traffic flows through the U.S. Ports of Entry at Laredo, Texas (37 percent) and Eagle Pass, Texas (32 percent). Nogales is UP's third largest border crossing with 12 percent of the traffic.

While UP serves Tucson and Pinal County directly through the Sunset Corridor, UP, like BNSF accesses the MAG Region by a lesser used line, the Phoenix Subdivision. This 125 mile route connects to the Sunset Corridor near Eloy and terminates at a point west of Arlington, west of Phoenix. Maximum operating speed on the line is 60 mph with train activity currently at less than 10 trains per day. Union Pacific serves three transload facilities in the Sun Corridor.

- UP Wellton Branch Line - The UP Phoenix subdivision includes a line segment, the Wellton Branch, that provides another linkage between Phoenix and the Sunset Corridor connecting at Wellton Junction, Arizona. Besides UP freight trains, Amtrak at one time operated over this line. Currently, the Wellton branch is inactive between Roll and Arlington, although the line is still in place. That portion of the line was removed from operation in 1997 when UP modified its operations to serve Phoenix over the east leg of the Phoenix subdivision.

With the closure of the Wellton branch, freight traffic destined for the Phoenix area is delivered to UP's yard in Tucson by a mainline train. There it is consolidated with other traffic into a train for delivery to Phoenix. The opposite occurs for traffic originating in Phoenix. A new Red Rock, Arizona yard is intended to improve and expedite the

classification process.

Air Cargo

While only one percent (by weight) of freight is moved by air through Arizona², there is growing demand for air cargo. The Phoenix Sky Harbor International Airport (PHX) is the main freight airport in Maricopa County. It is conveniently located near Interstate 10, which facilitates the movement of cargo between the airport and the region's businesses and logistics facilities. The airport is about three miles east from downtown Phoenix, a central location that reduces drayage (truck connection) distances, allowing goods to be easily moved from the region and shipped to far locations, and vice versa. For example, Arizona produce can go from harvesting to a market in Europe within 48 hours³, and other goods produced in the MAG region can move just as quickly.

In 2015, PHX originated 143 thousand tons and received 121 thousand tons of air cargo, for a total of 264 thousand tons⁴. A recent air cargo planning study⁵ noted that freight and mail air cargo is expected to go from 256 thousand tons in 2012 to over 460 thousand tons in 2033. Based on data from 2012, FedEx and UPS represented about 65 percent of the total air cargo moving through PHX; other air cargo carriers were commercial airlines and DHL, both handling mainly international shipments. As air cargo increases to and from PHX, it is expected that truck drayage traffic along Interstate 10 will also increase proportionately, and other interstate corridors will see increased truck traffic to a lesser degree as trucks spread out to a variety of destinations. These corridors include Interstates 8, 19, 17, and 40 as cargo is transported to/from San Diego, Mexico, and the Eastern United States, respectively.

Air cargo operations are also present at the Phoenix-Mesa Gateway Airport, which is located in the southeastern area of Mesa, Arizona, and 20 miles southeast of Phoenix. Among other features, Gateway has the three long runways that accommodate any cargo aircraft, is located within a Foreign Trade Zone, and has 24-hour airport operations.

Pipelines

At present, the El Paso Corporation and the Southwest Gas Corporation are the only companies that are actively involved in the regional distribution of natural gas products for residential and commercial use. In addition to these companies, there is a primary metropolitan pipeline

² Source: Arizona Forward, "Are we there yet? The Role of Transportation in Driving Arizona's Global Economy," Oct 2012, <http://www.arizonaforward.org/ARE_WE_THERE_YET.pdf>.

³ Source: Arizona Forward, "Are we there yet? The Role of Transportation in Driving Arizona's Global Economy," Oct 2012, <http://www.arizonaforward.org/ARE_WE_THERE_YET.pdf>.

⁴ Source: Phoenix Sky Harbor International Airport, 2016, "Passengers, Cargo, and Aircraft Operations At Phoenix Airports: December 2015", <<https://skyharbor.com/docs/default-source/pdfs/StatisticsReports/stat-jan-dec-2015.pdf>>.

⁵ Source: InterVISTAS Consulting Group, "Phoenix Regional Air Cargo Planning Study," Phoenix Sky Harbor International Airport, Jan 2014, <<https://skyharbor.com/docs/default-source/default-document-library/finalreportaircargoplanningstudy.pdf?sfvrsn=2>>

terminal facility located on the west side of the City of Phoenix. This facility is located near I-10 and provides refined oil and gasoline products that are transferred to trucks. It also contains main pipelines that connect with the States of California and New Mexico, and a series of smaller pipelines that connect to Phoenix Sky Harbor International Airport and Luke Air Force Base. The facility also contains a smaller line that extends south to the Tucson area.

Regional Freight Planning

Figure 14-7 illustrates the “Big Picture” for supply chain opportunities in the Sun Corridor. As depicted in Figure 14-7, the Sun Corridor is strategically located to serve as an import distribution gateway for nearshored products being imported from Mexico, and as a mixing center pooling international goods with products from points of origin in the southeastern U.S., including the maritime ports along the Gulf Coast. The Sun Corridor represents the only major anchor market in the 1,500 miles between Southern California and Houston providing opportunity to serve as a local warehouse and distribution center. Furthermore, existing and proposed transportation connectivity to Southern California and other West Coast, Mountain West and North West Markets makes the Sun Corridor convenient to serve as a major forward distribution hub.

Freight Transportation Framework Study

In 2012, MAG completed the Freight Transportation Framework Study in cooperation with the Joint Planning Advisory Council (JPAC). The goal of the Freight Transportation Framework Study was to identify freight related economic development opportunities in the Arizona Sun Corridor. The framework study completed an extensive freight survey that: (1) included 2,500 shippers and carriers across the United States, (2) conducted phone and in-person interviews with local freight stakeholders, (3) evaluated commodity flows and truck rates, (4) identified 16 freight focus areas, (5) analyzed the industry real estate market, (6) completed a detailed assessment of four emerging focus areas that included the evaluation of the industry market, land use plans (existing and future), inventory of existing businesses, education, travel times, commodities, transportation infrastructure and economic development incentives.

The Freight Framework study also presents the results of a detailed evaluation of commodity flows affecting the Sun Corridor, with a particular focus on goods movements between Mexico, sources in the southeast United States and markets along the West Coast. A screening of potential freight focus areas leads to the determination of freight related opportunities within the region, including the designation and evaluation of area typologies representing differing relevant majority use types that would support an enhance role for the Sun Corridor in the global supply chain.

MAG Freight Transportation Plan

Currently (2016), MAG is working on the MAG Freight Transportation Plan to designate a forward-looking core roadway freight network for long-term protection and investment, with

the goal of attracting industry and supporting household needs through better performance in terms of speed, reliability, cost, productivity, and safety. This network will be readily accessible (within approximately fifteen minutes) to major existing and future clusters of freight generation and consumption. It will also facilitate cross-town travel so that clusters and multimodal facilities are well connected and benefit from route redundancy, reducing the risk from delay and disruption. To the extent possible, the network will also anticipate the introduction of new transportation technologies. Defining such a network will greatly facilitate freight planning in the region, particularly in establishing candidate facilities for designation as Critical Urban Freight Corridors under the FAST Act.

Future Freight Planning

Building on the findings from the Freight Transportation Framework Study (2010) and the MAG Freight Transportation Plan (2016), MAG will select the top critical urban freight corridors in the region and start the next level of analysis to develop project recommendations. This effort will be structured to complement the Regional Freight Network infrastructure needs identified in the MAG Freight Transportation Plan.

FIGURE 14-7

SUN CORRIDOR SUPPLY CHAIN OPPORTUNITIES



CHAPTER FIFTEEN

SPECIAL NEEDS TRANSPORTATION

The transportation needs of special populations are a regional concern. Limitations caused by age or disability often complicate the process of securing transportation for a portion of the population. In addition, those with limited financial resources often find transportation options to get to employment or training activities out of their financial reach. In the MAG region, human services transportation is facing increasing demand for services. It is estimated the MAG region will grow to 4.9 million by 2020 and to 6.7 million by 2040. This population growth will increase the strain on services already at capacity.

As the region continues to grow, the need for transportation assistance places an additional burden on services. Individuals are requesting more assistance as they struggle to maintain their jobs and get to medical care. At the same time, many providers report available funding not keeping pace with the increase in demand for services. Many agencies have experienced funding reductions that have forced them to reduce or eliminate services altogether. Several providers in the region have merge together to consolidate costs and resources. This creates gaps in service that cannot easily be filled.

These conditions represent an ongoing challenge: to meet the transportation needs of the most vulnerable population with limited service options. In addition, many providers in outlying communities are not only facing a growth in population, they are challenged with providing transportation options in areas with little to no transportation infrastructure. MAG, in partnership with stakeholders throughout the region, is undertaking steps to meet the need of the most vulnerable populations. Innovative efforts are being implemented through collaborations throughout the region.

Concerns of Older Adults, People with Disabilities and People with Low Incomes

Older Adults

The 2010 U.S. Census reports 12.1 percent of residents in Maricopa County are aged 65 and over. By the year 2020, approximately 13 percent of the residents in the region will be age 65 or older. Of this number, approximately 43 percent will be 75 years or older. Although the older adults of the future will be healthier, better educated, and more financially secure than their peers of a few years ago, many will experience physical, financial, emotional and mental barriers in using various modes of transport. Older adults living alone may have disabilities that prevent them from driving. They may also lack the availability of close-by family members to provide assistance and/or have limited financial means which can lead them to face more difficult and life-threatening transportation challenges.

People with Disabilities

A disability may be defined both within the context of the person's level of ability, as well as by society's ability to accommodate their needs. Disabilities include physical limitations, cognitive impairments, and visual impairments. The 2010-2014 U.S. Census Bureau American Community Survey (ACS) 5-year Estimates report 10.3 percent of people in the region live with a disability of any kind. The human services transportation solutions identified for people with disabilities often benefit all people by making transportation more accessible for everyone.

People with Low Incomes

The 2010-2014 ACS 5-year Estimates report 17.1 percent of people in the region live below the poverty level. Income affects access to a variety of resources, including transportation. People with low incomes are more likely to utilize transit services. They are also more likely to work second or third shifts when transit services are not available. People with low-incomes out of necessity will live in more affordable housing that may not be located near employment centers. Previous federal grants that addressed job access and reverse commute issues developed specifically to address these needs have been rescinded. As with people who have disabilities, it is more cost effective to offer people with low incomes access to transportation so they may maintain their self-sufficiency instead of using to state sponsored health care and financial assistance.

Resources for Transportation Disadvantaged Populations

Regional Action Plan on Aging and Mobility

To address the mobility needs of older adults, MAG began an intensive process to develop a *Regional Action Plan on Aging and Mobility*. MAG brought together experts and concerned citizens to form the Elderly Mobility Stakeholder Working Group. The group studied and then developed 25 recommendations for an action plan based on Infrastructure and Land Use, Alternative Transportation Modes, Driver Competency, and Education and Training needs. The plan provided a comprehensive overview of senior mobility issues and was adopted by the MAG Regional Council on October 3, 2001. MAG continues to use the 25 recommendations to guide regional planning on aging and mobility.

The MAG Municipal Aging Services Project (MASP) also addresses the transportation needs of older adults in the region. MAG engaged community stakeholders to determine current and projected transportation needs, preferred transportation modes, and ways to provide input to MAG and local governments. The information gathered helped to develop a toolkit that identified best practices and offers resources for local government to address the needs of older adults. The work of these projects will guide changes in the community to help people lead more social, active lives and allow greater opportunity for aging in place.

Human Services Transportation Coordination Planning

As a condition for receiving formula funding under certain Federal Transit Administration programs, proposed projects must be included from a locally developed Public Transit/Human Services Transportation Plan. Under the Fixing America's Surface Transportation (FAST) Act federal regulations, there is a need to provide short-term strategies specifically for applicants of Section 5310. While an agency applying for this funding is required to comply with these strategies, all agencies providing human services transportation have been encouraged to utilize these concepts.

- Public Transit/Human Services Transportation Plans - Each plan contains an extensive inventory of the human services transportation providers. This activity has taken on even more importance as other agencies that used to keep track of similar information have ceased doing so due to funding reductions. The inventory is updated with each plan and has grown considerably from one year to the next. The plans also contain a gaps analysis based on the provider inventory, population demographics, and strategies for addressing the needs as revealed by the gaps analysis are included and tracked in every plan. Each plan builds on the success of the previous plan.

The plans are developed through a process that includes representatives of the public and private sectors, non-profit transportation and human services providers, and members of the general public. The first plan was approved by the MAG Regional Council in 2007. Updates have been approved from 2008 through 2017. In March 2009, the Federal Transit Administration bestowed the United We Ride Leadership Award for major urbanized areas to the Maricopa Association of Governments Human Services Coordination Transportation Planning Program. The award was given on the basis of the 2007 MAG Human Services Coordination Transportation Plan and the 2008 Update.

- 2007 Plan - The 2007 Public Transit/Human Services Transportation Plan focused on establishing a good base for coordination through improved communication and interaction among stakeholders. Goals such as creating an online comprehensive service directory, the coordination of sub-regional meetings, and ongoing assessment and evaluation poised the region to intensify coordination efforts. The success of the first plan was evident through the impact at the regional level and recognition at the national level. A MAG representative was invited to serve on the Steering Committee for the National Resource Center for Human Services Transportation Coordination. This alignment of regional and national synergy gave additional energy and influence to local coordination efforts.
- 2008 Update - The 2008 Update strove to standardize operations and policies among the human services transportation service providers. Strategies such as standardized driver training, the development of coordination policy templates, and travel training assisted agencies and individuals to implement this goal. The MAG Transportation Ambassador Program (TAP) engages people in mainstream venues such as community centers and libraries to learn more about human services transportation options. The result is that people are empowered to move more easily throughout the region. The

Virginia G. Piper Charitable Trust generously sponsored the launch of the program in 2008 and helped to lay the foundation for the program to continue.

- FY 2009 Update - The 2009 Update focused on maximizing resources and reducing unused capacity to coordinated effort among agencies to meet the demands of an increasing population. An inventory of agency travel training programs in the region was completed. The inventory is leading to a better understanding of the availability of programs, better coordination, and the development of new programs to fill gaps in service. The inventory provided information on agencies that offer, or would be willing to offer, travel training to others outside of their agency.
- FY 2010 Update - The FY 2010 Update integrated changes to include data from fiscal year activities for use in analyzing gaps in the region along with the inclusion of long-term strategies to ensure the sustainability of coordination planning efforts. The update focused on utilizing existing programs such as available grant opportunities and alternative transportation options to support human services transportation activities. Providing information on available grants increases opportunities for agencies to provide services for their clients. The use of vanpools and travel training to clients of non-profit agencies provides the targeted population access to their community, services, social and recreational activities, and to necessary medical appointments. The long-term strategy focused on utilizing more taxi cab and mileage reimbursement programs for areas where transportation services are unavailable and/or insufficient. The result was an increase in the awareness of programs and resources that are already available in the community to assist consumers in areas with less transportation infrastructure who once relied on public transit which has been reduced or is no longer available
- FY 2011 Update - The FY 2011 Update focused on strengthening the coordination efforts with stakeholders in the community such as Title VI stakeholders, the private sector, and the Native Community. Domestic violence and homeless shelters were engaged to identify and map their clients' travel needs. The goal is to provide better access to transportation that supports their employment and work-preparation activities. Discussion of the issue of insurance policies as a barrier for agencies to collaborate on transportation services was explored to offer support of coordination efforts among agencies. An inventory of human services transportation providers' vehicle usage offered insightful information to aid in the better utilization of vehicles and improve services for clients. An inventory of volunteer drivers programs was a long-term strategy to identify programs throughout the region as possible transportation alternatives. Outreach to private sectors, Native Communities, homeless and domestic violence shelters enhances regional coordination planning efforts. Researching travel training programs, exploring insurance policy concerns, and inventorying the usage of agency's vehicles provides valuable resources to address transportation needs in the community.

- FY 2012 Update - The FY 2012 Update focused on maximizing the capacity of the current system by providing more rides for the targeted populations with the same or fewer resources. A MAG Human Services Provider Inventory webpage was designed that enabled consumers to search for alternative transportation options. Researched the issue of insurance as a barrier for agencies to coordinate and provides human services transportation rides. Developed a TAP information flyer to disperse at community events. Utilized Sub-Regional Mobility Managers to provide a network of coverage for regional coordination efforts. The outcome was an increase in opportunity for collaborating with other nonprofit agencies to support coordination efforts across the region. Facilitated regional dialogue regarding establishing a one-call center to coordinate the scheduling and dispatch of human services transportation services for older adults and people with disabilities benefits consumers in the region. These goals were consistent with the goal of the United We Ride initiative to reduce duplication of transportation services and improve the efficiency of services.
- FY 2014 Plan – The FY 2014 Plan focused on maximizing the capacity of regional stakeholders to support opportunities to improve coordination of human services transportation. Coordinated stakeholder workgroups exploring solutions to maximize the use of the current vehicle inventory. Developed a Passenger Safety and Securement training to ensure that requirements and standards are universally met for providers transporting older adults and people with disabilities. Utilized Sub-regional Mobility Managers as community liaisons to engage providers in coordination planning efforts. Sub-regional mobility managers participated in designated workgroups, provided feedback on the brown bag trainings, and reported on their agency’s coordination efforts at the quarterly TAP meetings. Supported the facilitation of a One-Call Center by supporting the Northwest Valley Connect’s Call-Click-Connect Mobility Center. The Northwest Valley Connect Mobility Center connects residents in the West Valley to local available transportation resources in an area with limited transportation options.
- FY 2017 Plan - The FY 2017 Plan will continue to focus on maximizing the capacity of regional stakeholders to identify, establish and support opportunities to improve coordination of human services transportation. The Plan will expand on the Brown Bag trainings to assist regional stakeholder providers in adhering to federal training requirements, as well as explore ways to maximize the capacity of vehicles already in place as an effective and efficient way to support the use of federal funds. The Plan will address the inclusion of new regional stakeholders in the rural MAG planning area by looking at gaps in services and available resources in place.

The plan’s strategies are consistent with the goals of the United We Ride initiative to: (1) simplify customer access to transportation, (2) reduce duplication of transportation services, (3) streamline federal rules and regulations that may impede the coordinated delivery of services, and (4) improve the efficiency of services using existing resources to provide more rides for the same or lower cost. Following these guidelines, the Human Services Coordination Transportation plans have provided a continuum of efforts to

ensure the transportation needs of the vulnerable population that includes older adults, people with disabilities and people with low-income are met.

CHAPTER SIXTEEN

TRANSPORTATION ENHANCEMENT ACTIVITIES

The Transportation Enhancement Program is designed to strengthen the aesthetic, cultural and environmental aspects of the region's intermodal transportation system. The Maricopa Association of Governments (MAG) enhancement projects have focused on the provision of facilities for pedestrians, bicycles, and related elements. Many of these projects also have strong intermodal ties to regional transit activities. MAG is working closely with the Arizona Department of Transportation (ADOT) and the transit designated and direct recipients to identify procedures for integrating enhancement projects into FAST Act (Fixing America's Surface Transportation Act) programs.

Transportation Enhancement Projects

Within the MAG Region, the majority of enhancement projects have focused on traditional uses of enhancement fund categories, which include items that are focused on the provision of facilities for pedestrians, bicycles, and landscaping. Some enhancement projects are incorporated into larger construction projects, and some are completed as stand-alone projects that add to, improve, and expand the existing bicycle and pedestrian network. Since 1993, the majority of projects in the MAG Region have received funding to complete multi-use pathways, sidewalks, and bike-share facilities to support pedestrians and bicyclists. Since the inception of the bicycle and pedestrian program in the MAG Region, funding has been awarded for multi-use or shared use pathways along existing routes and canals, including projects for sidewalks and pedestrian crossings, as well as projects directly related to bike routes and bike facilities.

Many enhancement projects occur near transit centers, rail facilities, and bus stops, and provide safer pedestrian access through the construction of new paths and sidewalks, including ADA-compliant curb cuts and marked pedestrian walkways. In many cases, they also provide an aesthetic upgrade to adjacent transit facilities by providing landscaping, shading, artwork, signs, lighting, benches and trash receptacles.

Since the beginning of the program, the MAG Transit and the MAG Bicycle and Pedestrian Committees review a number of transit-related projects for the consideration of funding. Such items have included shading for bus stops, and a number of requests to provide enhancements to areas containing existing transit stops along bus routes connecting to the regional bus system.

Intercity bus services – those provided between the metropolitan areas of Phoenix and Tucson and various cities outside the MAG Region - are provided solely by the private sector carriers. MAG's role is limited to transit services within the MAG Region (Maricopa County and portions of northern Pinal County). Rural Connectors in the MAG region operate similarly to intercity buses, but operate in order to link passengers from rural communities to the urbanized areas.

At present, a Rural Connector provides transit service from West Phoenix to Ajo; other Rural Connectors are being evaluated for future implementation.

The State of Arizona, through the Arizona Department of Transportation, does not at present have a program for the operations or subsidization of state managed intercity bus. ADOT has analyzed the potential for dedicated bus service between downtown Phoenix and downtown Tucson as a precursor to future commuter/intercity passenger rail. As a component of the Tier 1 Environmental Impact Statement (EIS) commissioned within ADOT's Passenger Rail Study, an intercity bus alternative was evaluated using existing HOV lanes on I-10 within Maricopa County, with a conceptual dedicated busway on I-10 from Chandler to Tucson.

Funding of Transportation Enhancement Projects

The Transportation Enhancement Program was originally enacted by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, and was created to improve surface transportation activities by developing projects that go "above and beyond" normal, or routine transportation activities and funding. Subsequent efforts such as the SAFETEA-LU (Safe Accountable Flexible Efficient Transportation Equity Act – A Legacy for Users), MAP-21 (Moving Ahead for Progress in the 21st Century), and the FAST Act continue funding for enhancements through the Federal Highway Administration's Transportation Alternatives (TA) as a sub-allocation of the STBGP (Surface Transportation Block Grant Program).

Eligible activities include:

- Transportation alternatives.
- Recreational trails program.
- Safe routes to schools eligible activities.
- Planning, designing, or constructing roadways within the right-of way of former Interstate routes or other divided highways.

Fifty percent of TA funds are distributed to areas based on population (sub-allocated). States and MPOs for urbanized areas with more than 200,000 people will conduct a competitive application process for use of the sub-allocated funds; eligible applicants include tribal governments, local governments, transit agencies, and school districts. Options are included to allow states flexibility in use of these funds. Approximately \$134 million (YOE \$'s) in Federal Highway Administration (FHWA) monies has been projected to be available for TA projects during the RTP planning period (FY 2018 - FY 2040) for the MAG region. Congestion Mitigation and Air Quality Improvement program funding of approximately \$236 million (FY 2018-2040) is also available for bicycle and pedestrian facilities in the RTP. Including a local match of 5.7 percent, these two funding sources total approximately \$393 million (YOE \$'s).

Enhancement Project Selection and Programming

MAG is working closely with ADOT to interpret the TA program guidance, and identify procedures for transitioning enhancement project funding from SAFETEA-LU and MAP-21 to the FAST Act. This includes determining the amount of funding available for enhancement projects, addressing enhancement projects already “in the pipeline”, and developing revised procedures for prioritizing, selecting, and reporting on enhancement projects in the future.

Current project evaluation and programming include an evaluation of projects for funding with Congestion Mitigation and Air Quality improvement program funding and Transportation Alternatives funding. Projects are submitted through a competitive Call-for-Projects and are ranked and selected based on quantitative and qualitative criteria defined in the MAG Programming Guidelines published annually. The Bicycle Pedestrian Committee begins the technical review of applications submitted and the recommendations move through the MAG approval process. Typically, a Call-for-Projects occurs every other year for FHWA funded projects. Additionally, as Federal Transit Administration (FTA) Section 5307 funds become available through the transit programming priorities, enhancement projects may be directly included as part of capital improvements, or may be submitted as stand-alone projects through a transit Call-for-Projects. Projects are technically evaluated beginning at the MAG Transit Committee, and follow the MAG approval process. During FY 2016, the MAG region made a one-time approval to allocate \$2.5 million of FTA funding for bus stop improvements. The bus stop improvement program to distribute the funding is currently under development. Availability of transit funding for enhancement projects varies greatly from year to year, with the majority of transit related enhancement projects being included during larger capital facility construction projects.

CHAPTER SEVENTEEN

EXTENDED REGIONAL TRANSPORTATION PLANNING OUTLOOK

In 2003, the MAG Regional Transportation Plan (RTP) was updated through a comprehensive review, which resulted in the adoption of a major revision of the RTP by the MAG Regional Council. Since 2003, the RTP has been updated periodically to reflect new information and changing conditions in the region. MAG has continued to look to the future in an effort to assess regional trends that affect transportation demand, and continues to assess the need for additional new facilities and services. Three important aspects of this ongoing effort are inter-regional cooperation and coordination, modal and area transportation studies, and illustrative corridors/projects.

Inter-Regional Cooperation and Coordination

One of the key factors affecting future transportation needs in the MAG Region has been the emergence of individual regional growth patterns in Central Arizona into a multi-county matrix of development. This pattern has made inter-regional coordination among planning agencies increasingly important. MAG has pursued inter-regional coordination of its planning programs for many years and will continue to place an emphasis on this effort in the future.

Interagency Coordination

The projected population growth throughout the Maricopa County, Central Arizona and other areas of the state is fostering the need for effective, ongoing cooperation and coordination among Councils of Government and Arizona counties. Since the formation of the Maricopa Association of Governments (MAG) in 1967, the agency has continually reached out maintain a dialogue with other agencies, counties and communities throughout Arizona on a variety of issues and common interests. Beginning in the early 1980s, the MAG Executive Director has served as an active member of the Arizona COG Directors Association, which was established for the purpose of fostering communication and ensuring coordinated planning efforts among Arizona's Councils of Governments. MAG has used this association, as well as individual one-on-one sessions, to coordinate with other regions on a variety of regional, state and federal programs, including human service, land use, environmental, and transportation planning issues of concern. MAG also maintains discussions with other Councils of Governments and similar organizations throughout the United States concerning common transportation issues and federal policies.

This interagency dialogue has been crucial in order to effectively assess congestion issues, evaluate key transportation needs, and identify funding options for the construction of future transportation corridors to address regional and statewide connectivity. As part of this effort, MAG developed transportation study partnerships with Central Arizona Governments (CAG), the Pima Association of Governments (PAG), and their member agencies. Another example has

been coordination on data collection and population forecasting covering Maricopa, Pinal and Pima Counties. These three core counties of Arizona are often referred to as the “Sun Corridor” (see Figure 17-1).

Joint Planning Advisory Council

On December 17, 2009, MAG, PAG, and CAG signed a resolution stating their desire to jointly coordinate planning efforts in the Sun Corridor, creating the Joint Planning Advisory Council (JPAC). These three agencies are located adjacent to one another with linked economies and acknowledge that regional planning issues transcend jurisdictional boundaries. On May 9, 2013, the Governor of Arizona approved an expanded metropolitan planning area (MPA) boundary for MAG that takes in areas in Pinal County, including Maricopa, Florence and unincorporated portions of the County (see Figure I-1). In addition, a new metropolitan planning organization (MPO) was formed in Pinal County (Sun Corridor MPO or SCMPO), generally encompassing the incorporated communities of Casa Grande, Coolidge, and Eloy, as well as surrounding unincorporated areas in Pinal County. SCMPO now also participates in JPAC activities.

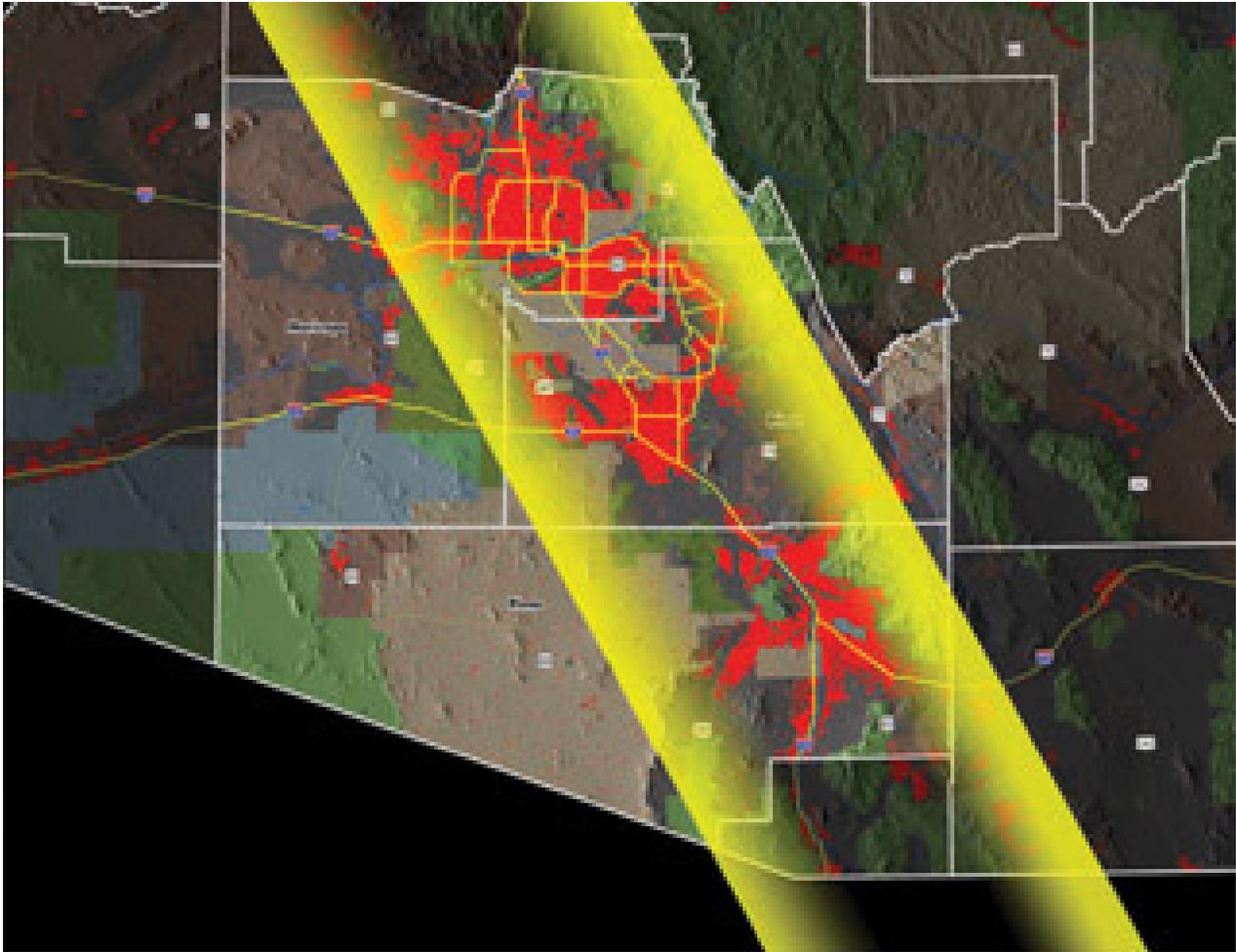
In the past, MAG, CAG, and Pinal County have participated in many cooperative planning studies, such as the Southeast Maricopa/Northern Pinal County Study, the Commuter Rail Strategic Plan, the Hidden Valley Transportation Framework Study, and the Freight Transportation Framework Study for the betterment of the overall region. To further demonstrate regionalism, MAG and CAG have six member agencies in common (Apache Junction, Florence, Gila River Indian Community, Maricopa, Pinal County, and Queen Creek), and PAG and CAG share one member agency in common (Marana). In addition, MAG coordinates closely with CAG and SCMPO to conduct required transportation air quality conformity analyses and public involvement activities.

The Joint Planning Advisory Council (JPAC) was established to identify mutually agreed upon goals and interests, provide guidance on possible technical assistance and joint planning activities, and enhance the communication and cooperation among the policymakers in the three regions. JPAC has a shared vision to jointly coordinate planning efforts for the greater good of the regions and the State of Arizona. It is the intent of MAG, PAG, SCMPO and CAG to coordinate their respective planning activities and cooperatively work together to foster a successful and economically viable Sun Corridor in the State of Arizona.

Modal and Area Transportation Studies

Modal and area transportation planning studies play a key part in the overall MAG transportation planning process. These studies provide the opportunity to assess growth and resulting transportation needs that are not identified in the current RTP. The study findings provide detailed information for a specified geographic area or modal facility system, and identify potential new RTP elements for consideration in the decision-making process. The studies often cover multi-county areas and include the participation of other COGs and agencies outside of Maricopa County, as well as state and federal agencies.

**FIGURE 17-1
THE SUN CORRIDOR**



Southeast Maricopa/Northern Pinal County Area Transportation Study

Completed during 2002, the Southeast Maricopa/Northern Pinal County Area Transportation Study (SEMNPTS) was initiated in an effort to develop inter-county planning; document the transportation relationships between Maricopa and Pinal Counties; examine the long-range transportation needs of the study area between the two counties; and identify projects to address the area's primary transportation needs. The study represented an opportunity for joint cooperation between Maricopa and Pinal Counties, and reinforced the dialogue between both areas to identify shared, regional transportation issues and concerns. The findings and recommendations of the SEMPTS were considered in the development of the MAG RTP,

provided input for the Pinal County Transportation Plan, and identified the major corridors for the ADOT Pinal County Corridor Definition Studies.

ADOT Pinal Corridors Studies

As an outgrowth of the SEMPTS, during September of 2004 the Arizona Department of Transportation (ADOT) initiated a total of three corridor studies within Pinal County, in areas located adjacent to the MAG Region. These studies involved the U.S. 60 Corridor Definition Study, the Williams Gateway Corridor Definition Study, and the Pinal County Corridors Definition Study. The ADOT corridor studies assessed overall need and feasibility, and identified general locations for the development of high-capacity roadways within the study area. At its February 2006 meeting, the State Transportation Board approved the adoption of the recommendations of the three Corridor Definition Studies into the MoveAZ (Move Arizona) long-range statewide plan. While no funding was identified for the purchase of right-of-way or for the construction of the recommended corridors, inclusion in MoveAZ allowed for the funding of further studies that would identify the actual alignments of the potential new roadways.

In 2009, ADOT initiated the study of a continuous north-south route through central Pinal County, covering the area between U.S. 60 in Apache Junction and Interstate 10 near Eloy and Picacho. The North-South Corridor Study (NSCS) will result in the preparation of a Location/Design Concept Report and an Environmental Impact Statement for a proposed 45-mile-long transportation corridor in Pinal County. The purpose of the new corridor is to relieve traffic on I-10, improve access to future activity centers in Pinal County, enhance transportation system linkages, and create a more direct connection to the eastern portion of the Phoenix metropolitan area. In the fall of 2015, the extension of SR-24 (Gateway Freeway) was incorporated into the project. There is an existing study being pursued by ADOT to extend SR-24 to Ironwood Road, and the NSCS will continue that study from Ironwood Road to the east. It is anticipated that the entire NSCS will be completed in 2017.

Interstate 10 /Hassayampa Valley Transportation Framework Study

On February 27, 2008 the MAG Regional Council accepted the findings of the Interstate 10 / Hassayampa Valley Transportation Framework Study. MAG, in association with ADOT, the Maricopa County Department of Transportation, the Town of Buckeye, and the Cities of Goodyear and Surprise, funded and developed the study. The study began in May 2006 for an area bounded by SR-74 on the north, SR-303L on the east, the Gila River on the south, and 459th Avenue on the west.

The action to accept the study included: (1) accept the findings of the Interstate 10-Hassayampa Valley Transportation Framework Study as the surface and public transportation framework for the Hassayampa Valley; (2) adopt the traffic interchange locations for the Interstate 10/Papago Freeway from SR-303L/Estrella Freeway to 459th Avenue, (3) adopt a two-mile traffic interchange spacing policy for new freeway facilities within the Hassayampa

Valley with appropriate planning for non-access crossings of the freeway facilities to facilitate local transportation movements; (4) adopt a new functional classification as a parkway, recognizing the Arizona Parkway as a type of parkway with unique operating characteristics for congestion and air quality planning purposes; (5) accept the findings and implementation strategies as described in the study for inclusion as illustrative corridors in the Regional Transportation Plan; and (6) recommend the affected jurisdictions within the Hassayampa Valley study area incorporate this study's recommendations into future updates of their general plans.

While the study provides a significant milestone in transportation planning for the Hassayampa Valley, the recommendations are not funded. Therefore, the Regional Council was requested to accept the study's findings versus adopting them. In taking this action, the planning process can be moved forward in an illustrative manner, thereby providing guidance to MAG and the affected agencies in the Hassayampa Valley for future activities, including updates to the Regional Transportation Plan.

Interstates 8 and 10 - Hidden Valley Transportation Framework Study

On September 30, 2009, the MAG Regional Council accepted the findings of the Interstate 10 / Hassayampa Valley Transportation Framework Study. This is a joint study including MAG, the Central Arizona Association of Governments, county and local jurisdictions in Maricopa and Pinal Counties, ADOT and FHWA. The study began in 2006 and covers portions of both Maricopa and Pinal Counties, and is generally bounded by: Overfield Road on the east, I-8 on the south, 459th Avenue on the west, and the Gila River and/or the north boundary of the Gila River Indian Community on the north.

The action to accept the study included: (1) accept the findings of the Interstates 8 and 10 – Hidden Valley Transportation Framework Study as the surface and public transportation framework for the Hidden Valley area of the MAG region that is bounded by the Gila River on the north, SR-87 and Pinal County on the east, the Tohono O'Odham Indian Community and the Barry Goldwater Range on the south, and 459th Avenue on the west; (2) adopt a two-mile traffic interchange spacing policy for new freeway facilities within the Hidden Valley area with appropriate planning for non-access crossings of the freeway facilities to facilitate local transportation movements; (3) accept the findings and implementation strategies as described in the study for inclusion as long-range unfunded illustrative corridors in the Regional Transportation Plan; (4) recommend the affected jurisdictions within the Hidden Valley study area incorporate this study's recommendations into future updates of their general plans; and (5) coordinate this acceptance with the tribal councils of the Gila River and Ak Chin Indian Communities.

As with the Hassayampa Valley Study, it is recognized that most of the study recommendations are not funded. Therefore, the Regional Council was requested to accept the study's findings versus adopting them. However, in taking this action, the planning process can be moved forward in an illustrative manner, providing transportation planning guidance to MAG, ADOT,

CAAG, Maricopa County, Pinal County Department of Public Works, the Town of Buckeye, the Cities of Goodyear, Maricopa, and Casa Grande, and the Federal Highway Administration.

Hassayampa Transportation Framework Study for the Wickenburg Area

The Hassayampa Transportation Framework Study for the Wickenburg Area covers the northwest part of Maricopa County, from approximately the SR-74/Carefree Highway alignment to the south, encompassing the Town of Wickenburg planning area, north to the US-93/SR-71 junction, 459th Avenue to the west, and to the extension of the proposed Turner Parkway (267th Avenue) to the east. The study area includes the northern planning area of the Town of Buckeye, the Town of Wickenburg planning area, the portions of the City of Surprise, and unincorporated areas in Maricopa and Yavapai Counties. This study developed a transportation framework for the study area that will ultimately be implemented at multiple jurisdictional levels. The Town of Wickenburg accepted the study findings on November, 15, 2010.

Central Phoenix Transportation Framework Study

The Central Phoenix Transportation Framework Study aimed at developing a multi-modal, transportation framework for the area approximately bounded by Northern Avenue on the north, the SR-143/Hohokam Expressway (projected northward) on the east, the South Mountain Freeway on the south, and 75th Avenue on the west. The study established a blueprint for future transportation investment decisions to improve mobility along Interstate 10, Interstate 17, SR-51, Loop 202, key arterials streets and proposed corridors in the RTP. While the major beneficiary of the study effort will be the core of the Phoenix urban area, the framework resulting from the study will enhance transportation in and out of the region's primary economic center, guiding decision-making affecting the entire MAG area. The final work products and findings of the study were provided to the MAG Regional Council for information and discussion on October 22, 2014.

Southeast Corridor Major Investment Study

The Southeast Corridor Major Investment Study was originated for the purpose of investigating alternate transportation strategies, in response to the growing travel demand between the East Valley and Central Phoenix. This included identifying member agency needs and developing a multi-modal approach in accordance with the anticipated traffic volume on I-10, including the US-60/ Superstition Freeway and the Interstate 17/Black Canyon Freeway traffic interchanges.

Beginning in 2001, the Arizona Department of Transportation (ADOT) and the Federal Highway Administration (FHWA) launched an Environmental Impact Statement (EIS) Study for the Interstate 10 corridor between SR-51 and SR-202L/Santan-South Mountain Freeways. The primary purpose of this EIS was to consider different expansion options for Interstate 10. As this effort was underway, MAG member agencies wanted other transportation options to be considered in the Southeast Corridor, as well as the potential for congestion pricing along I-10

to meet future travel demand. The Southeast Corridor Major Investment Study was developed to examine these options in this portion of the Valley.

The analysis performed for this Major Investment Study produced alternatives for the corridor in the form of high capacity transit on exclusive right-of-way, improved local transit access via ramps directly accessing HOV lanes, additional freeway general purpose lanes, increasing HOV capacity, interconnectivity with the existing light rail system, potential commuter rail options, and managed lanes concepts. The study found that managed lanes operations along I-10 and I-17, including DHOV ramps, provides highest level of performance while accommodating increased traffic volumes in the freeway corridor. Also, a strategically focused network of high capacity transit services featuring exclusive guideway transit offers the most productive transit investment in the corridor. The final work products and findings of the study were provided to the MAG Regional Council for information and discussion on September 26, 2012.

MAG Managed Lanes Development Strategy

MAG, in cooperation with the Arizona Department of Transportation (ADOT), Federal Highway Administration (FHWA), Valley Metro, and member agencies, explored a regional managed lanes system in the Phoenix Metro area. This effort was in part a response to Arizona House Bill 2396, which enables ADOT to consider Public-Private-Partnerships (P3) as a tool for financing transportation infrastructure in Arizona. The study entails determining future needs for High-Occupancy Vehicle (HOV), and evaluating the potential introduction of High-Occupancy Toll (HOT) lanes, and active traffic management strategies.

Specific study efforts include establishing goals and objectives for managed lanes in the region, exploring various management strategies and operations policies for managed lanes, and evaluating the existing regional freeway network for managed lanes potential in terms of constructability, traffic performance, facility cost, and revenue potential. The results of the Phase One study have determined that implementing a system of managed lanes in the MAG region is feasible. Results reveal that a system of managed lanes is constructible, improves overall highway system performance, efficiency and traffic operations, provides additional reliable travel options for system users, and generates a net positive cash flow. Based on the Phase One study effort, it was recommended that MAG and its key transportation partners endorse and actively pursue the implementation of a broad array of enhanced mobility options, including the use of managed lanes, congestion pricing, active traffic management, and other similar innovative transportation solutions.

Based upon the Phase I study findings, on May 1, 2013, the MAG Regional Council approved moving on to Phase II of the MAG Managed Lanes Network Development Strategy project. In Phase II, the project work focuses on developing a unified branding strategy, identifying demonstration projects as an initial proof of concept, and assessing methods for enhancing existing HOV operations on the regional freeway system.

US-60/Grand Avenue Corridor Optimization, Access Management Plan, and System Study (COMPASS)

The US-60/Grand Avenue COMPASS project identified a long-term transportation vision for this regional West Valley corridor. The project examined the route between the SR-303L/Estrella Freeway in Surprise and Willeta Street in Central Phoenix, the end of Arizona Department of Transportation (ADOT) maintenance. A key component to this study effort was the establishment of a “Charter Partners” group representing the elected leadership in the corridor. Upon study completion, this group presented its recommendation, a vision for the US-60/Grand Avenue corridor, to the MAG Regional Council for incorporation into a future Regional Transportation Plan.

Options under study ranged from roadway improvements, to traffic operations strategies, to transit possibilities for US-60. These options were grouped into four concepts:

- Continuing with planned improvements from the MAG Regional Transportation Plan as a benchmark for measuring the next three concepts.
- Reconsidering the US-60/Grand Avenue Expressway option that originally envisioned for the corridor recommended in Proposition 300.
- Planning for commuter rail in the US-60 corridor with operational highway improvements to meet the demands for this new mode.
- Identifying other High Capacity Transit options for Grand Avenue with improvements for accommodating future US-60 travel demand.

On January 27, 2016, the MAG Regional Council received an update (for information) on the final recommendations on the US-60/Grand Avenue Corridor Optimization, Access Management Plan, and Systems Study (COMPASS). Staff reported that neither the expressway option nor the other high capacity transit option met the criteria as alternatives for the corridor. The study recommended establishing a corridor access management system; continuing with improvements in the Regional Transportation Plan; addressing remaining bottlenecks and congestion points; and planning for commuter rail with operational improvements. A key change for the corridor could be consolidating approximately 430 driveways along the corridor to only 230 access points. The recommendations are only concepts at this point, and design and environmental clearances are the next steps with required local, state and federal agency approvals.

Interstate 11 Corridor/CANAMEX Corridor

The Phoenix and Las Vegas metropolitan areas are the largest in the nation not linked by an Interstate Highway corridor. The combined population of the Phoenix, Tucson, Las Vegas and Reno areas was less than 700,000 when the Federal Aid Highway Act of 1956 was enacted.

Today, the combined population of these cities is 8 million and is expected to grow even further, prompting the need for better surface transportation connections to accommodate not only the travel demand between these metropolitan areas, but also improved mobility for freight shipments throughout the Intermountain West and inland portions of the West Coast.

An Interstate 11 (I-11) corridor to address this need was designated as part of the federal transportation bill, Moving Ahead for Progress in the 21st Century Act (MAP-21), which was signed into law by President Obama on July 6, 2012. The move makes the corridor eligible for federal funds; however, funding to construct a potential I-11 corridor has not been identified. Subsequently, I-11 was officially designated by the United States Congress in the 2015 Fixing America's Surface Transportation Act. It is planned to run from Nogales, Arizona to Reno, Nevada, with the potential to extend the corridor north to the Canadian border, essentially becoming the new CANAMEX corridor through the Intermountain West. Such a corridor would connect communities, national and international economies, existing and future domestic and international deep-water ports, and would intersect with transcontinental roadways and railroad corridors.

The idea for an Interstate Highway corridor had its origins at the Maricopa Association of Governments through MAG studies on establishing a network of transportation facilities to meet the buildout travel demand in the region, including the need for a 152-mile freeway corridor (I-11) west and south of the Phoenix area, connecting Casa Grande to Wickenburg. The I-11 Corridor was identified in the Hassayampa Valley Transportation Framework Study and the Hidden Valley Transportation Framework Study, which were described previously. The findings and implementation strategies of these studies, including the I-11 Corridor, were accepted for inclusion as illustrative corridors in the Regional Transportation Plan. (See Illustrative Corridors/Projects below.)

In November 2014, the Arizona and Nevada Departments of Transportation completed a two-year I-11 and Intermountain West Corridor Study. The study included detailed corridor planning of a high priority Interstate Highway link between Phoenix and Las Vegas, and high-level visioning for potentially extending the corridor north to Canada and south to Mexico. In December 2015, ADOT began a Tier I Environmental Impact Statement and Conceptual Engineering Document that will be structured to select a preferred corridor alignment (approximately 2,000 feet in width) and preferred transportation mode choice for accommodating future traffic needs from Nogales to Wickenburg, Arizona as recommended in the Final I-11 and Intermountain West Corridor Study. The study is expected to take three years to complete.

Construction in a segment of the I-11 corridor in Nevada started in the summer of 2015 on the north side of the Mike O'Callaghan-Pat Tillman Memorial Bridge over the Colorado River at Boulder City, Nevada. The \$318 million, 15-mile segment of divided highway will bypass Boulder City and connect with U.S. 93 near Henderson, Nevada. The Nevada Department of Transportation broke ground on two segments: a 2.5-mile portion bypassing Boulder City for

\$83 million; and a \$235 million, 12.5-mile segment funded by the Regional Transportation Commission of Southern Nevada.

Interstate 10/Interstate 17 Corridor Master Plan Study

The Maricopa Association of Governments, in partnership with the Federal Highway Administration and the Arizona Department of Transportation, launched a study in 2014 to develop a Corridor Master Plan for the Interstate 10 and Interstate 17 corridor. This corridor is referred to as the “Spine,” because it serves as the backbone for transportation in the metropolitan Phoenix area. In fact, the corridor handles more than 40 percent of all daily freeway traffic in the region. The 35 mile Spine corridor begins at the I-17/Loop 101 North Stack interchange and continues south and east to the I-10/I-17 Split Interchange. The corridor continues east and south along I-10 to the interchange with Loop 202 (Pecos Stack).

The Spine Study effort is analyzing various long-term strategies to improve mobility in the corridor. The study is evaluating the full range of transportation modes and concepts, including cars, transit, biking, freight and walking, to identify the best multimodal solutions. These long-term solutions are envisioned as a combination of traditional methods, new technology, and increased use of transit (such as buses.) The key outcome of the Spine Study will be a detailed strategy to manage traffic in the I-10 and I-17 corridors through 2040. In addition to the Master Plan being developed, the study team has identified several near-term improvements along I-10 and I-17 that will be implemented while the Spine Study is underway. The study also will look at traffic operations on the street and transit network around the freeways. Study recommendations will be programmed in the MAG Regional Transportation Plan and Transportation Improvement Program.

The current MAG Regional Transportation Plan allocates approximately \$1.5 billion for the Spine Corridor. This amount includes funding for any identified near-term improvements, in addition to longer range improvements. The Spine Study will identify how to best use these funds to achieve the greatest benefit to the region. It will also define funding shortfalls of the preferred corridor improvement approach so that additional funding allocations can be considered in the future. In recent years, ADOT and FHWA were developing design concept reports and environmental impact statements as part of the I-10 Corridor Improvement Study and I-17 Corridor Improvement Study. These studies looked at ways to add capacity, such as general purpose lanes, to both I-10 and I-17 in the Phoenix area. The two previous studies identified long-term improvements that would have required more funding than was available in the Regional Transportation Plan for either corridor. ADOT and MAG agreed, and FHWA accepted, the decision to rescind the studies in 2012 after it was determined that separate studies may not result in the best overall plan for the corridor. However, it is important to note that much of the planning, engineering and environmental information from those studies will be folded into the new Corridor Master Plan. In addition, the studies also identified a number of near-term improvements that will be carried forward and implemented by ADOT through a separate but parallel effort.

Stakeholder coordination and public involvement is a critical component of the Spine Study. The overall goal is to engage diverse groups of stakeholders and members of the public to obtain public comment suggestions on potential corridor improvements, as well as develop a unified corridor vision. Multiple rounds of public engagement, including public meetings and online surveys, are being conducted during the study. Meetings are held at key project milestones and spread geographically throughout the corridor.

Key phases of the study process include:

- Initiate study.
- Conduct corridor needs assessment.
- Define and evaluate alternatives.
- Develop corridor master plan recommendations..
- Complete final master plan.

Freight Planning Studies

In 2012, MAG, in cooperation with the Joint Planning Advisory Council (JPAC), completed the Freight Transportation Framework Study. The goal of the Freight Transportation Framework Study was to identify freight related economic development opportunities in the Arizona Sun Corridor. The framework study completed an extensive freight survey that: (1) included 2,500 shippers and carriers across the United States, (2) conducted phone and in-person interviews with local freight stakeholders, (3) evaluated commodity flows and truck rates, (4) identified 16 freight focus areas, (5) analyzed the industry real estate market, (6) completed a detailed assessment of four emerging focus areas that included the evaluation of the industry market, land use plans (existing and future), inventory of existing businesses, education, travel times, commodities, transportation infrastructure and economic development incentives.

The Freight Framework Study also presented the results of a detailed evaluation of commodity flows affecting the Sun Corridor, with a particular focus on goods movements between Mexico, sources in the southeast United States and markets along the West Coast. A screening of potential freight focus areas leads to the determination of freight related opportunities within the region, including the designation and evaluation of area typologies representing differing relevant majority use types that would support an enhanced role for the Sun Corridor in the global supply chain.

As a follow-up to the Freight Framework Study, in 2015 MAG began work on the MAG Freight Transportation Plan. This study builds upon the recommendations identified in the Freight Framework Study, with the goal of identifying a strategic network for the movement of goods specifically in the MAG area. The project team will work with MAG member agencies to identify freight clusters, model the flow of goods, and locate bottlenecks and other potential barriers to the efficient flow of freight. The plan will conduct an infrastructure assessment along existing and proposed freight corridors that estimates bridge and roadway life cycle costs, evaluates the impact of overweight vehicles on transportation infrastructure, and analyzes

overall traffic operations. A major goal of the study is to identify freight and logistic clusters and ensure that these regional economic generators are protected from non-compatible uses, are served by corridors that will move goods and commuters safely and efficiently, and that will remain competitive and continue to attract companies to the MAG region. The final results of the study will be to identify projects that will enhance the flow of goods in the MAG region and complement the projects identified in the RTP. Completion of the plan document is anticipated in early FY 2018.

MAG Commuter Rail Studies

It should be noted that the RTP does not include funding to build and operate commuter rail in the MAG region. Generally, regional forecasts indicate that population densities and market demand are sufficient to warrant an investment in commuter rail in the future, but operations and capital funding were not included within the RTP's original twenty year planning horizon through 2026. However, recognizing that population growth, economic conditions, travel demand and public opinion are constantly evolving, the RTP allocates planning funding to continue developing illustrative, commuter rail concepts for the region.

- Commuter Rail Planning – MAG staff was directed by the Regional Council to develop a Commuter Rail Strategic Plan in 2008. Three additional rail passenger planning studies were commissioned: System Study, Grand Avenue Corridor Study and Yuma West Corridor Study. These three studies were subsequently completed and the findings and recommendations were accepted by Regional Council in May 2010.
- Commuter Rail Strategic Plan - On April 23, 2008, the MAG Regional Council accepted the findings of the MAG Commuter Rail Strategic Plan. Subsequently, MAG launched the commuter rail strategic planning process and completed the efforts in February 2009. The purpose of the planning process was to develop an implementation strategy for commuter rail service in Maricopa County and northern Pinal County. The strategic plan builds upon technical information from the High Capacity Transit Study and ongoing passenger rail planning by the Arizona Department of Transportation (ADOT) to provide a framework for implementing commuter rail service in the MAG region.

The action by the Regional Council included accepting the findings of the Commuter Rail Strategic Plan as the guiding implementation framework for commuter rail, and for MAG to proceed with the first four implementation steps identified on page nine of the Executive Summary: 1) Ongoing Coordination; 2) Union Pacific Passenger Rail Coordination; 3) BNSF Railway Coordination; and 4) Regional Transit Planning.

- MAG Commuter Rail System Plan - The purpose of this study was to evaluate commuter rail options for the MAG region and the potential connecting routes immediately adjacent to the MAG region. The study established priorities for implementing commuter rail service through an evaluation of ridership potential, operating strategies, and associated capital and operating costs. All existing freight corridors and possible

rail extension areas identified in the Commuter Rail Strategic Plan were evaluated as part of the study. This system plan included a review of existing documentation, ongoing public involvement, an inventory of the existing BNSF and UPRR rail lines, potential extension corridors, development of a conceptual commuter rail operating plan, identification of infrastructure improvements necessary for the implementation of commuter rail service, development of capital cost estimates, and the development of annual operating cost estimates for commuter rail service. The study findings were accepted by the MAG Regional Council on May 12, 2010.

- BNSF/Grand Avenue Commuter Rail Corridor Development Plan - The purpose of this study was to determine the feasibility of implementing commuter rail service along the BNSF Railway Phoenix Subdivision between Phoenix and Wickenburg, Arizona, a distance of approximately 54 miles. The final product provided a Corridor Development Plan that describes the elements necessary to successfully implement commuter rail transit service in the Grand Avenue Corridor. This corridor development plan includes a review of existing documentation, ongoing public involvement, an inventory of the existing BNSF Northwest rail line, development of a conceptual commuter rail operating plan, identification of infrastructure improvements necessary for the implementation of commuter rail service, development of capital cost estimates, and the development of annual operating cost estimates for commuter rail service. The study findings were accepted by the MAG Regional Council on May 12, 2010.
- Union Pacific/Yuma West Commuter Rail Corridor Development Plan - The purpose of this study was to determine the feasibility of implementing commuter rail service along the Union Pacific (UP) Yuma West line between Buckeye in the west and Union Station in downtown Phoenix. The final product is a Corridor Development Plan that describes the elements necessary to successfully implement commuter rail transit service along this corridor. The project also addresses opportunities for connections with other high capacity transit corridors, including the METRO I-10 West AA/EIS currently being studied in the MAG region. This corridor development plan provides a review of existing documentation, ongoing public involvement, an inventory of the existing Union Pacific West rail line, development of a conceptual commuter rail operating plan, identification of infrastructure improvements necessary for the implementation of commuter rail service, development of capital cost estimates, and the development of annual operating cost estimates for commuter rail service. The study findings were accepted by the MAG Regional Council on May 12, 2010.
- MAG Regional Commuter Rail System Study Update - In FY 2017, MAG initiated the Regional Commuter Rail System Study Update. The purpose of the study is to update the data included in the original, 110-mile MAG 2010 Commuter Rail System Study (specifically new regional socioeconomic forecasts, revised ridership, cost estimates, corridor rankings) and information from other relevant passenger rail studies and technical content. Governance and indemnity/liability issues related to passenger rail implementation will also be studied, as these elements must be addressed prior to any

agreement between the owner railroads and the eventual commuter rail governing/operating agency. Increased mobility to jobs, housing alternatives, and connectivity to downtowns, airports and entertainment centers, travel and tourism options, and traffic mitigation will be evaluated. Figure 11-10 in Chapter Eleven depicts a concept map for a regional commuter rail system. There are currently no funds identified for implementing commuter rail through 2040.

- Phoenix-Tucson Commuter Rail Study - In addition to the MAG studies described above, MAG participated in the Tucson-Phoenix Regional Passenger Rail (and blended Commuter Rail Service) Study conducted by the Arizona Department of Transportation. From 2011 to 2016, this thorough, joint Federal Railroad Administration (FRA)-Federal Transit Administration (FTA) project study assessed the potential for passenger rail service between Phoenix and Tucson, with a focus on: (1) connecting downtown Phoenix to downtown Tucson, and (2) ensuring system connectivity, including commuter rail extensions to Buckeye and Surprise. Two corridor alternatives and a no-build alternative for implementing a passenger rail system were evaluated as a part of the study process. A Draft Tier One Environmental Impact Statement (Project Level EIS) was completed in the spring of 2016 and a Recording of Decision (ROD) on the minimum operating segment (MOS) was expected by early 2017 from the FRA. There is currently no construction schedule and no dedicated capital or operating funding source has been identified for a passenger rail system between Tucson and Phoenix.

MAG Regional Transit Framework Study

In FY 2017, the 2017 Regional Transit Framework Study (RTFS) Update was initiated to revise the 2010 RTFS, in order to guide future transit investments and decisions. The 2017 Regional Transit Framework Study Update will serve to formalize regional high-capacity transit system corridors by updating the work completed in the 2010 RTFS through a planning horizon of 2040. The 2017 Regional Transit Framework Study Update will address factors such as: (1) changes in transportation conditions since the completion of the 2010 RTFS, (2) role transit plays in meeting regional transportation needs now and into the future, (3) composition of the transit system in 2040, and (4) advancements in existing and future transportation technologies and their impact on modal choice and long-term transit planning. The details of the 2010 Regional Transit Framework Study are discussed below.

The initial MAG Regional Transit Framework Study (RTFS) was begun in 2008 to provide a needs-based planning process for identifying and prioritizing regional transit improvements through year 2030, with consideration for even longer range transportation needs through year 2050. The planning process included a technical approach to identify future travel demand and travel markets through an analysis of future growth patterns. Specific markets were identified through a technical evaluation of high-demand travel markets and an understanding of traveler behavior. It included the technical analyses of land use, socioeconomic conditions, existing and planned transit service, and infrastructure, along with the stated customer preference attributes, identified public transit needs, deficiencies, opportunities and constraints within the

region. On March 31, 2010, the MAG Regional Council accepted the Illustrative Transit Corridors map in the Regional Transit Framework Study for inclusion as unfunded regional transit illustrative corridors in the RTP. In addition, the future planning actions identified in the study were accepted for consideration through the MAG Unified Planning Work Program process.

Other Transit Studies

Several local transit system studies have been conducted to investigate the transit service needs brought about by extended periods of rapid population and employment growth in certain areas of the MAG region. Communities saw their populations double or triple in size in less than a decade. Not surprisingly, with such increases in growth comes increased demand for transit service. While these areas have experienced rapid growth in the past, the recent economic downturn has impacted the outlook for current and future transit services. The purpose of the studies was to identify opportunities and strategies for improving existing transit services, and to develop short, mid, and long range local transit plans that effectively provide circulation within the study areas, as well as connections to the regional transit system.

- Southwest Valley Local Transit System Study - The purpose of the Southwest Valley Local Transit System Study was to develop a three-phased plan that identifies short-, mid-, and long-range strategies for local transit. This study includes portions of the City of Phoenix, City of Avondale, City of Goodyear, City of Tolleson, City of Litchfield Park, Town of Buckeye and surrounding unincorporated portions of Maricopa County. Ultimately, the recommendations arising from these studies will serve as a blueprint for local communities for a sustainable and market-based local transit system, which ties into the regional transit network. Recommendations also included creating a regional partnership among cities and identifying funding sources. This study was accepted by Regional Council on May 10, 2013.
- Northwest Valley Local Transit System Study - The purpose of the Northwest Valley Local Transit System Study was to develop a three-phased plan that identifies short-, mid-, and long-range strategies for local transit. Ultimately, the plan arising from this study will serve as a blueprint for a sustainable and market-based local transit system that tie into the regional transit network. The study area included the communities of El Mirage, Surprise, and Youngtown, and portions of Glendale, Peoria and unincorporated Maricopa County, as well as the unincorporated communities of Sun City, Sun City West and Sun City Festival in the northeastern area of the town of Buckeye. Additional recommendations included creating a local volunteer drive program in Sun City, modifying existing Glendale and Peoria transit routes to better align with a consolidated express route, extend Valley Metro service into Sun City and increasing frequency on a route serving Banner Boswell Medical Center. Recommendations also included creating a regional partnership among cities and identifying funding sources. This study was accepted by Regional Council on October 23, 2013.

- Southeast Valley Transit System Study - The Southeast Valley Transit System Study (SEVTSS) analyzed transit services and ridership demand in transit-established and transit-aspiring communities within the southeast subarea of the Maricopa Association of Governments (MAG) region. In a joint effort, MAG and Valley Metro conducted the study over an 18-month period, which concluded in July 2015. The study area encompassed the full extents of the City of Apache Junction, City of Chandler, Town of Florence, Town of Gilbert, Town of Guadalupe, City of Maricopa, City of Mesa, City of Tempe, Town of Queen Creek, as well as parts of the Gila River Indian Community, City of Phoenix, Maricopa County and Pinal County. Through a process that was both data-driven and collaborative, this study resulted in the identification of recommendations for optimizing the existing transit system, and mid-term and long-term improvements to enhance a performance-based transit system throughout the Southeast Valley. This study was accepted by Regional Council on October 28, 2015.
- Sustainable Transportation and Land Use Integration Study (ST-LUIS) - This transit-related study highlights the potential to move the region towards greater use of sustainable transportation modes – transit, walking and biking. The study provides a fresh look at ideas for transit investments and services that have been under previous consideration, and supports the creation of walkable and transit-oriented communities. The uniqueness of the ST-LUIS is the holistic approach taken to investigating transit's potential, by integrating real estate market analysis with transit corridor assessment and ridership modeling. The focus on transit and supportive land use is joined up with recommendations for creating compact walkable places throughout the region. The findings of this study were distributed in the fall of 2013.
- Regional Multimodal Level of Service (RMLOS) Study - This study will assess how well an urban street serves the needs of all users, including pedestrians, bicyclists, and transit users. It will include a tool that demonstrates the applicability of a multimodal LOS analysis, and how it can be utilized by engineers, development review staff, city planners, and transit planners to better understand the impact of geometry, design, and traffic on all users of the urban street. This study is expected to be completed by spring 2017.
- Achieving Transit Accessibility Now (ATAN) (Short-Term Transit Accessibility Program) - The MAG Regional Council approved the use of \$2.5 million of transit funding to improve the accessibility at transit stops in the MAG region. While Valley Metro conducts the Transit Stop Inventory and Accessibility Study to evaluate the compliance with ADA standards and accessibility, staff has worked with Valley Metro, City of Phoenix Transit, and the MAG Transit Committee to develop a proposed implementation program for these funds. This is intended to be an interim program that will be reviewed and revised once the regional Transit Stop Inventory and Accessibility Study is completed by Valley Metro over the next year. The proposed short-term transit accessibility program, ATAN, was recommended for approval by MAG in late 2016.

- Transit Stop Inventory and Accessibility Study - The purpose of this joint Valley Metro, City of Phoenix, MAG and member agencies project is to conduct a regional inventory of transit stops for ADA compliance and accessibility, to house the survey findings in the regional transit stop database, and to adopt a regional transit stop standard. The project will provide the region with valuable information about bus stop ADA compliance and accessibility. The inventory is expected to be completed in July of 2017. A previous related study, the Designing Transit Accessible Communities Study (DTAC) focused on challenges faced by pedestrians and bicyclists as they access transit at the stop level. The study furnishes member agencies with additional tools and guidance to promote and sustain better planning associated with improving existing deficiencies and deploying future stops that are more accessible and supportive of adjacent neighborhood needs. It was also completed and accepted by MAG on February 26, 2014.
- Rural Paratransit Needs Assessment - The purpose of the MAG Rural Paratransit Needs Assessment Study will be to address the mobility needs of disadvantaged (i.e., older adult and persons with disabilities) and regional paratransit service levels necessary to address those needs within the rural areas of the Maricopa Association of Governments (MAG) region. The six month study will analyze a variety of tasks that can build a case for transit improvements and may lead to future opportunities to secure local, regional, state and/or Federal Transit Administration (FTA) funding. Valley Metro, Maricopa County, Pinal County and Arizona Department of Transportation (ADOT) will be included as partnering agencies. The assessment will be completed by summer 2017.
- City of Maricopa Rural Transit Demand Study - This study will determine the market for new service that would link rural communities such as City of Maricopa with its own residents as well as with other MAG Region communities. The Study has the potential to expand transit service via SR-347 to better connect Maricopa with Phoenix Tempe and Chandler. It will also analyze the enhancement of intra-Maricopa transit service for local demand as the city is trying to transition from Demand Response to fixed service. The study will be completed by December 2017.

Illustrative Corridors/Projects

The transportation studies discussed in the previous sections represent collaborative efforts between MAG and other agencies, communities, counties and regions, and have implications for the extended planning effort beyond the currently adopted MAG RTP. Given the current and expected continuing population growth in the MAG Region, these studies provide a perspective on future transportation needs, which is essential for effective long range planning. Their findings and recommendations identify potential new corridors or other transportation improvements that can be considered in future updates of the RTP. One approach to identifying potential new corridors/projects or other transportation improvements that might be considered for inclusion in future updates of the RTP is the concept of illustrative projects.

Illustrative Corridor/Project Concept

Federal regulations for metropolitan transportation planning identify the concept of “illustrative projects” as an element of the planning process. These are projects that could potentially be included in the plan, if additional resources beyond the reasonably available financial resources identified in the plan were available. They are discussed in the metropolitan transportation plan for illustrative purposes only, and are not included in the financial plan or air quality conformity determination. There is no requirement to select any project from an illustrative list of projects in a metropolitan transportation plan at some future date, when funding might become available. In addition, no priorities are stated or implied by inclusion as an illustrative corridor.

An illustrative project may not be needed until after the planning horizon of the RTP. However, illustrative projects can be helpful in guiding transportation and land use planning efforts at both the regional and local level, even though funding for the projects has not yet been identified. This would be especially applicable to making provisions for the development of potential future transportation facilities in municipal general plans. In addition, including an illustrative regional transportation project provides the project sponsor with support in seeking funding from other sources to implement the project, since the project has been vetted through a planning study or process and through MAG.

An illustrative project must be identified through a transportation planning process such as a framework study, corridor or modal analysis, or other similar transportation studies. The illustrative project must be for a regionally significant project and is a corridor or link in the regional transportation system that enhances mobility in the region. The inclusion of an illustrative project in the Regional Transportation Plan does not imply in any way that the project has priority for future funding over other illustrative projects in the RTP or future projects yet to be identified. The MAG Regional Council, acting on a recommendation from the Transportation Policy Committee, can add or delete an illustrative project in the MAG Regional Transportation Plan.

The illustrative corridors/projects included in the RTP are discussed below.

Interstate 10/Hassayampa Valley Transportation Framework Study

On February 27, 2008, the MAG Regional Council accepted the findings of the Interstate 10/Hassayampa Valley Transportation Framework Study. A key aspect of this action was to accept the findings and implementation strategies as described in the study for inclusion as illustrative corridors in the Regional Transportation Plan.

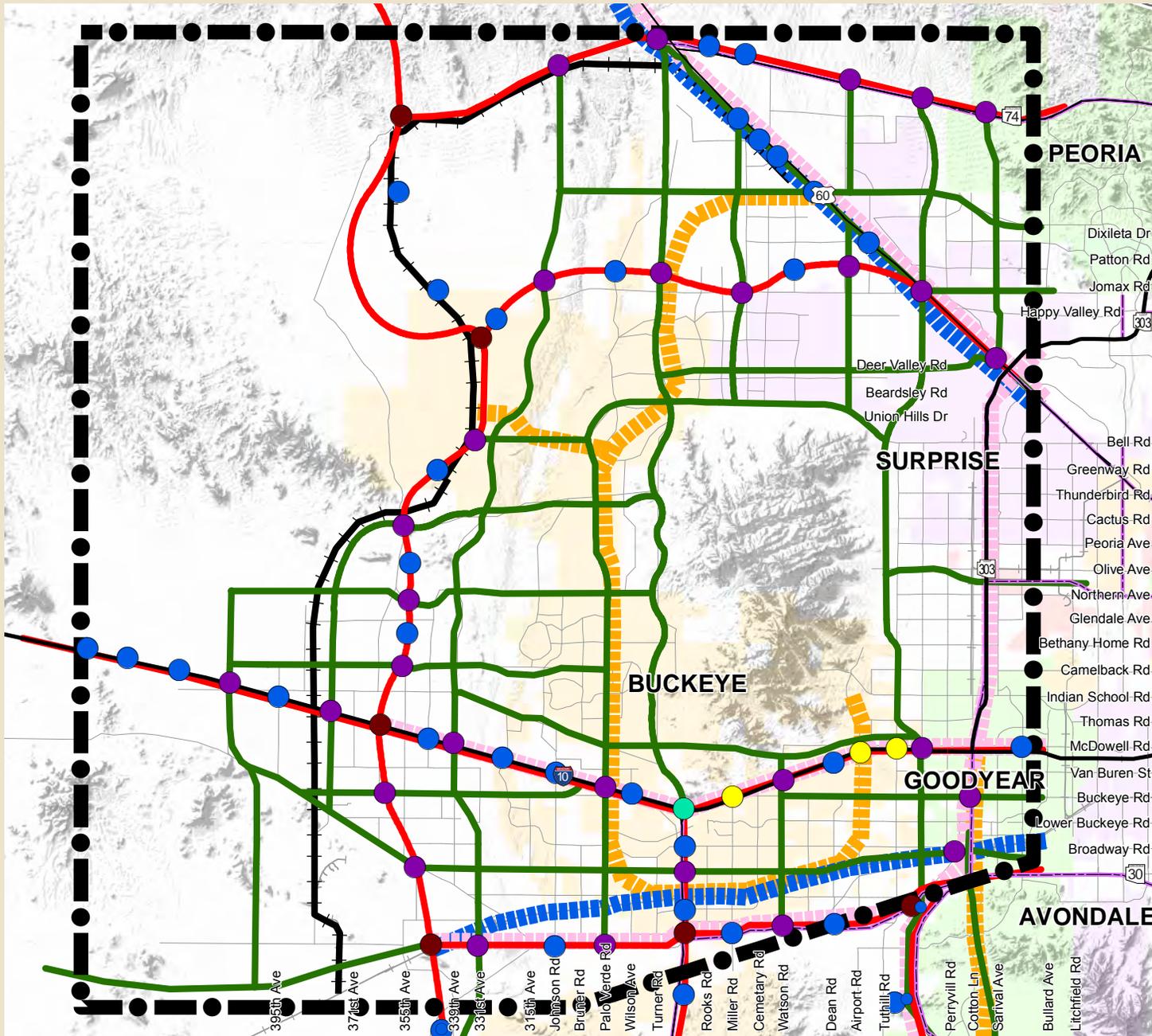
In taking this action, it was recognized that the study recommendations are not funded. Figure 17-2 depicts the illustrative corridors recommended by this study, which includes potential freeway facilities, parkway facilities, interchanges, and high capacity transit corridors.

2040 Regional Transportation Plan

Fig. 17-2



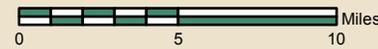
Hassayampa Illustrative Corridors



- Study Area Boundary
- Existing Traffic Interchanges
- Illustrative Traffic Interchanges
- Existing System Interchange
- Illustrative System Interchanges
- Illustrative Parkway Traffic Interchanges
- Illustrative Freeways/Improvements
- Illustrative Parkways
- Adopted Regional Transportation Plan Facilities
- Illustrative and Adopted Bus Rapid Transit
- Illustrative High Capacity Transit (Peak Service)
- Illustrative High Capacity Community Transit
- Illustrative Freight Rail Connector
- Existing Railroads
- Existing Freeway
- Major Roads
- Metropolitan Planning Area



While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.



Alignments for new freeway, highway, arterial, and bridge facilities will be determined following the completion of appropriate design and environmental studies.

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Interstates 8 and 10/ Hidden Valley Transportation Framework Study

On September 30, 2009, the MAG Regional Council accepted the findings of the Interstates 8 and 10 - Hidden Valley Transportation Framework Study. A key aspect of this action was to accept the findings and implementation strategies as described in the study for inclusion as illustrative corridors in the Regional Transportation Plan.

In taking this action, it was recognized that the study recommendations are largely unfunded. Figure 17-3 depicts the illustrative corridors recommended by this study, which includes potential freeway facilities, parkway facilities, interchanges, and high capacity transit corridors.

New River Corridor

On November 25, 2003, the Regional Council approved inclusion of a connection between Loop 303 and I-17 in the vicinity of New River Road as a corridor for further study. At that time, it was noted that funding for the New River Corridor was not included in the Regional Transportation Plan. In August 2005, the Arizona Department of Transportation completed an Alignment Selection Report, which identified a possible alignment for a potential future freeway facility in the corridor. Consistent with the federal planning regulations promulgated by USDOT as a result of SAFETEA-LU, the status of this corridor as an illustrative corridor was formalized in the 2010 Update of the RTP, and has been included in the 2035 RTP. The New River Corridor is depicted in Figure 17-4.

Sky Harbor Automated Train System

On April 22, 2009, the MAG Regional Council approved inclusion of Stage Two of the Sky Harbor Automated Train System (Sky Train) as an illustrative project in the RTP. Since the City of Phoenix approved full funding for Stage Two in October 2016, the project is being included in the 2040 RTP and will no longer be an illustrative project. The Sky Train system is paid for with airport revenues and passenger fees (no local tax dollars). The details of the Sky Train are discussed below.

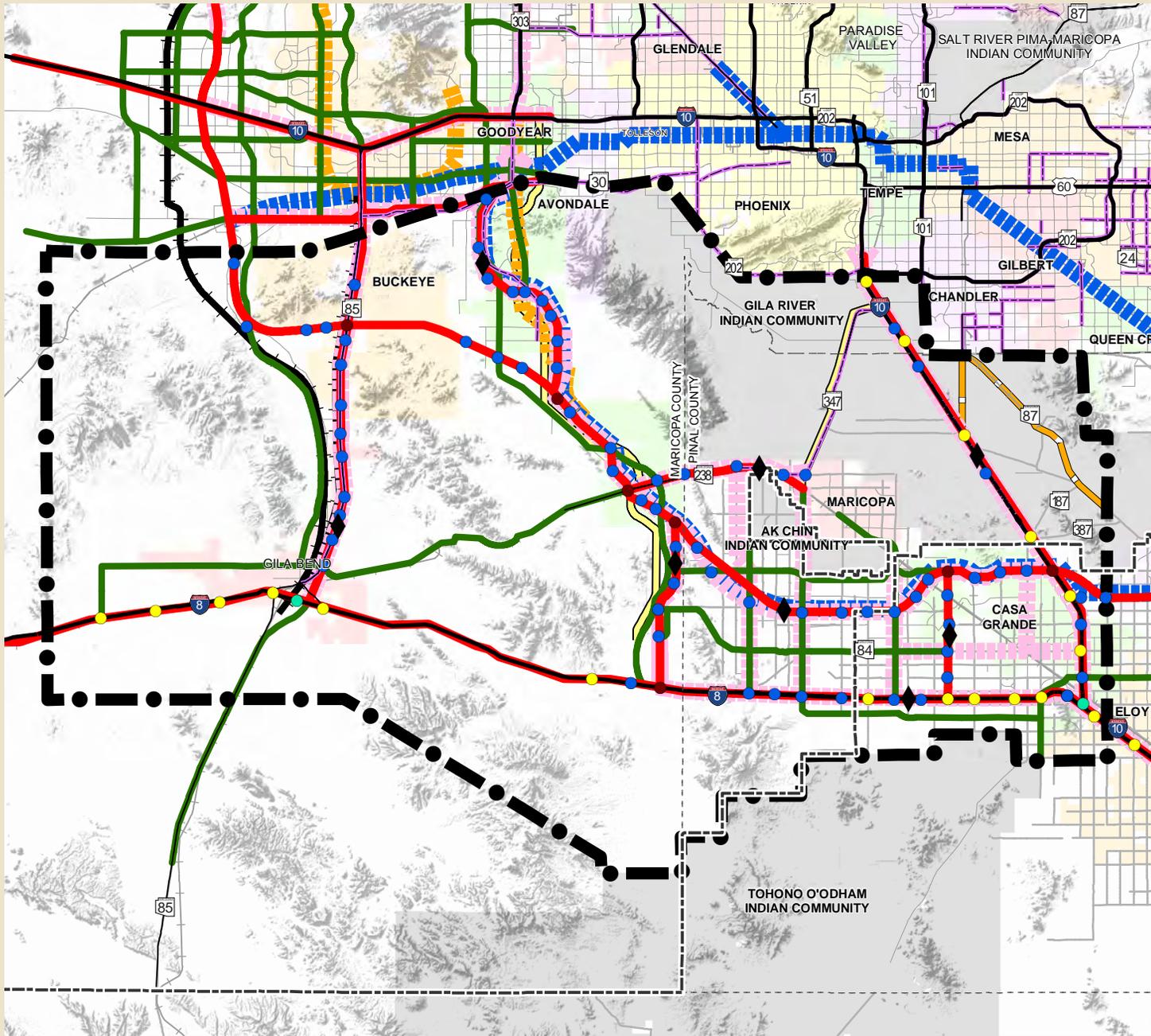
The Sky Train is a fully automated, nearly 2.5 mile grade-separated transit system that connects several major facilities at Sky Harbor International Airport with the Valley Metro bus and light rail system. Stage One of the project, which was completed in early 2013, extends from the LRT station at 44th St. to Airport Terminal 4. Stage One-A, which continues from Terminal 4 to Terminal 3 for 0.7 miles with a short walkway to Terminal 2, opened in December 2014. On April 22, 2009, the MAG Regional Council approved inclusion of Stage Two of the Sky Harbor Automated Train System (Sky Train) as an illustrative project in the RTP, with the City of Phoenix approving full funding in October 2016. Stage Two, a \$700 million, 2.5 mile extension approved by Phoenix City Council in October 2016, will link Terminal 4 with the Rental Car Center by 2021. The total estimated project cost of \$1.6 billion for the 5.7-mile Sky Train system is paid for with airport revenues and passenger fees (no local tax dollars).

2040 Regional Transportation Plan Fig. 17-3



Hidden Valley Illustrative Corridors

- Study Area Boundary
- Existing Traffic Interchange
- Illustrative Traffic Interchange
- Existing System Interchange
- Illustrative System Interchange
- Illustrative High Occupancy Vehicle Lane
- Illustrative Freeways/Improvements
- Illustrative Parkways; Scenic Parkways
- Adopted Regional Transportation Plan Facilities
- Illustrative and Adopted Bus Rapid Transit
- Illustrative High Capacity Community Transit
- Illustrative High Capacity Transit (Peak Service)
- Freight Connector
- Enhanced Transit Corridor
- Safety and Operational Improvements Corridor
- Existing Freeway
- Major Roads
- Existing Railroads
- Metropolitan Planning Area Boundary
- County Boundaries



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Alignments for new freeway, highway, arterial, and bridge facilities will be determined following the completion of appropriate design and environmental studies.

2040 Regional Transportation Plan

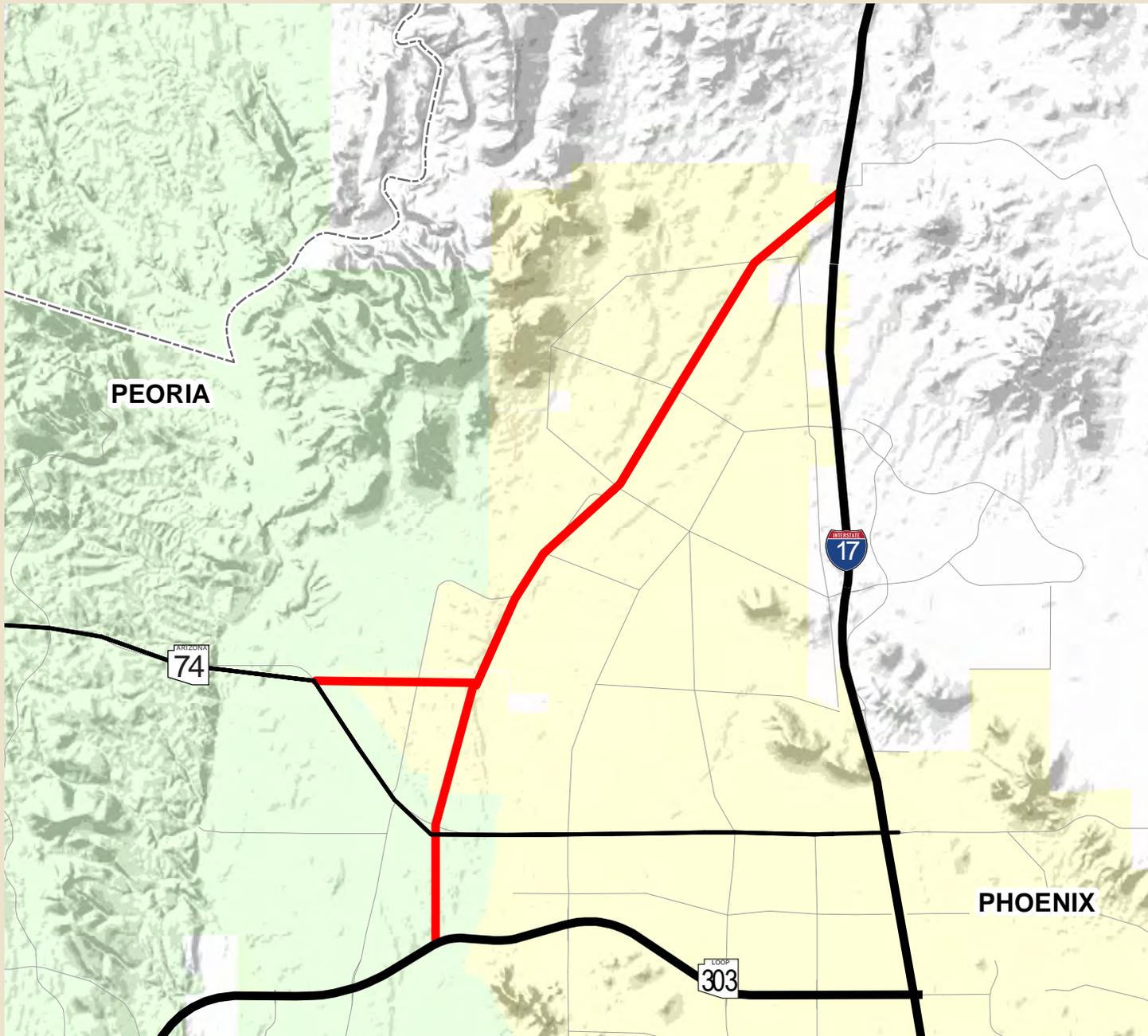
Fig. 17-4



New River Illustrative Corridors

-  Illustrative Freeway Corridor
-  Existing Freeway
-  Highways
-  Major Roads

Alignments for new freeway, highway, arterial, and bridge facilities will be determined following the completion of appropriate design and environmental studies.



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Regional Transit Framework Study

On March 31, 2010, the MAG Regional Council accepted the Illustrative Transit Corridors map in the Regional Transit Framework Study for inclusion as unfunded regional transit illustrative corridors in the RTP. In addition, the future planning actions identified in the study were accepted for consideration through the MAG Unified Planning Work Program process. Figure 17-5 depicts the illustrative corridors recommended by this study, which include all-day and peak period high capacity transit, and arterial bus rapid transit. Future recommendations from the ongoing RTPS Update initiated in FY 2017 may result in revisions to the concepts approved in 2010, subject to Regional Council action.

Tempe South Alternatives Analysis

On December 8, 2010 the MAG Regional Council approved a recommendation for inclusion of a potential future phase of modern streetcar east along Southern Avenue to Rural Road, as an illustrative transit corridor in the MAG Regional Transportation Plan (RTP). This illustrative project is being dropped from the 2040 RTP, since it is no longer compatible with the routing subsequently approved for the Tempe Streetcar, as discussed below.

In June 2014, the Tempe City Council supported a route recommendation for a three-mile Tempe Streetcar route on Rio Salado Parkway from the Marina Heights development west to Mill Avenue, downtown loop on Mill and Ash avenues and south to Apache Boulevard, then east to Dorsey Lane. In spring 2015, the Tempe City Council approved the recommended stop locations, which was also approved by the Valley Metro Rail Board and the Maricopa Association of Governments.

The project received a Finding of No Significant Impact (FONSI) from the Federal Transit Administration (FTA) in October 2015, which indicates that the project will have no significant environmental effect on the neighboring communities. The FONSI comes following the project's Environmental Assessment (EA), which evaluates the potential impacts to the neighboring environment, including noise and vibration, traffic and parking, and historical and archaeological resources.

On February 9, 2016, planning for the Valley's first streetcar reached a significant funding milestone. Tempe Streetcar is included in President Obama's budget for Fiscal Year 2017, for \$75 million. The Tempe Streetcar project capital costs are estimated at \$186 million and will be funded using regional Proposition 400 funds, local funds, and federal grant dollars. The project is due to open in 2020.

Potential Improvements to the Existing Freeway/Highway System

Certain additional projects to improve the existing freeway/highway system have been identified as a result of various ADOT corridor and design concept studies. These illustrative

2040
Regional Transportation Plan
Fig. 17-5

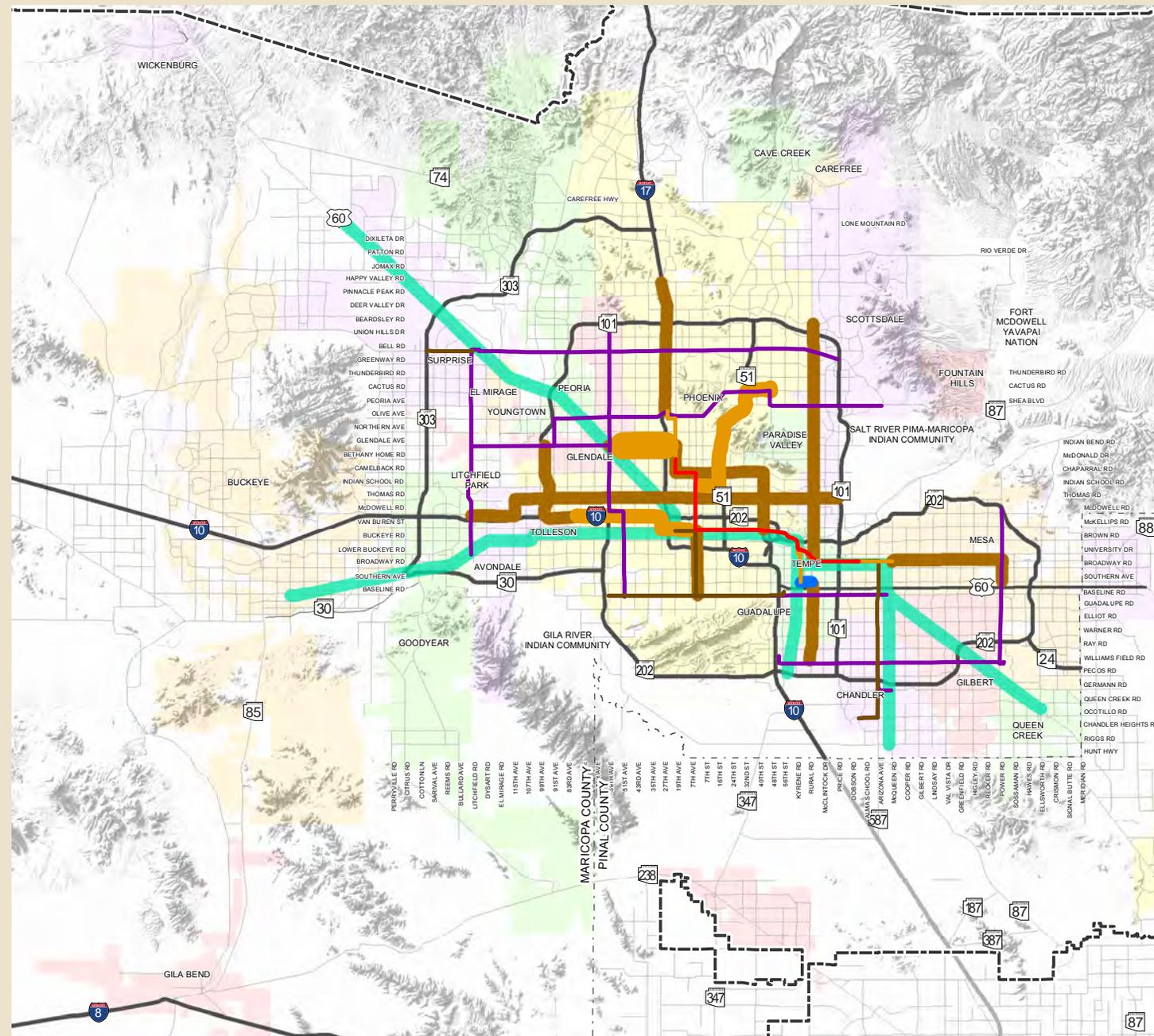


Illustrative
Transit Corridors

- Initial 20-mile Light Rail Segment
- Adopted High Capacity Transit Corridors (RTP Funded) *
- Adopted Arterial Bus Rapid Transit (RTP Funded) *
- Illustrative Modern Streetcar Transit
- Illustrative High Capacity Transit (All-day Service) **
- Illustrative High Capacity Transit (Peak Service) **
- Illustrative Arterial Bus Rapid Transit **
- Freeways
- Other Roads
- Metropolitan Planning Area

* RTP funding based on estimates of reasonably available revenues (2011-2031)

** Illustrative corridors do not have funding identified in the RTP



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Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.

projects are:

- SR-85 (I-10 to I-8) - Upgrading SR-85 to a full freeway, including construction of a fully directional interchange at I-8.
- I-10 / I-17 (System Interchange) - Possible enhancements to the I-10/I-17 “Stack”.
- SR-101L (Agua Fria Freeway) - Installation of direct HOV ramps at the system interchanges with I-17 and I-10.

SECTION THREE

SYSTEM MANAGEMENT, OPERATIONS AND PERFORMANCE

CHAPTER EIGHTEEN

SYSTEM MANAGEMENT AND OPERATIONS

Planning for Systems Management and Operations (SM&O), in the context of surface transportation in large urban regions, refer to that region's approach for continuously striving to optimize the operation and performance of the transportation system. This is generally accomplished through the coordination of multi-modal, cross-jurisdictional traffic management systems and related services that help deliver positive outcomes for the region through improved safety and mobility. The full spectrum of transportation technology applications and related infrastructure, known as Intelligent Transportation Systems (ITS), together with effective practices in traffic management and operations, form the basis for all SM&O programs and services.

Intelligent Transportation Systems (ITS) Infrastructure and Planning

Intelligent Transportation Systems, or ITS, involve the application of advanced sensors, surveillance cameras, computers, electronics and wired and wireless communication technologies in an integrated manner, along with effective management strategies, to improve safety, efficiency and reliability of the surface transportation system. The realization of full benefits from strategic investments in ITS applications and related infrastructure also requires the commitment, support and resources for hiring and retaining skilled personnel. Although automation is utilized in many ITS applications that are owned and operated by public agencies, these systems also depend on skilled technical staff for conducting day-to-day management of traffic operations and the maintenance of equipment.

Intelligent Transportation Systems Infrastructure

At the regional level, MAG has made a firm commitment to support ITS applications and the solutions they provide to enhance the regional transportation system. The Regional Transportation Plan (RTP) has provided funds for systematic regional investments in ITS infrastructure, both on the freeway system and on the arterial system. Most regional investments in ITS have been directed at new infrastructure or technology upgrades. A fully integrated system of ITS infrastructure has been funded by the RTP and implemented on the urban freeway network. This is referred to as the Freeway Management System (FMS) and is heavily utilized by the Arizona Department of Transportation (ADOT) and the Arizona Department of Public Safety to ensure safety and efficiency of freeway operations. The operation and management of the arterial street system is based on jurisdictional boundaries and ownership. Each local agency owns and operates their agency's traffic management system. Local agencies have utilized RTP funds to acquire such systems from different vendors. However, these systems are subject to federal requirements and are all compatible with each other. The region has continued to make investments in expanding ITS infrastructure while delivering improved SM&O during periods of heaviest travel demand.

The products and services related to ITS infrastructure helps improve efficiency, safety and travel time reliability by:

- Collecting and disseminating real-time information on traffic conditions and transit arrival times to aid travelers before and during their trips.
- Relieving traffic congestion by reducing traffic incidents and their impact through better traffic incident management response, traffic flow coordination, detecting and clearing incidents quickly when they occur, and efficient rerouting traffic flow.
- Making road condition information available to drivers to help them better plan their trips and reach desired destinations in a safe and efficient manner.
- Helping freight companies move goods safely and efficiently by utilizing real-time traffic information made available via ITS infrastructure.

National and Regional ITS Architectures

The USDOT led a nationwide effort involving many stakeholder agencies in the development of the first version of the National ITS Architecture (NIA) in 1994. The main goal of the NIA is the development of a nationally interoperable ITS infrastructure. An FHWA rule and FTA policy issued in 2001 requires that ITS projects funded by the Highway Trust Fund and the Mass Transit Account conform to the NIA. This was followed by the 2001 USDOT Rule 940 which stipulates that all federally funded regional ITS projects must: (1) be consistent with a Regional ITS Architecture (RIA); and (2) include a Systems Engineering Analysis.

The MAG Regional ITS Architecture is based on the NIA and provides a common framework for planning, defining, and integrating intelligent transportation systems across a region. It is a product that reflects the contributions of a broad cross-section of the ITS community (transportation practitioners, systems engineers, system developers, technology specialists, consultants, etc.). A comprehensive update of the RIA was performed through a project completed in 2009. The RIA was further updated in 2011 to reflect all programmed ITS projects through 2014. The RIA was modified in 2013 to accurately reflect Version 7.0 of the National ITS Architecture released in 2011 and also to incorporate new ITS projects programmed in the TIP through FY 2017. In addition, the 2013 RIA Update incorporated all Transit ITS applications that are implemented or planned by Valley Metro, thus enabling the regional transit planning agency to fully comply with FTA regulations related to RIA. The MAG RIA is considered a national best practice in ITS planning and has been presented to several national audiences including a webinar to FHWA staff nationwide.

The [RIA](#) is posted at the MAG website as interactive webpages and depicts many details that need to be considered when local agencies begin designing programmed ITS projects. Local agencies are currently utilizing the RIA information pertinent to their jurisdictions to better

define planned ITS projects, during the Design Concept Report stage, thus ensuring regional compatibility and better regionally integrated systems in the future. Figure 18-1 shows how the closed-circuit television (CCTV) camera component of ITS in the City of Phoenix is depicted in the RIA.

All federally funded ITS projects implemented in the MAG region, by both Arizona DOT and local agencies, are required to include a Systems Engineering Analysis (SEA). While MAG is responsible for compliance with the USDOT Rule 940 stipulation on RIA, the responsibility for compliance with SEA requirement is overseen by the local office of FHWA and Arizona DOT.

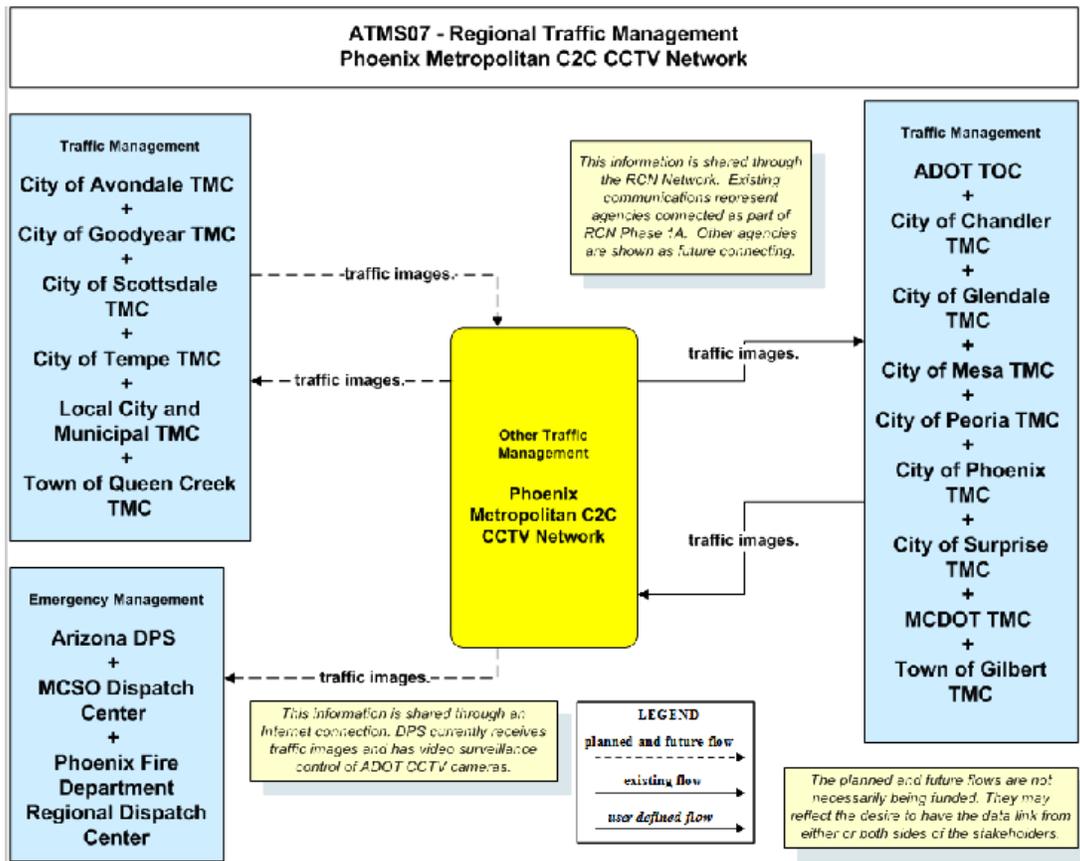
The Regional ITS Architecture defines:

- The stakeholders involved in transportation system.
- The needs of the stakeholders.
- The functions to fulfill the needs (e.g., gather traffic information).
- The physical entities or subsystems where these functions reside (e.g., the field or the vehicle).
- The information flows and data flows that connect the physical subsystems together into an integrated system.
- The standards that govern the smooth functioning of subsystems and information flows (e.g., communication standards).
- The security of all the ITS systems and information (e.g., controlled access to signal system).
- The maintenance of ITS architecture itself.

ITS Strategic Planning

Since 1996, MAG has taken progressive steps toward mainstreaming the development of regional ITS infrastructure within the transportation planning process. All planning activities for public sector owned ITS infrastructure development on freeways and arterials in the region are currently coordinated by MAG. In April 2001, MAG approved the first comprehensive ITS Strategic Plan for the region, which provided direction and guidance for ITS implementation within the region for the next ten years.

**FIGURE 18-1
CITY OF PHOENIX CCTV CAMERAS**



In December 2012, a new ITS Strategic Plan was approved by MAG, which was limited in scope to provide guidance for arterial ITS infrastructure investments. The Plan recommended a shift of focus from recommending specific future projects to identifying programs or emphasis areas. The programming of all available RTP funds for arterial ITS infrastructure improvements through FY 2019 has been completed and was guided by this plan.

Other Regional ITS Initiatives

In recent years, a number of other systems and initiatives have been pursued as part of the regional ITS planning process. These include the following:

- The development and refinement of the regional 24-hour Dynus-T mesoscopic traffic simulation model with dynamic traffic assignment. This model is being utilized extensively in planning for traffic management and operations.
- Development of a Concept of Operations for the I-10 Integrated Corridor Management System, aimed at mitigating the impact of a large regional freeway construction project.

- Regional Traffic Signal Optimization Program that provides technical assistance to local agencies for improving traffic signal operations. This includes providing assistance in obtaining the required signal timing software and providing training for agency personnel.
- Regional Archived Data Service (RADS), which is an archive of transportation system management data from ADOT and various agencies across the region. It is a computer server that is located at the ADOT TOC and administered by Maricopa County. Current information includes freeway speed detector data, Phoenix Fire Computer Aided Dispatch information, traffic signal timing data from various cities and towns, and traffic incident advisories to subscribed agencies.

System Management and Operations

In August 2016, MAG initiated a new study to develop a Systems Management and Operations (SM&O) Plan that would help guide the region in making strategic investments needed to: (1) expand essential ITS infrastructure components, and (2) support a business model that would address the staffing and related resources essential for efficient management and operation of the most critical components of the regional transportation system. The SM&O Plan will supersede previous ITS strategic plans that focused mostly on building infrastructure. The SM&O Plan will identify funding needs for the ten-year period FY2021 through FY2030. A key outcome from the SM&O Plan will be the recommendation of an institutional framework, and the funding support that would be necessary for the management and operation of critical transportation facilities in the region.

Management and Operation of the Urban Freeway System

The Arizona DOT utilizes an integrated package of ITS infrastructure and management strategies, commonly referred to as the Freeway Management System (FMS). The regional FMS first became operational in 1996 and currently provides surveillance, incident management, travel time displays and traveler advisory functions. All FMS operations are centrally coordinated from the ADOT Traffic Operations Center (TOC) which is staffed 24 hours. The TOC also serves as a statewide emergency coordination center during freeway emergencies.

- Freeway Management System - One of the key functions of the FMS is dissemination of real-time information on freeway traffic conditions. This is accomplished via real-time traffic speed maps and camera images available on the internet at www.az511.gov. This website is heavily utilized by local television and radio traffic reporters as well as members of the public to obtain freeway condition information. Information on freeway construction activities and major traffic incidents is also available via the telephone based 5-1-1 traveler information system. A joint MAG-ADOT project, completed in June 2007, extended the availability of freeway condition information to the public via cellular phones with access to the internet (www.az511.gov/pda/). Real-

time point-to-point estimated travel times are generated from traffic data gathered by sensors, and displayed on Dynamic Message Signs (DMS). In 2014, ADOT and MAG jointly funded a pilot project to co-locate Department of Public Safety troopers at the TOC for more efficient responses to freeway incidents blockages.

Based on a 2006 review of the FMS needs, some funds were allocated for increased maintenance of field devices, and the need to replace aging FMS devices. This was seen as essential for improving the overall reliability of the system. A 2014 review of funding priorities for completion of the FMS resulted in the approval of RTP funds for adding new coverage through FY 2019.

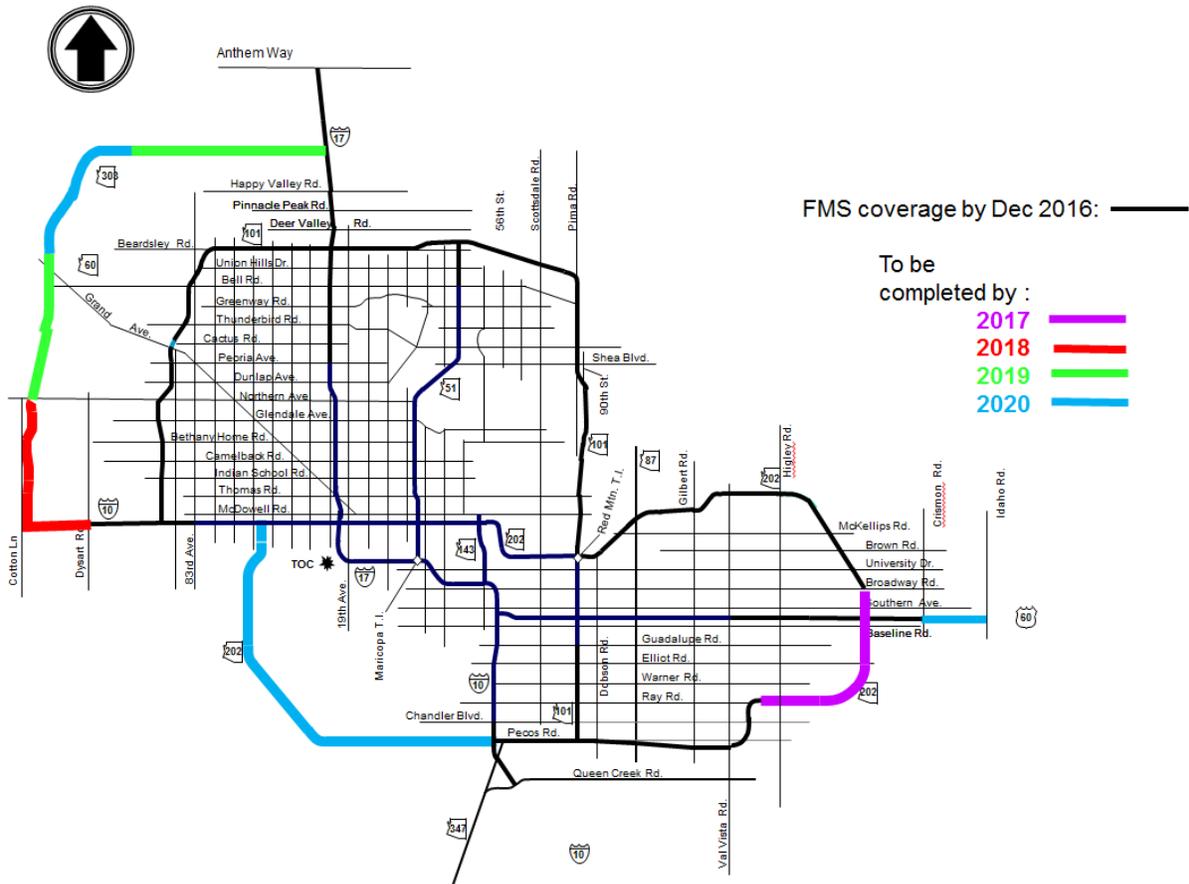
The extent of coverage of the regional FMS, as of late 2016, is approximately 200 miles. The system includes a total of 144 DMSs, 257 cameras and 225 metered entrance ramps. It is estimated that by 2020 the total FMS coverage on all regional freeways will be approximately 290 miles. This will include 35 miles of coverage on Loop 303, which was not included in the original Plan. All required FMS infrastructure on the Loop 202/South Mountain Freeway and the Williams Gateway Parkway are funded separately by each project.

Figure 18-2 shows the existing and projected expansion of the regional FMS based on resources allocated towards this project in the RTP. It is anticipated that the planned FMS coverage will be completed by 2020.

A number of new traffic information services have been launched by private sector agencies that utilize existing information sources such as the FMS, supplemented by additional traffic data generated by private data providers. As a result, real-time freeway speed information beyond the current FMS coverage is now available at a number of websites supported by companies such as Google, INRIX and SigAlert. Approximately 10 DMSs on the FMS are currently displaying travel times based on speed data purchased from private data providers. The need for such data is expected to be eliminated when the FMS coverage is completed.

- Freeway Service Patrol Program - The Freeway Service Patrol (FSP) Program is an important regional strategy that supports safe and efficient management and operation of the freeway system. This program is included as an element of the Regional Transportation Plan, with \$1million/year in state funds for the FSP identified in the Transportation Improvement Program (TIP). The many services provided by the FSP include: (1) removing road debris and abandoned vehicles, (2) helping change tires, (3) providing emergency gasoline, and (4) transporting stranded motorist off the freeway system as soon as possible. The program is extremely popular with the traveling public, with over 14,000 stranded motorists helped during 2015. Table 18-1 provides a brief summary of the services provided by the Freeway Service Patrol program in years 2011 through 2015.

**FIGURE 18-2
FREEWAY MANAGEMENT SYSTEM**



Source: ADOT FMS Information, October 2016

**TABLE 18-1
SUMMARY OF FREEWAY SERVICE PATROL ASSISTANCE**

	2011	2012	2013	2014	2015
Miles Driven	381,473	326,066	303,174	353,201	501,075
Assistance at Crash Scenes	331	337	421	601	686
Motorists Assisted	10,457	8,910	9,145	10,374	14,532

Source: FSP Quarterly Reports, Department of Public Safety

- Co-location of DPS Troopers at the TOC - In 2014, a three-year pilot project that was jointly sponsored ADOT and MAG helped co-locate DPS troopers at the ADOT Traffic Operations Center (TOC) to help improve the coordination and efficiency of traffic incident management activities. This has resulted in significant improvements and recent estimates have shown the pilot project has produced a benefit to cost ratio of 250 to 1. The annual benefit to the MAG region due to reduced congestion alone has been estimated at nearly \$112million, while the annual cost of the program is about \$425,000. These results illustrate that co-location of DPS troopers at the ADOT TOC has helped make a significant improvement to traffic incident management and should be considered as an essential function of the ADOT TOC in the future, with likely benefits for both regional and statewide traffic operations.

Management and Operation of the Arterial Street System

The responsibility for management and operation of the arterial street system is based on jurisdictional boundaries and facility ownership. Every local agency owns and operates the agency's traffic signals and related management systems with a few exceptions such as arterial traffic signals at freeway traffic interchanges, where the signals are owned by ADOT but operated by the local agency. Both Maricopa County and Pinal County are responsible for the management and operation of roads that are located within unincorporated County areas. Most of the larger cities and towns in the region have installed computerized traffic management systems, which are managed and operated from that jurisdiction's Traffic Management Center (TMC). The region currently has 13 TMCs. A few of the TMCs also house local law enforcement units and serve as local emergency coordination centers.

In 2011, MAG developed a comprehensive web-based summary of [Regional Transportation Systems Management and Operations](#) for the arterial street system. Tables 18-2 and 18-3 show updated summaries of the arterial ITS infrastructure and related operations in the region. The management and operation of traffic flow on arterial streets is the sole responsibility of individual MAG jurisdictions. The coordination of traffic operations across the many jurisdictional boundaries is accomplished through on-going regional dialogue among agency technical staff.

Planning for operations, at the regional level, is addressed by MAG through the ITS Committee where infrastructure improvement needs, as well as operational issues, are discussed. The committee provides recommendations for infrastructure improvements to be funded through the MAG TIP process. Special studies that may be required for exploring complex issues related to traffic operations are carried out through the MAG Work Program. An example is the Emergency Vehicle Pre-emption (EVP) Study that developed a state of the practice report.

Discussions related traffic operations, on a more detailed technical level, are coordinated and held under the AZTech banner. AZTech is a voluntary traffic management technical collaboration for public agencies in Maricopa County, co-chaired by Arizona DOT and Maricopa

County. ITS projects implemented by local agencies or Arizona DOT, that are funded by the RTP and the MAG TIP process, may sometimes be seen as referred to as AZTech projects.

The focus of local jurisdictions is to manage and operate the arterial street system to maximize the levels of safety and efficiency on the entire arterial grid system. Emphasis is generally given to north-to-south and east-to-west traffic flows, as determined by operators at local TMCs based on actual or anticipated conditions.

**TABLE 18-2
SIGNAL SYSTEM RESPONSIBILITIES**

Jurisdiction/Agency	# of Signals Owned	# of Signals Centrally Operated	# of Signals Maintained
Apache Junction, City of	32	N/A	32
Avondale, City of	47	10	63
Buckeye, City of	20	0	20
Carefree, Town of	2*	N/A	2*
Cave Creek, Town of	6*	0	6*
Chandler, City of	218	208	218
El Mirage, City of	12	N/A	12
Florence, Town of	7*	N/A	7*
Fort McDowell Yavapai Nation			
Fountain Hills, Town of	13	0	13
Gila Bend, Town of	1*	N/A	1*
Gila River IC	7	0	7
Gilbert, Town of	188	188	188
Glendale, City of	201	161	201
Goodyear, City of	88	51	88
Guadalupe, Town of	5*	N/A	5*
Litchfield Park, City of	7*	N/A	7*
Maricopa, City of	15	0	15
Maricopa County	143	120	158
Mesa, City of	422	455	455
Paradise Valley, Town of	12	12	12
Peoria, City of	118	116	118
Phoenix, City of	1138	1098	1138
Pinal County	29	0	29
Queen Creek, Town of	47	38	47
Salt River Pima Maricopa IC			
Scottsdale, City of	300	280	300
Surprise, City of	50	49	50
Tempe, City of	206	208	226
Tolleson, City of	13	0	13
Wickenburg, Town of	3*	N/A	3*
Youngtown, Town of	5*	N/A	5*
Total	3319	2994	3403

Note: * Identified from crash data

**TABLE 18-3
TRAFFIC MANAGEMENT AND OPERATIONS CENTERS**

Jurisdiction/Agency	Existing	Planned	Existing Traffic Management Center						
			Hours of Coverage				Square Footage		
			Peak	Business	Business+	24/7	<500	500-1000	>1000
Apache Junction, City of									
Avondale, City of	X				X		X		
Buckeye, City of		X							
Carefree, Town of									
Cave Creek, Town of									
Chandler, City of	X			X				X	
El Mirage, City of									
Florence, Town of									
Fort McDowell Yavapai Nation									
Fountain Hills, Town of									
Gila Bend, Town of									
Gila River IC									
Gilbert, Town of	X		X	X			X		
Glendale, City of	X				X			X	
Goodyear, City of	X				X		X		
Guadalupe, Town of									
Litchfield Park, City of									
Maricopa, City of		X							
Maricopa County	X				X				X
Mesa, City of	X				X				X
Paradise Valley, Town of									
Peoria, City of	X			X				X	X
Phoenix, City of	X				X			X	
Pinal County									
Queen Creek, Town of	X				X		X		
Salt River Pima Maricopa IC									
Scottsdale, City of	X				X				X
Surprise, City of	X		X					X	
Tempe, City of	X				X				X
Tolleson, City of									
Wickenburg, Town of									
Youngtown, Town of									

Management and Operation of the Public Transportation System

Advanced Public Transportation Systems (APTS) are defined as advanced technology based ITS applications in public transportation. These applications are relevant to fixed route bus, paratransit, vanpool, and rail. These technologies can be used to improve passenger convenience, vehicle operations, and mechanical systems. Passenger convenience technologies directly benefit passengers through advanced traveler information, real-time schedule updates, and fare payment. Vehicle operations technologies are associated with dispatching vehicles and in-vehicle systems. Mechanical systems technologies are designed to remotely monitor the electrical and mechanical infrastructure of transit vehicles.

Over the years, Valley Metro's Vehicle Management System (VMS) Master Plan has served as the regional guide for implementing APTS applications in the region. Full implementation of the VMS, which was completed in 2005, has resulted in an integrated system with components on 750 fixed-route buses, 200 paratransit (Dial-A-Ride) vehicles and 60 support vehicles. It also includes a Computer Aided Dispatch (CAD) system to track and manage the day-to-day operations of the region's transit vehicle fleet. Other features and devices installed in transit vehicles include: (1) a radio communication system, (2) an Automatic Vehicle Location (AVL) system, which uses Global Positioning Satellite (GPS) receivers to track vehicle location, (3) a next stop announcement system, and (4) an automatic passenger counting system, which has been installed on some transit vehicles. The VMS is engineered to be scalable to accommodate any future growth of Valley Metro operations.

In 2011, the region's first real-time transit arrival information system NextRide was launched. It provides real-time information on the next bus or train arrival times at any bus or train stop in the region. This information can also be received on a cell phone by sending a text message with the bus/train stop ID. The region's most advanced transit ITS applications are currently seen on the Arizona Avenue LINK bus route. This application provides next bus arrival information at bus stops, utilizes queue jump at signalized intersections to reduce intersection delay, and also provides free WiFi to passengers on the buses.

All bus transit operations are centrally managed from the Transit Control Center (TCC). The control center dedicated to Light Rail Transit (LRT) operations is located immediately adjacent to the TCC.

Integrated Corridor Management

The development of fully integrated traffic operations between freeways and adjacent arterials has long been a regional goal. The 2003 Regional Concept of Transportation Operations established a goal of establishing up to three Integrated Corridor Management (ICM) corridors. The development of ICM corridors in the MAG region is complicated by the fact that freeways and arterials are managed by separate agencies, often with different traffic management infrastructure that do not communicate well.

The primary goal of ICM is to coordinate the operation of freeways by ADOT, with adjacent arterial streets operated by local jurisdictions. The focus of ICM initiatives is to address traffic incident management issues on heavily traveled corridors within the region, through collaboration between MAG, DPS, ADOT and all affected local agencies. MAG has developed the necessary tools and has begun to provide planning support through analysis, modeling and simulation, for evaluating ICM strategies and testing effective traffic management tools.

MAG is working with ADOT and member agencies in developing incremental ICM solutions towards this goal, focusing initially the I-10 corridor that runs through Central Phoenix, which is the busiest interstate segment in Arizona. In recent years, significant progress has been made in developing efficient traffic signal timing strategies that could be quickly implemented during

major freeway closures. An ICM Playbook has been developed to fully address all possible freeway closures on an eight-mile freeway segment between I-17 and Loop 101. Based on these and other accomplishments in ICM, in 2015 the USDOT selected the MAG region as one of 13 sites to receive an ICM planning grant. This grant is currently being utilized to develop an ICM plan for the entire I-10 corridor (See Figure 18-3). Similar efforts are also underway to implement ICM strategies by ADOT and the City of Scottsdale in the Loop 101 corridor, and by MAG and the cities Tempe, Mesa and Gilbert in the US 60 corridor.

**FIGURE 18-3
INTEGRATED CORRIDOR MANGEMENT on I-10**



Funding for System Management and Operations

The 2003 RTP separately identified funds for ITS infrastructure on freeways and for arterials over the life of the Plan. In 2006, to help obligate CMAQ funds more efficiently, all arterial ITS funds were accelerated to the first ten-years of the RTP. While this accelerated the deployment of ITS infrastructure on the arterials, it also resulted in spending the RTP funds faster. All RTP funds that were identified for ITS infrastructure on arterials have now been fully programmed through FY 2019. It is anticipated that future discussions would lead to the identification of potential RTP funds for arterial ITS infrastructure projects through FY 2025.

A MAG survey of member agencies, conducted in 2014, to identify arterial ITS infrastructure needs estimated that nearly \$10 million per year would be needed to address the needs. In the annual distribution of CMAQ funds to the MAG region by the state, an amount of nearly \$8million/year has been identified for ITS infrastructure on freeways.

CHAPTER NINETEEN

DEMAND MANAGEMENT

The MAG region benefits from a broad range of demand management techniques and programs. Transportation Demand Management (TDM) reduces congestion by encouraging more efficient use of existing transportation infrastructure through alternatives to driving alone. Reducing vehicle miles traveled also helps improve air quality by decreasing vehicular emissions contributing to the total amount of air pollutants. TDM activities in the MAG region are described below.

Transportation Demand Management Programs

TDM programs encourage reductions in travel demand within the transportation system. TDM activities generally focus on both improved travel choice and incentives to reduce driving alone. These programs promote alternatives to driving alone, including carpooling, vanpooling, transit, walking, and bicycling. TDM also encourages alternative work schedules that reduce trips, including teleworking and compressed work schedules. TDM activities generally focus on commute trips and student trips during peak travel periods. In this region, MAG provides funding for TDM activities conducted by the Regional Public Transportation Authority (Valley Metro/RPTA), the Arizona Department of Administration, and Maricopa County Air Quality Department.

Regional Rideshare and Telework Program (Commute Solutions)

Valley Metro/RPTA receives funding from the Arizona Department of Environmental Quality, MAG, and the Maricopa County Air Quality Department to encourage commuters and employers to use alternative transportation modes and work schedules throughout the MAG region. Valley Metro/RPTA promotes alternative transportation modes including carpooling, bicycling and walking, subsidized transit fare, vanpools, teleworking and compressed work schedules through a variety of services, including a free on-line trip matching service, the promotion of Single-Occupancy Vehicle (SOV) alternatives, assistance to employers in the Maricopa County Trip Reduction Program, and a regional vanpool program.

- **Trip Matching** - Valley Metro/RPTA services include a web-based trip matching service at ShareTheRide.com that provides online ridematching and commute tracking. The service matches commuters based on proximity, destination and travel route, as well as schedules and preferences. The online tool connects commuters to a secure online matching program that displays carpooling, vanpooling, transit, and bicycle options. Valley Metro/RPTA also assists the general public with seeking a commute partner should they not have access to the online system. ShareTheRide also manages online contests for alternative mode users, calculates pollution savings from alternative mode usage on an individual or custom subsite basis, and also calculates gas savings and the financial savings associated with alternative mode usage.

The service also allows employers in the Maricopa County Trip Reduction Program to manage their Trip Reduction Plan (TRP) by administering custom subsites, obtaining reports of employees who are applicants, enter employee applications for employees without Internet access, include online matching services with other trip reduction efforts, monitor employee usage of alternative modes as recorded in the system, and facilitate contests as incentives to promote alternative mode usage. From FY 2012 to FY 2016, the number of companies using ShareTheRide to manage their TRP increased from 170 to 400, an increase of more than 135 percent.

ShareTheRide.com is a single source for alternative transportation information and is used as the call to action for all Valley Metro Commute solutions marketing efforts. The home page is attractively organized with large modal icons that can link site visitors to information on any mode of interest with a single click. At the bottom of the home page, areas of valleymetro.org most requested by Transportation Coordinators (TCs) are accessible with a single click-information such as the online material order form, event calendar, and High Pollution Advisory (HPA) information.

- SOV Alternatives Campaigns - Valley Metro/RPTA promotes SOV alternatives by developing and implementing campaigns and contests, enhancing online resources, contacting employers and providing regional advocacy for alternative modes and schedules, and by developing materials that educate users how to implement alternative modes and schedules. Each year, a communications plan is developed to encourage commuters to seek options to driving alone. Each April, a phone survey is conducted to measure commute mode choice, shifts to and away from SOV use, and to examine opinions regarding transit, rideshare, air quality and traffic issues. The survey helps staff determine marketing strategies and measure awareness and effectiveness of Valley Metro/RPTA programs and services.

Valley Metro/RPTA uses a number of campaigns, including Rideshare Month and Valley Bike Month, to bring awareness and attention to alternatives to driving alone. With campaigns and communication efforts, commuters and companies are educated about who provides commuter solutions and defines the available solutions.

Rideshare Month is held in October to bring awareness to ridesharing options, such as carpool, vanpool, and riding transit. Communication efforts and materials direct the audience to ShareTheRide.com to create an account to find carpool, bus and light rail travel options and to log daily commute trips for a chance to win prizes. Sometimes events are held to inform participants about alternative modes and schedules. Commuter challenges offer an additional opportunity for prizes when employees use an alternative mode of transportation one or more days during the week.

Valley Bike Month is held in April each year to bring attention to bicycling as an alternative mode for commuting and other trip purposes. People are encouraged to participate in biking events throughout the Valley, such as family fun rides, bike expos

and safety events. Bicycle safety and education information was provided at various Valley events, and cities sponsor close to two dozen special events to encourage bicycling. Events also include bike to work and school days. Bicycle rodeos are hosted to teach safe bicycling behavior. Valley Bike Month is a regional effort that relies on the partnership of both public and private organizations. Activities are promoted Valley-wide through cities and employers in the Maricopa County TRP.

The Clean Air Campaign Awards luncheon is held to honor individuals and organizations that demonstrate outstanding efforts in support of clean air programs and alternative mode usage. The event is made possible by sponsors and corporate donations. Award recipients were nominated in one of 25 categories. More than 500 attend each annual event.

In addition, on-line contests are administered to encourage commuters to register and track commute trips in the online trip matching system, ShareTheRide.com. Creating a larger database of potential ride matches increases the likelihood a new user will be matched successfully. Some prizes for online contests are donated by community organizations that support the clean air and reduced congestion messages provided to commuters.

- Employer/Employee Education and Partnerships - Valley Metro/RPTA develops brochures, informational materials, collateral materials and promotional items that promote alternative modes and schedules. Each year, a communications plan is developed that includes electronic newsletters, media and general public events to educate the public about transportation and commute options and benefits, periodic news releases to coincide with campaigns and annual survey results, and social media, including Facebook and Twitter postings. Each year, a campaign is developed to educate and encourage Valley residents to use alternative modes and work schedules, and other commute solutions. Methods of distribution include print materials, paid and unpaid media, public and media relations, and special events.

In addition, employer and general-public online resources are provided at ShareTheRide.com and ValleyMetro.org to enable employers build sustainable and effective alternative transportation mode programs, and to assist commuters with identifying the commute solution that best meets their individual needs. Each year, ShareTheRide.com is enhanced to improve the user experience, such as enhancing integration between ShareTheRide.com and ValleyMetro.org, adding commuter challenges and new user contests, exploring integration of social media, and improving appearance and functionality of calendar pages, user dashboard pages, and contest pages.

Valley employers are routinely contacted to increase use of alternative commute modes by their employees. Programs include, but are not limited to, carpooling, vanpooling, transit, telework, compressed work weeks, proximate commuting, and fare media

availability/access. Techniques such as online training and employer on-site presentations are used to encourage use of alternative commute modes.

Valley Metro/RPTA also seeks partnerships with employers and related community organizations to expand educational opportunities about alternative commute modes and work schedules. Staff coordinates with other organizations on measures that may impact the potential for alternative mode use including High Occupancy Vehicle facilities, new development, transit service and extensions, carsharing and bike sharing programs, and parking or zoning issues.

Valley Metro/RPTA works with major retailers to provide transit fares at retail outlets. This program reduces the cost of transit fares for passengers, saves time for transit riders, provides access to lower-cost passes in areas with Title VI populations and expands communication channels to additional businesses. Transit users may obtain a list of retail locations selling transit passes by visiting valleymetro.org. Transit users can also clearly see which fare types are sold at different retail locations. Site visitors may search by zip code or city name. There are now nearly 800 retail locations where passes can be purchased (an increase from 50 locations since mid-2009).

Trip Reduction Program

Mandated by Arizona legislation in 1988, employers with 100 or more workers at a site began participating in the Maricopa County Trip Reduction Program (TRP) in 1989. Participating employers are required to conduct an annual survey of the commuting modes of their employees, and prepare and implement a travel reduction plan to reduce the rates of single-occupancy vehicle trips or the single occupancy vehicle miles traveled. The program was amended in July 1994 to include employers with 50 or more employees. In the summer of 1996, a special session of the legislature passed an innovative enhancement to the TRP whereby employers would be allowed to implement several new "flexibility" strategies to meet TRP goals. Under these flexibility provisions, employers have an expanded menu of measures for implementation, including reduction of business-related vehicle trips, off-peak hour commuting, reduced use of other gasoline powered equipment, and stationary source emission reductions. As of FY 2015, approximately 2,985 sites representing 1,158 employers with 796,288 employees and driving-age students participate in the TRP.

The Trip Reduction Program is administered by the Maricopa County Air Quality Department, and Valley Metro/RPTA receives funding from Maricopa County to provide training and technical assistance through individual assistance, promotion and informational and educational materials to TRP employers on the requirements of the law including the survey process, plan writing, documentation, and the types of alternative modes and trip reduction strategies that may be used in achieving the prescribed reductions in single occupant vehicle trips or single occupant vehicle miles traveled. Valley Metro/RPTA also assists in the facilitation of Transportation Coordinator Associations in which employers share resources to promote alternative mode use, improve mobility, or implement trip reduction programs in their local

areas. There are five TCAs in the MAG Region. Finally, Valley Metro/RPTA conducts a year round campaign for employees which may include print materials, paid media, public and media relations, public affairs, and events that encourage weekly use of trip reduction solutions.

Travel Reduction Programs

The Arizona Department of Administration Office of Travel Reduction Programs encourages state employees in Maricopa County to use alternative modes of transportation through instruction, promotion, and incentives. In addition, the Travel Reduction Programs Office offers carpool matching and other rideshare services through Capitol Rideshare to all state employees located in Maricopa County. The Office of Travel Reduction Programs assists state agencies in meeting their travel reduction goals, designs and implements the State of Arizona Travel Reduction Plan for Maricopa County, and provides education and motivation for more than 23,000 state employees.

Vanpool Program

Valley Metro/RPTA has provided vanpool service to interested commuters since 1987. The clearly marked vans are provided to qualifying groups of six to 15 commuters, driven by one of the vanpool members. Passengers share the cost of operating the van by paying a monthly fee. The fee includes fuel, insurance and vehicle maintenance costs. In FY 2015, nearly 1.1 million passenger trips were made in approximately 400 vanpools. A Valley Metro/RPTA contractor, vRide, provides insurance, fleet services, and billing, and federal reporting. Vanpooling is one of the Transportation Demand Management strategies many employers have implemented as a Trip Reduction Program measure.

The Valley Metro/RPTA vanpool program has a 100 percent farebox recovery goal. Farebox recovery is the percentage of operating costs in a public transit system that are paid by users of the system. In FY 2015, the program had a 109.8 percent fare recovery. In FY 2012, staff introduced a pilot program to add bicycle racks to vanpool vehicles. Currently, approximately five percent of the vehicle fleet has bicycle racks. The program helps improve air quality by removing cold-start trips and short-distance SOV trips.

Teleconferencing / Videoconferencing Project

MAG has established a Teleconferencing Program to link MAG and its member agencies via teleconferencing. The MAG Regional Videoconferencing System Project is designed to facilitate communication between agencies while reducing the need to travel to meetings. The MAG Regional Videoconferencing System has a central videoconferencing location at the MAG offices and satellite locations housed at each member agency. This system allows for communication between MAG and its member agencies as well as among member agencies without direct participation by MAG. The system provides extensive audioconferencing for MAG member agencies.

Funding Outlook

Transportation Demand Management programs will be funded by a number of revenue sources during the planning period. Regional funding sources, as well as local transit funding sources, contribute to rideshare, trip and travel reduction, and vanpool activities. During the planning period, it is estimated that a total of \$153million will be devoted to vanpool programs, and approximately \$64 million for rideshare, trip reduction, and other travel demand management activities.

CHAPTER TWENTY

CONGESTION MANAGEMENT PROCESS

The Congestion Management Process (CMP) is an objectives-driven, performance-based systematic approach to addressing traffic congestion problems and their effects throughout the MAG Transportation Management Area. The CMP is intended to address congestion through effective development, management and operation of transportation facilities and services, as well as to implement effective strategies and solutions to reduce mobility problems in the region.

Information included in this chapter refers to congestion management applications, including the series of strategies to address congestion, and the development and implementation of the Congestion Management Process as mandated by MAP-21 and continued in the Fixing America's Surface Transportation (FAST) Act. This regulation mandates the establishment of an integrated Congestion Management Process (CMP) that is cooperatively developed and implemented, resulting in a metropolitan wide strategy for transportation facilities through the use of travel demand reduction and operational management strategies.

Congestion Management Concepts

Congestion results when traffic demand approaches or exceeds the available capacity of the system and travel time becomes unreliable. Congestion can be grouped into two categories: recurring congestion and non-recurring congestion. Recurring congestion typically occurs during peak travel periods when traffic volumes are high, while non-recurring congestion (NRC) is a more random phenomenon. Generally, traffic incidents and road construction are the primary causes of NRC.

Throughout the nation, regions utilize a variety of roadway and transit improvement programs in an effort to reduce traffic congestion. These programs generally cover four major strategies: (1) managing the existing system, (2) expanding public transit service, (3) reducing peak-period travel demand, and (4) constructing additional roadway capacity. Specific methods may include: coordinating traffic signals; using other intelligent transportation system approaches; promoting the use of buses, light rail and carpooling; implementing programs that reduce peak-hour travel demand; and constructing intersection and other road capacity additions.

Over the last two decades, the two primary factors responsible for increased traffic congestion within the MAG Region have generally been an increase in population and a strong economy. These factors resulted in high rates of urban metropolitan growth, and also brought significant levels of development to previously undeveloped lands on the urban fringe. Such internal and peripheral growth created greater travel demand throughout the region, bringing about higher traffic volumes and congestion on the existing freeway and arterial roadway network.

The great recession during 2008-2009 interrupted past high growth rates. However, recent

estimates indicate that the employment base and most regional economic indicators are continuing to experience improvement. This slow but steady pace of economic recovery during the last three years has had an effect on the demand for additional transportation facilities in the MAG region. Recently observed data and analysis shows somewhat higher travel times experienced in the afternoon peak period on freeways and especially on arterials.

Federal Congestion Management Requirements

The overall planning and programming process used at MAG and at other metropolitan planning organizations is driven by regulations put forth by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), two of the modal administrations of the United States Department of Transportation. FHWA and FTA issue regulations and policies that put into practice legislation that Congress passes authorizing federal funding for transportation. Federal requirements state that regions with more than 200,000 people, known as Transportation Management Areas (TMAs), must maintain a Congestion Management Process (CMP) and use it to inform transportation planning and decision-making.

These requirements were originally introduced by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, establishing the need for a Congestion Management System and were continued under the successor law, the Transportation Equity Act for the 21st Century (TEA-21). The Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) introduced a change to the reporting format and content, requiring a “congestion management process”. The goal of the law was to utilize a process that is an integral component of metropolitan transportation planning.

The latest federal transportation legislation continues congestion management requirements, as contained in the Moving Ahead for Progress in the 21st Century Act, (MAP-21) and the Fixing America’s Surface Transportation (FAST) Act, signed into law by President Obama on July 6, 2012 and December 4, 2015 respectively. Current transportation legislation emphasizes the need for performance measurement in planning and programming activities at the national, state and MPO levels. The performance and congestion management elements of MAP-21/FAST have been incorporated into the MAG transportation planning process.

Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)

The Congestion Management Process (CMP) was originally introduced in, 2005, when the President signed the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). As part of this Act, guidance was provided on the desired features of the congestion management process in transportation management areas. These focus areas have been incorporated in the new MAP-21 and FAST Act requirements.

Key features of the process include:

- Methods to monitor and evaluate the performance of the multimodal transportation system.
- Definition of congestion management objectives and appropriate performance measures.
- Establishment of a coordinated program for data collection and system performance monitoring.
- Identification and evaluation of anticipated performance and expected benefits of appropriate congestion management strategies.
- Identification of an implementation schedule, implementation responsibilities, and possible funding sources.
- Implementation of a process for periodic assessment of the effectiveness of implemented strategies.

The Fixing America's Surface Transportation Act (FAST)

Under FAST, U.S. DOT has established performance measures requiring state DOTs to develop performance targets in consultation with metropolitan planning organizations (MPOs) and others. The language in the bill stipulates that states must make cost-effective and efficient transportation investments that make progress toward these performance targets. MPOs must incorporate these performance measures and targets into their Transportation Improvement Programs (TIPs) and Long Range Transportation Plans; additionally, MPOs are also required to report on how these investments will make progress toward meeting those targets.

Performance measures under FAST introduce significant modifications to the federal-aid highway program and provide a means to accomplish the most efficient investment of federal funds. This is done by refocusing on national transportation goals, increasing accountability and transparency, as well as improving project decision making through performance-based planning and programming.

FAST identifies seven thematic areas for which the Secretary of Transportation has determined performance measures. These areas include:

- (1) Safety
- (2) Infrastructure condition
- (3) Congestion reduction
- (4) System reliability
- (5) Freight movement and economic vitality
- (6) Environmental sustainability

(7) Reduced project delivery delays

MAG Congestion Management Activities

MAG has pursued a broad range of programs in response to the need to address congestion issues in the region. These have included early efforts in the area of travel demand reduction and operational strategies, as well as programs directed at system performance monitoring and assessment. Most recently, efforts have focused on the MAG Congestion Management Process.

Travel Demand Reduction and Operational Strategies

The MAG Region currently benefits from a broad range of strategies for travel demand management, promotion of alternative modes, and optimization of operational procedures. Initially, the identification and selection of travel demand reduction strategies was a function of the collaborative MAG Congestion Management System (CMS) Working Group, which was established under TEA-21 and ISTEA. Through this process, a variety of alternative transportation options were developed in an effort to reduce congestion throughout the greater metropolitan region. These programs included carpooling, vanpooling, walking, bicycling, alternative/ compressed work schedules, and as telework programs. In order to develop project priorities and implementation schedules, the CMS Working Group process took into account the impact of each strategy on system performance, efficiencies as well as available funding and geographic conditions.

A number of projects are generated from individual MAG modal committees, taking into account MAG modal funding policies. This is the case for operations management strategies and improvements, which are identified and assessed by the MAG Intelligent Transportation Systems (ITS) and Safety Committees. Criteria applied by the ITS committee include whether the project has leveraged partners of adjacent jurisdictions to have greater impact, whether the project complies with the ITS Strategic Plan Guidelines, and if it is integrated with the Regional ITS Architecture.

Performance Monitoring and Assessment

MAG has an ongoing program for data collection and system monitoring, which includes periodic surveys of travel characteristics such as traffic volumes, travel times, congestion levels, occupancy rates, vehicle classification, trip making properties, and public transit user factors. This information is used to assess current conditions and provide data to enhance the MAG travel demand modeling capability.

In addition, continuing to place emphasis on performance-based planning, MAG has established an ongoing Transportation System Performance Monitoring and Assessment Program. Over the last four years, this program has developed various reporting methodologies and web-based components, allowing policymakers, technical users and the public in general easy access to

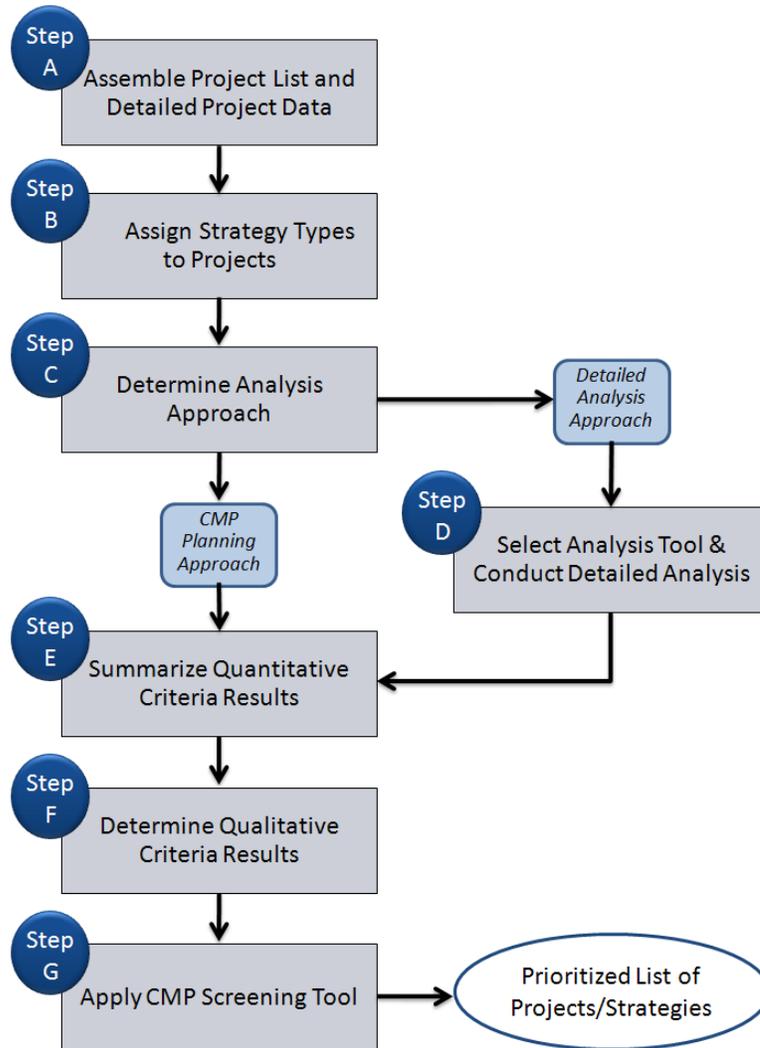
performance data and visualization. MAG has developed a Performance Measures Framework and Regional Performance Report, to illustrate the most important characteristics associated with the status of surface transportation in the MAG region. Measures captured in these multi-modal documents include VMT, throughput, speeds, spatial and temporal congestion, as well as travel times for the MAG modeling area. The MAG Performance Report is based on observed data sets and constitutes a fundamental tool in the CMP evaluation process. Not only does it establish benchmarks for evaluating current year performance and congestion levels, but in time will allow for historic data archiving that will facilitate trend analysis.

MAG Congestion Management Process

MAG conducted an update of its congestion management process (CMP), through the participation of the MAG CMP Working Group. This effort relied on historical and current traffic data analysis and culminated in a Congestion Management Process Report published in December of 2009. The CMP comprises two main criteria: (1) the establishment of a series of strategies to address congestion, and (2) the development and implementation of a CMP evaluative Sketch Tool. The elements that were considered include performance measures, data collection and system monitoring, the identification and evaluation of proposed strategies, the implementation of those strategies, and the evaluation of the effectiveness of those strategies.

- CMP Sketch Tool - The CMP Sketch Tool provides a step by step sketch planning approach that facilitates the analysis process for evaluating congestion management strategies or projects. The core of the tool is a spreadsheet that uses both quantitative and qualitative criteria to assess strategy and project effectiveness and to assist in the assignment of ranks to projects so they can be prioritized. The process and sketch planning tool are designed to be applied to sets of projects or congestion management strategies for which some quantitative data is available. Figure 20-1 depicts the structure of the CMP Sketch Tool. Target outcome for development of the CMP Sketch Tool included:
 - Assist in generating an evaluation and ranking of projects for programming during each application cycle.
 - Identify and document process in meeting the Regional Transportation Plan goals.
 - Meet FHWA requirements.
 - Provide a tested and accepted practice for evaluating projects if funding is increased or decreased in the adopted TIP.
 - Determine data collection needs and propose methods to address gaps in data collection that strengthens the quantitative evaluation.

**FIGURE 20 -1
MAG CMP SKETCH TOOL STRUCTURE**



The CMP makes use of existing performance measurement systems that monitor and report on the status of the transportation network. These measures are an integral part of the MAG CMP sketch tool, which incorporates evaluative elements for each of the modes including criteria developed by modal committees. The CMP tool also provides input to the development of the Transportation Improvement Program (TIP), using quantitative and qualitative methods to assist MAG committees in considering the merits of proposed projects under consideration for competitive funding.

- CMP in the Programming Process - A key component of MAG’s congestion management activities is the periodic updating of the Transportation Improvement Program (TIP).

This is the most important application of the updated Congestion Management Process and tools. Taking into account quantitative and qualitative factors, MAG's congestion management strategies have been implemented using the updated CMP model, combined with the modal committee-based recommendations. This process has been applied in the development of the MAG TIP since 2009.

For projects funded through the Congestion Mitigation and Air Quality (CMAQ) Improvement program, which constitutes a federally funded program, MAG has developed methodologies for quantifying emission reductions and cost effectiveness. As part of the programming process, jurisdictions are requested to submit annual requests for federally funded projects, through the MAG Management Committee, Transportation Review Committee, and MAG modal committees. MAG evaluates CMAQ projects for possible inclusion in the Transportation Improvement Program.

For the 2016 fiscal year cycle, the CMP update and tool were implemented at the Intelligent Transportation Systems and Bicycle and Pedestrian modal committees, as well as for Transportation Alternatives (TA) competitive funding process. Additionally, a modified CMP tool has been adapted to facilitate changes in the existing Arterial Life Cycle Program, as well as used in the Surface Transportation Program (Pinal County portion) project evaluation process. Typically, MAG modal committees develop the Sketch Tool scores and rank the projects. Figure 20-2 depicts an example project assessment results. These results are furnished with the CMAQ assessment, for final project evaluation purposes. Recommendations from the MAG modal committees are forwarded to the Transportation Review Committee for programming consideration. CMAQ guidance allows a qualitative evaluation to be made when a quantitative analysis is not possible. Although every effort is made to quantify the congestion reduction impact of each project, qualitative assessments may be based on a reasonable review of how a project or program will decrease congestion.

MAG has an established project application, programming schedule, project evaluation process, and project selection process. This process includes an evaluation of the expected emissions reductions and cost effectiveness, a CMP tool assisted project evaluation process at the modal committees, and project selection through the MAG committee process, including: Transportation Review Committee (TRC), Management Committee, and Transportation Policy Committee (TPC) for review and recommendation, and then Regional Council for approval.

The transportation project types and responsible technical advisory committees (TAC) are:

**FIGURE 20 -2
MAG CMP SCREENING TOOL – EXAMPLE RANKINGS SUMMARY**

CRITERIA	Weight	PROJECT NUMBERS:									
		1	2	3	4	5	6	7	8	9	
<i>Quantitative Data</i>	VOLUME/AADT *	25%	7	7	9	4	4	3	4	1	2
	CRASH RATE	5%	1	1	1	1	1	1	1	9	1
	TRUCK VOLUME / AADT	5%	7	7	9	4	4	3	4	2	1
	CONGESTION / LOST PRODUCTIVITY GP	10%	5	5	3	7	7	4	7	2	1
Total Weighted Score:			2.65	2.65	3.05	1.95	1.95	1.35	1.95	1.00	0.70
Rank Order:			2	2	1	4	4	7	4	8	9
<i>Qualitative Data</i>	CMP OBJECTIVES	35%	3.33	2.60	2.57	3.29	2.14	3.29	3.57	3.43	3.29
	PROJECT/MODE SPECIFIC ASSESSMENT	20%	4	4	1	4	3	4	3	4	4
Total Weighted Score:			1.37	1.11	1.70	1.35	1.15	1.35	1.65	1.40	1.35
Rank Order:			4	9	1	5	8	5	2	3	5
<i>All Data</i>	Total Weighted Score:		4.02	3.76	5.75	3.30	3.10	2.70	3.60	2.40	2.05
	Rank Order:		2	3	1	5	6	7	4	8	9

* For ITS Projects:
 - AADT can be replaced by VMT or VMT/lane
 - Cost can be another quantitative factor expressed in VMT/\$ spent

- Bicycle and pedestrian projects are presented, reviewed, ranked at the Pedestrian Working Group and The Regional Bicycle Task Force, and then forwarded to the TRC.
- Intelligent transportation system (ITS) projects are presented, reviewed, and ranked at the ITS Committee, and then forwarded to the TRC.
- Paving unpaved road projects are presented and reviewed at the Streets Committee, ranked at the Air Quality TAC, and then forwarded to the TRC.
- PM-10 certified street sweeper projects are reviewed at the Streets Committee, ranked at the Air Quality TAC, and then forwarded to the MAG Management Committee.

- In addition, the AQTAC may forward a ranking of Air Quality Projects to the Transportation Review Committee.

Future Congestion Management Efforts

The RTP, which covers a twenty year planning period, includes projects from three life cycle programs: the Freeway Program Life Cycle Program (FLCP), the Arterial Life Cycle Program (ALCP), and the Transit Life Cycle Program (TLCP). Multi-modal programs and projects included in the life cycle programs have been determined since the RTP's inception and are scheduled for inclusion in the MAG TIP following the annual update process. These life cycle programs establish a programming approach that forecasts and allocates funds through the full life of a major funding source such as the Proposition 400 tax extension, local and other federal funding sources, and reflect a fiscal balance between anticipated revenues and expenditures.

Pursuant to MAP-21 and FAST regulations and as new funding sources become available, the updated CMP will play a greater role in the planning and programming of future transportation investments in the MAG Region. CMP strategies will continue to be based on the same goals and objectives of the original 2003 RTP, and will continue to use the same congestion mitigation criteria in the assessment and evaluation of the projects submitted for consideration. Following this principle, the future of CMP will evolve from its current role to become a further integral part of the planning process.

The MAG Performance Measurement Report continues to be updated since its first edition in 2009 with charts, maps and graphics available on the MAG website, additionally; an interactive web-based dashboard tool has been developed to reach a greater audience. These tools constitute a performance measuring and monitoring system for regional multi-modal transportation planning, as well as an integral component for life-cycle programming and federally funded programs.

CHAPTER TWENTY-ONE

TRANSPORTATION SAFETY

In September 2004, the Maricopa Association of Governments (MAG) formed a Transportation Safety Committee clearly establishing the intent to incorporate explicit safety considerations within the metropolitan planning process. One year later, in October 2005, MAG adopted the region's first Strategic Transportation Safety Plan (STSP or Plan) that was developed and recommended by the committee. A comprehensive update of the STSP was carried out 2015 with oversight provided by the Transportation Safety Committee (TSC). All planning activities related to transportation safety are performed in close coordination with the TSC. Crash data analysis is performed in-house at MAG, and a range of safety studies are managed by MAG staff.

Transportation Safety Planning Process

Transportation safety planning, or planning for safer roads, is addressed through several activities within the MAG transportation planning process, as described in the following sections.

Safety Assessment of Transportation Alternatives

At the highest level of planning, likely road safety outcomes are used as criteria in long-range planning, such as the MAG Regional Transportation Plan (RTP), where decisions are made on large investments in regional transportation infrastructure. These planning decisions, made at the regional level on infrastructure investment priorities, have a significant indirect impact on the long-term road safety provided by the transportation system. This decision making task is supported by an assessment of the different regional transportation alternatives from a safety viewpoint. The regional travel demand model is typically used to forecast future travel demand on the future transportation system.

The methodology used by MAG in the past for safety impact assessment of transportation alternatives utilized results from the travel demand forecasting model to estimate the total number of crashes in the system, based on the forecasted traffic volumes. Simplified models that utilized historical crash rates for different road types were then applied to estimate the number of crashes. It should be noted that the forecasting of road safety consequences of planning alternatives, at the macroscopic or regional level, is largely based on the stability of crash rates and their historical trends. Since 2010, MAG has developed the in-house ability to perform complex crash data analyses. In addition, MAG is currently moving towards an Activity-Based Travel Demand Model that might provide better information on future travel patterns and crash risk exposure. It is anticipated that a more sophisticated safety forecasting methodology will be utilized in the next major update to the RTP.

Strategic Transportation Safety Plan

At the next level, planning for safer roads is addressed more strategically and identifies short to medium-term needs, as comprehensively described in the 2015 STSP (see Table 21-1). The Plan establishes the regional vision, goals, objectives, strategies, countermeasures, and performance measures for making systematic improvements in transportation safety.

The Strategic Transportation Safety Plan (STSP) adopted “Zero Deaths and Zero Injuries” as the vision of the MAG region for road safety. The STSP is a data-driven, multi-year comprehensive plan that integrates the four E’s of highway safety – Engineering, Education, Enforcement and Emergency Medical Services (EMS). A review of the most recent five-year crash data shows that nearly 50 percent of the road deaths, and nearly 70 percent of all crashes in the state of Arizona, occur in the MAG planning area. The STSP documented over forty (40) strategies, summarized in Table 21-1, that would help reach the goal of eliminating deaths and serious injuries. These strategies were identified based on detailed analyses of crash data.

TABLE 21-1
2015 Strategic Transportation Safety Plan
Action Areas & Strategies

Education		
<p style="text-align: center;">Intersection Related</p> <p>Develop and distribute educational materials related to intersection safety.</p> <p>Partner with local professional societies to hold an annual workshop on safety tools available to assess and improve substantive safety.</p>	<p style="text-align: center;">Vulnerable Users</p> <p>Develop on-going training and public information bicycle and pedestrian safety campaigns.</p> <p>Explore the development of a smartphone application to educate vulnerable users on road safety.</p>	<p style="text-align: center;">Impaired Driving</p> <p>Develop materials for educating target groups for impaired driving including mass-media campaigns on DUI dangers and penalties.</p> <p>Explore methods of educating young road users through Mass-media campaigns.</p> <p style="text-align: center;">Younger Drivers</p> <p>Partner with GOHS and ADOT to deploy distracted driver safety awareness campaigns.</p>
Enforcement		
<p style="text-align: center;">Intersection Related</p> <p>Explore feasibility of using automated enforcement at intersections with high crash risk.</p> <p>Conduct targeted enforcement at high crash risk intersections.</p>	<p style="text-align: center;">Speeding & Aggressive Driving</p> <p>Utilize automated enforcement where appropriate to address speeding.</p> <p>Conduct enforcement in all work zones and increase enforcement in school zones.</p>	<p style="text-align: center;">Impaired Driving</p> <p>Conduct high visibility DUI saturation patrols.</p>

Engineering - Programs, Projects & Practices

<p>Intersection Related</p> <p>Include safety as an explicit project evaluation criteria in the MAG processes for prioritizing projects for programing projects in the TIP.</p> <p>Implement systemic improvements based on the identification of specific characteristics of high risk intersections.</p> <p>Identify new practices or standards that integrate safety into planning and design.</p> <p>Prepare a "best practices" guide for Road Diet and Complete Streets projects for incorporating safety.</p> <p>Enhance the MAG RSA Program: (1) Data driven location nomination; (2) Design phase reviews; (3) Focus on bicyclist safety.</p> <p>Prioritize Improvements based on screening for high crash risk.</p> <p>Prepare a technical resource that documents regional and national effectiveness of safety countermeasures for all E's.</p> <p>Emergency Medical Services (EMS)</p> <p>Perform a comprehensive review of current EVP practices, and develop a recommended EVP practice.</p>	<p>Vulnerable Users</p> <p>Promote Safe Routes to School studies in the MAG TA non-infrastructure program.</p> <p>Continue to support the regional training program for school crossing guards.</p> <p>Promote practices that ensure safety and multimodal connectivity.</p> <p>Share best practices on getting to and from school.</p> <p>Develop a Complete Streets Implementation Guide that integrates safety analysis and design.</p> <p>Produce a white paper on wrong way bicycle crashes and local ordinances.</p> <p>Prepare a "best practices" guide for high exposure bicycle and pedestrian nodes.</p> <p>Develop an action program: (1) high transit activity stops, and (2) new routes that enhance transit safety.</p> <p>Install Pedestrian Hybrid Beacons (HAWKs), medians and crossing islands at mid-block locations</p> <p>Install bicycle detection at signalized intersections.</p>	<p>Speeding & Aggressive Driving</p> <p>Develop best practices guidelines on using automated enforcement to improve road safety.</p> <p>Younger Drivers</p> <p>Identify best practices for promoting or implementing Safe Driving pledge campaigns.</p> <p>Impaired Driving</p> <p>Implement wrong-way detection system to prevent wrong-way driving crashes on the freeway system.</p> <p>Traffic Management</p> <p>Support and encourage the implementation of Intelligent Transportation Systems (ITS) technologies that show promise for reducing fatalities and serious injuries.</p> <p>Support Incident Management (IM) and Integrated Corridor Management (ICM) strategies that would help eliminate secondary crashes during major traffic incidents.</p>
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Other Strategies - Improve Data Collection, Quality, Availability, Integration, and Analysis for Decision Making

Enhance and expand the current MAG network screening methodology for intersections to include road segments.	Develop or purchase a comprehensive road safety assessment tool that utilizes HSM methodologies.	Develop local calibration factors for existing national HSM Safety Performance Functions (SPFs) specific to the MAG planning area.
Enhance the crash data analysis software, Regional Transportation Safety Information Management System (RTSIMS)	Develop a framework and tools to conduct benefit-cost analyses and develop crash reduction factors (CRFs) using local data.	

Coordination with the State’s Strategic Highway Safety Plan

All MAG transportation safety planning activities are closely coordinated with similar planning at the state level. In 2014, ADOT’s adopted an update to its Strategic Highway Safety Plan. The 2015 update of the MAG Strategic Transportation Safety Plan occurred at the same time and the two efforts were closely coordinated.

Tools, Solutions and Activities for Improving Transportation Safety

Regional Traffic Safety Information Management System (RTSIMS)

The 2005 STSP identified a project to develop the Regional Traffic Safety Information Management System (RTSIMS). As a result, the RTSIMS was delivered in October 2010. The RTSIMS software has been through several updates and enhancements through 2016. Through a separate project, MAG developed a complete User’s Manual for the use of local agencies requesting access to RTSIMS. MAG provides training sessions as needed. This tool provides a useful crash analysis system for local agency staff wanting to run queries and also provides a valuable tool for smaller agencies that may not have the resources to procure their own crash analysis software. Local agencies requesting access to the system are required to have a Data Access Agreement in place with ADOT and may access data only for roadways in their jurisdiction.

Network Screening Methodology to Identify Intersection Crash Risk

In 2010, MAG developed a network screening methodology, to identify and rank all intersections in the region based on crash risk. The Network Screening Methodology for Intersections (NSM-I) has been applied to screen over 20,000 intersection crash locations in the region and rank them by crash risk. The functionality of running a query utilizing NSM-I has also been added to the RTSIMS software. Utilizing the NSM-I functionality, MAG produces a high

level list of intersections for local agencies as a starting point in a data driven process to nominate road safety assessment and project assessment locations. This was a landmark accomplishment for the region, and has helped local agencies obtain Highway Safety Improvement Program funds from the state for deserving road safety projects.

MAG Road Safety Assessment Program

The 2005 STSP recommended the performance of Road Safety Assessments (RSA) at high risk locations in the region. Enhancements to the RSA program were identified in the 2015 STSP update. In 2011, MAG developed and executed a very successful RSA program with valuable assistance from the RSA program at ADOT. Since there were few examples available for establishing an urban RSA program, the MAG program was developed from fundamental principles of RSAs, including the addition of a human-factors expert to the RSA team. As the next logical step following an RSA, Project Assessments (PA) are developed that result in a road safety improvement project, designed up to 15 percent completion. Projects with completed PAs are better positioned to compete for federal road safety funds. A total of 44 RSAs and five PAs have been successfully completed. The RSA program will continue to be funded by MAG with planning funds.

Annual School Crossing Guard Training Workshop

Until 2006, the City of Phoenix had been providing training to School Crossing Guards through a structured workshop for nearly 40 years. While this workshop was mainly focused on schools within the City of Phoenix, a few schools from adjacent jurisdictions also benefited. In 2006, staff from MAG, City of Phoenix and a few other member agencies developed a regional training workshop for School Crossing Guards. It is based on the workshops conducted by the City of Phoenix and the City's national award winning school safety program. These regional workshops have now been held on ten successive years.

Based on the demand for this training, it has become an annual road safety training event sponsored by MAG. Starting in 2013, three training workshops were held covering the central city and both east and west valleys. Each year, nearly 400-500 crossing guards are provided basic safety training at these workshops that are held prior to each school year. MAG has also produced a road safety video documentary titled "Guardians of Future" that explains safety procedures that need to be followed at yellow crosswalks. It is available in both English and Spanish versions and is used in the training workshops. Copies of the video documentary have been distributed to nearly 975 schools in Maricopa County, all public school districts in the region, and to a number of agencies outside Arizona that have sent in requests. The increased utilization of new traffic control technologies by local agencies at school crossings initiated the update to the documentary. The updated version includes instructions on operating these various new technologies, such as crossings equipped with flashing beacons. The most recent update to the documentary, completed in 2015, is available online on the MAG Safe Routes to School Program (SRTS) webpage, as well as available on YouTube.

New programs and projects identified in the 2015 STSP are being carried forward or newly implemented to support regional SRTS programs. These include: (1) sharing best practices

among regional stakeholders on best safety practices for getting to and from school, (2) supporting a regional training program for school crossing guards, and (3) promoting and administering SRTS framework studies as a priority in the MAG Transportation Alternatives Non-Infrastructure Projects Program.

Status of Transportation Safety in the MAG Region

The MAG planning area is the most populous urban area in Arizona and crash patterns in this area are significantly different than statewide crash patterns. Review of crash data for the analysis period of 2006 through 2015 shows that nearly 51 percent of the deaths and nearly 74 percent of all crashes in the state occur in the MAG planning area. The area also has a crash injury rate of 7.77 persons injured per 1,000 population. When comparing fatality rates for urban regions, the Phoenix metropolitan area has the second highest rate of 8.75 deaths per 100,000 persons – next to Houston, Texas.

The Transportation Safety program utilizes the MAG website extensively for sharing information on the road safety performance in the region. This information is generated through safety analyses performed by MAG staff. The crash data used in these analyses are provided to MAG by ADOT. Community leaders, citizens, public and private agencies, and local media interested in road safety issues can now refer to accurate safety information and indicators provided at the website. Road safety data, statistics, and trends for the MAG region, generated using Regional Transportation Safety Information Management System (RTSIMS), are posted at the MAG website. They are frequently quoted by news media and agencies interested in road safety.

Appendix F provides a range of statistics on the road safety experience in the MAG planning area. In 2015, the economic loss due to vehicular crashes in Maricopa County was estimated to be nearly \$5 billion. A total of 450 lives were lost due to road crashes in 2015, and nearly 39,500 persons seriously injured due to crashes in the region. From 2010 to 2015, the trend indicated an increase in the total number of crashes, injuries and deaths. Between 2010 and 2015 total crashes have increased by 23 percent, total injury crashes have increased by 18 percent, and the total number of fatal crashes increased by 26 percent.

Planning data at MAG indicate that about 60 percent of the state’s population lived in the MAG planning area and 53 percent of the state’s travel (measured in vehicle miles of travel or VMT) occurred in the MAG planning area. Commensurate with these levels, the MAG planning area generally represents about three-quarters of all injuries in the state due to motor vehicle crashes and about 50 percent of fatalities. The State of Arizona has been identified by the USDOT as an “opportunity state” for road safety improvement, due to the state’s poor road safety record. Crash statistics indicate that the state’s poor road safety record could be attributed to the number and severity of crashes in the MAG region. This points to the need for increased investment of the state’s road safety resources in the MAG region.

Freeways

The urban freeway system currently consists of I-8, I-10, I-17, US 60, SR 51, SR 143, Loop 101, Loop 202, and Loop 303. The Loop 303 freeway opened as a limited access freeway in 2013. Crash statistics clearly indicate that the urban freeway system is a much safer road environment in comparison to the arterial street network. The freeway system carried about 43 percent of the vehicle travel in the region, but experienced only 28 percent of all crashes, and 18 percent of fatalities in 2015.

Different freeway corridors in the region have differences in road geometry, traffic demand, vehicle composition, etc. The I-10 corridor is a major national truck route and carries a high percentage of trucks. A comparison of road safety levels also requires the consideration of total traffic flow or traffic exposure. An accepted measure for traffic exposure is the number of vehicles miles traveled on a facility, expressed in millions of vehicle miles traveled (MVMT). Based on the crash rate per million vehicle miles traveled for the calendar year 2015, I-17 had the highest crash rate of 2.41, while Loop 202 had the second lowest with a rate near 1.62. The Loop 303 had the lowest crash rate of 0.71 in 2015, although it has only been in service since 2013, and operates in a largely undeveloped area of the MAG region.

The overall safety on the regional freeway system has been enhanced through several MAG-sponsored safety projects launched in the past, such as the implementation of Cable Median Barriers, the Freeway Service Patrol Program (launched in 2001), and the Freeway Management System (FMS), which is operated by Arizona Department of Transportation (ADOT). A recently launched pilot project (2014) has co-located DPS troopers at the ADOT Traffic Operations Center for improved coordination and response for clearing freeway crashes. Nearly all freeway traffic advisories broadcast on local radio stations, television channels, and the internet are based on information generated by the FMS. This information is made available to media at no cost. Expansion of the FMS to cover the entire urban freeway system, identified and funded as a regional priority through the RTP (see Chapter 18), is expected to be completed by 2021.

Excessive speeding and occasional incidents involving road rage and impaired driving continue to pose a threat to road safety on freeways. In 2015, there was a dramatic increase in wrong-way driver crashes within a few months. The Department of Public Safety receives over 25 reports a month of drivers entering or driving the wrong direction on the freeway. Crash occurrences are a fraction of those reported on average, but have been on an increasing trend. In most cases the crash reports indicate alcohol and medication or controlled substance impairment was involved. Through their enforcement effort, the Department of Public Safety and local police departments continue to monitor and address threats to overall safety. The 2015 STSP identified a strategy to implement wrong-way detection systems to reduce wrong-way crashes on freeways. Efforts are underway by ADOT to identify a technology based solution, to prevent wrong-way driving on the freeways.

Arterials and Local Streets

On the arterial street system, the most severe crashes occur at intersections, which is a major traffic safety concern in the region. These crashes occur mainly due to the number of conflicting movements possible at intersections. The arterial street system carries nearly 60

percent of all travel in the region but experiences nearly 73 percent of all crashes, and also 76 percent of crashes involving injuries or fatalities. In 2015, of the 63,338 crashes that occurred on the arterial system, 56 percent occurred at or near intersections. Of these crashes at intersections, a total of 12,185 crashes, or 34 percent, resulted in either a fatality or serious injury. These statistics clearly point to the need for improving safety at intersections on the arterial street system in the region.

Crash statistics indicate that, following a declining trend for all crashes in the region between 2006 and 2010, the total number of crashes have increased from a low of 71,071 in 2010 to 87,371 in 2015. This trend is also reflected in crashes on arterial streets. One area that the region has improved is the trend for crashes for alcohol-impaired fatalities, which have decreased three percent from 2014 to 2015, compared to the statewide increase of 36 percent. Ride hailing services such as Uber™ and Lyft™ available in many large metropolitan areas, including the MAG region, may be contributing to the decrease in alcohol impaired crashes.

Bicycle Facilities

Developing safe bicycle facilities or bikeways as an integral part of a multi-modal transportation system in the MAG Region, as well as making bicycling a viable option for daily travel trips, is a stated goal of the Regional Bicycle Plan (RBP). Plans are being developed to update the RBP that will have more focus on safety considerations. In addition, more local agencies have been placing bicycle facilities and connectivity at a high priority in their own planning efforts, which may result in an increase in bicycling activity in the region. The 2015 MAG Strategic Transportation Safety Plan has identified a number of strategies and actions for improving bicyclist and/or pedestrian safety. A few of the key strategies are:

- Develop Complete Streets Implementation Guidelines that integrate safety analysis and design throughout the planning process.
- Promote practices that ensure safety and multimodal connectivity in planning and design.
- Produce a white paper on wrong way bicycle crashes and model ordinances to prevent crashes.
- Install pedestrian Hybrid Beacons (HAWKs).
- Install medians and pedestrian crossing islands.
- Prepare a "best practices" guide for high risk intersections and high exposure bicycle and pedestrian crossing nodes.
- Provide bicycle detection at signalized intersections.

It is difficult to obtain a comprehensive assessment of crash risk for bicycle users, as crash data are available only for crashes on public roads that involve at least one motor vehicle. However, crash statistics for bicycle involved crashes indicate a decrease of 36 percent between 2012 and 2015. There was an increase in bicycle involved crashes, between 2010 and 2012, of nearly 16 percent, possibly due to the declining economy in that period, which may have resulted in an increase in the number of persons utilizing bicycles for regular commutes, therefore increasing the exposure of bicyclists to vehicle traffic. The MAG Road Safety Assessment (RSA) program

has recently started conducting bicyclist and pedestrian counts along with the traditional vehicle counts, in order to capture more non-motorist volume data. These counts along with other data gathered through the MAG bicycle counts program may help establish much needed data on bicyclist exposure for screening candidate locations for implementing safety improvements.

Pedestrian Facilities

Although the percentage of pedestrian crashes in the region is relatively small, pedestrian safety is a primary area of concern due to very high fatality rates. In recent times, national studies have referred to Phoenix as having very high pedestrian fatality rates. Similar to the trends of crashes involving bicyclists, those involving pedestrians indicate an increase of 20 percent between 2010 and 2013, but have since decreased 13 percent to 998 crashes in 2015.

The 2015 MAG Strategic Transportation Safety Plan collectively addresses the topic of bicyclist and pedestrian safety, since many of the road safety issues are common to both modes of movement. Some of the goals identified in the Plan are: (1) incorporating safety considerations in pedestrian facility planning, (2) promoting safe multimodal access, and (3) reducing mid-block pedestrian crashes.

Younger and Older Drivers

Both road safety research and literature have documented that both younger drivers (of age less than 25 years) and older drivers (of age more than 65 years) are associated with elevated risk for vehicular crashes, based on their historical involvement in crashes. The total number of younger drivers involved in crashes each year has steadily decreased until 2012, but have increased since then. A similar trend is observable for crashes involving older drivers. Both these trends seem to reflect the overall trend in crashes observable across all types of crashes.

The 2015 STSP update identified a predominance of younger driver crashes where both distracted driving and impaired driving was indicated. Three strategies were developed to address these crash types for younger drivers: (1) identify best practices for promoting or implementing Safe Driving Pledge campaigns, (2) explore methods of educating young road users through mass-media campaigns, and (3) partner with ADOT and local agencies to deploy distracted driver safety awareness campaigns.

The 2015 STSP did not show the predominance of crashes involving older drivers that was indicated for younger drivers. As a result, no specific strategies were identified in the 2015 STSP to address crashes involving older drivers. However, older drivers have been observed to be particularly susceptible to crashes at intersections. Older driver related issues are always considered by local agencies when existing intersections are improved, such as the addition of a left-turn lane or a left-turn protected signal phase. A number of local agencies are exploring other initiatives that would assist older drivers, such as installation of flashing yellow arrows at intersections.

Transit Riders and Operators

Through the procurement process for transit operations, Valley Metro requires operators to be apprised of safety and security issues, as well as to perform multiple functions related to safety of capital equipment. Contract incentives are provided for preventable accidents. Future improvements to safety and security in transit vehicles are being addressed through Valley Metro's Vehicle Management System Plan. The light rail (LRT) transit system, also operated by Valley Metro, began service in December of 2008. The in-street system is currently 26 miles long, and with extensions either under construction or planned will extend to a total of 66 miles by 2034. Very few crashes involving LRT have resulted in serious injuries to LRT passengers, or motor vehicle occupants. There were a total of five crashes in the years of 2009, 2010, and 2013 that resulted in serious injuries. In the first seven years of LRT services, only one fatality has occurred, which was in 2013.

There are several strategies that were identified in the 2015 STSP update, including enhancements to the MAG Road Safety Assessment (RSAs) program, to include road safety assessments that focus on riders' access to transit. MAG has conducted four transit RSAs in the vicinity of light rail stations, in coordination with Valley Metro, in order to help inform safety features to be integrated into new facilities or improvements that can be made to existing facilities. There are several overarching strategies under the Vulnerable User action area of the STSP that address access to transit, with the recognition that all transit riders are bicyclists and pedestrians, of all ages and abilities.

Availability of Funds for Improving Transportation Safety

The implementation of countermeasures that involve physical improvements that address existing road safety issues are carried out by MAG member agencies. The role of MAG is limited to recommending qualifying safety improvement projects using available funding sources. At the current time, two sources of federal funds are available to local agencies for implementing qualifying road safety improvements: (1) Federal Highway Safety Improvement Program (HSIP) funds; and (2) Transportation Alternatives/Safe Routes to School (TA-SRTS) program funds. During the project review process at MAG, all available information on project eligibility for federal funds is used to screen projects. However, the final determination whether a candidate project qualifies for federal funds is made by the Arizona office of the Federal Highway Administration and ADOT.

Programming of HSIP Funds

The national Highway Safety Improvement Program (HSIP) has provided new guidelines and criteria to be considered when allocating safety resources to problem locations, giving consideration to the number of fatalities, the amount of travel, and the lane-miles of public roadway available. Responsibility for the process that allocates federal funds to the MAG region for safety improvements lies with ADOT.

In May 2015, ADOT announced a new process for allocating HSIP resources across the state for qualifying road safety improvement projects. Previously, ADOT provided an annual sub-allocation to the MAG region in the amount of \$1.9 million that could be directed to qualifying,

low-cost safety improvement projects at discretion of MAG. These funds, referred to as MAG-HSIP, were systematically programmed by MAG for qualifying road safety projects in FY 2010 through FY 2018. Starting in FY 2019, under the new ADOT HSIP process, no sub-allocation will be provided by ADOT to any COG or MPO region, and all candidate projects statewide will compete for Arizona's total allocation of federal HSIP funds, approximately \$42 million per year.

Moving forward under the new ADOT HSIP guidance, all roadway safety improvement projects from the MAG region would be competing with similar projects statewide (including ADOT projects) for nearly \$42 million available in HSIP funds. Many types of low-cost systemic road safety improvement, such as pedestrian countdown timers, that were previously recommended by MAG (and implemented with MAG- HSIP funds) are no longer eligible for HSIP funds. This is due to the minimum cost of \$250,000 for all road safety projects, established by ADOT under the new 2015 HSIP process. However, several strategies identified in the 2015 STSP could lead to the identification of region-wide systemic road safety projects that could qualify for HSIP funding, provided a suitable procurement method (a lead agency) is available to handle such a multi-agency project.

At present the only other regional road safety improvement funding source is the Transportation Alternatives Safe Routes to School (TA-SRTS) program.

Programming of Transportation Alternatives Safe Routes to School (SRTS) Funds

Starting in 2012, following MAP-21 guidelines, ADOT began sub-allocating a portion of federal funds to the MAG region for the Transportation Alternatives (TA) Program, with the flexibility to use a portion of these funds for Safe Routes to School (SRTS) projects, since the statewide SRTS Program administered by state DOTs was no longer funded. Currently, the MAG region receives \$4.4 million in TA funds, and MAG has allocated \$400,000 per year to fund SRTS non-infrastructure projects. The MAG Transportation Safety Committee identified programming goals and objectives based on regional SRTS priorities. For the first programming cycle of TA-SRTS in 2013, two project priorities were established by MAG, guided by the Federal Highway Administration (FHWA) Safe Routes to School eligibility criteria.

Priority One - SRTS Framework Studies: These studies are based on the regional desire to identify the unique traffic safety issues within the walking and biking boundary of schools. It was anticipated that the development of SRTS framework studies would establish and foster partnerships and identify improvements that could be implemented, either on the school site or in the public right-of-way. The main deliverable of such SRTS studies would be new or updated walking and biking route maps used by schools and parents.

Priority Two - Support Activity Projects: These projects were established recognizing the importance of funding for on-going SRTS activities that are administered by schools and local agencies. Support Activity Projects provide educational print and incentive materials, development of SRTS webpages, and bulk ordering of items such as yellow crossing roll-out signs, crossing guard stop paddles, and safety vests, among other items.

Since 2013, nearly 28 projects have been programmed for utilization of the TA-SRTS funding by local agencies for over 600 schools. In addition, strategies identified in the 2015 STSP will be implemented to support regional encouragement of safe walking and biking for K-8 students.

The Future of Regional Road Safety Funding

The federal Fixing America's Surface Transportation (FAST) Act passed in 2015 covers funding only through fiscal year 2020, and maintains the HSIP funding source. Therefore, it is not feasible to develop a long range federal funding projection for the safety program. Based on the crash history of the MAG planning area (in comparison to the entire state) and execution of the new HSIP process, it is estimated that about 50 percent of the state's annual HSIP allocation, or \$21 million, would need to be allocated to qualifying road safety projects in the MAG region. However, this assumes that, for each fiscal year, MAG recommends a sufficient number of excellent candidate road safety improvement projects for locations that have experienced fatal and serious injury crashes. The generation of HSIP project applications to meet the new HSIP criteria is a rather complex task that some smaller member agencies may find challenging, despite having sites with road fatalities and serious injuries.

Until the RTP establishes a dedicated regional funding source for road safety, the bulk of the funds would continue to come from the Highway Safety Improvement Program (HSIP) federal aid source, in addition to improvements funded entirely by local agencies. Moving forward it is assumed that MAG member agency safety improvement projects would need to meet current HSIP eligibility criteria. The key elements of project eligibility focus on countermeasures that: (1) align with the State Highway Safety Plan (SHSP 2014) emphasis areas, (2) are to be implemented only at locations that experience fatal and serious injury crashes in the most recent five-years, and (3) demonstrate a cost-benefit ratio of 1.5 or greater by using established crash reduction factors and historical data on fatal and serious injury crashes.

It is recognized that road safety improvements in the MAG region may be better realized by focusing on locations with a predominance of certain crash types (left-turn, angle and rear end), which tend to cause more severe injuries and fatalities. The challenge in this will be that focusing on crash types and countermeasures with known safety benefits may not necessarily meet the current HSIP eligibility criteria, due to the low number of fatal and serious injury crashes experienced. An alternate source of regional funding, possibly a set-aside in the next major update of the RTP, may enable funding of safety projects that address the crash types experienced in the MAG region. Until then the focus is likely to continue on implementing countermeasures at locations with the most severe and fatal crashes. The implementation of the programs and projects identified in the 2015 STSP will help identify effective region-wide safety projects, as well as large projects at single intersection locations, with excellent potential of competing for available state-wide HSIP funding.

CHAPTER TWENTY-TWO

TRANSPORTATION SECURITY

The purpose of this chapter is to provide an overview of transportation security, and to discuss security-related issues and ongoing efforts that are currently being coordinated to protect transportation networks and facilities at the federal, state and regional levels. This chapter will consider a variety of responses to national security issues as they pertain to transportation, and will focus on a number of agencies and transportation security efforts at various levels of government. While it is acknowledged that there are many smaller agencies, offices, consortiums, groups and committees that are committed to providing various aspects of security, this chapter will address some of the primary governmental and regional efforts that directly impact, assess, or implement measures to protect transportation facilities, systems and networks.

Transportation Security Concepts

When reviewing transportation security, immediately following the September 11, 2001, terrorist attacks on the United States, many agencies began to develop and implement policies and programs to provide for the safety and security of the nation's transportation networks. Also, recent attacks on foreign public transit systems have heightened the need for increased transit security efforts in American cities. Although programs for transportation safety have been around for many years, the concept of planning for transportation security and implementing security procedures on different modes of transportation is relatively new. In some cases, the phrases "safety" and "security" are used simultaneously or interchangeably by many agencies to describe planning or programming components of broader transportation programs or initiatives. However, the intent of the words "safety" and "security" are different from one another. By definition, safety can be described as the "freedom from danger," whereas security is the "freedom from *intentional* danger." While implementing safety programs for transportation is intended to protect the motoring and non-motoring public by reducing fatalities, injuries and crashes, the implementation of security measures and security programs are developed to identify and prevent attacks that are intended to harm people, facilities, modes of travel and important transportation infrastructure.

Transportation security efforts consist of programs, measures or initiatives that are primarily focused on an overall transportation system, or network, which collectively comprise our overall means of travel. However, another important aspect of transportation security is concerned with maintaining the American economy and allowing for the free flow of goods. Protecting free trade and allowing for the safe movement of imports and exports is vital to the economy of the United States, and involves providing a high level of security for the nation's overall freight system. Therefore, when considering transportation mobility and the movement of goods, the implementation, or planning for transportation security measures or policies is crucial to protecting important transportation infrastructure. Important infrastructure includes a variety of elements such as roads and freeways; local and regional

road networks; bridges; tunnels; emergency access roads; connector roads; railroads; ports; intermodal passenger facilities; intermodal cargo facilities; freight corridors; pedestrian and bicycling networks; airports; pipelines; public transit systems and evacuation corridors.

Another aspect of providing for secure transportation has to do with the subject of “emergency planning.” While transportation security is directly related to preventing attacks that are intended to harm people and damage facilities, harm modes of travel, and harm important transportation infrastructure, emergency planning is intended to respond to unforeseen natural events and disasters. A security incident is one that directly pertains to acts of terror resulting in regional, local or specific-location attacks on people, sites, facilities, or transportation infrastructure; whereas emergency response planning efforts maintain responsibility for preparedness, and response and recovery to natural disasters such as earthquakes, floods, hurricanes, violent weather, fires, and similar incidents. However, there are several agencies that coordinate on security and safety matters for the purpose of homeland security. The term “homeland security” refers to domestic governmental actions designed to prevent, detect, respond to, and recover from acts of terrorism, and also respond to natural disasters. Homeland security is a definition, or broader concept that typically refers to a concerted, national effort to protect the homeland by all levels of government at the federal, state, local and tribal levels, for the sole purpose of protecting the territory of the United States from internal and external hazards.

The following sections of this chapter will address a variety of transportation security efforts at various levels, and also provides a summary that identifies the Maricopa Association of Governments (MAG) future role in regional transportation security efforts. The information located within Table 22-1 identifies a list of federal agencies, state agencies, and regional efforts within the MAG Region that actively address transportation security concerns on a regular basis. Table 22-1 displays each agency responsible for addressing the primary transportation “sectors of concern” relating to roads, transit, air transportation facilities, cargo facilities and commodity movements, and transportation security planning. While these efforts may range from the active implementation of programs and measures, to lesser actions of simply coordinating activities with other agencies, the role of each agency enhances security on the MAG regional transportation network. The agencies identified in Table 22-1 collectively represent a multifaceted and layered approach to protecting and maintaining security, and responding to potential incidents throughout the MAG Region.

Federal Programs

A number of federal agencies have responsibilities for addressing security-related issues and pursuing efforts to protect transportation networks and facilities from a national perspective. While there are numerous agencies throughout the federal government that provide various aspects of security, the discussion below will focus on the major programs that directly impact, assess, or implement measures to protect transportation facilities.

**TABLE 22-1
AGENCIES AND TRANSPORTATION SECURITY EFFORTS
BY SECTOR OF CONCERN**

AGENCY	SECTOR OF CONCERN				
	Roads	Transit	Air Transportation Facilities	Cargo Facilities and Commodity Movements	Transportation Security Planning
U.S. DEPARTMENT OF TRANSPORTATION	•	•	•	•	•
• Federal Highway Administration	•				•
• Federal Transit Administration		•			•
• Federal Railroad Administration		•			•
• Federal Aviation Administration			•	•	•
U.S. DEPARTMENT OF HOMELAND SECURITY	•	•	•	•	•
• Transportation Security Administration			•	•	•
• U.S. Customs and Borders Protection			•	•	•
• Federal Emergency Management Agency	•				
TRANSPORTATION RESEARCH BOARD					•
STATE OF ARIZONA					
• Arizona Office of Homeland Security	•	•	•	•	•
• Arizona Div. of Emergency Management	•	•	•	•	•
• Arizona Department of Public Safety	•				•
• Arizona Department of Transportation	•	•	•	•	•
REGIONAL EFFORTS					
• Maricopa Co. Dept. of Emergency Mgmt.					•
• MAG 911 – Emergency Telephone					•
• RPTA/Valley Metro		•			•
• Valley Metro Rail		•			•

U.S. Department of Transportation Programs

The U.S. Department of Transportation is responsible ensuring a fast, safe, efficient, accessible, and convenient transportation system that meets national interests and enhances the quality of life for the nation’s citizens. The department consists of 11 administrations, which are collectively responsible for establishing national transportation policies pertaining to highway

planning, development and construction; mass transit; aviation; railroads; ports, waterways and pipelines; and transportation safety and security issues. Individual administrations coordinate with officials at the state, regional and local levels on fiscal, regulatory, administrative and policy-related matters. Although each administration with the U.S. Department of Transportation is involved with different aspects of transportation security, the following information will provide a brief overview of agencies that are directly involved in various aspects of MAG's regional transportation system. These agencies include the Federal Highway Administration, the Federal Transit Administration, the Federal Railroad Administration, and the Federal Aviation Administration.

- Federal Highway Administration - The Federal Highway Administration (FHWA) is responsible for ensuring that the nation's roads and highways are safe and efficient, and have access to the most current forms of technology that allows for a high-level of system performance. Through a variety of programs, the FHWA provides technical and financial support to state, local and tribal governments in an effort to allow for the construction, improvement, and preservation of the National Highway System. Assistance is also provided for roads on federal lands, such as national parks and forests.

In time of national disasters or external security threats, the National Highway System serves as an essential component of the nation's defense mobility. The FHWA coordinates with state officials and members of the U.S. military to specifically address a variety of issues pertaining to military deployment coordination during times of natural disasters and national security emergencies. The FHWA works with the U.S. Department of Defense to maintain and strengthen deployment coordination and military mobilization during security emergencies by enhancing the conditions of the Strategic Highway Network (STRAHNET) and its connectors.

The FHWA works with states and local transportation agencies to increase the awareness and understanding of emergency planning and security operations. The FHWA has a team of engineers trained to identify terrorist threats, understand explosive phenomena, and identify risk of members of critical bridges and tunnels. Based on this knowledge, the FHWA has developed workshops and training courses to educate bridge and tunnel owners and emergency responders. This assists in identifying vulnerable transportation facilities, and disseminating best practices for deterring and mitigating potential attacks.

Through its Emergency Transportation Operations (ETO) website, the FHWA Office of Operations provides tools, guidance, capacity building and good practices that aid local and State DOTs and their partners in their efforts to improve transportation network efficiency and public/responder safety when a non-recurring event either interrupts or overwhelms transportation operations. ETO uses the National Incident Management System (NIMS) to functionally organize its content.

The National Incident Management System is a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work together seamlessly and manage incidents involving all threats and hazards—regardless of cause, size, and location. Homeland Security Presidential Directives require all Federal departments and agencies to adopt the NIMS and to use it in their individual incident management programs and activities, as well as in support of all actions taken to assist state, tribal, and local governments.

- Federal Transit Administration - The Federal Transit Administration (FTA) provides financial assistance to develop new transit systems throughout the country, and to improve and maintain other transit systems that are already in existence. The FTA is responsible for distributing grant funds to state and local transit providers, who in turn are responsible for operating their own systems and programs in accordance with federal guidelines. The FTA also oversees many initiatives and programs that are directly related to transit, livable communities, financing, database maintenance, human services coordination, and Intelligent Transportation Systems (ITS). The FTA is involved in many different aspects of transit, public transportation throughout the MAG Region, including buses, maintenance facilities, vanpools, paratransit vehicles and light rail.

A primary focus of FTA is to integrate security throughout individual transit-provider programs, operations and transit infrastructure. In an effort to protect the general public from security threats, the FTA has implemented provisions for direct funding and providing initiatives and assistance to local transit agencies throughout the country. The FTA has developed a comprehensive, 20-point list of *Security Program Action Items*. This checklist was specifically developed for transit agencies to incorporate the most important security elements pertaining to transit into their System Security Program Plans. In September 2014, FTA and the Transportation Security Administration (TSA) collaborated to update and consolidate the FTA Top 20 Action Items into 17 Action Items, which are aligned with TSA's National Terrorism Advisory System. These Action Items apply to all transit modes directly operated or contracted by transit agencies. Transit agencies are encouraged to include all of these Action Items in their security programs scaled appropriately to risk environment and operation size.

In addition to the TSA, FTA also coordinates security activities with the Department of Homeland Security, the Federal Emergency Management Agency, the National Institute of Standards and Technology, the Transportation Research Board, the U.S. Coast Guard, the American Public Transit Association, and state and local agencies.

- Federal Railroad Administration - The Federal Rail Administration (FRA) is primarily responsible for enforcing rail safety; providing a number of assistance programs related to rail; addressing issues related to intermodal transportation; and conducting research for rail transportation policy and safety. The FRA is also responsible for addressing security-related issues. Through joint efforts with the U.S. Department of Homeland Security, the Transportation Security Administration (TSA), and the Federal Transit

Administration (FTA), the FRA is working toward establishing initiatives that are intended to enhance security efforts. The FRA's efforts have been directed at addressing both passenger rail and freight rail security issues. The FRA is responsible for administering federal grants to the Amtrak rail system throughout the United States, and has been working toward the assessment of Amtrak's nationwide passenger rail system in an effort to ascertain passenger rail's level of preparedness toward external security threats and acts of terrorism.

The FRA works closely with the U. S. Department of Homeland Security to conduct comprehensive vulnerability assessments on passenger rail networks that operate in highly dense urban settings. When assessing the movement of freight over rail corridors, the FRA also works with the U.S. Department of Homeland Security on issues related to implementing security action items on the movement of hazardous materials. The FRA also works with the Association of American Railroads, focusing on areas pertaining to the identification and protection of critical assets; the movement and transportation of hazardous materials; freight operations; and the intensification of inspections. A full-time operations center referred to as the Railway Alert Network (RAN), works to monitor various levels of intelligence on potential threats to the national rail network.

The Federal Railroad Administration's security mission includes the public safety of the freight and passenger railroad networks. Railroad security operational functions include: (1) uniformed police, (2) special agents, (3) state of the art security systems, (4) high speed redundant communications, and (5) passenger train emergency preparedness. The FRA maintains a railroad security communications network to alert the railroad industry of potential security threats and to immediately notify law enforcement about security related incidents that occur on our Nation's railroads. The FRA receives information from all sources about potential security threats and disseminates this information to railroads, police and other relevant security officials.

- Federal Aviation Administration - The Federal Aviation Administration (FAA) is primarily responsible for regulating civil aviation to promote safety and to develop civil aeronautics, new aviation technologies, and to oversee a system of air traffic control and navigation for civil and military aircraft throughout the country. The FAA also works to control aircraft noise, regulates commercial air transportation, and researches and develops the National Airspace System. In addition, the FAA maintains an Internal Security function that specifically works to reduce and eliminate risks associated with terrorism, sabotage, espionage, theft, vandalism and a variety of other criminal acts. Although the FAA has an internal security function, it also maintains an active and open working partnership with the Transportation Security Administration (TSA). The TSA is responsible for screening airline passengers in an effort to minimize security threats. The TSA is also responsible for screening all air cargo materials and onboard airline baggage, and ensures that all commercial air activity is free from potential security risks.

U.S. Department of Homeland Security Programs

The U.S. Department of Homeland Security (DHS) was established during the aftermath of the September 11, 2001, attacks on the nation. The agency is responsible for protecting the security of the United States from external threats and terrorist attacks, and for responding to natural disasters and domestic emergencies. The Department was created from 22 existing federal agencies, and today consists of a number of directorates and eight other departments. As part of the agency's mission, the DHS leverages resources at the federal, state and local levels, and thereby coordinates the transition of multiple agencies and layers of government into a single, integrated agency that is focused on protecting the overall security of the American people. As reported by the DHS, there are more than 87,000 different governmental jurisdictions at the federal, state and local levels that are charged with employing homeland security responsibilities. This is a strategy of maintaining a complementary system that connects all levels of government without duplicating efforts, resulting in a "national mission" of security.

The DHS is primarily concerned with items such as border security, critical infrastructure protection, emergency preparedness and response, domestic intelligence activities, biodefense, researching and implementing security technologies, the detection of nuclear and radiological materials, and the provision of transportation security. Although DHS consists of many agencies that are responsible for national security issues, the agencies listed below have a direct responsibility for overseeing cargo movements and aviation activities within the MAG Region.

- U.S. Customs and Borders Protection - The U.S. Customs and Border Protection (CBP) agency is responsible for the overall protection of the country's borders, and for facilitating the flow of legal trade and travel. The CBP prevents terrorists and dangerous weapons from entering into the country, and enforces hundreds of U.S. Trade and immigration laws. The agency processes incoming and outgoing passengers, pedestrians, cargo, vehicles and ships, and protects the nation's borders with Canada and Mexico. The CBP is also responsible for protecting the nation's shorelines. Aside from border patrol enforcement, the CBP is also responsible for processing all incoming trade via truck, rail, ship and sea containers, and for managing the nation's 317 ports of entry at terminals, ports and airports. The CBP established the Container Security Initiative (CSI), which identifies high-risk containers; uses technology to screen high-risk containers at a faster pace; uses smarter and secure, tamper proof containers; and prescreens containers before they are shipped. This level of scrutiny is extremely vital to national security, because once received, the majority of these imported containers are shipped from American ports of entry to all destinations throughout the country, including Arizona.

The CBP is also responsible for maintaining security for incoming trade to Arizona's Foreign-Trade Zones. Foreign-Trade Zones are defined by the CBP as secure areas under customs supervision that are generally considered outside the customs area, upon activation of the zone. Merchandise located in the zone can be shipped in "duty-

free” for the purposes of storing, packing, repackaging, assembling or manufacturing. There are currently Foreign-Trade Zones located at Phoenix Sky-Harbor and Phoenix-Mesa Gateway airports. To ensure security, the CBP maintains verification and inspection of incoming shipments at these facilities, and offers a full-range of cargo processing functions. As U.S. ports of entry, shipments coming into the Phoenix Sky Harbor and Phoenix-Mesa Gateway airports are subject to the same levels of scrutiny and enforcement procedures that are implemented at other Foreign-Trade Zones throughout the country.

- Transportation Security Administration - The Transportation Security Administration (TSA) was created on November 19, 2001, as part of the Aviation and Transportation Security Act. The agency was created to fill three separate mandates, which included the creation of a new federal agency with the responsibility for providing security on all modes of transportation; to recruit and train security officers for commercial airports at 450 locations; and to take on the responsibility of screening all commercial luggage and packages for explosives and other threats. The TSA maintains the mission of protecting air passengers, and has deployed federal air marshals aboard commercial air flights. The federal air marshals serve as the primary law enforcement entity within TSA, and also work closely with a variety of other law enforcement agencies in order to provide security for airline passengers. The TSA also maintains programs that place an emphasis on law enforcement training teams, canine detection teams, deploying federal flight deck officers, hazardous materials training, crew member self defense, a registered traveler program, and the implementation of transit and rail inspection pilot programs. The TSA has also created an Air Cargo Program, which has recommended enhancements to the current security requirements for various types of cargo carried on commercial aircraft.
- Federal Emergency Management Agency - The Federal Emergency Management Agency (FEMA) is responsible for preparing the nation for potential hazards, and effectively coordinating and managing a national response to an array of disasters such as earthquakes, hurricanes, tornadoes, fires, floods, hazardous material spills, and terrorist threats. FEMA works in coordination with other organizations and agencies that are part of the nation’s emergency management system. Some of FEMA’s primary goals are focused on reducing the loss of life and property; minimizing the level of disruption and suffering affiliated with the consequences of a national disaster; serving as the nation’s portal for emergency management information and services; and preparing the nation to address issues and consequences associated with terrorist activities. FEMA functions as the independent federal agency responsible for leading the nation’s efforts to prepare for, prevent, respond to, and recover from disasters.

Under the U.S. Department of Homeland Security, FEMA has formed the internal Office of Protection and National Preparedness. This FEMA office serves to implement terrorism incident management programs, and is responsible for coordinating efforts with state and local governments to prepare functions that are necessary to manage

natural disaster and terrorist related emergencies. FEMA works in coordination with other agencies, and also works to address issues pertaining to transportation mobility and security at different levels of government during times of natural disasters and terrorist attacks.

Transportation Research Board

The Transportation Research Board (TRB) is a division of the National Research Council, and functions within an advisory role to the federal government and other entities on subject matters of national importance. The primary purpose of the TRB is to promote innovation and progress through solid transportation research. TRB provided research on the subject of transportation system security, and has collaborated with all levels of federal government and the private sector. The TRB conducts special studies on a number of transportation policy issues and research items at the request of the United States Congress, and at the request of government agencies.

The TRB maintains a Security and Emergencies webpage that highlights recently released TRB reports, meeting announcements, requests for proposals, and other announcements related to security and emergencies. In addition, it includes links to selected security and emergencies research-related activities taking place at the federal and state levels, and within the academic and international transportation communities. This page also highlights and provides links to TRB programs and activities, which are the source of most of TRB's security and emergencies-related research products.

State of Arizona Programs

Arizona Department of Homeland Security

Governor Janet Napolitano created the Arizona Office of Homeland Security during March of 2003, in an effort to coordinate activities of the U.S. Department of Homeland Security at all levels of government within the State of Arizona. In 2006, the Arizona Office of Homeland Security became the Arizona Department of Homeland Security. As defined, the mission of the Arizona Department of Homeland Security is to protect Arizona by providing strategic direction and access to resources that will enable all the state's homeland security stakeholders to achieve our collective goals of:

- Preventing terrorist attacks in Arizona.
- Reducing Arizona's vulnerability to all critical hazards.
- Enhancing the capacity and expertise to plan for, mitigate, respond to and recover from all critical hazards that affect the safety, well-being and economic security of Arizona.
- Building the resiliency of Arizona.

AZDOHS administers and manages federal homeland security grants related to terrorism prevention and protecting Arizona from all hazards.

Arizona Division of Emergency Management

The Arizona Division of Emergency Management (ADEM) is a unit within the Department of Emergency and Military Affairs, which also includes the Army and the Air National Guard and the Joint Programs Division. The Division of Emergency Management is structured into four sections to address disaster preparedness, response, recovery, mitigation, and logistics. The Preparedness Section prepares state agencies and local emergency management organizations to prevent, respond to, recover from and mitigate against disasters through planning, training and exercise activities. The Operations Section is ADEM's disaster mitigation and emergency response arm. The Disaster Recovery Section's mission is to coordinate state and federal actions with local jurisdictions to assist those impacted communities in recovering from disasters. The Logistics Section provides facilities, transportation, supplies, equipment maintenance and fueling, food service, communications, and medical services for incident personnel.

The State of Arizona Emergency Response and Recovery Plan (SERRP) is administered by ADEM, and is designed to complement and coordinate preparedness, emergency response, and recovery activities by integrating with the National Response Framework and county, local, and tribal emergency operations plans and procedures. The plan consists of four sections: The Basic Plan, Functional Annexes, Support Annexes, and Incident Annexes. The Functional Annexes are organized by emergency support Functions as defined by the Department of Homeland Security. The Support Annexes provide detailed guidance regarding the Division's procedures for managing disaster operations and administration. Incident Annexes have been composed to provide policies and delineate responsibilities for response to specific events requiring complex interagency coordination.

Arizona Department of Public Safety

The mission statement of the Arizona Department of Public Safety is to protect human life and property by enforcing state laws, deterring criminal activity and providing vital support to the State of Arizona and its citizens. It is comprised of four divisions, which include the Director's office, highway patrol, criminal investigations and technical services. The Department of Public Safety is a multi-faceted state-level law enforcement agency, which works in close partnership with other agencies to protect the public. It is also a service organization providing a broad range of vital scientific, technical, operational and regulatory services to Arizona's citizens and the criminal justice community.

The Department of Public Safety participates in the Arizona Counter Terrorism Information Center, which is a joint effort between the Arizona Department of Public Safety, Arizona Department of Homeland Security, Federal Bureau of Investigation and other participating agencies. The Center operates on a 24/7 basis, providing both intelligence, investigative and technical support to state, local, tribal and federal law enforcement agencies as well as other agencies critical to Arizona and the country's homeland security efforts.

Arizona Department of Transportation

The Arizona Department of Transportation (ADOT) coordinates activities with the U.S. Department of Transportation on a variety of modes for the purpose of providing transportation security, and also works with state and local agencies on issues pertaining to transportation security and emergency response. Ongoing security efforts by ADOT include the following:

- Utilization of Homeland Security Grant Funds to Support Internal Projects:
 - Continuity of Operations
 - Interoperable Communications
 - Cyber Security
 - Automated Vehicle Location Devices on Critical Vehicles
 - HAZMAT
 - Needs Assessment
 - Vulnerability Assessment
 - Energy Assurance
- Internal Programs:
 - Vulnerability Assessment of Highway/Interstate Structures (bridges, tunnels, etc.)
 - Employee Training and Exercises
 - Business Continuity/Disaster Recovery Planning
 - Emergency Operations Planning
- Continued Support and Distribution of Public Information via 511 and www.az511.com
- Situation Reporting for major incidents and responses shared through WebEOC to multiple state agencies and the Arizona Counterterrorism Information Center
- Support of State, Regional, and National Programs:
 - National Incident Management System (NIMS) Compliance
 - State Emergency Response and Recovery Plan (SERRP)
 - Participation in Local, Regional, and Statewide Exercises for Emergency Preparedness
 - Participation in Urban Area Security Infrastructure (UASI) Efforts and Exercises
 - FHWA Traffic Incident Management Training
 - Distribution of TSA's Highway Infrastructure Counterterrorism Guide

MAG Area Programs

Maricopa County Department of Emergency Management

The Maricopa County Department of Emergency Management (DEM) is responsible for providing a comprehensive emergency management program for Maricopa County. The department is responsible for coordinating response and recovery activities through the implementation of emergency response plans during and after emergencies. As part of the emergency response process, the system coordinates implementation through assistance from local cities and towns, volunteer agencies, and other agencies and county departments. In addition, through intergovernmental agreements, DEM staff members are assigned as liaisons to incorporated cities and towns to provide assistance in the preparation of local emergency plans and training programs.

Some of the departmental functions include:

- Hazard Mitigation - This planning is documented in the Maricopa County Multi-Jurisdictional Hazard Mitigation Plan. As a part of this planning effort, hazard mitigation plans were developed for all of the 24 incorporated cities and towns in the county.
- Maricopa County Emergency Operations Plan - This plan closely follows the National Incident Management System (NIMS), which was established by the U.S. Department of Homeland Security to ensure a common disaster response framework throughout the nation. The plan has been carefully coordinated with the State of Arizona Emergency Response and Recovery Plan and the emergency operations plans of the cities and towns in the county.
- Homeland Security - Assist in the development of the Central Region (Maricopa County) homeland security strategy and help the various cities, towns, tribes, and independent fire districts integrate their efforts into that strategy. We also assist them in complying with the rules and procedures they need to follow to receive the U.S. Department of Homeland Security grant funds that are so critical to establishing and maintaining a capability to prevent or respond to terrorist events.
- Disaster Planning - Provide assistance in disaster planning and mass casualty management exercises and drills for hospitals, nursing homes, 1000 schools and school districts in Maricopa County.
- Disaster Assistance - Provide damage assessment support following a disaster to teams that are surveying areas to determine eligibility for state and federal assistance. Affected county and city/town agencies are briefed and Local Assistance Centers are opened, if necessary, to aid local jurisdictions and individuals in recovering from losses incurred during the disaster.

MAG 9-1-1 Emergency Telephone Number

In the late 1970s, the Maricopa Association of Governments (MAG) formed a committee to implement the 9-1-1 emergency telephone number system in Maricopa County. This system became operational on September 9, 1985. A MAG Committee comprised of public safety managers meets on a regular basis to make recommendations regarding operational issues, and to guide the purchase of new equipment to ensure system compatibility. The City of Phoenix serves as the contract agent for the system.

In January 2003, MAG was awarded a contract by the Arizona Department of Environmental Quality to establish and operate the Community Emergency Notification System/Reverse-911 that provides emergency agencies within the MAG 9-1-1 service area with the ability to notify citizens by telephone (in English or Spanish) of evacuations, security threats, or other emergencies. The system became operational on January 1, 2004. In 2015, there were 3.2 million 9-1-1 calls processed in the MAG region, with 80 percent of those calls from cell phones. In the MAG region, 9-1-1 utilizes multiple fiber networks including the Regional Community Network (RCN) owned by MAG member agencies. The RCN is a fiber network initially utilized for transportation purposes but now is also being used to provide redundancy for 9-1-1 calls and ensures public safety.

Valley Metro/Regional Public Transportation Authority

The safety and security of light rail, bus, paratransit, dial-a-ride and vanpool customers are very important to Valley Metro. Valley Metro's Safety, Security and Quality Assurance Division is responsible for establishing requirements for the identification, evaluation, and minimization of safety and security risks during revenue transit operations, construction and testing of service, rail line extensions, and related facilities. Additionally, the Division has developed, and is currently administering provisions of its System Safety Program Plan, System Security Plan, Safety and Security Management Plan, and Security and Emergency Preparedness Plans, and has increased security personnel presence and modern security-related technologies that assist in securing our system and facilities throughout. Valley Metro's Light Rail safety and security programs have been developed in cooperation with the Arizona Department of Transportation (ADOT), which is the designated State Oversight Agency for Light Rail in Arizona.

The Federal Transit Administration (FTA) and the Department of Homeland Security (DHS) have been very active through their attempts to work with transit providers across the country to develop security measures, which are intended to protect members of the transit public, and to also protect vital components of transit system infrastructure. With regard to transportation security, Valley Metro currently coordinates a number of activities with FTA and DHS. In an effort to provide a secure environment for its passengers, Valley Metro conducts periodic, project related Transit Threat and Vulnerability Assessments (or TVA's) at its facilities. The assessments considers general threat conditions and potential vulnerabilities to attacks, and also involved personnel interviews, site visits and documentation review. System wide TVAs are conducted in conjunction with local law enforcement and work to address facilities and operational infrastructure in order to enhance security practices, staffing and technology.

Additionally, Valley Metro partners with local, state and federal law enforcement agencies to share information or intelligence that greatly assist in the development of strategies and plans to keep its passengers safe. To ensure the effectiveness of Valley Metro's plans, Valley Metro conducts and participates in numerous yearly and triennial audits.

Future Security Program Efforts

This Chapter provided an overview of agencies at the federal, state and regional levels, which collectively address various aspects of transportation security throughout the MAG Region. The United States, the federal government, the State of Arizona, and local governments have taken considerable steps to protect the nation's transportation networks, which include roads, local and regional rail networks, passenger and freight terminals, port facilities, intermodal facilities, transportation infrastructure and transit systems. A range of agencies have taken steps to ensure the implementation of necessary security measures within the MAG Region.

These agencies will continue to refine transportation security measures over the years, and work toward closer cooperation, coordination and integration of tasks at all levels of government in an effort to provide safe transportation networks and facilities throughout the United States. Although MAG does not currently have a direct role in federal and state transportation security policy decisions, in the future, MAG will continue to maintain a supportive regional role for transportation security planning. As the regional Metropolitan Planning Organization, MAG will work to coordinate activities with local, state and federal agencies and officials in order to provide a regional forum on security issues, and will continue to provide a high level of support for existing and ongoing transportation security measures.

CHAPTER TWENTY-THREE

TRANSPORTATION SYSTEM PERFORMANCE

Consistent with federal state legislation, the development of the MAG Regional Transportation Plan (RTP) has included a performance-based planning and programming process. This process established goals, objectives and performance measures for developing various options and evaluating potential scenarios to be included in the Plan. Continuing to place emphasis on performance-based planning, MAG has established an ongoing Transportation System Performance Monitoring and Assessment Program. This program has developed various reporting methodologies and web-based components, allowing policymakers, technical users and the public in general easy access to performance data and visualization.

Federal Performance Targets and Performance Reporting

On December 4, 2015 President Obama signed into law the Fixing America's Surface Transportation Act, or FAST Act. This federal transportation legislation replaces the Moving Ahead for Progress in the 21st Century Act (MAP-21), which had been continued through numerous short term extensions and continuing resolutions until the enactment of FAST. The FAST Act provides substantially the same transportation planning guidance contained in MAP-21 and continues to place emphasis on: (1) following a performance-based approach to transportation decision-making, (2) establishing performance targets, and (3) integrating state department of transportations and public transit operators' targets into the metropolitan planning process.

Federal Performance Rules

Three final rules initially introduced by MAP-21 are still under development by the U.S. Department of Transportation. Four rules are available in final form and have been published: The Highway Safety Improvement Program (HSIP), the Safety Performance Management Measures, the Statewide and Metropolitan Planning Rule and the Highway Asset Management Plan. The Pavement and Bridge Condition, the MPO Coordination and Planning Area Reform and the System Performance/Freight Movement and CMAQ Program Performance Measures Rules are still in proposed format. The Federal Transit Administration has also published the final Public Transportation Safety Program Guidance, effective Sept 12, 2016, and the Transit Asset Management (TAM) Rule, effective October 1, 2016. Still in proposed format is the FTA Public Transportation Agency Safety Plan Rule, initially posted in February 2016, as well as the National Public Transportation Safety Plan Rule.

The Statewide and Metropolitan Planning Rule (Title 23 CFR Part 450.306(d)(3)) states that: "Each MPO shall establish the performance targets under paragraph (d)(2) of this section not later than 180 days after the date on which the relevant state or provider of public

transportation establishes the performance targets”. Federal regulations also require that “The transportation plan shall include a transportation system performance report and subsequent report updates evaluating the condition and performance of the transportation system with respect to the performance targets described in 450.306(d).”

MAG Target-Setting Activities

The FAST Act establishes performance-based programs and sets forth requirements for performance goals, outcomes and targets. MAG staff efforts are focusing on the development of specific performance measures and targets for the transportation system in the MAG metropolitan planning area. A collaborative Performance Measures and Targets Advisory Group (PMTAG) has been created to gather input from MAG member agencies with respect to the requirements included in the Metropolitan Planning Rule and System Congestion Proposed Rule from the Federal Highway Administration. The PMTAG continues to meet and is currently awaiting coordination sessions with ADOT to discuss targets.

At the time of this writing, relevant state and/or transit provider performance targets are not available. While proposed system congestion targets for the MAG region have been identified at the technical committee level, they have not been established or approved by the MAG Regional Council. Also, a transportation system performance report that evaluates the condition and performance of the transportation system with respect to those performance targets has not been prepared. It is anticipated that when relevant state and/or provider targets become available, and subsequent consideration of targets through the MAG committee process has been completed, the RTP will be revised to include the appropriate performance targets and performance report.

MAG will continue to follow general transportation planning concepts as included in FAST, and is coordinating an effort with state and transit partners to follow performance based planning and programming criteria and principles in developing targets required by the final rules.

MAG Performance Monitoring Program

Performance measurement and management are not new activities at MAG. An extensive performance measurement and management program has been developed in cooperation with regional partner agencies and member jurisdictions and has been integral to the development of MAG’s Unified Planning Work Program (UPWP). Based on a robust data collection and processing component, the program includes a series of analytic procedures, various reporting methodologies and web-based products, allowing policymakers, technical users and the general public easy access to performance data and visualization.

Performance Based Planning

At the state level, Proposition 400 legislation set forth the factors to be considered during the development of the MAG Regional Transportation Plan (RTP), such as the impact of growth on transportation systems and the use of a performance-based planning approach. Consistent with state legislation, the development of the MAG Regional Transportation Plan (RTP) included a performance-based planning and programming process. This process established goals, objectives and performance measures for developing various options and evaluating potential scenarios to be included in the Plan. A number of the goals and objectives adopted relate to the performance of the system as a whole as well as the individual components of the multimodal system across various facilities such as freeway, arterial and transit corridors.

Pursuant to national goals and performance management requirements set forth in current transportation legislation at the federal and state levels, MAG continues to place emphasis on performance-based planning. In order to ensure compliance with the associated regulatory requirements, the RTP sets forth a number of goals and objectives, and has built a framework of performance measures and measurement tools that are available to member agencies and the public on MAG's website at <http://performance.azmag.gov/>.

The following are a few examples of MAG's goals with the performance products that address them:

- Goal: "Provide a safe and secure environment for the traveling public, addressing roadway hazards, pedestrian and bicycle safety, and transit security."

Product: Tables and graphic analysis showing trends in total crashes for the major corridors of the urban freeway system in the MAG region, as well as total injuries and fatalities on arterial facilities by mode. These data provide a reference for MAG programming activities involving member agencies as they factor safety into project prioritization and selection.

- Goal: "Maintain an acceptable and reliable level of service on transportation and mobility systems serving the region, taking into account performance by mode and facility type."

Product: Tables, graphs and interactive maps that allow the user to select a freeway or arterial corridor and choose a peak period to obtain results for measures of delay, congestion, or travel time index. The map is accompanied by charts which track statistics through the day and a map depicting graphic gauges that compares percentage changes in performance between 2011 and 2014

- Goal: "Provide the people of the region with transportation modal options necessary to carry out their essential daily activities and support equitable access to the region's opportunities."

Product: Regional maps and charts showing the location and extent of areas within walking distance of transit stops that provide high frequency service, and the population in those areas that fall below the poverty line.

MAG continues to focus on enhancing the ongoing Transportation System Performance Monitoring and Assessment Program by monitoring available data sets, online tools, and publicly available information sources to continue to provide quality products that meet or exceed industry standards.

Monitoring Current Conditions

The optimum combination of accuracy and detail for performance measurement is based on real time, observed data sources. These data provide the information to assess the principal operating characteristics of the current transportation system and to establish a historical record that tracks performance trends over time. The specific parameters observed vary by transportation mode and must take into consideration the practicality and expense of collecting data on a continuing basis. The latter factor is particularly important if a historical record is to be established that allows effective analysis of performance trends. A large amount of data is collected annually in the MAG region related to the movement of people, goods, and services.

- Data Items - For roadway systems, typical data collected to assess current performance includes: vehicle counts at a sample of locations; vehicle densities along various roadway segments; speeds and point-to-point travel times; delays; number and types of accidents; and, as a result of special studies, intersection queue lengths. For transit systems, common data items cover: boardings and farebox revenues by route; on-board passenger loadings at various points in the system; operating costs; and service standards.
- Data Sources - Data from the Arizona Department of Transportation's (ADOT) Freeway Management System (FMS), which now includes 158 centerline miles of the regional freeway system, is collected continuously in five minute increments from loop and acoustic sensors that detect and record the movement of vehicles across a large portion of the MAG region. Currently the FMS instrumented portion covers approximately 56 percent of the entire MAG freeway system. As the FMS system continues to grow, it will allow the use of these data for future reliability performance calculations over the entire urban highway system.

In addition, traffic count data is collected on arterial roadways through both permanent and temporary counting stations deployed by a variety of MAG member agencies as well as a by a MAG sponsored vehicle counts program at selected regional locations. Moreover, periodic studies are conducted to collect information on topics such as the average number of people in cars, the proportion of trucks on the roadways, and levels of congestion on the freeways and arterials.

MAG has also acquired traffic speed data for freeways and arterials in the region from third party commercial sources. A major national private data provider is under contract with MAG to supply GPS-probe based speed data for all regional freeways and all major arterials, thus supplementing the existing arterial database and ADOT FMS freeway database. It is anticipated that this acquisition will be renewed on a yearly basis, allowing the current data archive to be more geographically complete and enable MAG to perform analysis on system and corridor performance from comprehensive data sources.

In 2013, the Federal Highway Administration (FHWA) made available, free of charge to States and Metropolitan Planning Organizations (MPOs), the National Performance Management Research Data Set (NPMRDS), which is a national data set of average travel times for use in performance measurement. Additionally, MAG has established a partnership with the University of Maryland’s Center for Advanced Transportation Technology Laboratory (CATTLAB), which has developed a data tool called The Regional Integrated Transportation Information System (RITIS).

- System-Wide Monitoring - Per Capita Freeway Vehicle-Miles of Travel (VMT) is defined as the average number of freeway miles a vehicle in the Phoenix-Mesa urbanized area travels per day per person. This measure reflects overall vehicle travel trends for the region. Table 23-1 lists the total number of freeway vehicle miles traveled each year during 2011 to 2014. Between 2011 and 2013, VMT trended slightly lower with a decrease of 0.3 percent. However, between 2013 and 2014 there was a significant increase of 4.8 percent. The level of VMT per capita in 2014 was 0.9 percent higher than in 2011.

**TABLE 23-1
PER CAPITA FREEWAY VMT for the PHOENIX/MESA URBANIZED
AREA**

	2012	2013	2014	2015
Total Freeway VMT*	29,073,331	29,400,899	30,802,738	31,209,013
Population of Phoenix-Mesa Urbanized Area**	3,392,348	3,414,591	3,490,349	3,542,153
Per Capita Freeway VMT	8.57	8.61	8.83	8.81

Source:

*ADOT Highway Performance Monitoring System (HPMS) 2014 Draft

** ACS and Census 2010 (2014 Draft Estimate)

Another system-wide monitoring result is displayed in Figure 23-1. The GPS-probe based speed data mentioned above was used to depict the amount of time afternoon commuters may expect to lose, reflecting the difference between peak hour and free flow conditions.

2040 Regional Transportation Plan

Fig. 23-1



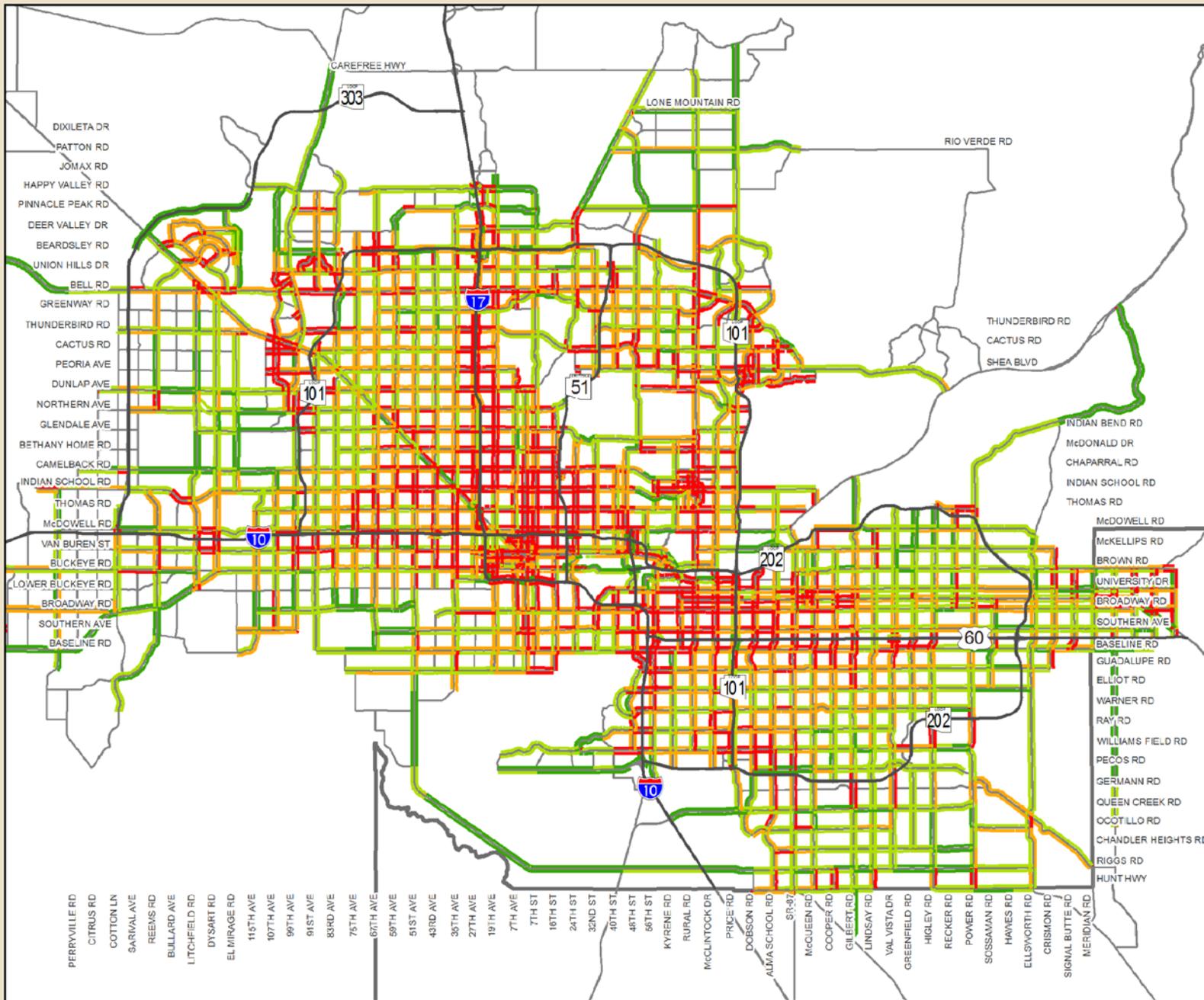
2014 PM Peak Period Average Delay Arterial Roadways

Legend

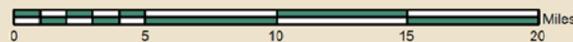
Average Delay (seconds per mile) 3PM - 7PM (2014)

- 0 - 10
- 10 - 20
- 20 - 30
- 30+
- Freeways
- Major Roads

Delay calculated in seconds per mile relative to free flow speed.



While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.



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Map derived from weekday speed data for analysis year. Source: Maricopa Association of Governments

Roadway System Performance

A broad range of monitoring data on the performance of the roadway system in the MAG area has been collected over the years. Currently traffic data is available for the MAG Region from various studies and surveys completed within the last five years, as well as the yearly ADOT FMS and private sector speed data. These data collection efforts have supported a variety of performance factors and have enabled historical comparisons to be made.

Traffic Volume Data

The ADOT Freeway Management System (FMS) provides count data on the mainline general purpose lanes and HOV lanes 24/7/365, and on ramps on the majority of the urbanized freeway system. Traffic counts are collected through 273 in-pavement loop detectors and 83 passive acoustic detectors (PADs). This data feeds directly to the Arizona AZ511 system, providing real-time traveler information. MAG's programs and products do not include real-time data feeds as this data is generated at the ADOT's Traffic Operations Center (TOC) and this information is more appropriate for traveler information rather than planning functions. For archive and analysis purposes volume data is also aggregated in periods from five minutes to 24 hours for weekdays and weekends.

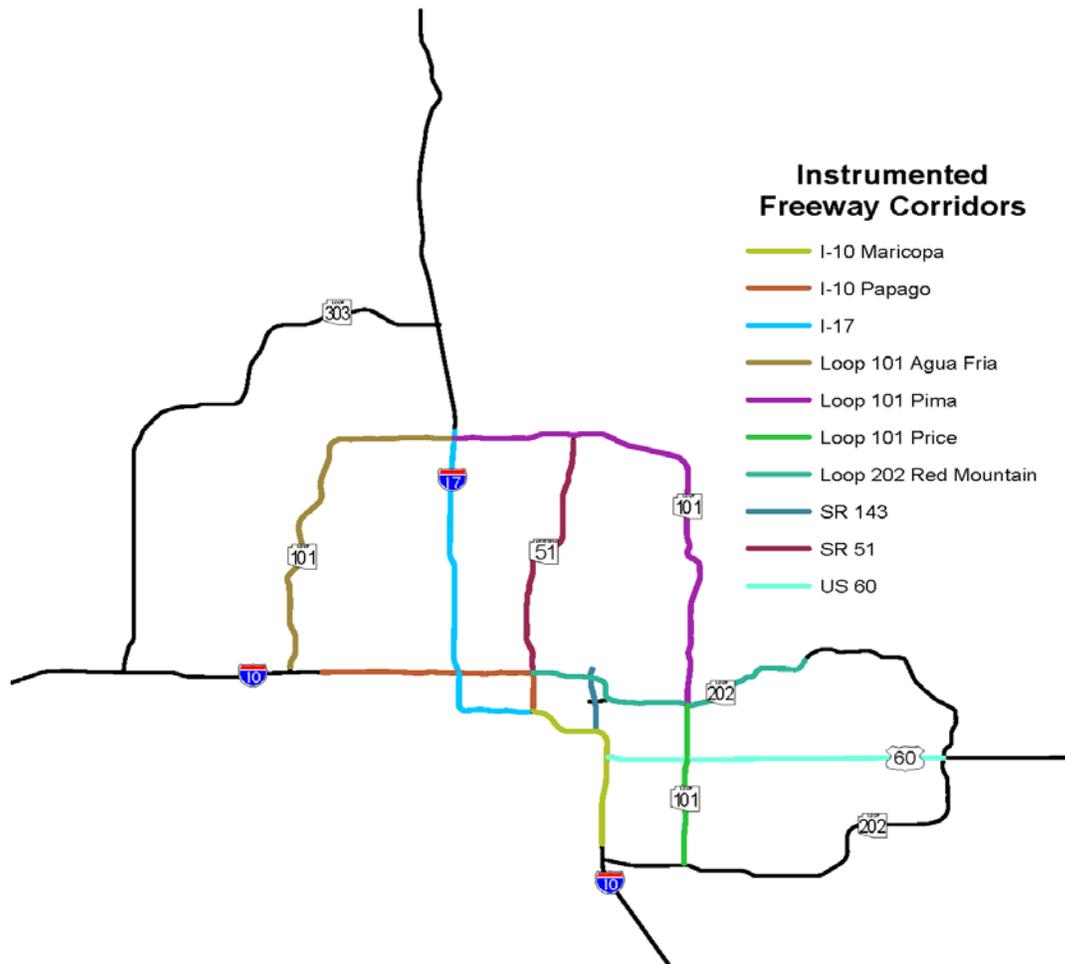
For the arterial system, MAG collects traffic data at over 770 stations using machine counts. Data is collected on weekdays every three to four years, over a 48-hour time period, and aggregated by 15-minute, hour, peak period, and 24-hour periods. Counts are conducted by direction at mid-block locations and approach locations throughout the region. Data from the MAG count program undergoes a variety of data quality control checks; count data collected from other jurisdictions/member agencies is usually subject to the same kind of quality control checks. Since 2010 MAG has developed a web-based Traffic Data Management System which is a repository of all available traffic counts, turning movement counts and travel time databases.

Travel Time Data

Travel time is among the measures that are most meaningful to travelers and system managers alike, since it relates to their experience of everyday travel. The Travel Time Index (TTI) is a measure of average conditions that tells one how much longer, on average, travel times are during congestion compared to during light traffic. For example, a value of 1.30 TTI means that a 20 minute trip at free flow speeds takes 30 percent longer, or 26 minutes in the peak hours.

Figure 23-2 depicts the location of the regional freeway segments for which TTI's have been calculated. Appendix Table G-1 provides a detailed listing of the calculated commuting TTI's for the a.m. and p.m. commuting peak periods on the instrumented freeway corridors, based on 2013 and 2014 ADOT FMS data.

**FIGURE 23-2
SELECTED FREEWAY CORRIDORS**



The 2014 TTI peak period values have generally maintained their levels, with the exception of a PM period westbound I-10 segment between I-17 and SR-101, which experienced an increase of 3.9 percent and a southbound segment of SR-51 between Glendale Ave. and I-10 which increased by 3.15 percent in travel time. The highest percent changes in travel time indices between 2013 and 2014 are seen during the AM peak periods, certain corridors have experienced significant service level declines, such as eastbound I-10 between I-17 and SR-51, southbound I-17 between Peoria Ave. to I-10 and westbound US-60 between SR-101 and I-10, experiencing travel time increases of 7.5 and 8.7 and 7.5 percent respectively.

With respect to the SR-101 and SR-202 Corridors, the highest percent change in travel time is seen on the northbound segment of SR-101 between SR-202 and Pima Rd., and on the westbound segment of SR-101 between SR-51 and I-17, with increases of 6.6 and 7.7 percent in travel time index respectively.

As a whole, the percent increases in travel times comparing 2013 and 2014 are been moderate across the freeway system, the most significant differences are seen in the direction of central locations with higher concentrations of job destinations near the urban core. This pattern is generally an indicator of a recovering regional economy.

Speed Data

Currently, the three principal, most comprehensive sources of speed data for the MAG region are: the private sector data bases, (which have been acquired by MAG starting in 2010), ADOT's Freeway Management System (FMS) permanent count detector database, and the National Performance Measurement Research Data Base (NPMRDS), made available to States and MPOs by the FHWA. The source for private sector and national traffic data is mainly probe GPS-equipped vehicles and other mobile consumer devices. The significant benefit to these products is their consistency in reporting, as well as the full coverage of the MAG freeway and major arterial network. Speed data for the instrumented portions of the freeway system is also available through the ADOT Transportation Planning Division traffic detector stations.

Appendix Tables G-2 and G-3 depict changes in average speed for freeway corridors monitored by ADOT'S FMS System between 2014 and 2015. For these two years, it can be observed that general purpose lanes have generally maintained their morning peak period average speeds in 2015, with the exception of westbound I-10 between 83rd Ave. and SR-51 and northbound i-10 between Chandler Blvd. and US-60, where speeds have decreased between 15 and 17 percent as compared with 2014. Westbound US60, has also experienced speed decreases of up to 8 mph. between SR-101 and the I-10 interchange.

During the afternoon peak period, for 2015, the freeway system in general maintained balanced speed conditions as compared to 2014; a few segments located within the urban core corridors experienced a significant decline. General purpose lanes and HOV lanes on westbound I-10 between SR-51 and I-17 experienced significantly decreased speeds up to 10 mph. Similarly, eastbound I-10 between SR-51 and US-60, speeds experienced decreases of 6 and 8 mph. on general purpose lanes and HOV lanes respectively.

A number of projects initiated construction phase during 2014 outside of the urban core area, such as additional travel lanes and an interim interchange on SR-303. Additionally, on SR-101 between SR-202 and Shea Blvd., additional travel lanes are being built in both directions; a new traffic interchange is being constructed on US -60 and Meridian Rd., New general purpose and HOV lanes are being added to SR-202 between SR-101 and Broadway Rd. Despite, the significant non-recurring congestion effects from road work, none of these segments have experienced measurable loss of throughput or speeds.

With regards to arterial corridors, the highest increases in travel time are experienced in morning and afternoon peak periods especially in popular commute directions, accessing and exiting major freeway corridors and approaching and leaving regional employment centers. For example, in the morning peak period, travel time on the westbound Glendale Avenue

corridor increased by 8 percent between 59th Ave. and the I-17; on the northbound Arizona Ave. corridor, travel time between Riggs Rd. and SR-202 increased by 6 percent. The Chandler Blvd. corridor in Ahwatukee, experienced increases of approximately 6 percent as well. In the afternoon peak period, when commuter travel is exiting the freeway corridors, southbound Gilbert Rd. between SR-202 and Queen Creek Road and southbound Scottsdale Rd. from SR-101 to Bell Road experienced the highest travel time increases at 8 and 7 percent respectively.

Corridor-Specific VMT Statistics

MAG uses data to calculate vehicle-miles-of-travel (VMT) for individual freeway segments and arterial roads. Tables 23-2 and 23-3 report several statistics for corridors, including VMT. The chart shows how many miles are driven on each segment every day, or the “demand” on that segment. Traffic counts, by themselves, do not portray demand, but must be weighted using the length of the segment, resulting in VMT values. The segments between Loop 101 Agua Fria and State Route 51 on I-10 carry significant traffic, as highlighted in Table 23-2. VMT per mile for both segments is over 100,000. This means that over 100,000 vehicles drive each mile of those segments every day. The U.S. Highway 60 segment between the Loop 101 and Val Vista is the only other freeway segment with a daily VMT per mile that is over 100,000 as highlighted in Table 23-2. In Table 23-3, the same calculation applied to arterial roadways indicates that Shea Boulevard with 18,961 VMT and Bell Road with 18,574, handle the most travel per mile every day. Frank Lloyd Wright Boulevard comes in third with over 16,615 VMT.

Congestion Measures and Trends

Two of the most common measures of congestion are Travel Time Index (TTI) and Planning Time Index (PTI). TTI is the measure of how long it will take to drive a segment of road, compared to how long it would take if there were no congestion. For example, a mile long segment of road that averages one minute of travel time with no congestion, and has a TTI of 1.1 for a peak period, would take 66 seconds to complete. PTI is similar, but is calculated on the 95th percentile travel time. PTI tells someone how much extra time to build in to be on time to work 95 percent of the time. PTI is the principal measure of the reliability of the travel time on a given roadway. Performing analysis over the course of a number of consecutive years makes it possible for decision makers to see year-to-year comparisons and evaluate trends.

Figure 23-3 is an example of the TTI and PTI trend charts available on the MAG Performance Dashboard, comparing congestion changes over the period from 2011 to 2014. The 2014 chart includes a TTI dashboard gauge that communicates the trend simply. (Note: The legend that explains these gauges can be found below the charts in Figure 23-3.) These same measures are used system-wide to communicate how well capacity on freeways and arterials is keeping up with demand. Figure 23-4 shows system summary graphics comparing key measures for freeways and arterials.

**TABLE 23-2
SELECTED FREEWAY
CORRIDOR STATISTICS**

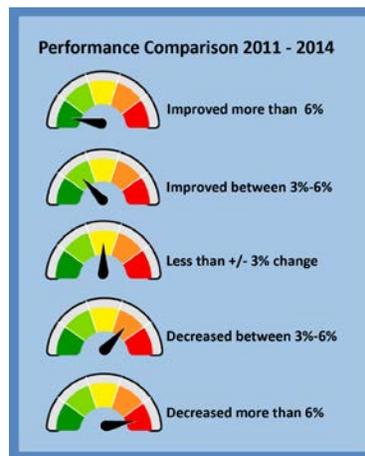
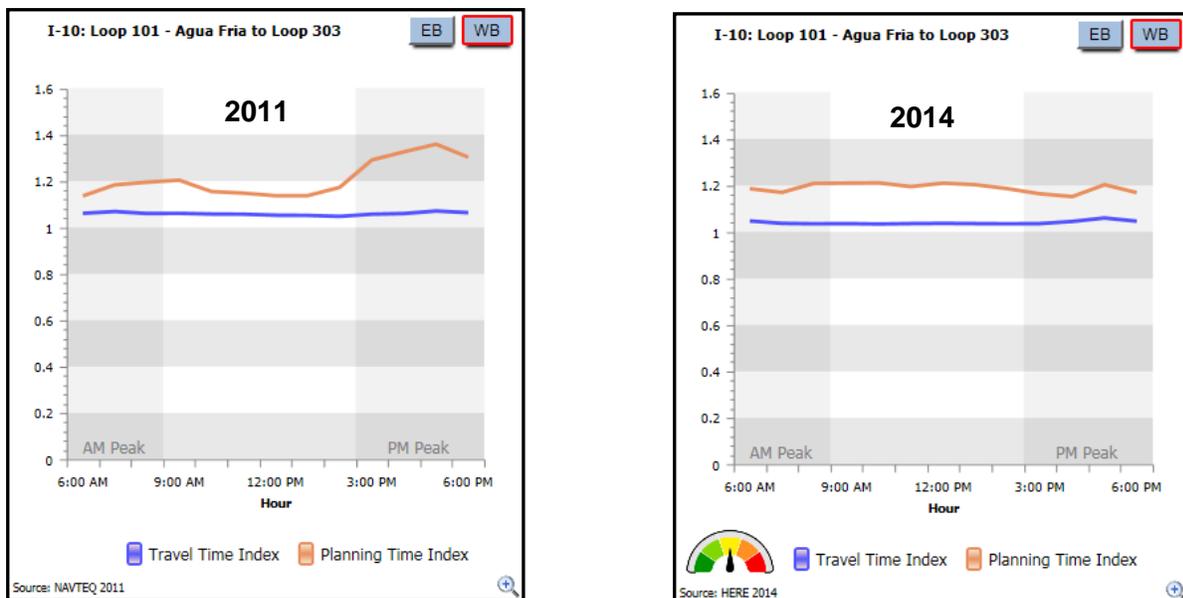
			YEAR 2014									
FREEWAYS			Requested Direction					Reverse Direction				
On	From	To	Length (miles)	PM Time (minutes)	PM Congested Lane Miles	PM VHD	DailyVMT	Length (miles)	PM Time (minutes)	PM Congested Lane Miles	PM VHD	DailyVMT
I-10	La Paz County	AZ 85	41.6	34.7	-	3.4	421,472.1	42.6	35.6	-	7.0	452,186.0
I-10	AZ 85	L 303	12.1	10.6	-	58.9	357,508.7	11.9	10.9	-	159.6	365,089.6
I-10	L 303	L101	9.2	8.4	-	189.8	588,405.2	8.9	9.8	9.6	981.5	596,387.1
I-10	L101	I-17	9.2	10.3	13.7	1,037.8	1,015,712.0	9.6	18.3	36.7	5,754.7	994,476.9
I-10	I-17	SR 51	3.8	4.6	7.1	546.1	406,850.5	3.8	6.8	14.6	2,002.2	399,384.4
I-10	SR 51	US 60	7.9	11.7	23.3	2,619.3	732,861.6	7.8	9.6	10.1	1,333.4	801,111.4
I-10	US 60	L202-Santan	6.1	10.9	19.7	2,467.9	474,772.6	6.7	7.6	12.0	623.5	502,790.1
I-10	L202-Santan	I-8	38.3	35.7	1.1	653.3	981,968.4	37.5	32.1	-	84.9	972,628.1
I-10	I-8	Pima County	33.6	28.2	-	29.1	687,125.2	33.2	27.8	-	20.3	693,813.8
I-17	I-10 Maricopa	I-10Pap	6.3	10.5	15.2	1,968.7	471,456.9	6.3	7.6	11.2	737.1	452,598.9
I-17	I-10Pap	Peo	8.5	15.8	24.1	3,602.3	667,070.3	8.4	10.9	18.8	1,283.3	721,871.4
I-17	Peo	L 101	5.8	9.6	17.5	1,828.5	426,651.9	5.7	6.6	8.2	534.9	409,258.8
I-17	L 101	L 303	6.9	7.7	5.0	591.0	312,240.9	7.2	6.6	-	124.5	356,706.4
I-17	L 303	Yav	22.9	19.9	-	165.7	464,952.0	22.0	18.6	-	22.6	429,034.0
L101_AgFr	I-10	UniHls Dr	14.3	14.2	-	532.7	594,702.6	14.1	13.5	-	393.7	629,045.6
L101_AgFr	UniHls Dr	I-17	7.2	7.1	-	275.5	394,212.0	8.1	9.2	10.8	840.7	425,759.7
L101_Pima	I-17	SR 51	7.0	7.4	1.9	412.2	411,777.7	6.4	8.8	15.8	1,307.3	385,980.6
L101_Pima	SR 51	PmPn Dr	6.6	6.4	0.9	194.4	337,567.8	6.4	7.4	8.4	622.1	321,568.4
L101_Pima	PmPn Dr	Pma90th	5.8	5.4	-	137.5	291,661.2	5.7	6.1	1.8	398.2	302,146.4
L101_Pima	Pma90th	L202RdMtn	9.0	12.2	20.5	1,680.2	673,939.1	9.6	12.9	27.3	1,739.5	705,601.8
L101_Price	L202RdMtn	US60	3.3	5.4	10.3	1,255.0	293,880.2	3.1	3.4	4.5	298.7	247,559.2
L101_Price	US60	L202Sntn	6.4	9.3	15.3	1,500.6	423,246.9	5.6	6.0	3.5	342.4	370,141.5
L202- RdMtn	I-10	WashSt	4.5	5.1	5.4	477.5	339,879.7	4.2	5.7	6.8	806.4	298,277.2
L202- RdMtn	WashSt	L101	4.6	5.7	9.1	950.9	419,350.3	5.4	5.0	-	114.4	388,826.9
L202- RdMtn	L101	McDowellRd	7.9	8.9	6.3	753.3	311,229.9	7.1	6.1	-	26.5	262,762.5
L202- RdMtn	McDowellRd	US60	12.6	11.3	-	145.3	297,508.1	13.8	11.7	-	3.3	305,774.9
L202- Santan	I-10	L101	4.9	4.7	-	120.8	149,724.4	4.2	3.7	-	14.9	165,793.2
L202- Santan	L101	LindsayRd	7.6	9.2	15.5	991.2	379,640.7	7.0	6.3	-	88.8	363,015.1
L202- Santan	LindsayRd	US60	12.1	10.7	1.3	120.1	332,535.3	13.4	11.6	-	48.8	353,919.4
SR 143	I-10	McDowellRd	3.8	4.9	4.0	241.9	131,749.0	3.8	4.8	1.4	244.1	129,759.6
SR 51	I-10	GlendaleAve	4.8	8.0	15.2	1,519.9	349,406.7	5.4	6.2	5.2	485.5	406,633.6
SR 51	GlendaleAve	L101	10.0	11.1	12.2	977.3	527,806.8	9.4	8.4	-	123.2	515,376.2
US 60	I-10	L101	3.7	5.2	12.3	978.9	313,926.6	4.5	4.8	1.7	347.7	405,919.4
US 60	L101	ValVista	7.6	12.3	36.4	3,621.3	826,125.7	7.7	7.6	0.5	448.8	846,093.6
US 60	ValVista	L202	6.0	6.5	1.8	712.4	475,086.1	6.2	5.4	-	61.0	430,498.5
US 60	L202	Goldfield Rd	8.2	8.4	4.0	344.4	270,289.8	7.9	6.9	-	39.1	251,497.6

**TABLE 23-3
SELECTED ARTERIAL
CORRIDOR STATISTICS**

ARTERIALS			YEAR 2014									
			Requested Direction					Reverse Direction				
			On	From	To	Length (miles)	PM Time (minutes)	PM Congested Lane Miles	PM VHD	DailyVMT	Length (miles)	PM Time (minutes)
19th Ave.	Southern Ave.	Deer Valley Rd.	20.1	43.1	-	890.1	231,789.6	20.1	42.9	3.4	696.5	211,293.9
59th Ave.	I-10	Loop 101 Agua Fria	13.9	29.3	-	618.0	187,451.0	13.9	29.1	-	468.1	163,865.8
7th St.	Southern Ave.	Loop 101 Pima	19.0	43.6	0.3	1,145.2	259,680.3	19.0	41.2	0.2	692.3	227,782.2
Apache Blvd./Main St	Mill Ave	Ironwood Dr.	21.8	45.7	-	856.5	232,482.7	21.8	38.9	-	290.4	228,297.3
Baseline Rd.	51st Ave.	Loop 202 SanTan	29.9	60.1	3.2	1,285.4	354,267.1	29.9	59.1	1.8	1,110.2	364,493.3
Bell Rd.	Grand Ave.	Scottsdale Rd.	24.5	51.9	1.1	1,417.8	455,587.2	24.5	61.4	10.0	2,907.2	450,119.4
Chandler Blvd./Willi	17th Ave.	Loop 202 SanTan	20.8	41.2	1.5	861.4	257,160.1	20.8	40.3	0.4	675.1	253,308.2
Arizona Ave./County	Riggs Rd.	McDowell Rd	17.1	34.3	0.6	635.2	246,968.9	17.1	37.4	-	980.2	250,373.2
Dysart Rd.	I-10	Bell Rd.	12.4	26.6	1.0	448.3	122,541.0	12.4	22.8	-	208.4	121,066.7
Frank Lloyd Wright B	Scottsdale Rd.	Shea Blvd.	7.0	18.7	2.4	716.7	116,045.2	7.0	15.5	-	372.4	115,379.4
Gilbert Rd.	Queen Creek Rd.	Loop 202 Red Mountain	14.0	28.0	0.3	545.7	196,932.2	14.0	30.6	1.8	906.9	199,315.7
Glendale Ave. Lincoln	Loop 101 Agua Fria	Scottsdale Rd.	20.1	43.6	0.6	936.2	293,998.0	20.1	48.3	6.7	1,611.2	298,936.2
Grand Ave.	Van Buren St.	Loop 101	14.2	45.3	18.4	1,933.7	207,795.7	14.2	34.3	1.0	765.2	213,375.1
Grand Ave.	Loop 101	Loop 303	10.5	33.7	8.7	2,012.5	167,427.3	10.5	26.4	4.9	894.8	167,496.5
Indian School Rd.	Loop 303	Loop 101 Pima	31.1	65.5	2.4	1,391.6	432,583.3	31.1	72.3	7.5	2,269.4	438,480.7
McDowell Rd.	Dysart Rd.	Loop 101 Pima	26.1	50.5	0.5	637.9	263,747.9	26.1	55.0	0.5	1,038.4	266,147.8
Power Rd.	Loop 202 Santan	Loop 202 Red Mountain	9.9	19.3	-	303.4	128,186.4	9.9	19.9	-	370.2	128,195.2
Rural Rd./Scottsdale	US 60	Carefree Hwy.	28.5	73.1	8.5	2,942.4	460,858.3	28.5	61.4	0.8	1,510.9	463,598.9
Shea Blvd.	SR 51	Frank Lloyd Wright Blvd.	10.0	24.1	0.4	946.0	189,994.3	10.0	22.6	0.5	681.4	181,778.9
Southern Ave.	19th Ave.	Ironwood Dr.	31.0	63.4	2.6	1,024.3	284,795.7	31.0	58.8	-	750.0	300,403.5
44th St./Tatum Blvd.	Loop 202 Red Mountain	Pinnacle Peak Rd.	17.2	41.4	4.3	1,406.1	241,789.6	17.2	35.3	0.1	643.3	234,331.8
Buckeye Rd.	AZ 85	24th St.	17.7	32.4	-	208.3	155,700.8	17.7	41.0	1.0	826.9	164,714.0

MAG's Performance Measurement program has developed maps such as the one depicted in Figure 23-5, showing how congestion on each segment of I-10 westbound during afternoon commute hours improved or declined between 2011 and 2014. Additional comparative information for the remainder of the freeway corridors can be found in MAGitude at http://azmag.gov/Documents/TRANS_2016-10-28_PSD_05_2011-14-Trend-Analysis.pdf.

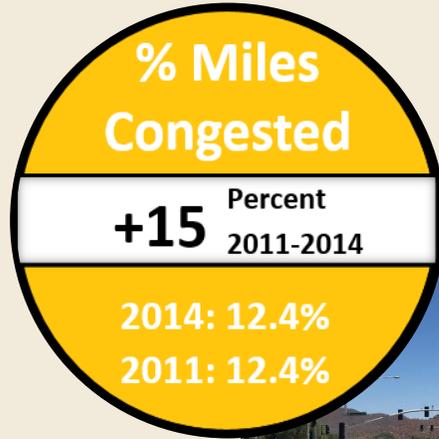
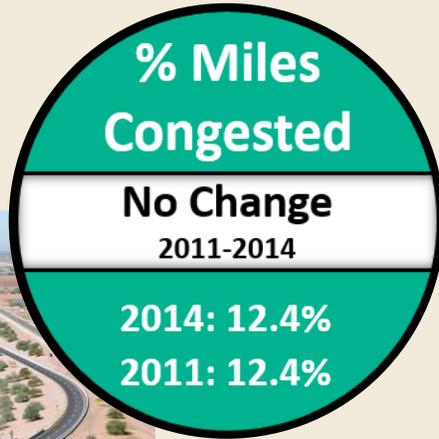
**FIGURE 23-3
CONGESTION CHARTS - 2011 & 2014**



**FIGURE 23-4
SYSTEMWIDE CONGESTION
TRENDS**

Freeway

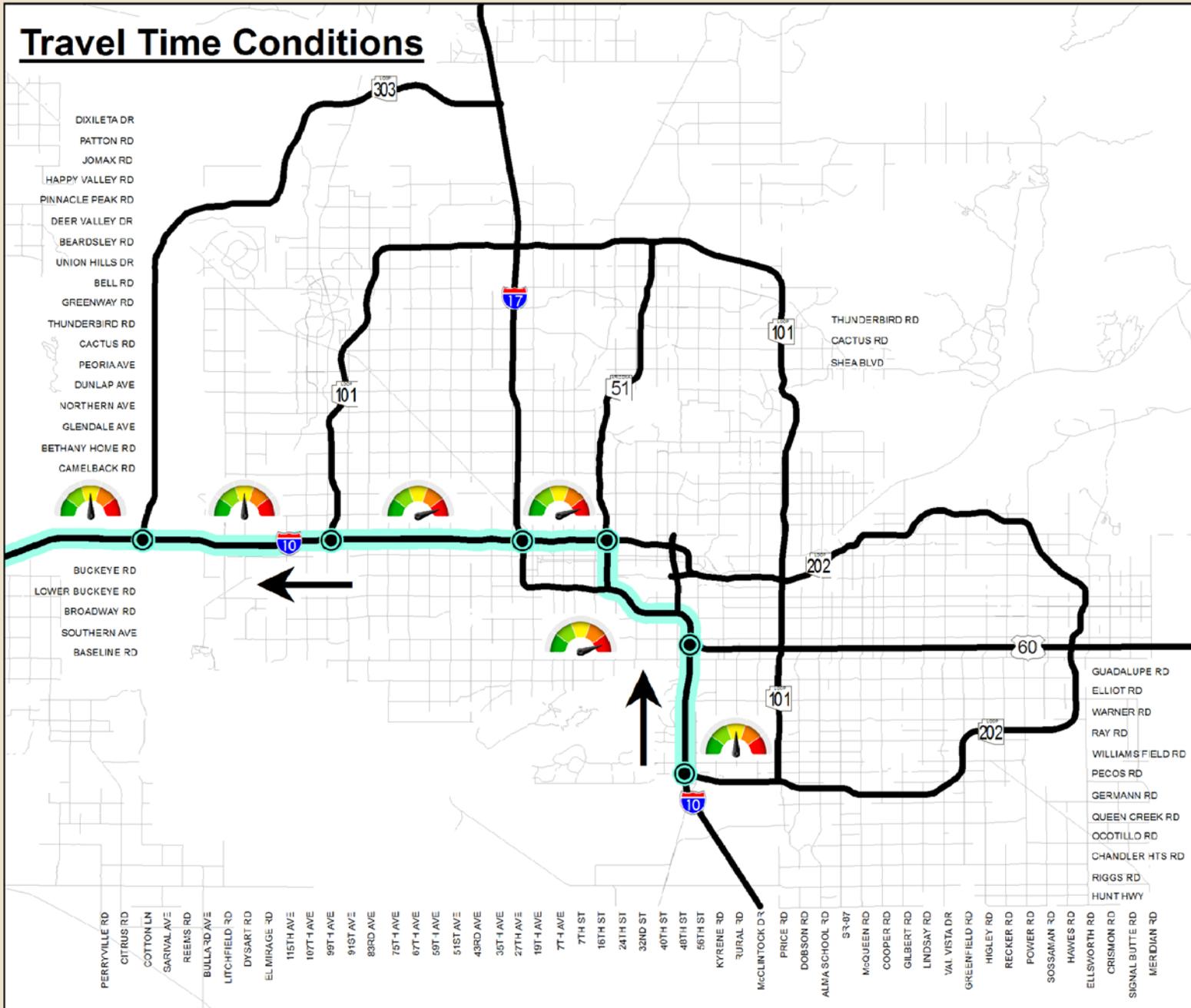
Arterial



**2040 Regional
Transportation Plan**



Travel Time Conditions



2040 Regional Transportation Plan

Fig. 23-5



Freeway Segment Travel Time Index % Change (2011-2014)

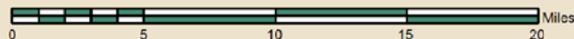
Travel Time Conditions

- Improved 6% +
- Improved 3-6%
- Less than +/- 3% Change
- Decreased 3-6%
- Decreased 6% +
- Segment Endpoints



MARICOPA COUNTY

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Source: Maricopa Association of Governments

Map derived from weekday speed data for analysis year.
 Source: Maricopa Association of Governments

Transit System Performance

There are two key components to the transit performance monitoring effort: the Transit Performance Report (TPR) and the Ridership Report. The TPR is prepared and updated annually by Valley Metro/Regional Public Transportation Authority (RPTA). This report is developed using input from, and is reviewed by, member agencies and the RPTA Board. The TPR serves as an important information source for the MAG regional transportation planning process. This Report also updates the Valley Metro Short Range Transit Plan.

Valley Metro also publishes an annual Ridership Report, which covers transit passenger ridership for all the operating agencies in the region. The report includes annual weekday, Saturday and Sunday ridership figures by select transit modes (bus, circulator, rural and light rail). Principal performance measures include total boardings and boardings per mile across the system as well as total number of riders and revenue miles by route and by city.

The full Transit Performance Report and The Valley Metro Ridership report can be accessed from the Valley Metro Website (www.valleymetro.org).

Service Standards and Performance Measures

In 2006 RPTA hired a consultant to conduct a Service Efficiency and Effectiveness Study (SEES). One task of this study was to develop a series of performance measures. This SEES also developed initial performance targets that allow comparison between performance expectations and actual performance. These performance measures are being incorporated into the TPR, as well as reported on the Transit Ridership Report and Dashboard. The SEES framework established a baseline of performance expectation for Fixed Route bus (system-wide); Fixed Route bus at the route level; Paratransit; and Light Rail Transit (LRT). One of the key goals of the performance targets is to ensure consistent service levels throughout the region.

A Technical Advisory Group (TAG) made up of Valley Metro member agencies and MAG, was formed in November 2012, being tasked with the development of Regional Transit Service and Facility Standards and Performance Measures. Phase I of this effort was completed with Valley Metro/RPTA Board adoption in November of 2013, and included service standards and service delivery goals and objectives. It also developed transit standards, initiated a performance measures review, and developed a fully documented process for transit service changes. Phase II which was built upon the effort initiated as part of Phase I, was completed in December 2014. Phase II focused on the development of transit service performance measures, transit service thresholds, application principles, and implementation standards for new service. The Phase II recommendations were approved by the Board of Directors for the Valley Metro Regional Public Transportation Authority and Valley Metro Rail in December 2014. Phase III was initiated in December 2014 to establish standards and performance measures for regionally funded transit vehicles such as buses and light rail vehicles and transit facilities such as bus stops and

park and ride facilities. Phase III is now complete and approved by the Valley Metro Board of Directors June 16, 2016.

Performance Targets and Operating Results

The original performance measures developed during the Service Efficiency and Effectiveness Study are listed in Tables 23-4 through 23-6. These tables also include actual operating results, from the 2013, 2014 and 2015 Transit Performance Reports (TPR). The annual (TPR) provides information to the Boards of Directors and member cities concerning ridership, operating costs, fare revenue and performance indicators for region-wide transit services.

**TABLE 23-4
LIGHT RAIL TRANSIT (LRT) PERFORMANCE MEASURES**

Measure	2013	2014	2015
Cost Efficiency/Effectiveness			
Farebox Recovery Ratio	45.00%	40.00%	41.00%
Operating Cost per Boarding	\$2.01	\$2.18	\$2.19
Subsidy (Net Operating Cost per Boarding)	\$1.11	\$1.31	\$1.29
Operating Cost per Revenue Hour	\$11.81	\$12.60	\$12.60
Service Effectiveness			
Annual Total Boardings	14,286,093	14,331,488	14,276,884
Boardings per Revenue Mile	5.88	5.77	5.75
ADA On-time Performance	97.70%	93.50%	92.10%

Source: FY 2015 Valley Metro Transit Performance Report

**TABLE 23-5
FIXED ROUTE BUS PERFORMANCE MEASURES**

Measure	2013	2014	2015
Cost Efficiency/Effectiveness			
Farebox Recovery Ratio	21.60%	21.90%	20.50%
Operating Cost per Boarding	\$3.85	\$3.83	\$4.07
Subsidy (Net Operating Cost per Boarding)	\$3.02	\$3.00	\$3.24
Operating Cost per Revenue Mile	\$8.09	\$7.65	\$7.90
Average Fare	\$0.83	\$0.84	\$0.83
Service Effectiveness			
Annual Increase in Total Boardings	2.84%	-2.23%	-2.29%
Annual Increase in Average Boardings			
Weekday	4.34%	-4.16%	-2.46%
Sat.	5.12%	-3.59%	3.78%
Sun.	6.50%	-2.17%	1.37%
Average Boardings per Revenue Mile	2.1	2.0	1.9

Source: FY 2015 Valley Metro Transit Performance Report

**TABLE 23-6
PARATRANSIT PERFORMANCE MEASURES**

Measure	2013	2014	2015
Cost Efficiency/Effectiveness			
Farebox Recovery Ratio	5.70%	7.00%	7.70%
Operating Cost per Boarding	\$36.90	\$37.29	\$33.78
Subsidy (Net Operating Cost per Boarding)	\$34.81	\$34.69	\$31.17
Operating Cost per Revenue Hour	\$97.17	\$88.99	\$84.70
Service Effectiveness			
ADA On-time Performance	95.81%	96.83%	95.50%

Source: FY 2014 Valley Metro Transit Performance Report

The modes covered by the TPR include fixed route bus, paratransit, and light rail transit. Fixed route bus service includes local routes, super grid (major arterial routes), express/bus, circulators, rural connector routes and shuttles.

Since the adoption of service provision goals and standards, in December 2014, Valley Metro has undertaken the development of transit service performance measures and thresholds to evaluate transit operations and assess the attainment of the adopted service provision goals. Transit service performance measures are intended to assess the effectiveness of transit operations in achieving the adopted system goals.

Performance Audit of the Regional Transportation Plan

In conjunction with the adoption of the MAG RTP in November 2003 and the passage of Proposition 400 in November 2004, the Arizona Legislature issued A.R.S. 28-6313 which requires the Auditor General to contract with a nationally recognized independent auditor to conduct a performance audit of the regional transportation system beginning in 2010 and every five years thereafter. The 2010 Performance Audit of the MAG RTP was successfully completed and released to the public on December 21, 2011. The audit examined the RTP multimodal plan and evaluated it using specific performance measures included in MAG’s Performance Measurement Program.

By August of 2014 all recommendations derived from the audit were completed by MAG, with the exception of two that would require legislative and policy changes. Performance measurement for freeway, arterial and transit facilities is now abundantly documented, quantified and communicated via dashboard visualization, web archives and project descriptions that are located on web-based project cards.

MAG is currently completing work associated with the second iteration of the Performance Audit of the MAG RTP, which was initiated in March 2016. Similarly to 2011, this audit examines

expenditures related to the RTP as well as assesses the system and corridor performance of the RTP investments. It is anticipated the audit will be finalized before the end of 2016

Performance Monitoring Program Outlook

The MAG Transportation System Performance Monitoring and Assessment Program has been established to provide a framework for reporting performance at the system and corridor levels, and serves as a repository of historical, simulated and observed data for the transportation system in the MAG Region. In light of MAP-21 and FAST Act legislation, this program has reached an important level of development and is poised to serve as the performance measurement and management component in the planning and programming activities at MAG. A major goal of the program is to communicate measures related to mobility and accessibility in the MAG Region, and to continuously provide the public with timely and relevant information on the performance of the multi-modal transportation system.

Non-Traditional and Socioeconomic Reporting

In an effort to foster and advance transportation infrastructure in the region to support economic growth and vitality, MAG's vision is to maximize efficiency and innovation in the practice of planning and programming activities. At the transportation system level, this enables access to work and educational opportunities, along with the cultural and social activities. Current federal legislation requires performance analysis to inform optimized development of the regional transportation plan. At MAG, performance-based programming guides project selection and prioritization so that funds are allocated based on data and analysis across the region.

In addition to all of the above measures of performance and congestion, MAG has started to explore non-traditional performance measures. With the goal of examining the extent to which the regional transportation system is providing access to employment and other regional activity centers for those who have the greatest need. For this purpose, the Performance Measurement Program is using US Census data and other national and regional database sources analyzing accessibility and mobility for households with lower incomes and no vehicle availability.

Commuting Mode Performance comparisons

Starting in 2016, the MAG Performance Measurement Program began to work with the City of Phoenix Transit Department to analyze available data for the purpose of determining how commuting modes compare for travel times along freeway segments in the system. Phoenix Transit staff has provided a large database for the purpose. The process of conducting calculations and creating graphics is underway. When complete, residents and agencies will be able to access maps and statistics online to compare average travel time conditions and savings between the different modes.

The monitoring program consolidates the data collection efforts related to system performance and develops an archive of historic and current performance data sets that can be used for future evaluation, analysis and decision making. Web-based, performance monitoring products published by MAG include MAGnitude (a performance dashboard) and the RTP Project Cards. These products serve as a primary source for roadway system and corridor performance information in the region, providing a broad range of data to support analysis for multimodal planning and programming activities at MAG.

Extensive reporting has been also developed by Valley Metro, starting with the SEES report, which established an initial set of performance measures to monitor and evaluate bus and rail systems in the region. Valley Metro has recently published a web-based Performance Dashboard documenting ridership, productivity and financial statistics for the regional transit system. These measures are now complemented by the results of the Service Standards and Performance Measures effort.

The MAG Performance Measurement Framework was developed with the participation of MAG's member agencies and will continue to be used as a vital information source, as the implementation of the RTP moves forward. Additionally, recognizing the close relationship between congestion and performance, and in an effort to align key performance measurement indicators with the congestion management process, MAG continues to use the tools developed with the Congestion Management Process in 2010 to coordinate results, prioritize investments, and assess the implementation of strategies. Based on the multitude of observed and archived data sources, as well as input from the Transit Performance Report, MAG will continue to publish semi-annual performance reports in various formats including hard-copy, web-based, map and interactive dashboards.

CHAPTER TWENTY-FOUR

AIR QUALITY CONFORMITY

As required by the Clean Air Act, an air quality conformity analysis was conducted by MAG on the Draft FY 2018-2022 MAG Transportation Improvement Program (TIP) and the Draft 2040 MAG Regional Transportation Plan (RTP), as a whole. The conformity analysis demonstrates that the TIP and RTP are in conformance with regional air quality plans and will not contribute to air quality violations. In its entirety, the conformity analysis demonstrates that the criteria specified in the federal transportation conformity rule for a conformity determination are satisfied by the TIP and RTP. A description of the conformity requirements, conformity tests, and results of the 2017 MAG Conformity Analysis are summarized below. The 2017 MAG Conformity Analysis supports a finding of conformity for the FY 2018-2022 MAG Transportation Improvement Program and 2040 MAG Regional Transportation Plan.

Conformity Requirements

The federal transportation conformity rule (40 Code of Federal Regulations Parts 51 and 93) specifies criteria and procedures for conformity determinations for transportation plans, programs, and projects and their respective amendments. Under the federal transportation conformity rule, the principal criteria for a determination of conformity for transportation plans and programs are:

- The TIP and RTP must pass an emissions budget test with a budget that has been found to be adequate or approved by EPA for transportation conformity purposes, or interim emissions tests.
- The latest planning assumptions and emission models in force at the time the conformity analysis begins must be employed.
- The TIP and RTP must provide for the timely implementation of transportation control measures (TCMs) specified in the applicable air quality implementation plans.
- Consultation generally occurs at the beginning of the conformity analysis process; on the proposed models, associated methods, and assumptions for the upcoming analysis and the projects to be assessed; and at the end of the process, on the draft conformity analysis report. The final determination of conformity for the TIP and RTP is the responsibility of the Federal Highway Administration and the Federal Transit Administration.

The conformity tests specified in the federal transportation conformity rule are: (1) the emissions budget test, and (2) interim emissions tests. For the emissions budget test, projected emissions for the TIP and RTP must be less than or equal to the motor vehicle emissions budget specified in the approved air quality implementation plan or the emissions budget found by EPA to be adequate for transportation conformity purposes. If there is no approved air quality plan for a pollutant for which the region is in nonattainment or no emissions budget found to be adequate for transportation conformity purposes, interim emissions tests apply.

Maricopa County Nonattainment and Maintenance Areas

For the 2017 MAG Conformity Analysis, for carbon monoxide the emissions budget test was applied using the approved conformity budget from the MAG 2013 Carbon Monoxide Maintenance Plan. For eight-hour ozone, emission budget tests were applied using the approved conformity budgets from the MAG 2007 Eight-Hour Ozone Plan and MAG 2009 Eight-Hour Ozone Maintenance Plan. For PM-10, the emission budget test was applied using both the approved budget from the MAG 2012 Five Percent Plan for PM-10 and the approved budget from the Revised MAG 1999 Serious Area Particulate Plan for PM-10.

For the 2017 MAG Conformity Analysis, a regional emissions analysis was conducted for carbon monoxide and PM-10 for the years 2025, 2035, and 2040. For the eight-hour ozone precursors (volatile organic compounds and nitrogen oxides) a regional emissions analysis was conducted for the years 2018, 2025, 2035, and 2040. All analyses were conducted using the latest planning assumptions and emissions models in force at the time the conformity analysis started on March 18, 2017. The major conclusions of the 2017 MAG Conformity Analysis are:

- For carbon monoxide, the total vehicle-related emissions associated with implementation of the TIP and Regional Transportation Plan for the analysis years 2025, 2035, and 2040 are projected to be less than the approved 2025 emissions budget. The applicable conformity test for carbon monoxide is therefore satisfied. The results of the regional emissions analysis for carbon monoxide are presented in Figure 24-1.
- For eight-hour ozone, the total vehicle-related volatile organic compound and nitrogen oxide emissions associated with implementation of the TIP and Regional Transportation Plan for the analysis year of 2018 are projected to be less than the approved 2008 emissions budgets and the total vehicle-related volatile organic compound and nitrogen oxide emissions for the analysis years of 2025, 2035, and 2040 are projected to be less than the approved 2025 emissions budgets. The applicable conformity tests for eight-hour ozone are therefore satisfied. The results of the regional emissions analysis for eight-hour ozone are presented in Figures 24-2 and 24-3.
- For PM-10, the total vehicle-related emissions associated with implementation of the TIP and Regional Transportation Plan for the analysis years of 2025, 2035, and 2040 are projected to be less than the approved 2012 emissions budget and the approved 2006 emissions budget. The conformity test for PM-10 is therefore satisfied. The results of the regional emissions analysis for PM-10 are presented in Figure 24-4.
- A review of the implementation status of TCMs in applicable air quality plans has indicated that the TIP and Regional Transportation Plan will provide for the timely implementation of the TCMs and there are no obstacles to the implementation of any TCM.
- Consultation has been conducted in accordance with federal requirements.

Figure 24-1: Carbon Monoxide Results for Conformity Budget Test, Maricopa County Nonattainment and Maintenance Areas

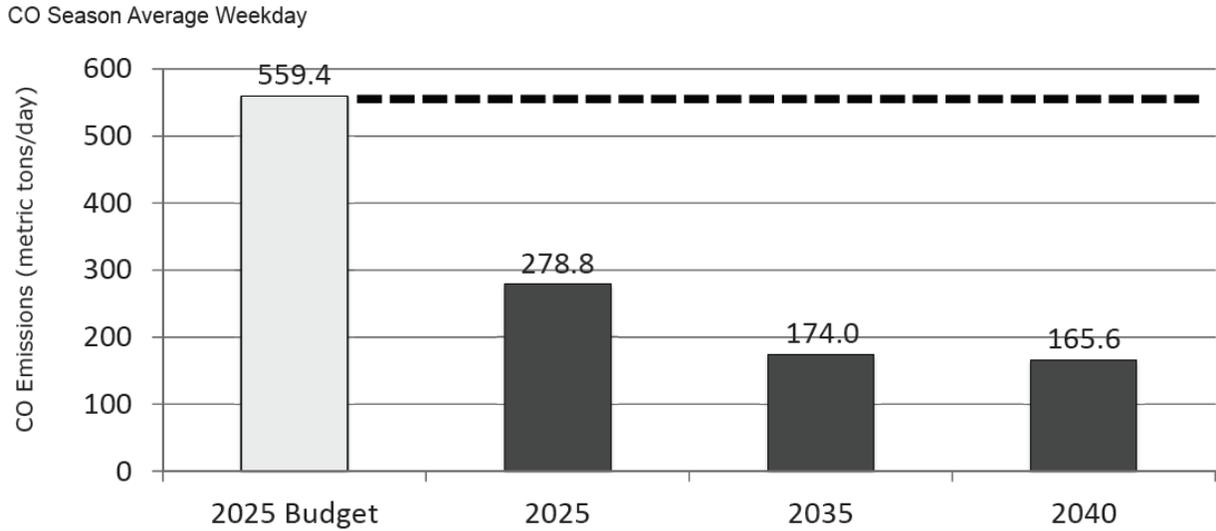


Figure 24-2: Eight-Hour Ozone: Volatile Organic Compounds (VOC) Results for Conformity Budget Test, Maricopa Nonattainment and Maintenance Areas

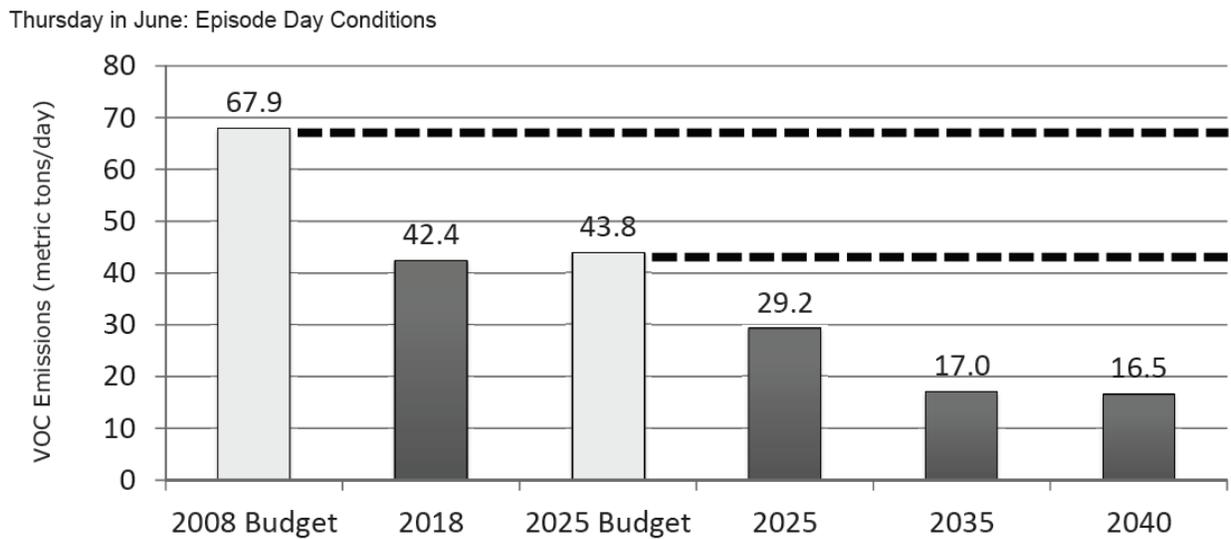


Figure 24-3: Eight-Hour Ozone: Nitrogen Oxides (NOx) Results for Conformity Budget Test, Maricopa Nonattainment and Maintenance Areas

Thursday in June: Episode Day Conditions

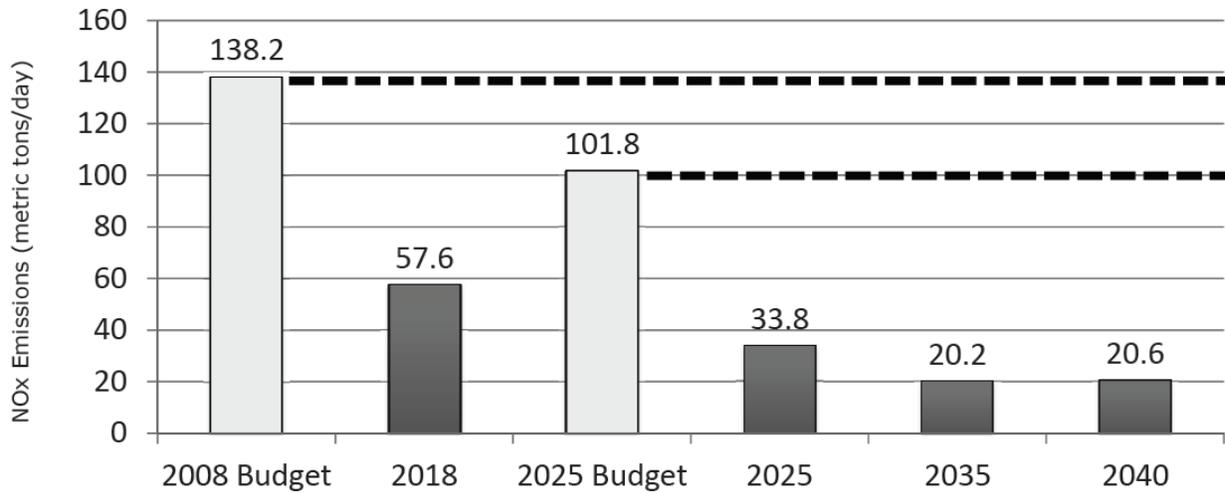
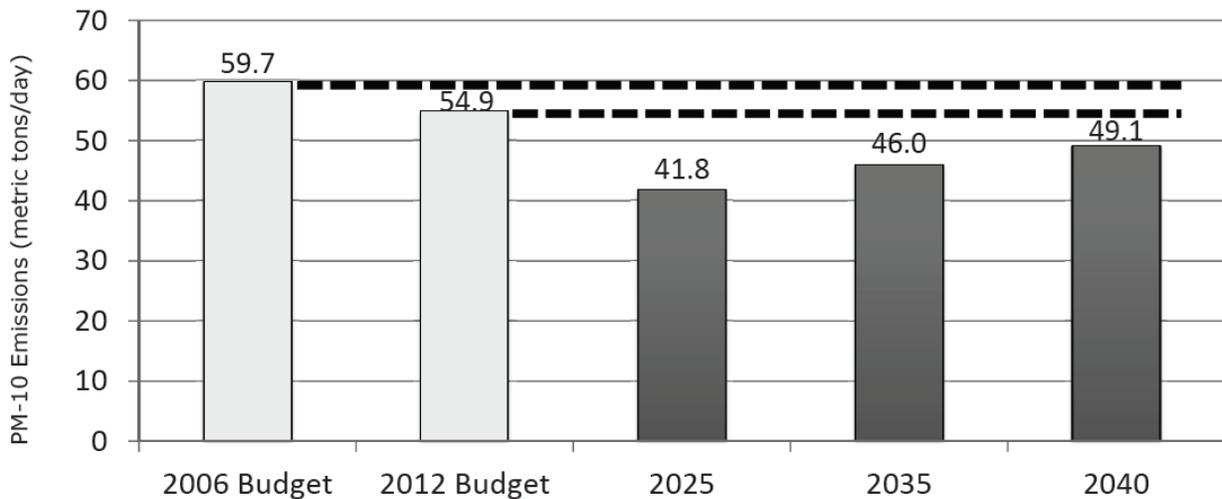


Figure 24-4: PM-10 Results for Conformity Budget Test, Maricopa County Nonattainment and Maintenance Areas

Annual Average Day Conditions



The conformity results are shown compared with the 2006 budget from the *Revised MAG 1999 Serious Area Particulate Plan for PM-10* approved by the EPA on July 25, 2002 and the 2012 budget from the *MAG 2012 Five Percent Plan for PM-10* approved by the EPA on June 10, 2014.

Pinal County Nonattainment Areas

For the Pinal County nonattainment areas, there are no adequate or approved motor vehicle emissions budgets for conformity. Therefore, the conformity interim emissions tests were applied. The action/baseline tests were conducted for PM-10 for the West Pinal PM-10 Nonattainment Area and for PM-2.5 and NOx for the West Central Pinal PM-2.5 Nonattainment Area for the analysis years of 2018, 2025, 2035, and 2040.

For PM-10, for each analysis year the projected emissions for the action scenario are not greater than the projected emissions for the baseline scenario. Since the PM-10 emissions projected for the action scenarios are not greater than the PM-10 emissions projected for the baseline scenarios, the conformity interim emission test is satisfied. It is also reasonable to expect the action emissions would not exceed the baseline emissions for the time periods between the analysis years. The results of the regional emissions analysis for PM-10 are presented in Figure 24-5.

For PM-2.5, for each analysis year the projected emissions for the action scenario are not greater than the projected emissions for the baseline scenario. Since the PM-2.5 emissions projected for the action scenarios are not greater than the PM-2.5 emissions projected for the baseline scenarios, the conformity interim emission tests are satisfied. It is also reasonable to expect the action emissions would not exceed the baseline emissions for the time periods between the analysis years. The results of the regional emissions analysis for PM-2.5 are presented in Figure 24-6.

For NOx, for each analysis year the projected emissions for the action scenario are not greater than the projected emissions for the baseline scenario. Since the NOx emissions projected for the action scenarios are not greater than the NOx emissions projected for the baseline scenarios, the conformity interim emission tests are satisfied. It is also reasonable to expect the action emissions would not exceed the baseline emissions for the time periods between the analysis years. The results of the regional emissions analysis for NOx are presented in Figure 24-7.

Figure 24-5: PM-10 Results for Conformity Interim Emission (Action/Baseline) Test, Pinal County PM-10 Nonattainment Area

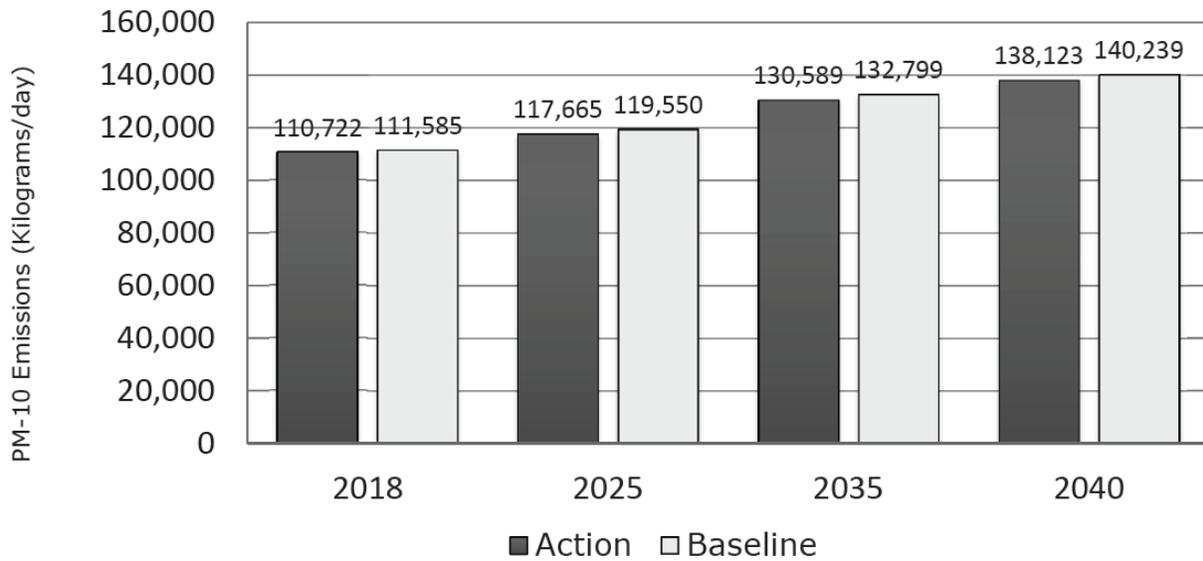


Figure 24-6: PM-2.5 Results for Conformity Interim Emission (Action/Baseline) Test, Pinal County PM-2.5 Nonattainment Area

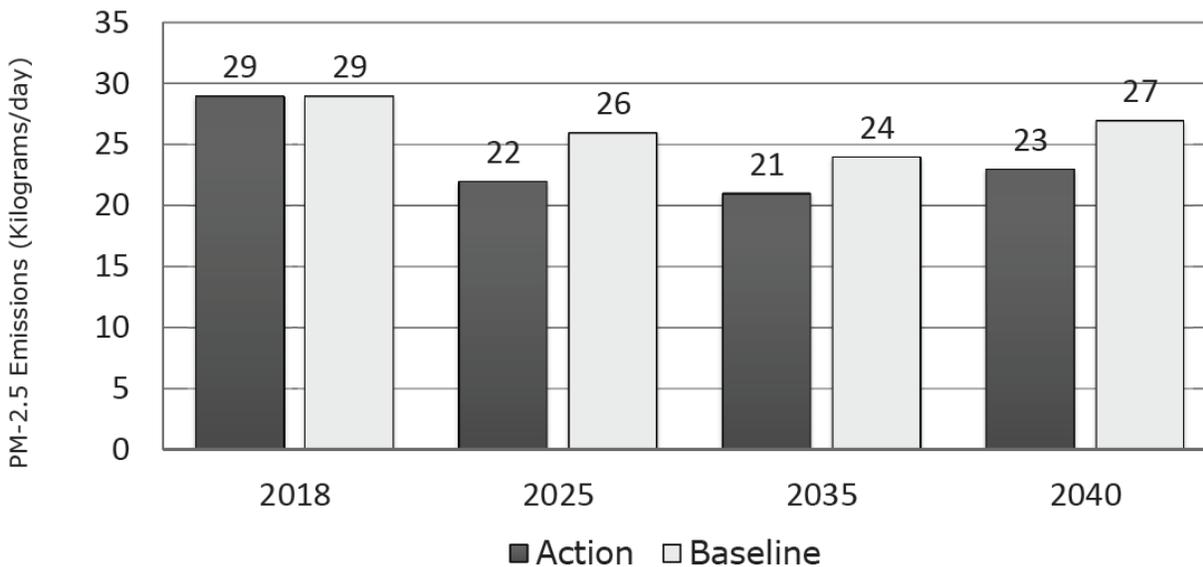
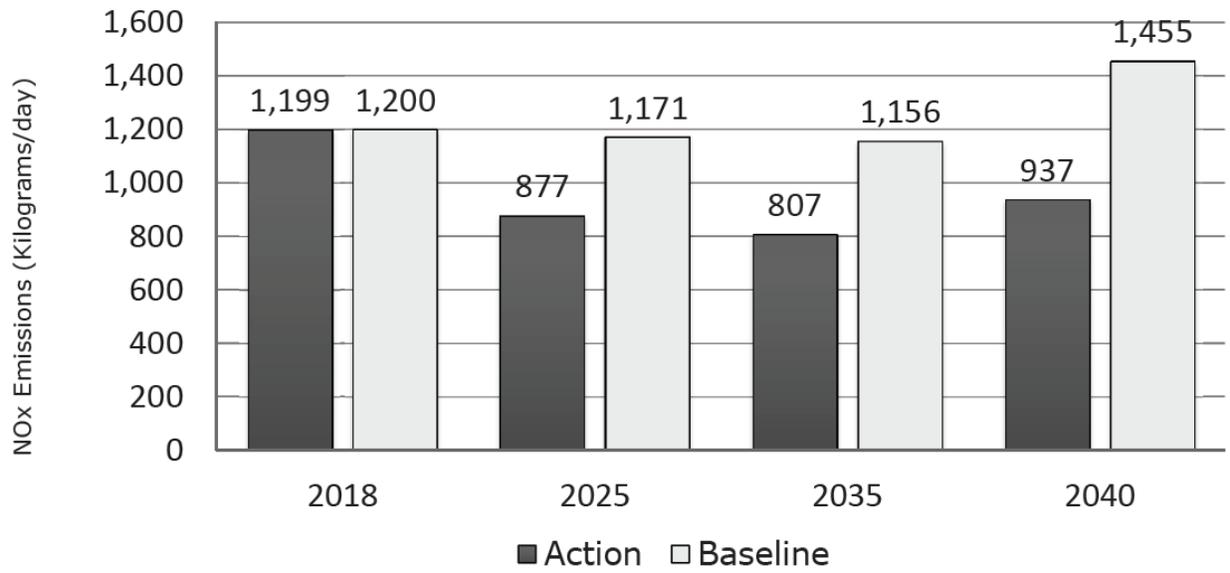


Figure 24-7: NOx Results for Conformity Interim Emission (Action/Baseline) Test, Pinal County PM-2.5 Nonattainment Area

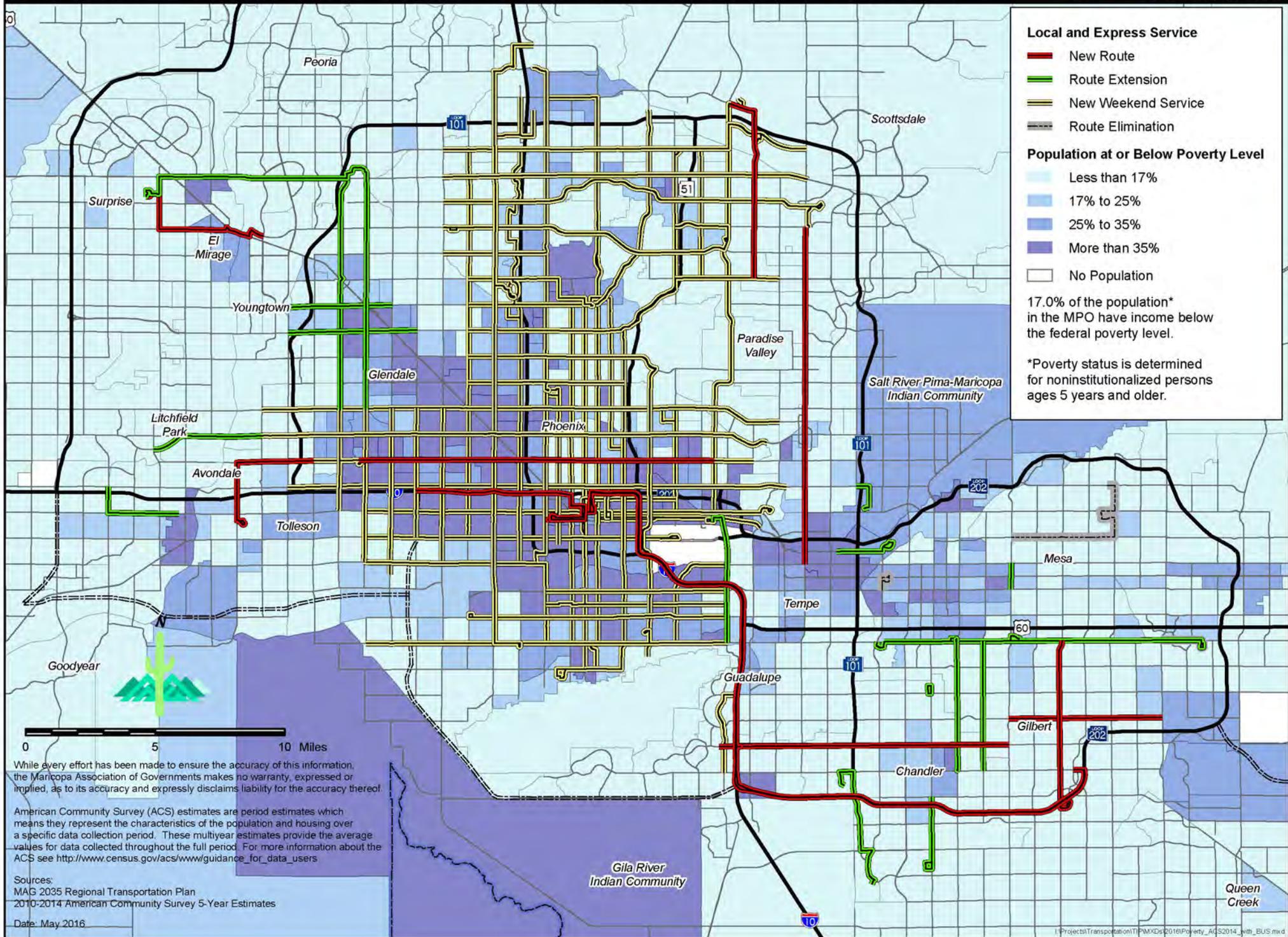


APPENDICES

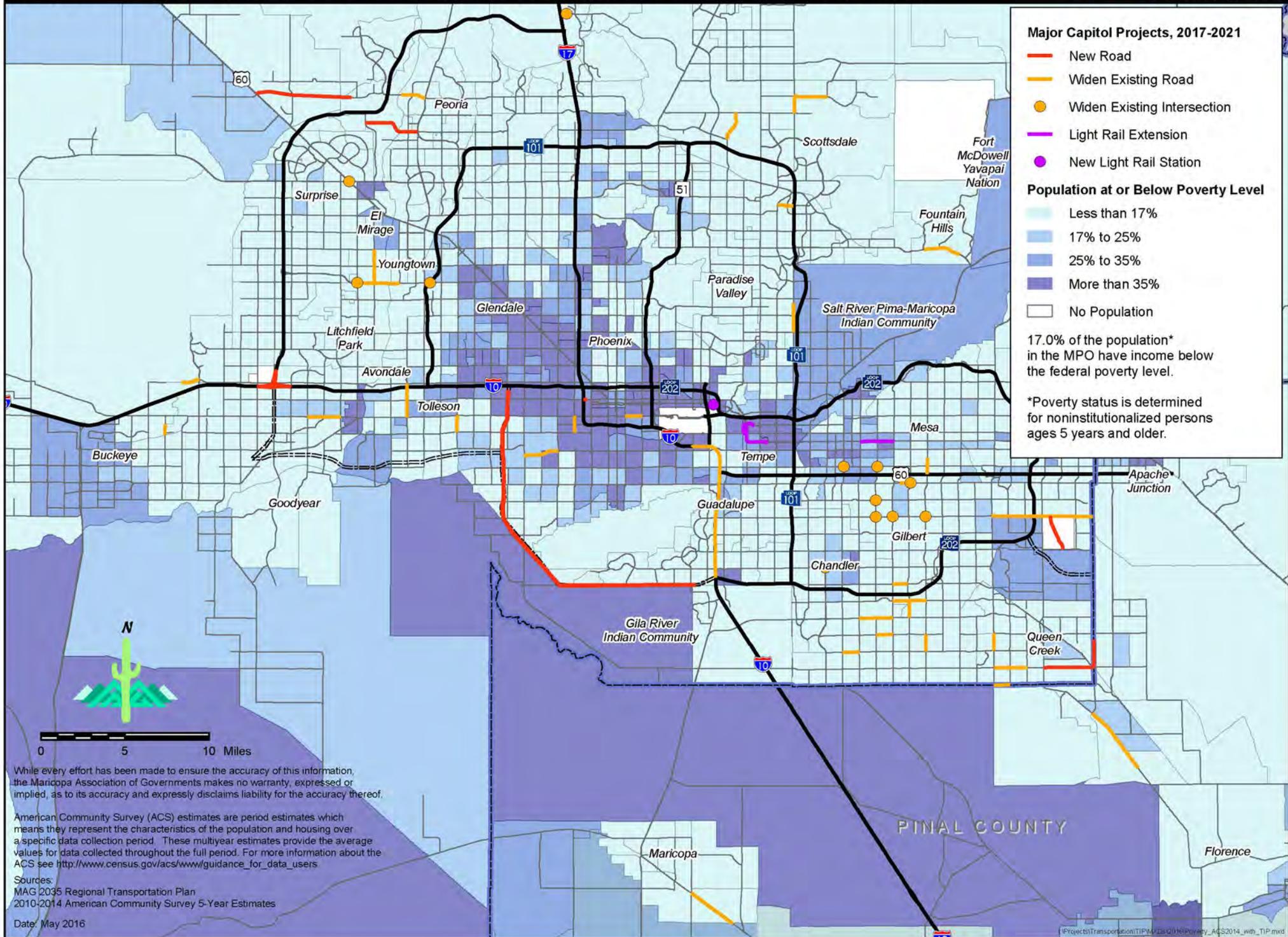
Appendix A

Title VI and Environmental Justice Maps

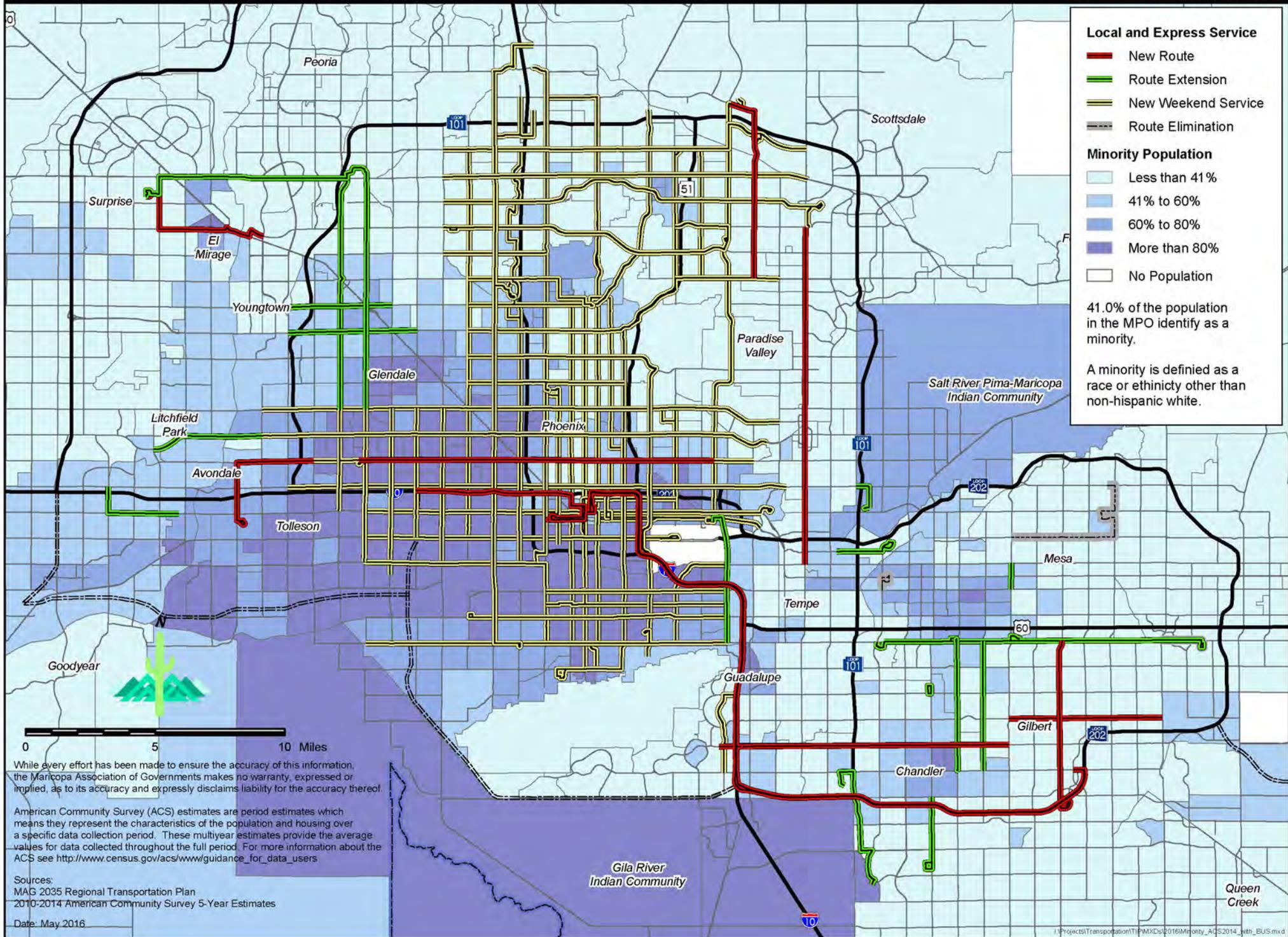
Bus Route Changes, 2017-2021, and Population at or Below Poverty Level



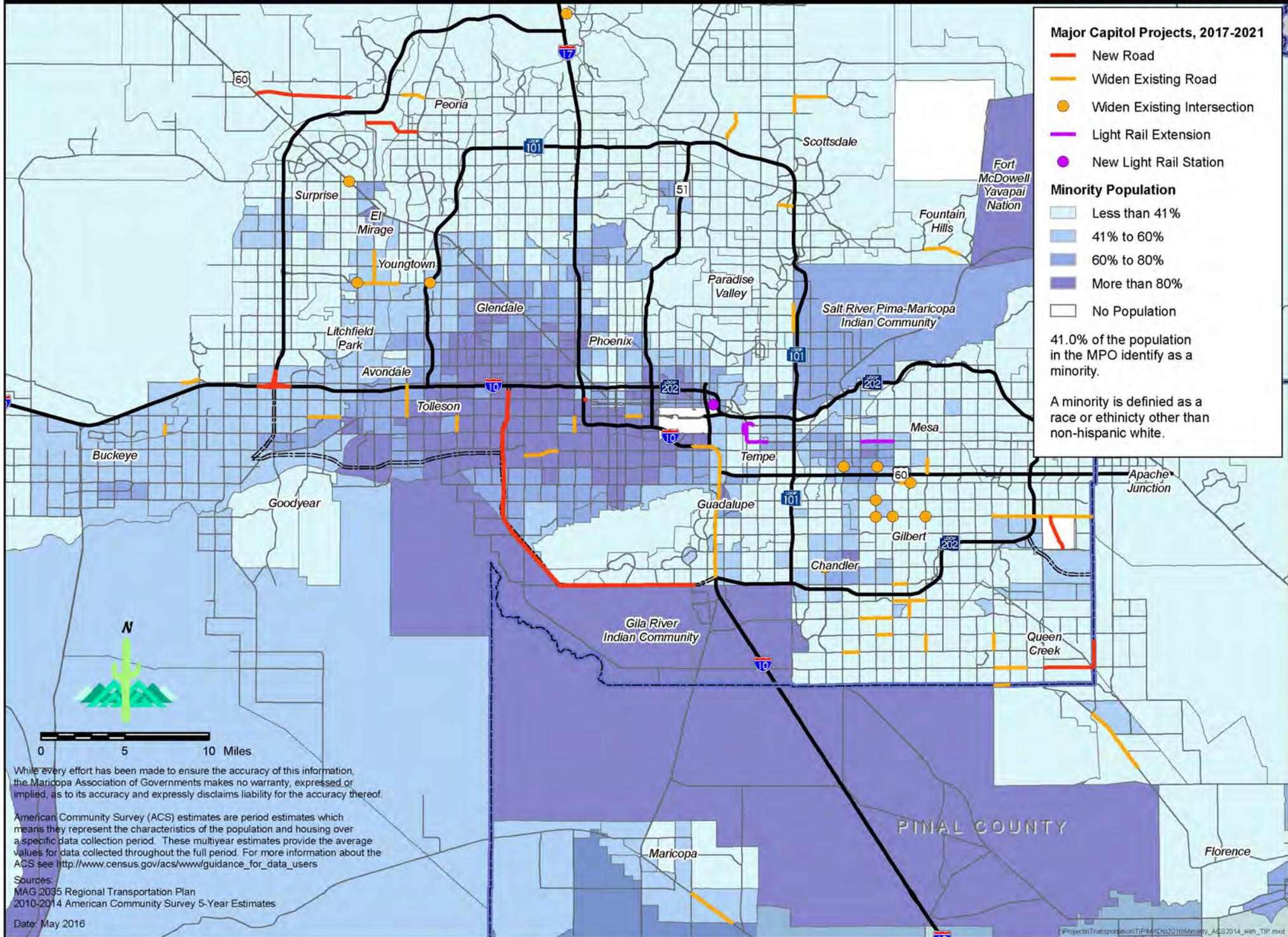
Major Capitol Projects, 2017-2021, and Population at or Below Poverty Level



Bus Route Changes, 2017-2021, and Minority Population



Major Capitol Projects, 2017-2021, and Minority Population



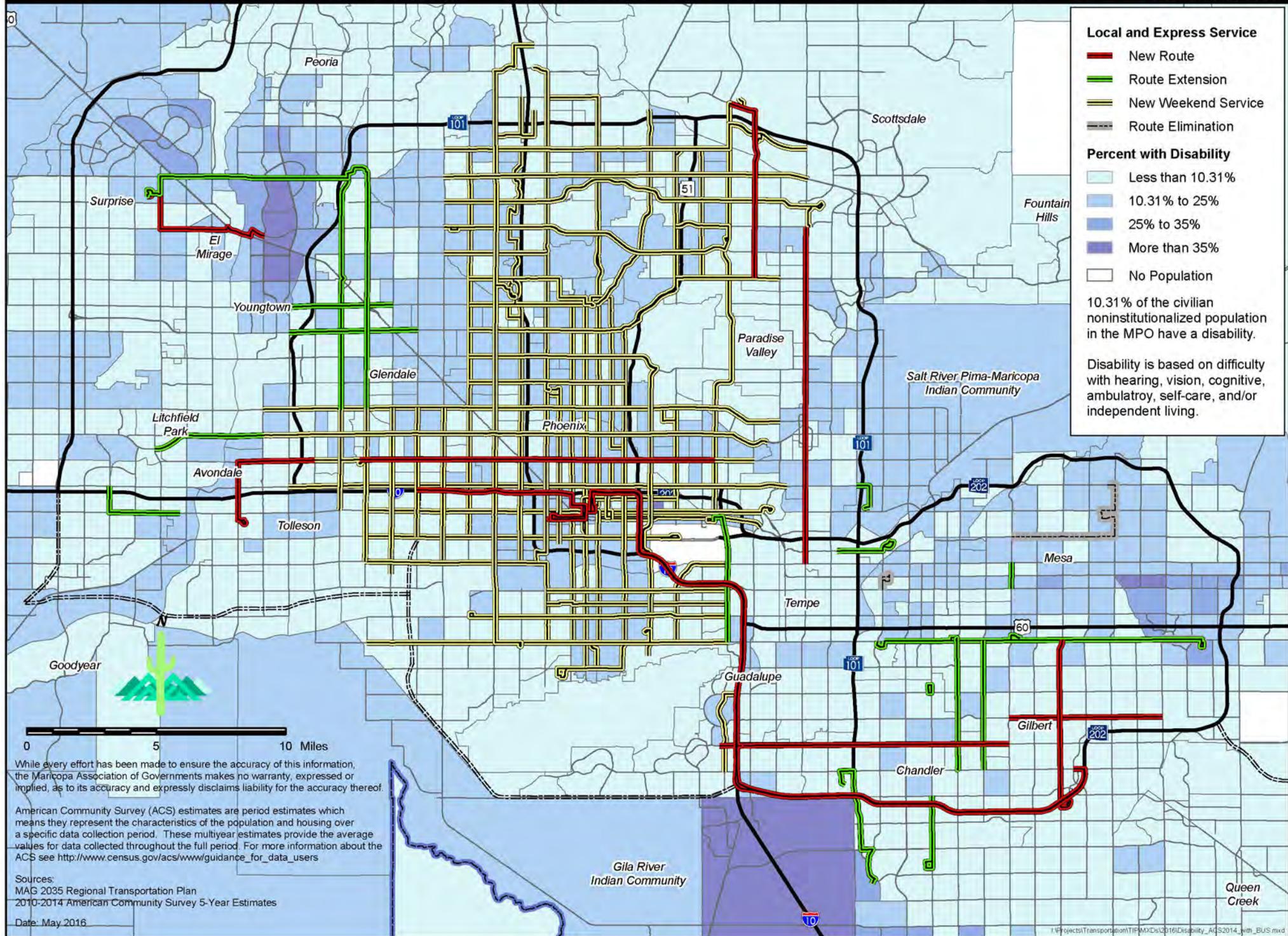
While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

American Community Survey (ACS) estimates are period estimates which means they represent the characteristics of the population and housing over a specific data collection period. These multiyear estimates provide the average values for data collected throughout the full period. For more information about the ACS see http://www.census.gov/acs/www/guidance_for_data_users

Sources:
MAG 2035 Regional Transportation Plan
2010-2014 American Community Survey 5-Year Estimates

Date: May 2016

Bus Route Changes, 2017-2021, and Civilian Noninstitutionalized Population with a Disability



Local and Express Service

- New Route
- Route Extension
- New Weekend Service
- Route Elimination

Percent with Disability

- Less than 10.31%
- 10.31% to 25%
- 25% to 35%
- More than 35%
- No Population

10.31% of the civilian noninstitutionalized population in the MPO have a disability.

Disability is based on difficulty with hearing, vision, cognitive, ambulatory, self-care, and/or independent living.

0 5 10 Miles

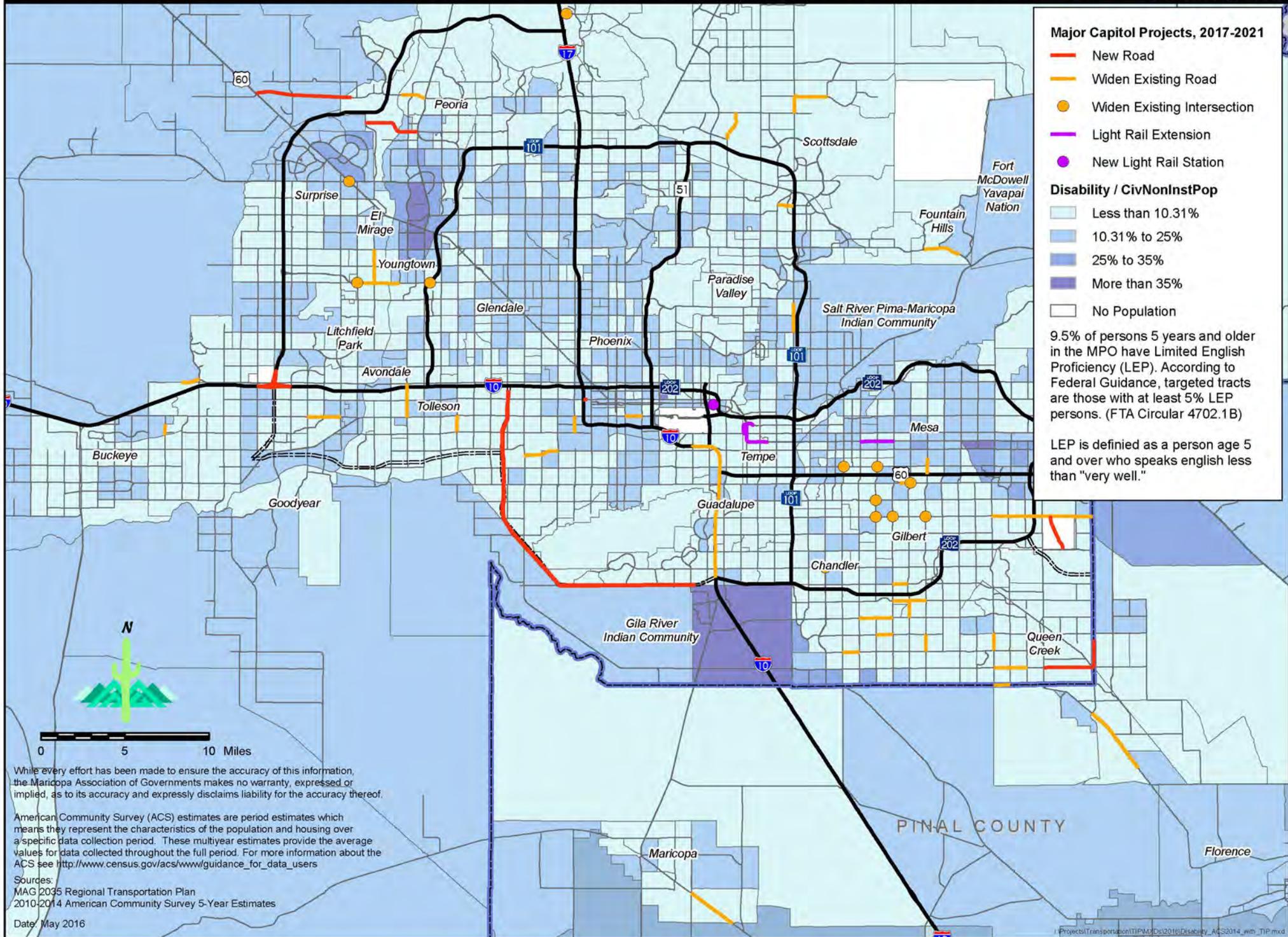
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Sources:
 MAG 2035 Regional Transportation Plan
 2010-2014 American Community Survey 5-Year Estimates

Date: May 2016

Major Capitol Projects, 2017-2021, and Civilian Noninstitutionalized Population with a Disability



Major Capitol Projects, 2017-2021

- New Road
- Widen Existing Road
- Widen Existing Intersection
- Light Rail Extension
- New Light Rail Station

Disability / CivNonInstPop

- Less than 10.31%
- 10.31% to 25%
- 25% to 35%
- More than 35%
- No Population

9.5% of persons 5 years and older in the MPO have Limited English Proficiency (LEP). According to Federal Guidance, targeted tracts are those with at least 5% LEP persons. (FTA Circular 4702.1B)

LEP is defined as a person age 5 and over who speaks english less than "very well."



0 5 10 Miles

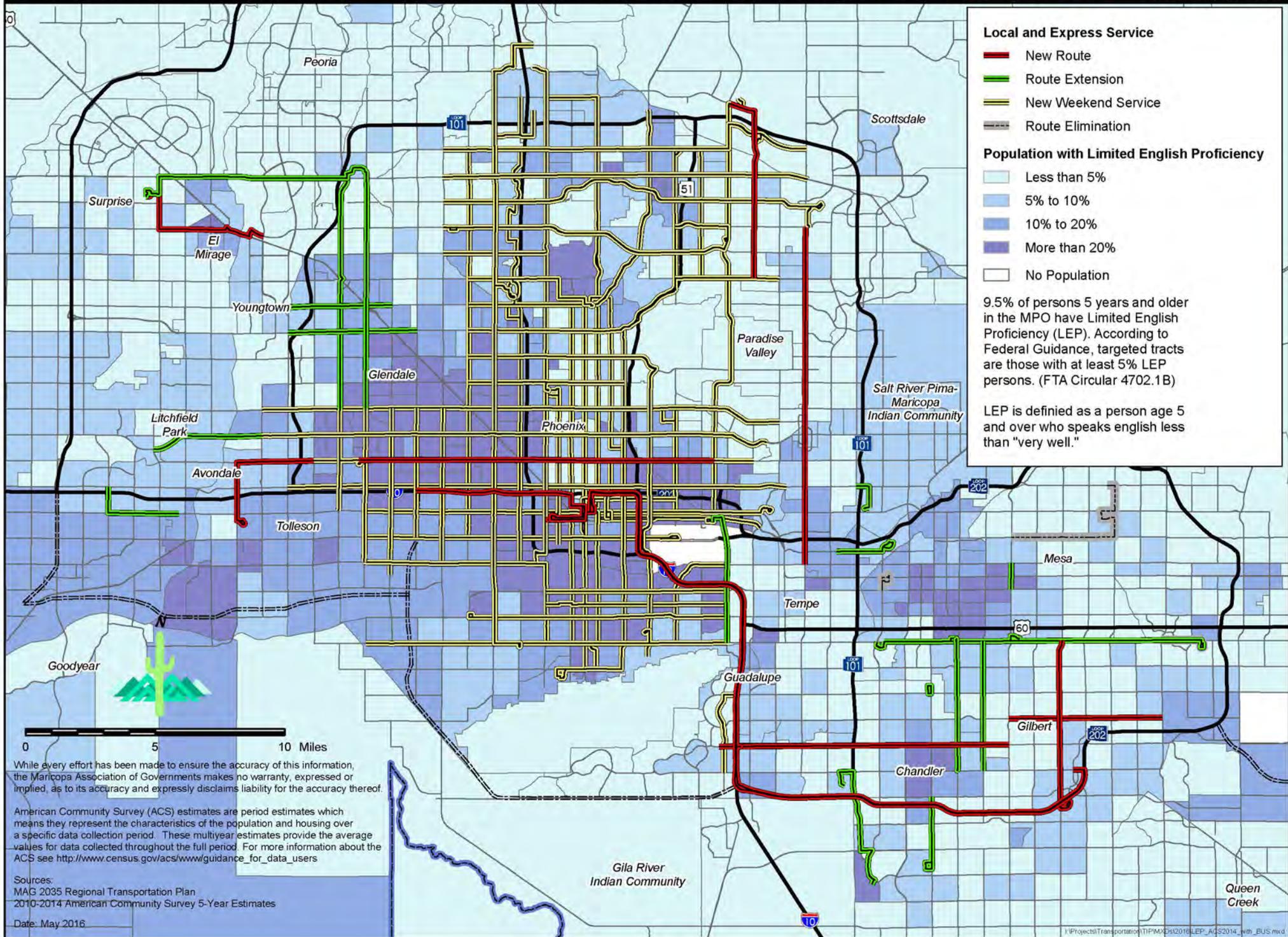
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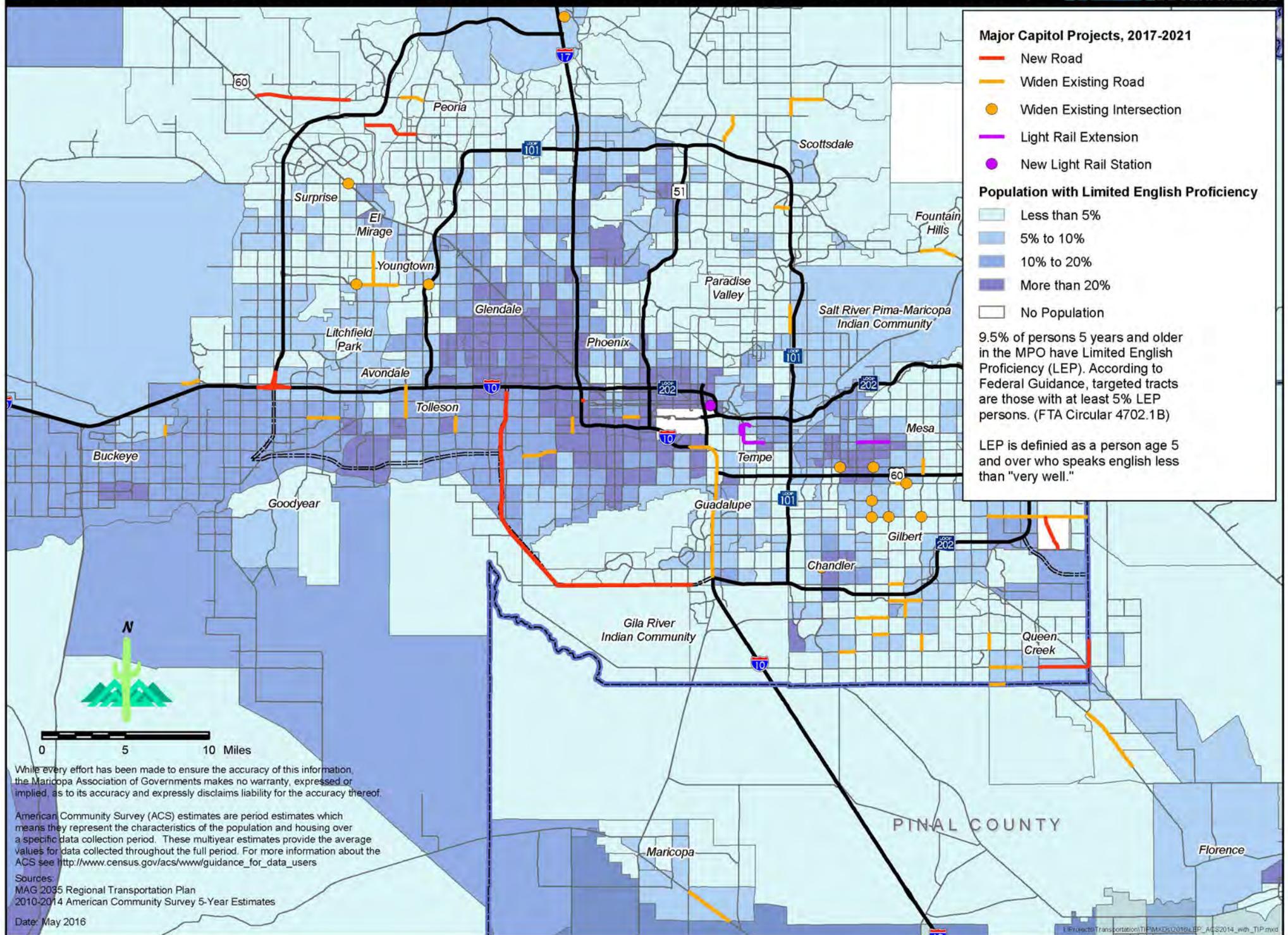
Sources:
 MAG 2035 Regional Transportation Plan
 2010-2014 American Community Survey 5-Year Estimates

Date: May 2016

Bus Route Changes, 2017-2021, and Population with Limited English Proficiency



Major Capitol Projects, 2017-2021, and Population with Limited English Proficiency



Major Capitol Projects, 2017-2021

- New Road
- Widen Existing Road
- Widen Existing Intersection
- Light Rail Extension
- New Light Rail Station

Population with Limited English Proficiency

- Less than 5%
- 5% to 10%
- 10% to 20%
- More than 20%
- No Population

9.5% of persons 5 years and older in the MPO have Limited English Proficiency (LEP). According to Federal Guidance, targeted tracts are those with at least 5% LEP persons. (FTA Circular 4702.1B)

LEP is defined as a person age 5 and over who speaks english less than "very well."

While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

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Sources:
 MAG 2035 Regional Transportation Plan
 2010-2014 American Community Survey 5-Year Estimates

Date: May 2016

Appendix B

Consultation on Environmental Mitigation and Resource Conservation Factors

TABLE B-1 ENVIRONMENTAL INFORMATION RESOURCES

- Arizona Department of Environmental Quality
 - Air Quality Inventory (Ambient air quality data).
 - AZMAPPER: Water Quality Database.
- Arizona Department of Transportation
 - Website has a number of environmentally related resources. Templates for Categorical Exclusions and Environmental Assessments would help to identify key environmental factors and issues that may be considered. Air Quality Inventory (Ambient air quality data).
- Arizona Game and Fish Department
 - Website covering species of concern, riparian locations, wildlife environments and other related information. The Department has additional resources that would be useful in the transportation planning process, such as wildlife habitat corridors. Air Quality Inventory (Ambient air quality data).
 - Wildlife Linkages Assessment. Specific linkage assessments are also being currently being performed. These documents and maps will be made available through the ADOT Linkages Website.
 - The Heritage Data Management System is a database that tracks locations of sensitive species in Arizona. This data system has GIS and database analysis for species in a particular area etc. Visit the programs web site at <http://www.azgfd.gov/hdms> for more specific information such as species abstracts, species lists, and distribution maps. AZMAPPER: Water Quality Database.
- Arizona State Historic Preservation Office
 - AZSITE Database – Arizona’s designated Cultural Resources Electronic Inventory system including a database and GIS, which includes identified properties, information about the properties, National Register eligibility, and survey areas.
 - Archeological and Historical Sites Inventory (Hardcopy listing and maps).

- Arizona State Land Department
 - Land Use GIS Database.
- Gila River Indian Community
 - Historical and Cultural Site Inventories.
- Maricopa County Air Quality Department
 - Maricopa County Point Source Emission Inventories.
 - Travel Reduction Program Commuter Travel Database.
- Maricopa County Department of Transportation
 - Environmental information resources applicable to the regional transportation planning process.
- Maricopa County Flood Control District
 - Water Course Master Plans.
 - Drainage Area Master Plans.
 - Cultural and biological inventories from water course and drainage studies
 - GIS flood plain contours and other GIS cultural and biological layers.
- National Resource Conservation Service
 - Soil and vegetation maps can be used in the long-range transportation planning process to identify potential wetland areas.
- U. S. Army Corp of Engineers
 - Los Angeles District Regulatory Web Page
 - Clean Water Act Section 404 Program Regulations (33 CFR 320-331)
- U. S. Bureau of Land Management
 - Soil and vegetation maps can be used in the long-range transportation Preliminary Draft Management Alternatives; Phoenix South and Sonoran

Desert National Monument Planning Areas; Department of the Interior, Bureau of Land Management, Phoenix Field Office; Public Workshops February – March 2005.

- Agua Fria National Monument and Bradshaw-Harquahala Draft Resource Management Plan and Draft Environmental Impact Statement; Department of the Interior, Bureau of Land Management, Phoenix Field Office; October 2005.
- U. S. Forest Service - Tonto National Forest
 - Tonto National Forest: Forest Resources GIS Database
 - Tonto National Forest: Land Management Plan

FIGURE B-1

CONSULTATION ON ENVIRONMENTAL MITIGATION AND RESOURCE CONSERVATION

FY 2017 Agency Consultation

A stakeholder workshop to obtain input on the RTP update process was held on August 22, 2016. All key environmental and resource agencies were invited to attend (see Table 6-1). In addition, MAG member agencies were notified of the workshop. Since the update of the RTP is not anticipated to consider any new corridors, the workshop focused on the project programming process, as well as refinements to the existing freeway/highway life-cycle program.

The meeting began with presentations from MAG staff related to the public involvement process, transportation planning and programming, and current rebalancing efforts of the regional freeway and highway program. The presentations concluded with an overview of upcoming important dates to help stakeholders in understanding the MAG planning and programming efforts, and facilitate future input to the process. Following the presentations, a stakeholder discussion was held where agency representatives were encouraged to share information, ask questions, or discuss future projects.

Freeway/Highway Program Rebalancing Process

Agency comments regarding rebalancing the freeway/highway program included:

- Will the current MAG freeway/highway program rebalancing effort affect facilities in the Pinal County portion of the MAG planning area?
- Pinal County wants to work with MAG and ADOT to obtain funding for needed freeway/highway improvements in the Pinal County area of MAG.
- Will MAG be considering new projects or only projects that have already been identified and previously deferred as part of the rebalancing?
- Since Proposition 400 was voted on with different modal emphasis for east/central/west areas, the earlier rebalancing of the program affected different areas in different ways and there is a concern as to how these effects can be addressed.

- Will the Regional Transportation Plan update only consider projects proposed in studies that have already been conducted or will new projects also be considered?
- What will the timeframe be to submit proposals to MAG for projects to be consideration in the rebalancing process?
- Will the rebalancing process first accumulate project costs and then see how such costs line up with the total funding available, or will a cushion be identified and project selections required to fit within that cushion?

Transportation Framework Studies

Agency comments regarding MAG transportation framework studies included:

- Upcoming regional transportation studies should cover the entire MAG planning area, including the Pinal County portion of the MAG planning area.
- As part of the State Route 24 design and environmental process, Pinal County is attempting to identify approximately \$1.0 to \$1.5 million in design dollars for the extension of SR-24 to Ironwood Road in Pinal County.
- Maps and listings of all Pinal County Regional Transportation Authority proposed projects are being made available to MAG staff.
- Pinal County has hired a consultant to perform a Santan Valley Area Study with boundaries that generally include the area from Elliot Road to Hunt Highway and from Meridian Road to the Central Arizona Project Canal. The County wants to coordinate this study closely with the MAG Superstition Vistas Transportation Framework Study.
- The State Lands Department wants to coordinate closely with MAG on the upcoming MAG Superstition Vistas Transportation Framework Study. Who will the study manager be?

Bicycle/Pedestrian Trails

Agency comments regarding bicycle pedestrian trails included:

- The Maricopa (Bicycle/Pedestrian) Trail is progressing with completion anticipated within the next three years.
- Agencies should connect their trail systems to this regional system, if they are not already a part of it.

FY 2013 Agency Consultation

An update of the Regional Transportation Plan (RTP) was not conducted during FY 2011. Beginning in FY 2012 and continuing into FY 2013, work proceeded on the preparation of the 2035 RTP, which was targeted for adoption in August 2013. In conjunction with the development of the 2035 RTP, an agency workshop was held on November 6, 2012 to receive input from environmental and resource agencies, regarding the application of environmental mitigation and resource conservation concepts in the transportation planning process.

The emphasis at the November 2012 workshop was on work MAG has been conducting in the areas of: (1) sustainable transportation and land use integration, (2) complete streets guidelines, and (3) bicycle and pedestrian planning. In addition, an overview of the approach to developing the 2035 RTP was provided, which covered background on the contents of the current plan, new factors to be considered in preparing the updated plan, and future opportunities for comment on the planning process. Agencies were encouraged to provide input, either at the workshop or through later correspondence, regarding any experiences, insights, or concerns from their agency perspective on the studies MAG has been conducting, as well as the overall regional transportation planning process.

Sustainable Transportation and Land Use Integration

Agency comments regarding sustainability issues and transportation included:

- Transit oriented development (TOD) can be a very positive factor in enhancing the climate for transit usage, but the need to consistently retain business at TOD sites should not be overlooked.
- TOD is means to not only enhance transit usage, but offers an opportunity to promote and implement “green design” and other environmental considerations.
- The maintenance of wildlife habitat needs to be recognized as an important factor in the sustainability arena. Thinking should move from a view of “how do we have to accommodate wildlife” to “look at the benefits of keeping these habitats and wildlife intact”.
- There is a need to get people at all levels of government to think more about infrastructure development and how it affects wildlife resource conservation and open space, especially protecting wildlife corridors/linkages and habitats. A wealth of information is available

regarding these issues and should be taken advantage of during the planning, design and construction of transportation facilities.

Complete Streets Guidelines

Agency comments regarding street planning issues included:

- There appear to be conflicting messages sent by the transportation planning process regarding transit and street development. While a strong emphasis is placed on the benefits and desirability of transit usage, at the same time a major amount of resources is spent on planning, designing and constructing street facilities.
- Long-range street plans for currently undeveloped areas seem to include excessive amounts of street mileage, which may be redundant and encourage leap-frog development into these areas.
- There is a continuing need to maintain coordination among all levels of government in the street planning process. Local-government-to-local government coordination is an aspect that appears to need greater emphasis.

Bicycle and Pedestrian Planning

Agency comments regarding bicycle and pedestrian planning included:

- Bicycle and pedestrian planning efforts should stay aware of the need to improve non-motorized access to park and other recreational areas.
- Bicycle and pedestrian facilities have a large constituency that may, sometimes, be overlooked in the transportation planning process. Transportation plans should be more specific, regarding these facilities.

2035 Regional Transportation Plan Approach

Agency comments regarding the approach to development of the 2035 Regional Transportation Plan included:

- Multi-modal ground access to aviation facilities is an important element of the transportation planning process that warrants continuing consideration.
- Consultation early and often with environmental and resources agencies is a very productive effort and can yield increasing benefits to the transportation planning process. This kind of consultation should also be

applied to neighboring counties, regional planning organizations, and large activity centers such as hospitals and other health care centers. In addition, consultation efforts with environmental and resources agencies should be pursued not only by regional organizations but also by local governments.

- The regional transportation planning process should be continuously aware of the need to minimize right-of-way requirements for all types of transportation projects, and avoid impacts of facilities on the surrounding land uses.

FY 2010 Agency Consultation

The development of the 2010 Update of the Regional Transportation Plan (RTP) continued through calendar year 2009, and an additional agency workshop was held on November 9, 2009 to receive input from environmental and resource agencies, regarding the application of environmental mitigation and resource conservation concepts in the transportation planning process.

The emphasis at the 2009 workshop was on proposed legislation at the federal level that may have an effect on the transportation planning process. In this regard, considerable activity had been occurring at the federal level in the areas of clean energy, climate change, and national funding for transportation. Many of the concepts in this proposed legislation address issues affecting the environmental and resource conservation aspects of transportation planning. The goal of the workshop was to discuss pending legislation and develop insights and draw conclusions about the potential future direction of the regional transportation planning process.

Clean Energy Jobs and American Power Act - S. 1733 and American Clean Energy and Security Act of 2009 - H.R. 2454

The Clean Energy Jobs and American Power Act (S. 1733) was introduced in the U.S. Senate on September 30, 2009. A similar proposal, the American Clean Energy and Security Act of 2009 (H.R. 2454), was passed by the U.S. House of Representatives on June 26, 2009. Both pieces of legislation set targets for carbon emission reductions from major U.S. sources by 80 percent by 2050, and include various green house gas (GHG) requirements on the utility sector, as well as other elements of business and industry.

In addition, both proposed measures identify new roles and requirements for metropolitan planning organizations (MPO's), regarding the transportation planning process. While the details differ somewhat between the two proposals, the major thrust of each piece of legislation is very similar and is described in general terms below.

- New planning considerations for MPO's:
 - Achieve sustainability and livability.
 - Reduce surface transportation-related GHG emissions and reliance on oil.
 - Adapt to the effects of climate change.
 - Protect public health.
 - Promote consistency between transportation improvements and housing and land use patterns.
 - Assess impacts on the environment.

- MPOs in Transportation Management Areas must develop targets and strategies for GHG reductions to meet targets. Targets must demonstrate progress in stabilizing and reducing transportation GHG emissions, and contribute to national goals. MPO's must consult with state air agencies in setting targets and selecting strategies, and cooperate with state land use, resource management and environmental agencies.

- Possible MPO strategies for GHS reductions:
 - Increase transit ridership.
 - Increase walking, bicycling and other forms of nonmotorized transportation.
 - Implementation of zoning and other land use regulations and plans to support infill and transit oriented development.
 - Travel demand management programs – carpool, vanpool or car-share projects, transportation pricing measures, parking policies and programs to promote telecommuting, flexible work schedules, and satellite work centers.
 - Transportation system operation improvements – intelligent transportation systems and congestion system management.
 - Intercity passenger rail.
 - Intercity bus improvements.
 - Freight rail improvements.
 - Use of materials or equipment for construction or maintenance of transportation projects that reduce GHG emissions.
 - Public facilities for supplying electricity to electric and hybrid-electric vehicles.

- U.S. DOT and EPA must approve the plan and determine that plan is likely to achieve the GHG targets.

Surface Transportation Reauthorization

The current surface transportation funding legislation, the Safe, Accountable, Flexible, Efficient, Transportation Equity Act - A Legacy for Users (SAFETEA – LU) was signed by

the President on August 10, 2005. This act expired on September 30, 2009, and has been held over through continuing resolutions. These temporary extensions are anticipated to continue to occur for the foreseeable future. However, in June 2009, the U.S. House Transportation and Infrastructure Committee passed a concept for the Surface Transportation Authorization Act of 2009, which provides some indication of the direction of future transportation legislation at the federal level. Key features of this legislative blueprint are listed below.

- Create a National Transportation Strategic Plan.
- Improve the safety of the surface transportation network.
- Bring existing highway and transit facilities and equipment to a state of good repair.
- Facilitate goods movement.
- Improve metropolitan mobility and access.
- Expand rural access and interconnectivity.
- Lessen environmental impacts from the transportation network.
- Improve the project delivery process by eliminating duplication in documentation and procedures.
- Facilitate private investment in the national transportation system that furthers the public interest.
- Ensure that States receive a fair rate of return on their contributions to the Trust Fund.
- Provide transportation choices.
- Improve the sustainability and livability of communities.

Metropolitan Planning Organizations may be particularly affected by proposals involving a Metropolitan Mobility Program, a larger role for transit services in urban areas, an emphasis on livability to be facilitate through cooperative efforts of U.S. DOT, EPA and HUD, implementation of high speed and commuter rail, and a changing revenue source landscape.

FY 2009 Agency Consultation

MAG reached out to Federal, State, Tribal, regional, and local agencies to consult on environmental mitigation and resource conservation issues and concerns, during the development of the 2010 Update of the Regional Transportation Plan (RTP). An agency workshop was held on November 13, 2008 to review MAG studies and receive input from environmental and resource agencies, regarding the application of environmental mitigation and resource conservation concepts in the transportation planning process.

Three studies were discussed at the workshop, including the I-10/Hassayampa Valley Transportation Framework Study, the I-8/I-10/ Hidden Valley Transportation Framework

Study, and the Regional Transit Framework Study. Preliminary information from the first two of these studies was presented at the FY 2008 Workshop, and the FY 2009 Workshop provided an opportunity to discuss the studies in greater detail. In addition, preliminary information from the MAG Regional Transit Framework Study was presented, which evaluates future transit needs beyond those contained in the RTP.

Comparisons of Transportation Plans with Conservation Plans and Inventories of Natural or Historic Resources

As part of the FY 2009 consultation effort, environmental scans prepared for the I-10/Hassayampa Valley Transportation Framework Study and the I-8/I-10/ Hidden Valley Transportation Framework Study were presented at the November 13, 2008 agency workshop. These environmental scans included geographic coverages to help identify potential areas where future facilities may impact environmental and resource elements in the surrounding areas.

Specific overlays that were reviewed included:

- Air Quality Non-Attainment Areas
- Drainage Floodplains
- Hazardous Materials
- Existing Land Use
- Natural Vegetation
- Recreational Opportunities
- Wildlife Linkages
- Conservation Areas
- Environmental Justice Populations
- Land Ownership
- Future Land Use
- Planned Developments
- Biological Resources/Species

In addition, as part of the presentation of findings from the MAG Regional Transit Framework Study, land use patterns and the transportation system were discussed, including key connections between activity centers. Corridor concepts at the community level, subarea level, and regional level were described, and the tie between transit system options and environmental issues such as sustainability, carbon footprint, smart growth, and air quality were assessed.

Environmental Mitigation Factors, Natural and Historic Resource Conservation, and Planning Process Considerations

Key comments received at the FY 2009 workshop are summarized below. The points listed are not intended to represent MAG policies, but rather, are factors for consideration in the transportation planning process.

- Significant progress regarding the consideration of environmental mitigation factors, as well as natural and historic resource conservation, has been made in the MAG long-range transportation planning process. The environmental scans included in the transportation framework studies have been

particularly effective in analyzing environmental and resource factors. This approach should be pursued on a continuing basis, as it offers the opportunity to identify environmental and resource issues early in the transportation planning process and effectively involve key environmental and resource agencies.

- As a part of the transportation framework studies, as well as the transportation planning process in general, it will continue to be important to emphasize that findings resulting from study efforts are general and subject to change. It is true that identifying the potential, future location of transportation facilities and services is a key output of planning studies and is of major interest to the public. However, it is important to avoid premature conclusions by neighborhoods, communities, and the public-at-large about the localized impacts, and benefits, of transportation improvements. Every effort should be made to remind the audiences of both planning presentations and written documents that the “lines on the map” are not “cast in stone”.
- Drainage studies by the Maricopa County Flood Control District are ongoing in the Wittman area and should be used as a resource in transportation planning activities.
- The location of existing and future power transmission lines should be considered as part of the transportation planning process for new facilities, as well as the location of waters of the United States.
- Continuing involvement of the Maricopa County Parks and Recreation Department will be important to identify recreational opportunities as new areas of the region develop.
- Planning of future transportation systems in developing areas should recognize the need for accessibility to health care facilities.
- Land use planning in the developing parts of the region should take into account conflicts between conservation areas and areas planned for development. In addition, the potential limits of water availability and strategies for water reuse should be included in the planning process.

FY 2008 Agency Consultation

Although the RTP was not updated during FY 2008, an agency workshop was held on November 6, 2007 to obtain input on ongoing MAG transportation studies. The main purpose of the workshop was to receive input on two MAG studies that assess transportation needs in developing areas of the region. These studies were the I-10/Hassayampa Valley Transportation Framework Study, and the I-8 and I-10/Hidden Valley Transportation Framework Study.

The I-10/Hassayampa Valley Roadway Framework Study covers the western portions of the MAG planning area and includes concepts for future freeway and parkway corridors in the area. Since these corridors are not yet a part of the Regional Transportation Plan, the goal of the workshop was to gain insights regarding agency concerns before the corridors are considered for inclusion in the Plan at some future date. In addition, preliminary results from the I-8 and I-10/ Hidden Valley Roadway Framework Study were reviewed. This study covers southwest Maricopa County and west/central Pinal County. Although the process for both these studies has included extensive involvement of environmental and resource agencies, the RTP workshop provided another opportunity for MAG to familiarize the agencies with the study results and to obtain comments on potential mitigation and conservation approaches.

Comparisons of Transportation Plans with Conservation Plans and Inventories of Natural or Historic Resources

As part of the FY 2008 consultation effort, a series of maps that depict the distribution of natural resources, land use patterns, demographic factors, and conservation areas was prepared for the Hassayampa Valley and Hidden Valley study areas. Proposed transportation facility networks were overlaid on these coverages to help identify potential areas where future facilities may impact the natural environment, and existing or future land use patterns. These maps were presented at the November 6, 2007 Workshop and provided a basis for comment and discussion.

Specific overlays that were reviewed included:

- Air Quality Non-Attainment Areas
- Drainage Floodplains
- Hazardous Materials
- Existing Land Use
- Natural Vegetation
- Recreational Opportunities
- Wildlife Linkages
- Conservation Areas
- Environmental Justice Groups
- Land Ownership
- Future Land Use
- Planned Developments
- Biological Resources/Species

Environmental Mitigation Factors, Natural and Historic Resource Conservation, and Planning Process Considerations

Key comments received at the FY 2008 workshop are summarized below. The points listed are not intended to represent MAG policies, but rather, are factors for consideration in the transportation planning process.

- When assessing air quality issues and potential impacts, the new eight-hour ozone standards and non-attainment area boundaries should be employed.
- The transportation planning process in developing areas should include consideration of methods for protecting right-of-way for new freeway corridors and other key transportation facilities.
- Drainage studies by the Maricopa County Flood Control District are ongoing in the Wittman area and should be used as a resource in transportation planning activities.
- The location of existing and future power transmission lines should be considered as part of the transportation planning process for new facilities, as well as the location of waters of the United States.
- Continuing involvement of the Maricopa County Parks and Recreation Department will be important to identify recreational opportunities as new areas of the region develop.
- Planning of future transportation systems in developing areas should recognize the need for accessibility to health care facilities.
- Land use planning in the developing parts of the region should take into account conflicts between conservation areas and areas planned for development. In addition, the potential limits of water availability and strategies for water reuse should be included in the planning process.
- Future noise mitigation issues should be anticipated in planning corridors in currently vacant areas. Policies should be established as part of the planning process to help ensure that community development patterns are designed to minimize future mitigation requirements. This is especially important to conserve funding so that it can be focused on construction of actual transportation facilities.
- Provisions for future park-and-ride lots should be considered in the planning process for the transportation framework in developing areas. These facilities are key elements of the transportation system and need to be recognized early, and throughout, the planning process. Fueling locations for alternative vehicle should also receive some consideration.

- The full range of transportation modes should be addressed in planning for developing areas, including high capacity transit facilities, goods movement facilities, and both passenger and freight intermodal facilities.
- The effects of an extensive roadway network on the urban heat island effect should be considered in the planning process as new areas are developed.
- Concerns about the impacts of transportation facilities on specific cultural sites, as well as the overall effects on the traditional cultural, are an important issue for Native American communities.

FY 2007 Agency Consultation

The FY 2007 consultation effort was initiated with an agency workshop, which was held on August 17, 2006. The workshop provided an opportunity to familiarize the agencies with MAG's organization and planning responsibilities, as well the goals of the consultation process. Most importantly, agency input was obtained on environmental mitigation and resource conservation issues, available databases and other information resources, and future steps in the planning process. Following the workshop, MAG staff held additional individual meetings with thirteen key environmental and resource agencies during September/October 2006.

Key input provided at the workshop and follow-up sessions is summarized below. This input cover three main topic areas: (1) environmental mitigation factors, (2) natural and historic resource conservation, and planning process considerations.

Environmental Mitigation Factors

The consultation process with environmental and resource agencies yielded mitigation issues and concepts in four major areas: air quality, water quality, noise, and habitat. The key points emerging from the discussions on these topics have been summarized below for consideration in the transportation planning process.

Air Quality

- PM-10 - A major, transportation-related air quality issue in the MAG Region is PM-10 non-attainment. Streets and highways are a source of fugitive dust, as the action of traffic stirs up dust from the roadway into the air. Also, construction activity on transportation facilities can result in the track-out of soil onto streets and highways, and fugitive dust can be generated on transportation construction sites. Unpaved roads are also dust generators. Currently

undeveloped areas contain significant mileages of unpaved roads. As development in the region expands, these facilities could become an increasingly important element in addressing PM-10 air quality issues.

Street sweeping, paving of shoulders, paving unpaved roads, and construction site management can help reduce dust emissions significantly. The application of “best practice” dust control measures at construction sites is essential in helping to reduce the impacts of developing new transportation corridors or improving existing facilities. Making effective use of available funds for PM-10 control measures may help move the region into attainment as quickly as possible. Arterial improvement projects to extend existing roadway would have the dual benefit of improved access and reducing emissions from unpaved roads. At the same time, paving these unpaved roads may increase access to sensitive habitat areas.

- Other Mobile Sources - Transportation can affect air quality because of the tailpipe emissions of gases and particles from vehicles. Increases in vehicle-miles-of-travel can result in higher total emissions compared to what they would be without those increases. The emissions from potential future transportation corridors in both attainment and non-attainment areas of the region should be considered. An overall assessment of how additional corridors will affect regional air quality issues is important.

Efforts to reduce growth in vehicle-miles traveled can help lessen the impacts of the transportation system. The overall impact of travel and transportation facilities can be reduced by measures that lessen the amount of vehicular travel on streets and highways. Steps such as telecommuting, carpooling, flexible schedules, transit, and usage of alternative modes such as bicycles and walking can contribute to this effort. MAG Region ambient air quality readings for ozone are quite close to the allowable 8-hour standard. At some point in the future, this may require the implementation of new or enhanced transportation control measures aimed at reducing precursor emissions.

- Stationary Sources - The location of significant stationary sources should be considered when locating new transportation corridors or expanding existing transportation facilities. The proximity of transportation sources and stationary sources may have the potential to create concentration “hot spots” that should be avoided. On the other hand, serving certain major stationary sources with adequate transportation facilities may be important to minimize impacts on surrounding communities.

Water Quality

- Development Impacts - In general, transportation facilities, as a component of development in the region, place an increasingly intensive burden on natural water systems. Effective design and management of this development to take into account the range of impacts it has on the environment will be vital as growth continues in the region.
- Storm Water Runoff from Existing Facilities - A major water quality issue affected by transportation facilities involves the storm water runoff from existing roads. Beginning in December 2007, the U.S. Environmental Protection Agency is expected to increase the enforcement of water quality standards related to storm water runoff. Runoff contains contaminants that may affect the quality of surface water and ultimately ground water. The quality of runoff from existing transportation facilities into rivers and streams represents a significant water quality issue. In addition, ground water may be affected by the retention basins associated with major freeways and highways, especially where drywells are employed.

The runoff from existing transportation facilities can be dealt with through containment and treatment, before it is allowed to enter surface streams or ground water aquifers. The primary mitigation measures for storm water runoff involve the application of best management practices to address transportation facility impacts. These best management practices include steps such as retention basins or traps for runoff that enable capture of sediments before the runoff enters natural streams or lakes. Use of screens at facility drains can catch trash and prevent it from entering natural water courses. Substitution of planted drainage channels for concrete-lined structures can improve water quality and also reduce the velocity of water that enters natural streams and lakes, reducing erosion. Best management practices need to be applied to both freeways and arterial streets, and the right-of-way needs of these measures should be taken into account when new facilities are being identified and developed.

In addition, the amount of runoff and the areas where water is concentrated can affect surrounding land uses. Storm water runoff from freeways can impact ground water quality in adjacent areas. Best management practices should be employed to monitor and treat any runoff that may encroach into the adjacent community. In the long term, storm water should be directed away from the adjacent areas entirely.

- Storm Water Runoff During Construction - Storm water runoff from transportation facilities under constructions may also contain contaminants that affect surface and ground water quality. In addition, any discharge of dredge or fill materials into waters of the U.S. during construction must adhere to a series

of watercourse permitting procedures administered by the U.S. Army Corp of Engineers. This includes the 404 Permit process.

During the construction of transportation facilities, measures are needed to control and/or treat storm water to meet water quality discharge standards and avoid exacerbating any existing water quality problems. The water quality impacts from storm runoff at transportation facility construction sites can be addressed through site management plans. These plans call for “Best Management Practices” that apply specific measures to limit the amount of contaminants that may be contained in the runoff from construction sites. On larger projects, this can include installation of sediment basins to ensure the quality of discharges. Measures such as street sweeping and steps to reduce track-out from construction sites can also reduce the amount of sediments in runoff from transportation facilities.

- Disturbance of Watercourses and Wetlands - Another effect of transportation facilities on water resources is related to the disturbance of watercourses and wetlands, impacting the ability of washes, rivers and wetlands to exist as functioning systems. Transportation structures can impede natural flow and flood patterns, which may affect surface water quality, the ground water recharge process, and riparian habitats.

The impacts of transportation facility crossings of washes, rivers and wetlands can be addressed through design practices that focus attention on keeping water courses as functional as possible. In addition to design measures, direct avoidance of sites, where possible, is another approach to limiting the impacts of transportation facilities. The trade-off between channelizing and bridging a stream, river or wetland involves both cost considerations and environmental factors. Bridging with channelization may be more attractive than bridging, alone, in terms of cost, but the environmental consequences of the former may be much more significant.

Future locations where new transportation facilities may have significant effects on water courses are in the Hassayampa Valley area and along the Gila River. In particular, this would involve an expanded transportation network to handle population growth west of the White Tank Mountains and the development of SR 801 (I-10 Reliever Freeway). New or expanded transportation facilities in both these locations will be affecting major riparian areas and their biological habitats. The crossing of the Agua Fria River delta at the Gila River will involve a number of major of 404 Permit and other environmental factors.

- Water Conservation, Subsidence and Other Factors - Ground water should not be used for high water using plants and water features located in publicly owned rights-of-way of highways, streets and other transportation facilities. Subsidence

due to ground water pumping can present an issue for transportation facilities, causing settling or misalignment of roadways after they are constructed. In addition other water-related sites should be avoided where possible. Examples of such sites includes water treatment plants, fresh water wells, test wells, contaminated or potentially contaminated areas (bio-soils, feed lots, superfund sites), surface water intakes, earth fissures, runoff discharges near well sites, and unique streams.

The evolving nature of data needs to be kept in mind. Features such as water tables, stream contours and water sheds can change in response to climatic trends, development and other factors.

Noise

- Facility Mitigation - The vehicular traffic in transportation corridors may potentially affect noise levels in areas adjacent to the corridor. Mitigation measures such as rubberized asphalt pavement overlays, noise walls, berms and depressed facilities should be considered. Also, coordination with local government planning can direct appropriate land uses to areas adjacent to major transportation facilities.

Habitat

- Wildlife Corridors - Wildlife movements often form corridors, and transportation facilities that cut across these corridors can interrupt normal migration patterns and jeopardize the viability of wildlife groups. Canals and railways, as well as roads, can be barriers to habitat and wildlife connectivity. Like wildlife, plant life dispersal patterns can be affected by transportation facilities, but perhaps to a lesser extent than wildlife. A wildlife corridor in general is defined as the entire habitat area including the entrance, exit, and habitat within.

As development increases along a wildlife corridor, it decreases the likelihood of travel by wildlife. Mountain ranges in general have been relatively easier to conserve due to the understanding that the species found there are specific to the montane habitat. However, now the valley bottoms between mountain ranges are becoming more important than ever. The species contained in these areas are becoming more threatened due to development and habitat fragmentation. It is important to note that even if wildlife connectivity corridors are incorporated into development patterns, it may be difficult for wildlife to find the specific corridor, because they are accustomed to traveling the entire valley bottom. One of the long term concerns is that wildlife populations will have to be artificially augmented through animal transportation to have continued genetic diversity, due to habitat fragmentation.

An effective response to this issue is to identify where wildlife corridor interruptions may occur and to provide “wildlife-friendly” crossing structures (bridges, culverts, underpasses etc.) for the involved transportation facility. Studies to determine the best habitat corridor and fencing options to funnel wildlife may be able to assist in these types of situations. Other measures include timing construction to minimize disruption of breeding seasons, and pursuing mitigation banking. Also, using existing utility corridors for roads, canals, railways, etc. can help limit the amount of disruption. The area along 51st Avenue needs a wildlife friendly crossing structure so that wildlife may travel from South Mountain to the Sierra Estrella Mountains. It should be noted that paving existing dirt roads may tend to increase traffic volumes and speeds, increasing barrier effects to wildlife.

- Riparian Areas - Wildlife migration patterns form corridors that are often along riparian areas. Transportation facilities can affect the wildlife and plant life associated with rivers, streams and wetlands, in addition to the water quality. Locations such as the Salt River, Gila River, Agua Fria River, and many large washes are used by a large diversity of wildlife. A continuing effort will be required in order to preserve existent habitat in the central part of Maricopa County, as well as the habitat in the currently rural areas of the County. Providing “wildlife-friendly” crossings, reducing the number of streambed crossings, and eliminating wetland intrusions can help minimize impacts. The current location of the Canamex Corridor crosses a number of major washes and will pose riparian habitat challenges.
- Mitigation Banking - There is a tendency for mitigation efforts to lag, and not be effective until well after construction is completed, resulting in greater impacts on habitat. Mitigation banking attempts to ameliorate this pattern by establishing new habitats, or implementing other mitigation measures at locations removed from the construction site, so that habitats will be continuously available. This helps maintain uninterrupted habitat opportunities for wildlife and lessens the impacts of new construction. The priority for mitigation banking is in a location immediately adjacent to a project, followed by locations in the same watershed, and finally “in-lieu” habitat purchases or mitigation measures in well removed locations.
- Facility Maintenance and Surveys - The timing of road maintenance and repairs, surveys of riparian vegetation and aquatic communities around bridge abutments, assessment of hazardous spills, and designation of critical habitat are factors of continuing interest for habitat protection as the transportation planning process proceeds.

- Urban Heat Island - The urban heat island effect of transportation facilities, especially heat retention by pavements, warrants consideration in assessing environmental issues related to long-range transportation planning efforts.

Natural and Historic Resource Conservation

The consultation process with environmental and resource agencies yielded resource conservation issues and concepts in three major areas: cultural resources, natural resources, and land use patterns. The key points emerging from the discussions on these topics have been summarized below for consideration in the transportation planning process.

Cultural Resources

- Tribal Cultural Resources - In the transportation planning process tribal cultural resources, in particular, should be considered early and in considerable detail. This may warrant early consultation with Native American Tribes concerning facility locations, before alternatives are actually identified in detail. This may help avoid selection of a final option that has major impacts that are not discovered until construction earthwork is underway. New technologies can yield significant information that will help in the definition of alignment alternatives that have the least impact on archaeological sites. In general, riparian locations are may be closely associated with archeological sites. This will be a major factor affecting the S.R. 801 corridor.

Excavation, particularly of burial sites, is no longer considered under Section 106 of the National Historic Preservation Act, to be a “no adverse effect” mitigation measure, but rather an “adverse effect.” Therefore, the potential for new transportation facilities to intrude in such areas has taken on greater significance and warrants extensive identification and eligibility determinations before final decisions are made regarding facility locations.

- Cultural Context - Another factor that warrants early consideration in the transportation planning process relates to the historic and cultural context (theme, location, time period) associated with the potential location of a transportation facility. Certain locations and topographical/geological features may have particular significance to a given culture. The potential impact of transportation structures in these locations bears consideration in the planning process. This factor is particularly relevant to the S.R. 202L (South Mountain Freeway) corridor.
- Historic Structures - Negative impacts to historic structures, archaeological sites, and Traditional Cultural Places should be avoided where possible. Cultural features such as canals may be historic, and the impacts of new

transportation facilities or facility improvements not overlooked. The structures associated with transportation facilities, in themselves, can be historic in nature, and a given route can represent an historic element in the overall history of a particular region or place. It is important to identify the key historical aspects of transportation facilities for future preservation.

- Visual Factors - The general visual effects of transportation facilities on the surrounding community are an aspect that should not be overlooked. This may be particularly important as it relates to historic and cultural elements of the community.
- Federal Requirements - Some projects will involve federal funding, land, permits, or other types of federal involvement. These projects will need to be reviewed for impacts to cultural resources following the Section 106 process. There are federal standards (the Secretary of Interior's Standards) and requirements, such as tribal consultation, that will need to be followed. The federal agency involved in the project or plan will take the lead completing this process.
- Other Considerations - While often not addressed in this context, bicycle and pedestrian facilities represent, in effect, important cultural resources that need to be maintained and fully taken into account in the transportation planning process.

Natural Resources

- National Forest Areas - Transportation facilities have high impacts on National Forest areas, potentially bringing high volumes of vehicles and people to areas that are readily affected by the accompanying air pollution, fire risk, soil erosion, damage to plants and wildlife, and other impacts. In addition, development that is adjacent to National Forest areas will place an increasing burden of users on a finite resource. Dealing with these demands, while conserving forest resources, requires a balanced approach and presents a variety of challenges.

Given their extensive impacts, new transportation corridors are a major concern for the protection of National Forest areas. Proposals for new corridors must first have a clearly defined purpose and need, as well as demonstrated benefits for Forest areas, before they can be considered for further study. The potential impacts of new transportation corridors are always accompanied by public and agency concerns over the degradation of the natural environment of Forest areas.

It is recognized that there may be a need for transportation facility operators to address safety and capacity issues related to existing highways through forest areas. This may result in the need for rock-fall prevention measures, addition of grade separations, shoulder widening or additional lanes. Assessing the potential impact of these kinds of improvements and identifying mitigation measures are a key element in the NEPA process. In addition to project-specific mitigation, there may be a need to mitigate the presence of a highway corridor, in general, through accommodations for wildlife linkages or other facility alterations.

- Other Federal Lands - Access to federal lands is a major issue in the relationship between transportation and resource conservation. An effort is made to focus access to federal lands through specific “portals” that control where people and vehicles can enter but, at the same time, provide adequate opportunities for the public to take advantage of recreational opportunities. Designated Federal Wilderness Areas may not be used for transportation purposes or developed in any other manner.

If local government land use and circulation plans result in blocking portals to federal lands, effectively isolating the land, public access suffers. On the other hand, if major roadways run through federal lands, it opens up the potential for vehicles to turn off and enter these areas indiscriminately. This can result in environmental damage and create other environmental issues such as dust from unauthorized off-road vehicle usage. In both cases, coordination by land use and transportation agencies is vital to reach a balance between too much and too little access. Exits from major roadways specifically to provide access to federal lands can help address the issue. Also, integrating federal land portals into local land use and circulation plans can help avoid isolating federal lands and maintain public access.

The future extension of the Loop 303 corridor, enhancements to SR 238, implementation of the Wickenburg Bypass, and development of new corridors in the West Valley will potentially have major impacts on federal lands.

Land Use Patterns

- Open Space - Maintaining critical open space areas should be a major factor in preparing future transportation plans, along with wildlife migratory routes between habitats. The Regional Park and Trail System warrant careful consideration as part of the transportation planning process. Maricopa County has a County Park Master Plan for the regional park system that looks out over the next 20 years. Similarly, the Maricopa Trail is an example of a resource that needs to be protected in the future. Transportation also needs to

consider transportation facilities that are effective in moving people to regional park areas.

- Sustainable Communities - A major aspect of the land use planning/transportation planning process should be a focus on the development of sustainable communities, taking a comprehensive view of transportation trade-offs in the urban environment. The land use planning/transportation planning nexus is key in the overall effort to maintain environmental quality. Land use planning approaches that emphasize mixed use development are essential. They help increase the proximity of homes to shopping and jobs and minimize the increase in travel that accompanies population growth in the region. Developments should be planned to accommodate park-and-ride lots and other alternative mode facilities, so that their implementation is not precluded as land costs increase in the future.

At the same time, traditional activities, such as agriculture, produce complaints from nearby residents who live in neighborhoods that were constructed immediately at the boundaries of these activities. Sustaining these activities in the overall land use mix represents a major challenge.

- Development Community - The development community should take a proactive role in addressing environmental issues and the impacts of development on transportation facilities and other infrastructure. Careful attention to the development process is vital to dealing with the high pace of growth in the region, and the resulting major infrastructure and environmental impacts. By working closely, at every opportunity with the development community during the land use planning process, State, regional, and local agencies can help ensure that effective infrastructure systems, including transportation facilities, are identified and integrated into development plans. This helps maintain an orderly development process and helps mitigate the regional impacts of growth.
- Access Impacts - Transportation facilities that lie along the border of a community may result in environmental impacts on that community, including effects on air and water quality, noise, dumping of trash, vehicle trespass, and potential effects of trucking. The commercial development that transportation facilities attract also may affect the surrounding community. These effects should be considering as part of the transportation planning process.

Planning Process Considerations

During the meetings with key environmental and resource agencies, the discussions often led into the area of transportation planning, in general, and how environmental and resource concerns can be effectively integrated into the planning process. The

major points made in this connection, which focused on the areas of early agency involvement and planning coordination, are summarized below.

Early Involvement

- Environmental and Resource Agencies - Early involvement by environmental and resource agencies in planning for new transportation corridors, as well as improvements to existing facilities, is essential to ensure that workable alternatives are defined, and full consideration of required mitigation measures is properly addressed. It is especially important not to overlook the fact that the need for early involvement improvements/changes to existing transportation facilities is as important as coordination on new corridors.
- All Project Levels - Early involvement is not only important for major corridors, such as those developed by ADOT, but is also vital for projects constructed at the city and county level. Participation in the planning process during MAG area studies and transportation corridor studies will provide the opportunity for input before key planning decisions are made. This involvement should occur prior to implementing the NEPA process, so that key environmental and resource issues can be considered before they become large and significant. Early involvement is also important for effective identification and application of databases and other information inventories.
- Cultural Resources - Early consultation regarding cultural resources has become an increasingly important factor in transportation studies. It is important to consider land use, cultural, and environmental factors at the very beginning of transportation studies (including the identification of alternatives), so that significant conflicts can be noted and alternatives with high impacts can potentially be avoided, before major amounts of time and resources are invested in analysis.
- Access Issues - Early involvement of resource agencies in the transportation planning process can help ensure that access control issues are addressed effectively, both in terms of the location of access and the timing of access control structures. Controlling access is a key factor in limiting damage to sensitive areas, but, at the same time, adequate access is an important factor for the value of State land holdings. Features such as interchange spacing intervals along freeway/expressway routes are especially significant.

Planning Coordination

- Corridor Level Focus - In transportation corridor and area studies, potential environmental mitigation measures specific to each corridor alternative should be described and assessed as part of the characteristics of the corridor, rather

than addressing the issue, as a whole, in the overall study process. In addition, as part of these studies it is important to maintain the focus on issues affecting the immediate study area and avoid diverting attention to other areas or facilities.

- Technical Committees - MAG technical committees and working groups represent an excellent avenue for agencies to follow key issues in the region, as well as to provide information on environmental mitigation and resource conservation methods and concerns. It would be advantageous for key environmental and resource agencies to be involved in these groups.
- Emergency Management - Emergency evacuation routes should be a consideration in the transportation planning process. This includes the potential need for evacuation of the MAG Region, as well as handling of evacuees into the area from other parts of the country. The need to use transportation facilities for evacuation purposes also has numerous design implications, including ease of facility ingress/egress, chokepoints, and alternative routes. Emergency evacuation preparedness requires regional coordination among local entities. As transportation facilities are planned, consideration should also be given to the need for access by emergency service vehicles and accommodation of farm equipment.
- Interregional Planning - The central Arizona area, especially the Maricopa County and Pinal County areas, would greatly benefit from an integrated planning program. The growth in this area has become a multi-county proposition, as development patterns have extended across county boundaries. Additionally, the issue of an adequate resources base needed to deal with multi-county infrastructure needs is a growing issue. Public transit services in the MAG Region should be closely coordinated with Pinal County communities. The impact of the motor vehicle travel from this high growth area into Maricopa County is significant and needs to be addressed.
- Public Information - A broad range of street, highway and light rail transit improvements are being constructed in the region simultaneously. Implementing agencies should make every effort to schedule improvement projects in a way that retains alternative route options along major north-south and east-west corridors. In addition, construction activities and closures should be well-publicized in advance, allowing motorists to make efficient adjustments in their travel patterns.
- Right-of-Way - The potential complexities of right-of-way acquisition for future facilities should be recognized early in the planning process, so that they do not become a major barrier to effective project development later in the plan

implementation process. This is particularly the case where right-of-way on allotted Indian Community land might be involved.

The State Land Department is legally prohibited from donating right-of-way for the construction of transportation facilities. Also, early transportation right-of-way sales, when prices are lower, to ensure good access to State lands in the future are problematic. The courts have held that the actual realization of increased future access and the resulting land value benefits are too uncertain to justify early sale of right-of-way.

Appendix C
Regional Freeway/Highway Projects

TABLE C-1
2040 REGIONAL TRANSPORTATION PLAN
REGIONAL FREEWAY/ HIGHWAY PROJECTS

PROJECT DESCRIPTION	COST FY 2018- FY 2040 (2016 \$'s in THOUSANDS)	PLAN GROUP *
<u>I-10/Maricopa</u>		
10 (Maricopa): Sky Harbor West Airport Access Reconstruction of interchange	30,000	Group 2
10 (Maricopa): SR-143 - 202 Santan NTIS Design Build Add general purpose lanes	161,300	Group 1
10 (Maricopa): I-10/I-17 (Split) to US-60 Construct improvements (Spine Opt. 2)	158,300	Group 2
10 (Maricopa): SR-143/Broadway TI Construct improvements (Spine Opt. 4)	273,500	Group 2
10 (Maricopa): Alameda Drive and Guadalupe Road Design and construct pedestrian bridges	9,100	Group 1
10 (Maricopa): Chandler Heights Rd TI Construct traffic interchange	22,900	Group 1
10 (Maricopa): SR-202 Santan - Riggs Rd Add one HOV and one general purpose lane in each direction	65,350	Group 2
10 (Maricopa): Riggs Rd to MPA Boundary Add one general purpose lane in each direction **	280,800	Group 3
Subtotal	1,001,250	
<u>I-10/Papago</u>		
10 (Papago): SR-85 - Verrado Way Add one general purpose lane in each direction	42,800	Group 3
10 (Papago):- Perryville Rd to Bullard Ave FMS	4,160	Group 1
10 (Papago): Fairway Dr (El Mirage Rd) TI New traffic interchange	15,560	Group 1
10 (Papago): SR-101 - I-17, Phase 2 Add one general purpose lane in each direction	278,200	Group 3
10 (Papago): Desert Creek/323rd Ave Construction new interchange ***	20,400	Group 3
10 (Papago): 395th Ave Construction new interchange ***	20,020	Group 3
10 (Papago): I-10/SR101L WN Ramp Restriping to change lane configuration	25	Group 1
10 (Papago): I-10/SR101L EN Ramp Restriping to change lane configuration	480	Group 1
10 (Papago): I-10/SR101L EN Ramp Restriping to include additional lane	3,500	Group 1
Subtotal	385,145	
<u>I-17/Black Canyon</u>		
17: Dunlap Ave - SR-101 Capacity improvements	219,000	Group 3
17: I-10/I-17 (Split) to Grand Ave. Add HOV lane and other capacity improvements (Includes Split HOV)	605,600	Group 2
17: SR-101 - I-10 Stack Interchange ITS improvements (Near-Term Improvement Strategy)	6,000	Group 1
17: Central Ave Reconstruct overpass	23,500	Group 1

PROJECT DESCRIPTION	COST FY 2018- FY 2040 (2016 \$'s in THOUSANDS)	PLAN GROUP *
17: Pinnacle Peak Rd to Happy Valley Rd Widen and reconstruct traffic interchanges	44,000	Group 1
17: Indian School Rd Reconstruct interchange	59,450	Group 2
17: Camelback Rd Reconstruct interchange	68,600	Group 1
17: Grand Ave - Dunlap Ave Capacity improvements	350,000	Group 3
17: Peoria Ave - Greenway Rd Drainage improvements	16,500	Group 2
17: SR-74 Carefree Highway - Anthem Way Add one HOV lane in each direction	89,500	Group 3
17: Anthem Way - New River Add one general purpose lane in each direction	57,400	Group 3
17: Mores Gulch Bridge replacement ****	5,900	Group 1
17: I-10/I-17 NW & SW Ramps Restriping to change lane configuration	40	Group 1
Subtotal	1,545,490	
<u>SR-24/Gateway</u>		
24 (Williams Gateway): SR-202 Santan - Ellsworth Rd, Phase 2 Construct ultimate freeway section	46,900	Group 3
24 (Williams Gateway): Ellsworth Rd - Meridian Rd Construct new freeway	212,600	Group 3
Subtotal	259,500	
<u>SR-30/I-10 Reliever</u>		
30 (I-10 Reliever): SR-85 - SR-303 Construct interim facility	192,700	Group 3
30 (I-10 Reliever): SR-303 - Estrella Pkwy Construct new freeway	279,400	Group 3
30 (I-10 Reliever): Dysart Rd - Avondale Blvd Construct new freeway	116,600	Group 3
30 (I-10 Reliever): Estrella Pkwy - Dysart Rd Construct new freeway	243,400	Group 3
30 (I-10 Reliever): SR-303 - SR-202 South Mountain Construct new freeway	55,900	Group 3
30 (I-10 Reliever): 67th Ave - SR-202 South Mountain Construct new freeway	278,500	Group 3
30 (I-10 Reliever): 97th Ave - 67th Ave Construct new freeway	223,200	Group 3
30 (I-10 Reliever): Avondale Blvd - 97th Ave Construct new freeway	148,900	Group 3
Subtotal	1,538,600	
<u>SR-51/Piestewa</u>		
<u>US-60/Grand Ave</u>		
60 (Grand Ave): Greenway Rd to Thompson Ranch TI Construct frontage road improvements	6,300	Group 1
60 (Grand Ave): SR-101 (Agua Fria Fwy) - Van Buren St, Phase 3 Construct three grade separated intersections	86,200	Group 3

PROJECT DESCRIPTION	COST FY 2018- FY 2040 (2016 \$'s in THOUSANDS)	PLAN GROUP *
Subtotal	92,500	
<u>US-60/Superstition</u>		
60 (Superstition) : Lindsay Rd Half TI Construct half traffic interchange	8,200	Group 3
60 (Superstition): Crismon Rd to Meridan Rd Add 1 HOV lane, 1 GP lane and FMS	28,400	Group 1
60 (Superstition): Crismon Rd - Idaho Rd FMS	4,400	Group 1
60 (Superstition): Kings Ranch Rd (EB) Left turn Construction left turn bay extension ****	270	Group 1
60 (Superstition): Mountain Rd to Renaissance Festival Construct Arizona Parkway (Widen to 6 GP lanes from 4 GP lanes) **	28,800	Group 3
Subtotal	70,070	
<u>SR-74/Carefree Hwy</u>		
74: US-60 Grand Ave - I-17 ROW Protection for Lake Pleasant Freeway corridor	40,100	Group 3
74: US-60 Grand Ave - SR-303 Estrella ROW Protection for Lake Pleasant Freeway corridor	1,860	Group 3
Subtotal	41,960	
<u>SR-79</u>		
79: Butte Ave to CAP (North of Florence) Widen from 2 GP Lanes to 4 GP lanes	14,400	Group 3
<u>SR-85</u>		
85: Warner Street Bridge Construction Bridge	5,300	Group 1
<u>SR-87</u>		
<u>SR-88</u>		
<u>US-93</u>		
93: Tegner St to Yavapai Co. line Construct two additional lanes	24,500	Group 1
<u>SR-101L/Agua Fria</u>		
101 (Agua Fria): I-10 - US60 Grand Ave Add one general purpose lane in each direction	116,400	Group 3
101 (Agua Fria): US60 Grand Ave - I-17 Add one general purpose lane in each direction	150,400	Group 3
Subtotal	266,800	
<u>SR-101L/Pima</u>		
101 (Pima): I-17 - SR-51 Piestewa Add one general purpose lane in each direction	103,425	Group 1
101 (Pima): SR-51 Piestewa - Pima Rd Add one general purpose lane in each direction	53,000	Group 1
101 (Pima):Pima Rd - Shea Blvd Add one general purpose lane in each direction	57,000	Group 1
101 (Pima): Pima Rd Extension Pima Rd Extension (JPA)	3,931	Group 1
Subtotal	217,356	

PROJECT DESCRIPTION	COST FY 2018- FY 2040 (2016 \$'s in THOUSANDS)	PLAN GROUP *
<u>SR-101L/Price</u>		
101 (Price): Baseline Rd - SR-202 Santan Add one general purpose lane in each direction	42,420	Group 2
<u>SR-143/Hohokam</u>		
<u>SR-202L/Red Mountain</u>		
202 (Red Mountain): Mesa Dr Ramps Construct freeway ramps	13,500	Group 3
202 (Red Mountain): Gilbert Rd - Higley Rd Add one general purpose lane in each direction	51,900	Group 3
202 (Red Mountain): Higley Rd - US60 Superstition Add one general purpose lane in each direction	108,300	Group 3
202 (Red Mountain): US-60 Superstition TI Construct DHOV freeway ramps	42,100	Group 3
202 (Red Mountain): Broadway Rd - US-60 Superstition Add one HOV lane in each direction	5,650	Group 2
Subtotal	221,450	
<u>SR-202L/Santan</u>		
202 (Santan): US-60 Superstition - Val Vista Dr Add one general purpose lane in each direction	104,000	Group 3
202 (Santan): US-60 Superstition - Gilbert Rd Add one HOV lane in each direction	50,200	Group 1
202 (Santan): Val Vista Dr - Dobson Rd Add one general purpose lane in each direction	83,500	Group 3
202 (Santan): Dobson Rd - I-10 Add one general purpose lane in each direction	50,300	Group 3
Subtotal	288,000	
<u>SR-202L/South Mountain</u>		
202 (South Mountain): I-10 Maricopa (MP 54) to I-10 Papago (MP 76) (Design-Build-Maintain) Design, build, and maintain new freeway	526,638	Group 1
<u>SR-238</u>		
238: SR-347 to Warren Rd Widen from 2 GP Lanes to 4 GP lanes **	24,000	Group 3
<u>SR-287</u>		
287: SR-79 to SR-87 Widen from 2 GP Lanes to 4 GP lanes **	14,400	Group 3
<u>SR-303L/Estrella</u>		
303 (Estrella): Riggs Rd - SR-30 (I-10 Reliever) Right-of-way protection for freeway extension	46,600	Group 3
303 (Estrella): MC-85 - Van Buren St, Phase 2 Construct new freeway	65,200	Group 3
303 (Estrella): MC-85 - Van Buren St, Phase 1 Construct new freeway	120,000	Group 1
303 (Estrella): Northern Parkway TI Construct final traffic interchange	85,600	Group 3
303 (Estrella): US-60 Grand Ave TI Construct final traffic interchange	124,600	Group 2

PROJECT DESCRIPTION	COST FY 2018- FY 2040 (2016 \$'s in THOUSANDS)	PLAN GROUP *
303 (Estrella): Northern Ave - Clearview Blvd FMS	4,260	Group 1
303 (Estrella): I-10/303 TI, Phase II Landscape	5,000	Group 1
303 (Estrella): I-10 - Northern Ave FMS	4,160	Group 1
303 (Estrella): Happy Valley Rd to I-17 Construct ultimate freeway section	227,400	Group 3
303 (Estrella): Lake Pleasant Rd - I-17 FMS	3,960	Group 1
Subtotal	686,780	
<u>SR-347</u>		
347: I-10 to SR-238 Widen from 4 GP Lanes to 6 GP lanes **	76,800	Group 3
<u>North-South Freeway</u>		
R/W Protection (Including SR-24 Corridor) **	65,000	Group 3
<u>System-wide Preliminary Engineering</u>		
	228,900	Group 1-3
<u>System-wide Freeway Management System</u>		
	86,368	Group 1-3
<u>System-wide Freeway Service Patrol</u>		
	29,000	Group 1-3
<u>System-wide Maintenance (Landscape, litter, sweeping)</u>		
	319,200	Group 1-3
<u>System-wide Quiet Pavement</u>		
	150,000	Group 3
<u>System-wide Right of Way (R/W Management & Protection)</u>		
	71,950	Group 1-3
TOTAL		
	8,293,777	

* Plan Groups:

Group 1 - (FY 2018 - FY 2022)

Group 2 - (FY 2023 - FY 2026)

Group 3 - (FY 2027 - FY 2040)

** Project is not part of Freeway/Highway Life Cycle Program. Cost covers MAG planning area portion only.

*** Privately funded.

****ADOT statewide funds.

For freeway/highway projects, the Plan Group generally indicates the period in which the majority of a project is programmed for construction activity. Projects may be programmed for design and/or right-of-way acquisition in earlier periods.

Appendix D
Regional Arterial Street Projects

**TABLE D-1
2040 REGIONAL TRANSPORTATION PLAN
REGIONALLY FUNDED ARTERIAL STREET PROJECTS**

FACILITY/LOCATION	REGIONALLY FUNDED REIMBURSEMENTS: FY 2018 - FY 2026 (2016 \$'S in millions)	REGIONALLY FUNDED REIMBURSEMENTS: FY 2026 - FY 2040 (2016 \$'S in millions)	TOTAL PROJECT COST: FY 2018 - FY 2040 (2016 \$'S in millions) *	PLAN GROUP**
<u>CHANDLER</u>				
Chandler Blvd/Alma School Rd		0.942	0.100	Group 1
Price Rd Substitute Projects				
Chandler Heights Rd: Arizona Avenue to McQueen Road	6.037		8.676	Group 1
Chandler Heights Road: McQueen Road to Gilbert Road	3.634		13.956	Group 1
Ocotillo Road: Cooper Road to Gilbert Road	5.327		7.502	Group 1
Chandler Heights Rd: Gilbert Rd to Val Vista Rd	1.180		12.187	Group 2
Ray Rd/Dobson Rd				
Ray Rd at Dobson Rd: Intersection Improvements Phase II	6.452		17.490	Group 2
Ray Rd/McClintock Dr	3.775		8.511	Group 3
Ocotillo Rd: Gilbert Rd to 148th Street	2.358		6.712	Group 3
Cooper Rd: South of Queen Creek to Riggs Rd				
Cooper Rd: South of Queen Creek Rd to Chandler Heights	4.202		4.954	Group 1
Cooper Rd: Chandler Heights to Riggs Rd	3.022	3.776	7.598	Group 1
Lindsay Rd: Ocotillo Rd to Hunt Hwy	4.433	3.018	22.685	Group 2
<u>CHANDLER/GILBERT</u>				
Queen Creek Rd: Arizona Ave to Higley Rd				
CHANDLER Queen Creek Rd: McQueen Rd to Gilbert Rd	7.079	5.112	13.402	Group 1
<u>EL MIRAGE/MARICOPA COUNTY</u>				
El Mirage Rd: Northern Ave to Bell Rd (Phase I)				
El Mirage Rd: Northern Ave to Peoria Ave (MC)	3.789		8.531	Group 1
Thunderbird Rd: 127th Ave to Grand Ave (ELM)			3.440	Group 1
El Mirage Rd: Northern Ave to Bell Rd (Phase II)				
El Mirage Rd: Cactus to Grand Avenue (ELM)	6.146		1.556	Group 1
Dysart Rd: Northern Ave to Peoria Ave			11.100	Group 1
<u>FOUNTAIN HILLS</u>				
Shea Blvd: Palisades Blvd to Cereus Wash				
Shea Blvd: Palisades Blvd to Technology Dr	2.172	0.692	8.327	Group 1
<u>GILBERT</u>				
Elliot Rd/Cooper Rd	4.140		14.453	Group 1

FACILITY/LOCATION	REGIONALLY FUNDED REIMBURSEMENTS: FY 2018 - FY 2026 (2016 \$'S in millions)	REGIONALLY FUNDED REIMBURSEMENTS: FY 2026 - FY 2040 (2016 \$'S in millions)	TOTAL PROJECT COST: FY 2018 - FY 2040 (2016 \$'S in millions) *	PLAN GROUP**
Elliot Rd/Gilbert Rd	3.775	3.600	13.774	Group 1
Elliot Rd/Greenfield Rd	3.774		12.582	Group 1
Elliot Rd/Higley Rd	3.775	1.137	11.497	Group 2
Elliot Rd/Val Vista Dr	3.775	0.669	15.081	Group 1
Germann Rd: GilbertRd to Power Rd				
Germann Rd: Gilbert Rd to Val Vista Dr	14.127	1.458	10.930	Group 1
Greenfield Rd: Elliot Rd to Ray Rd	3.775		5.254	Group 3
Guadalupe Rd/Greenfield Rd	2.992	1.919	10.646	Group 2
Guadalupe Rd/Power Rd	2.379	3.901	7.554	Group 2
Ray Rd/Gilbert Rd		3.775	7.744	Group 2
Higley Rd/Baseline Rd	3.775		4.919	Group 2
Lindsay Road/SR-202L Transportation Interchange and Corridor Improvements				
Lindsay Road/SR-202L Transportation Interchange & Frontage Road	2.225		23.086	Group 1
Lindsay Road: Pecos Road to Germann Road	7.608		8.492	Group 1
Mustang Drive: Rivulon Blvd to Germann Road	6.850		7.512	Group 1
<u>GILBERT/MESA/MARICOPA COUNTY</u>				
Power Rd: Santan Fwy to Chandler Heights				
Power Rd: Pecos to Chandler Heights (GIL)			27.993	Group 2
Power Rd: Baseline Rd to Santan Fwy				
Power Rd: East Maricopa Floodway to Santan Fwy/Loop 202 (MES)	8.193		31.571	Group 1
<u>MARICOPA COUNTY</u>				
Dobson Rd: Bridge over Salt River	0.000		1.000	Group 3
El Mirage Rd: Bell Rd to Jomax Rd				
El Mirage Rd: Bell Rd to Deer Valley Dr	0.853			Group 1
El Mirage Rd: L303 to Jomax			17.500	Group 3
Gilbert Rd: Bridge over Salt River	41.237		65.500	Group 1
Jomax Rd: SR-303L to Sun Valley Parkway	6.830	17.761	35.130	Group 3
McKellips Rd: Bridge over Salt River		14.005	72.925	Group 4
McKellips Rd: SR-101L to SRP-MIC/Alma School Rd	11.555	14.567	9.300	Group 1
Northern Pkwy: Sarival to Grand (Phase II)				
Northern Pkwy: Dysart to 111th	29.535		34.390	Group 1
Northern Parkway: 99th Ave to East Loop 101 Ramps	11.295		12.144	Group 1
Northern Pkwy: Dysart Overpass	0.783		0.883	Group 1

FACILITY/LOCATION	REGIONALLY FUNDED REIMBURSEMENTS: FY 2018 - FY 2026 (2016 \$'S in millions)	REGIONALLY FUNDED REIMBURSEMENTS: FY 2026 - FY 2040 (2016 \$'S in millions)	TOTAL PROJECT COST: FY 2018 - FY 2040 (2016 \$'S in millions) *	PLAN GROUP**
Northern Parkway: 111th Ave to Grand	4.779		5.068	Group 1
Northern Parkway: Loop 101 to Grand Ave Scoping Assessment				Group 1
Northern Parkway: Dysart and El Mirage Overpass	36.761		38.986	Group 1
Northern Pkwy: Sarival to Grand (Phase III)				
Northern Pkwy: El Mirage Alternative Access	2.915		3.182	Group 1
Northern Pkwy: El Mirage Overpass	0.943		1.000	Group 1
Northern Pkwy: Agua Fria to 111th	2.817		3.924	Group 2
Northern Pkwy: 111th to 107th	15.423		21.783	Group 2
Northern Pkwy: 107th to 99th	20.572		29.333	Group 2
Northern Pkwy: Loop 101 to 91st	3.575		4.536	Group 2
Northern Pkwy: 91st to Grand Intersection Improvements	5.907		7.229	Group 2
Northern Pkwy: ROW Protection	0.000		2.125	Group 2
Northern Pkwy: Ultimate Construction	15.840		18.812	Group 2
MESA				
Broadway Rd: Dobson Rd to Country Club	3.751	4.741	27.377	Group 1
Country Club/University Dr	8.325		25.268	Group 2
Crismon Rd: Broadway Rd to Germann Rd				
Crismon Rd: Broadway Rd to Guadalupe Rd		9.919	18.965	Group 3
Crismon Rd: Guadalupe Rd to Ray Rd	12.406		22.064	Group 2
Dobson Rd/University Dr		4.921	8.224	Group 3
Elliot Rd: Power Rd to Meridian Rd				
Elliot Rd: Power Rd to Ellsworth Rd	8.840	8.646	15.947	Group 1
Elliot Rd: Ellsworth Rd to Signal Butte Rd	11.560		18.383	Group 1
Elliot Rd: Signal Butte Rd to Meridian Rd	1.326		19.238	Group 1
Greenfield Rd: UniversityRd to Baseline Rd				
Greenfield Rd: Southern Ave to University Rd		6.585	10.316	Group 2
Hawes Rd: Broadway Rd to Ray Rd				
Hawes Rd: Broadway Rd to US60			10.697	Group 2
Hawes Rd: BaselineRd to Elliot Rd	7.108		10.368	Group 3
Hawes Rd: Elliot Rd to Santan Freeway	4.415		3.886	Group 4
Lindsay Rd/Brown Rd	3.919		7.867	Group 1
McKellips Rd: East of Sossaman to Meridian				
McKellips Rd: East of Sossaman to Crismon Rd	12.283		28.139	Group 2
McKellips Rd: Crismon Rd to Meridian Rd			13.545	Group 2

FACILITY/LOCATION	REGIONALLY FUNDED REIMBURSEMENTS: FY 2018 - FY 2026 (2016 \$'S in millions)	REGIONALLY FUNDED REIMBURSEMENTS: FY 2026 - FY 2040 (2016 \$'S in millions)	TOTAL PROJECT COST: FY 2018 - FY 2040 (2016 \$'S in millions) *	PLAN GROUP**
McKellips Rd: Gilbert Rd to Power Rd				
McKellips Rd/Lindsay Rd	6.137		10.668	Group 1
McKellips Rd/Greenfield Rd	2.630		3.897	Group 1
McKellips Rd/Higley Rd	6.310		10.993	Group 1
McKellips Rd/Recker Rd	3.393		7.210	Group 1
Mesa Dr: Southern Ave to US60 and Mesa Dr to Broadway Rd				
Mesa Dr: 8th Ave to Main Street	9.209		16.845	Group 1
Pecos Rd: Ellsworth Rd to Meridian Rd	10.381		25.186	Group 1
Signal Butte Rd: Broadway to Pecos Rd				
Signal Butte Rd: Broadway Rd to Elliot Rd	11.693		18.151	Group 2
Signal Butte Rd: Elliot Rd to Ray Rd	8.677			Group 1
Signal Butte Rd: Ray Rd to Pecos Rd	12.664		24.175	Group 2
Southern Ave: Country Club Dr to Recker Rd				
Southern/Country Club Dr	6.469		11.362	Group 1
Southern Ave/Stapley Dr	11.528		18.240	Group 1
Southern Ave: Gilbert Rd to Val Vista Dr	4.615		7.115	Group 1
Southern Ave: Greenfield Rd to Higley Rd	5.987		6.482	Group 1
Southern Ave: Sossaman Rd to Meridian Rd				
Southern Ave: Sossaman Rd to Crismon Rd		8.014	16.363	Group 2
Southern Ave: Crismon Rd to Meridian Rd		5.296	10.788	Group 2
Stapley Dr/University Dr	7.785			Group 2
University Dr: Val Vista Dr to Hawes Rd				
University Dr:Val Vista Dr to Higley Rd	11.204		16.340	Group 2
University Dr:Higley Rd to Sossaman Rd	9.018		16.127	Group 2
University Dr:Sossaman Rd to 88th St	1.387		0.000	Group 1
Val Vista Dr: University Dr to Baseline Rd				
Val Vista Dr:Baseline Rd to US-60	0.607		0.000	Group 1
Val Vista Dr:US-60 to Pueblo	6.820		7.251	Group 1
Baseline Rd: 24th Sreet to Consolidated Canal	3.418	4.722	4.561	Group 1
Mesa Main Street: Mesa Dr to Gilbert Rd Light Rail Extension	42.236		148.773	Group 1
PEORIA				
Happy Valley Rd: L303 to 67th Avenue				
Happy Valley Rd:Agua Fria to Loop 303			3.115	Group 1

FACILITY/LOCATION	REGIONALLY FUNDED REIMBURSEMENTS: FY 2018 - FY 2026 (2016 \$'S in millions)	REGIONALLY FUNDED REIMBURSEMENTS: FY 2026 - FY 2040 (2016 \$'S in millions)	TOTAL PROJECT COST: FY 2018 - FY 2040 (2016 \$'S in millions) *	PLAN GROUP**
Happy Valley Rd: LakePleasant Pkwy to Agua Fria		11.114	16.635	Group 1
Lake Pleasant Pkwy: Union Hills to SR74				
Lake Pleasant Pkwy:Loop 303 to SR-74/Carefree Hwy			22.045	Group 3
PHOENIX				
Avenida Rio Salado: 51st Ave. to 7th St.				
Avenida Rio Salado Phase II: 51st Ave to 35th Ave, 7th Ave, and 7th St.			2.395	Group 1
Happy Valley Rd: 67th Ave to I-17				
Happy Valley: 35th Ave to 43rd Ave		5.232	11.700	Group 2
Happy Valley: 43rd Ave to 55th Ave		4.671	9.497	Group 3
Happy Valley: 55th Ave to 67th Ave		3.310	10.124	Group 3
SCOTTSDALE/CAREFREE				
Pima Rd: SR101L to Happy Valley Rd and Dyn. Rd to Cave Creek				
Happy Valley Rd: Pima Rd to Alma School Rd	6.947		10.200	Group 2
Pima Rd: Pinnacle Peak to Happy Valley Rd (SCT)	14.645		19.002	Group 1
Pima Rd: Dynamite Blvd to Stagecoach Rd (SCT)	37.892		55.270	Group 2
Pima Rd: Stagecoach Rd to Cave Creek (CFR)	4.933	0.625	7.940	Group 2
SCOTTSDALE				
Carefree Hwy: Cave Creek Rd to Scottsdale Rd	8.012		14.344	Group 2
SR-101L North Frontage Roads: Pima/Princess Dr to Scottsdale Rd				
SR-101L Frontage Rd: Pima Rd/Princess Dr to Hayden Rd		29.014	41.449	Group 3
Miller Rd/SR-101L Underpass	13.305		19.007	Group 1
Pima Rd: Happy Valley Rd to Dynamite Blvd	23.747		33.925	Group 2
Pima Rd: McKellips Rd to Via Linda				Group 2
Pima Rd: Via Linda to Via De Ventura	0.986		2.166	Group 1
Pima Rd: Thomas Rd to McDowell Rd	9.463		12.491	Group 2
Pima Rd: Krail to Chaparral	5.826		16.192	Group 1
Pima Rd: Chaparral Rd to Thomas Rd	6.128		12.122	Group 2
Scottsdale Airport: Runway Tunnel				Group 2
Frank Lloyd Wright -Loop 101 Traffic Interchange	5.983		8.397	Group 2
Raintree -Loop 101 Traffic Interchange	3.167		4.524	Group 2
Frank Lloyd Wright Frontage Rd: Northsight to Greenway-Hayden Loop	7.746		11.065	Group 2
Redfield Rd: Raintree Dr to Hayden Rd	1.350		1.850	Group 1
Raintree Drive: Scottsdale Rd to Hayden Rd	13.476		27.162	Group 1

FACILITY/LOCATION	REGIONALLY FUNDED REIMBURSEMENTS: FY 2018 - FY 2026 (2016 \$'S in millions)	REGIONALLY FUNDED REIMBURSEMENTS: FY 2026 - FY 2040 (2016 \$'S in millions)	TOTAL PROJECT COST: FY 2018 - FY 2040 (2016 \$'S in millions) *	PLAN GROUP**
Raintree Drive: Hayden to Loop 101	6.304		9.098	Group 1
Southbound Loop 101 Frontage Road Connections	1.496		4.277	Group 1
Hayden Rd - Loop 101 Interchange Improvements	11.428		16.652	Group 2
Scottsdale Rd: Thompson Peak Pkwy to Jomax Rd				
Scottsdale Rd: Thompson Peak Pkwy to Pinnacle Peak Pkwy Phase II	6.128		18.000	Group 2
Scottsdale Rd: Pinnacle Peak Pkwy to Jomax Rd	1.800		36.937	Group 2
Scottsdale Rd: Jomax Rd to Carefree Hwy				
Scottsdale Rd: Jomax Rd to Dixileta Dr	9.499		18.082	Group 2
Scottsdale Rd: Dixileta Dr to Ashler Hills Dr	9.499		16.624	Group 2
Scottsdale Rd: Ashler Hills Dr to Carefree Highway	9.499		16.624	Group 2
Shea Blvd: SR-101L to SR-87				
Shea Auxiliary Lane from 90th St to Loop 101	6.390		9.129	Group 2
Shea Blvd at Via Linda (Phase 2)	2.086		2.980	Group 2
Shea Blvd: 96th St to 144th St, ITS Improvements	2.360		3.372	Group 2
Shea Blvd at Loop 101	3.688		5.270	Group 2
Shea Blvd at 110th St	0.266		0.350	Group 2
Shea Blvd at 114th St	0.266		0.250	Group 2
Shea Blvd at Frank Lloyd Wright Blvd	0.664		1.489	Group 2
Shea Blvd at 115th St	0.111		0.159	Group 2
Shea Blvd at 125th St	0.880		1.257	Group 2
Shea Blvd at 135th St	0.111		0.159	Group 2
Shea Blvd at 136th St	0.376		0.637	Group 2
Legacy Dr: Hayden Rd to 88th Street	2.073	10.021	17.297	Group 2
TOTAL	837.0	193.2	1,926.6	

FACILITY/LOCATION	REGIONALLY FUNDED REIMBURSEMENTS: FY 2018 - FY 2026 (2016 \$'S in millions)	REGIONALLY FUNDED REIMBURSEMENTS: FY 2026 - FY 2040 (2016 \$'S in millions)	TOTAL PROJECT COST: FY 2018 - FY 2040 (2016 \$'S in millions) *	PLAN GROUP**
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* May include some FY 2017 expenditures for certain projects.

** Plan Groups:

Group 1 (FY 2018 - FY 2022)

Group 2 (FY 2023 - FY 2026)

Group 3 (FY 2027 - FY 2040)

For arterial projects, the Plan Group indicates the period in which a project is anticipated to be completed. Certain projects in Group 1 may have been completed before FY 2018. Reimbursements from regional funding sources for arterial projects may occur in later periods.

Appendix E
Regional Transit Projects

**TABLE E-1
2040 REGIONAL TRANSPORTATION PLAN
REGIONAL BUS ROUTES - OPERATING**

	ROUTE	OPERATING COSTS FY 2018 - FY 2040 (2016 \$'S in THOUSANDS)	PLAN GROUP *
Express and LINK			
511	Tempe/Scottsdale Airpark Express	0	NA
512	Scottsdale Express	0	NA
514	Scottsdale Express	5,540	Existing
520	Tempe Express	3,042	Existing
521	Tempe Express	5,646	Existing
522	Tempe Express SC	6,523	Existing
531	Mesa/Gilbert Express	12,144	Existing
533	Mesa Express	13,494	Existing
535	Northeast Mesa/Downtown Express	10,854	Existing
541	Chandler Express	8,337	Existing
542	Chandler/Downtown Express	10,867	Existing
562	Goodyear Express	5,872	Existing
563	Buckeye Express	6,753	Existing
571	Surprise Express	3,816	Existing
573	Northwest Valley/Downtown Express	10,369	Existing
575	Northwest Valley/Downtown Express	6,355	Existing
	Ahwatukee Connector	2,564	Group 3
	Anthem Express	6,970	Group 3
	Apache Junction Express	7,357	Group 3
	Arizona Ave/Country Club LINK	0	NA
	Avondale Express	0	NA
	Black Canyon Freeway Connector	4,189	Group 3
	Buckeye Express	6,753	Existing
	Chandler Blvd LINK	18,535	Group 3
	Grand Ave Limited	3,058	Existing
	Loop 303 Express	8,336	Group 3
	Main St LINK	0	Existing
	North I-17 Express	7,527	Group 3
	Peoria Express	6,989	Group 3
	Pima Express	6,082	Group 3
	Red Mountain Freeway Connector	6,422	Group 3
	San Tan Express	18,270	Group 3
	Scottsdale/Rural Rd LINK	0	NA
	South Central Express	0	NA
	South Central LINK A	5,350	Group 3
	South Central LINK B	5,611	Group 3
	Superstition Freeway Connector	2,314	Group 3
	Superstition Springs Express	9,748	Group 3
	Sub-total	235,690	
Supergrid Routes			
3	Van Buren St	23,847	Existing
13	Buckeye Rd	6,959	Group 3
17	McDowell/McKellips	42,926	Existing
29	Thomas Rd	21,051	Existing
30	University Dr	58,465	Existing
40	Main St	75,745	Existing
41	Indian School Rd	11,957	Group 1

	ROUTE	OPERATING COSTS FY 2018 - FY 2040 (2016 \$'S in THOUSANDS)	PLAN GROUP
44	44th St/Tatum	1,191	Group 3
45	Broadway Rd	51,789	Existing
48	48th St/Rio Salado Pkwy	3,126	Existing
50	Camelback Rd	4,608	Existing
56	56th St	7,113	Existing
59	59th Ave	26,736	Existing
61	Southern Ave	89,348	Existing
66	Mill/Kyrene	4,939	Existing
70	Glendale Ave	45,792	Existing
72	Scottsdale/Rural	163,650	Existing
77	Baseline Rd	23,912	Group 1
81	Hayden/McClintock	110,190	Existing
83	83rd/75th Ave	20,685	Group 2
90	Dunlap/Olive	16,826	Group 3
96	Dobson Rd	44,606	Existing
99	99th Ave	22,920	Group 3
104	Alma School Rd	30,940	Group 1
106	Peoria/Shea	30,528	Existing
108	Elliot Rd	44,797	Existing
112	Arizona Ave/Country Club Dr	69,421	Existing
131	Dysart Rd	6,010	Group 3
136	Gilbert Rd	60,035	Existing
138	Wadell/Thunderbird	24,285	Existing
139	Litchfield Rd	23,901	Group 3
140	Ray Rd	25,737	Group 3
156	Chandler Blvd	78,979	Existing
160	Greenfield Rd	21,785	Group 3
170	Bell Rd	18,783	Group 1
184	Power Rd	48,938	Existing
204	Queen Creek Rd	5,902	Group 3
Sub-total		1,368,421	
Rural Service			
	Gila Bend connector	8,957	Existing
	Wickenburg connector	0	N/A
Sub-total		8,957	
Other Services			
	ADA Complementary Paratransit	798,168	Existing
	Regional Customer Services	180,201	Existing
	RPTA Planning and Administration	95,323	Existing
	Safety and Security Programs	14,989	Existing
	Vanpool Operations	21,774	Existing
Sub-total		1,110,455	
Total		2,723,524	

* Plan Groups:

Group 1 (FY 2018 - FY 2022)

Group 2 (FY 2023 - FY 2026)

Group 3 (FY 2027 - FY 2040)

Existing (in operation and being funded prior to the "Group 1" period)

For bus operations, the "Group" designations represents the first period in which at least some regional funding was provided for the route. Funding for these routes continues during subsequent periods, and service improvements on certain routes may also be provided in a later period. Operating costs reflect total costs and are not offset by farebox receipts. Routes designated as "Existing" may also receive service enhancements in later periods which are not specifically indicated. For detailed service enhancements please refer to the latest version of the Transit Life Cycle Program.

**TABLE E-2
2040 REGIONAL TRANSPORTATION PLAN
REGIONAL BUS ROUTES - CAPITAL**

ROUTE		CAPITAL COSTS FY 2018 - FY 2040 (2016 \$'S in THOUSANDS)	PLAN GROUP *
Fleet			
	Fixed Route Buses	969,751	Group 1,2,3
	Rural Routes	7,805	Group 1,2,3
	Paratransit	73,059	Group 1,2,3
	Vanpool	87,280	Group 1,2,3
	Sub-total	1,137,895	
Park and Rides			
	Baseline/24th St	0	Group 1
	Camelback/101	6,181	Group 3
	Elliot/-I-10	128	Group 3
	Laveen/59th Ave	5,667	Group 1
	Peoria Grand	5,830	Group 1
	Total Park and Rides	17,807	
Transit Centers			
	19thAveCamelback 6-bay	3,738	Group 3
	44th Cactus 6-bay	3,772	Group 3
	Arrowhead	0	Group 1
	Downtown Chandler 4-bay	2,604	Group 3
	Glendale/Grand 4-bay	2,616	Group 3
	Mesa Downtown 6-bay	0	Group 1
	Metrocenter TC Rehab	8,969	Group 3
	Peoria 4-bay	2,383	Group 1
	Scottsdale 4-bay	2,624	Group 3
	South Chandler	2,604	Group 3
	South Tempe 4-bay	2,600	Group 3
	Total Transit Centers	31,910	
Operations and Maintenance Facilities			
	Heavy Maintenance	65,529	Group 3
	Mesa Rehab	13,372	Group 3
	Paratransit Phoenix	12,993	Group 3
	South Rehab	13,372	Group 3
	Total O & M Facilities	105,266	
BRT Right-of-Way Improvements			
	Scottsdale/Rural Rd LINK	50,412	Group 1,3
	South Central LINK	22,699	Group 3
	Total BRT ROW Improvements	73,111	

ROUTE		CAPITAL COSTS FY 2018 - FY 2040 (2016 \$'S in THOUSANDS)	PLAN GROUP *
Other Capital Improvements			
	Bus Stop Improvements	0	N/A
	Vehicle Upgrades	14,049	Group 1
Total Other Capital		14,049	
Contingency for Capital Projects		0	N/A
TOTAL		1,380,039	

* Plan Groups:

Group 1 (FY 2018 - FY 2022)

Group 2 (FY 2023 - FY 2026)

Group 3 (FY 2027 - FY 2040)

For transit capital expenditures, the group designation indicates the period when equipment or other capital items are acquired, or when construction of facilities is funded.

TABLE E-3
2040 REGIONAL TRANSPORTATION PLAN
REGIONAL LIGHT RAIL TRANSIT/HIGH CAPACITY TRANSIT - OPERATING

ROUTE		OPERATING COSTS FY 2018 - FY 2040 (2016 \$'S in THOUSANDS)	PLAN GROUP (1)
<u>LRT/HCT Segments</u>			
	CP/EV	836,428	Existing
	Northwest Phase I	142,076	Existing
	Northwest Phase II	39,153	Group 2
	Central Mesa	121,718	Existing
	Tempe Streetcar	129,325	Group 1
	Capitol / I-10 West Phase I	66,135	Group 2
	Capitol / I-10 West Phase II	189,492	Group 3
	Northeast Phoenix	154,362	Group 3
	Gilbert Road Extension	74,622	Group 1
	West Phoenix / Central Glendale	117,281	Group 2
	South Central	439,563	Group 2
Total		2,310,154	

TABLE E-4
2040 REGIONAL TRANSPORTATION PLAN
REGIONAL LIGHT RAIL TRANSIT/HIGH CAPACITY TRANSIT - CAPITAL

ROUTE		CAPITAL COSTS FY 2018 - FY 2040 (2016 \$'S in THOUSANDS)	PLAN GROUP (1)
<u>LRT/HCT Segments</u>			
	Northwest Phase I	0	Existing
	Central Mesa	3,732	Existing
	Tempe Streetcar	153,594	Group 1
	West Phoenix / Central Glendale	444,759	Group 2
	Northwest Phase II	232,492	Group 2
	Capitol / I-10 West Phase I	153,034	Group 2
	Capitol / I-10 West Phase II	890,703	Group 3
	Northeast Phoenix	1,002,549	Group 3
	Gilbert Road Extension	69,750	Group 1
	South Central Extension	579,426	Group 2
Sub-total		3,530,039	
<u>LRT Systemwide Support</u>			
	Systemwide Support Infrastructure	313,864	Group 1,2,3
	Capital Project Development	20,807	Group 1,2,3
	System Planning and Design	125,440	Group 1,2,3
	Utility Reimbursements (2)	0	NA
Sub-total		460,112	
TOTAL		3,990,151	

(1) Plan Groups:

Group 1 (FY 2018 - FY 2022)

Group 2 (FY 2023 - FY 2026)

Group 3 (FY 2027 - FY 2040)

For transit capital expenditures, the group designation indicates the period when equipment or other capital items are acquired, or when construction of facilities is funded. For light rail transit/high capacity transit (LRT/HCT) operations, the group designation indicates the period when service is initiated. Funding continues during subsequent periods, and service improvements on certain routes may also be initiated in a later period. Operating costs reflect total costs and are not offset by farebox receipts. No regional funding is provided for LRT/HCT operating expenses.

(2) Included with project costs.

Appendix F
Transportation Safety

**TABLE F-1
SEVERITY OF CRASHES IN THE MAG PLANNING AREA & ECONOMIC LOSS (2006-2015)**

Year	Fatal Crashes	Injury Crashes	Property Damage Only (PDO) Crashes	Total Crashes	Economic Loss (Millions \$)
2006	599	31,265	67,880	83,203	\$6,574
2007	485	29,418	66,634	86,977	\$5,755
2008	391	24,786	55,569	86,789	\$4,733
2009	334	22,274	48,697	87,881	\$4,176
2010	332	22,167	48,572	84,651	\$4,110
2011	361	23,525	51,063	93,152	\$4,436
2012	356	23,761	50,304	96,701	\$4,389
2013	423	24,747	53,878	94,339	\$4,854
2014	377	25,385	56,062	78,180	\$4,562
2015	418	26,583	60,370	68,707	\$4,968

**TABLE F-2
COMPARISON OF CRASH RISK - STATEWIDE vs. MAG REGION (2006-2015)**

Year	Fatalities		% in MAG	Injuries		% in MAG	Total Crashes		% in MAG
	Arizona	MAG		Arizona	MAG		Arizona	MAG	
2006	1,296	685	53%	68,574	48,019	70%	140,197	99,744	71%
2007	1,071	536	50%	65,705	44,442	68%	140,371	96,537	69%
2008	937	438	47%	56,009	36,952	66%	119,588	80,746	68%
2009	806	369	46%	50,610	33,629	66%	106,767	71,305	67%
2010	762	358	47%	50,110	33,464	67%	106,177	71,071	67%
2011	825	391	47%	49,550	35,212	71%	103,423	74,949	72%
2012	821	384	47%	49,896	35,450	71%	103,637	74,421	72%
2013	844	450	53%	50,284	36,594	73%	107,348	79,048	74%
2014	708	402	57%	50,890	37,766	74%	109,554	81,824	75%
2015	895	450	50%	53,554	39,484	74%	116,609	87,371	75%

Table F-3

CRASH RISK ON ARTERIALS AND LOCAL STREETS vs. FREEWAYS (2006-2015)

Year	ARTERIALS & LOCAL STREETS			FREEWAYS		
	Fatalities	Injuries	All Crashes	Fatalities	Injuries	All Crashes
2006	532	38,767	78,868	153	9,252	20,876
2007	429	34,974	74,530	107	9,468	22,007
2008	349	29,083	62,165	89	7,869	18,581
2009	293	26,956	56,051	76	6,673	15,254
2010	281	26,199	54,317	77	7,265	16,754
2011	320	26,895	56,403	71	8,317	18,546
2012	301	27,264	55,912	83	8,186	18,509
2013	341	27,743	58,568	109	8,851	20,180
2014	333	28,794	60,358	69	8,972	21,466
2015	373	29,991	63,338	77	9,493	24,033

TABLE F-4

CRASH RISK ON ARTERIALS (2006-2015)

Year	INTERSECTION RELATED			MID- BLOCK			ALL		
	Fatal	Injury	PDO	Fatal	Injury	PDO	Fatal	Injury	PDO
2006	180	14,148	25,705	295	11,008	27,532	475	25,156	53,237
2007	151	12,850	24,040	241	10,335	26,913	392	23,185	50,953
2008	127	10,839	20,279	187	8,695	22,038	314	19,534	42,317
2009	105	10,228	19,009	162	7,680	18,867	267	17,908	37,876
2010	87	10,260	19,198	179	7,025	16,568	266	17,285	35,766
2011	119	10,905	20,836	179	6,918	17,446	298	17,823	38,282
2012	113	11,133	20,960	169	6,928	16,609	282	18,061	37,569
2013	152	11,062	20,132	169	7,587	19,466	321	18,649	39,598
2014	127	11,574	22,224	188	7,583	18,662	315	19,157	40,886
2015	141	12,044	23,518	205	7,899	19,531	346	19,943	43,049

**TABLE F-5
SEVERITY OF CRASHES INVOLVING BICYCLISTS & PEDESTRIANS**

Year	PEDESTRIAN		BICYCLIST	
	Fatal	Injury	Fatal	Injury
2006	108	969	22	1,075
2007	88	1,037	15	1,067
2008	76	939	10	1,144
2009	58	835	16	1,175
2010	88	796	16	1,117
2011	75	838	17	1,218
2012	75	891	14	1,282
2013	93	956	20	1,238
2014	104	895	18	1,082
2015	110	838	18	894

**TABLE F-6
SEVERITY OF CRASHES INVOLVING YOUNGER DRIVERS & OLDER DRIVERS**

Year	YOUNGER DRIVERS (< 25 YRS)			OLDER DRIVERS (> 65 YRS)		
	Fatal	Injury	PDO	Fatal	Injury	PDO
2006	238	14,993	30,714	71	3,632	6,854
2007	190	13,761	29,631	68	3,484	6,907
2008	147	11,017	23,540	63	3,240	6,420
2009	101	9,704	20,849	57	3,058	6,117
2010	94	9,586	20,610	52	3,152	6,331
2011	120	10,101	21,546	69	3,360	6,746
2012	122	10,063	20,937	52	3,553	6,811
2013	116	10,584	22,584	87	3,823	7,463
2014	119	10,889	23,740	66	4,051	7,799
2015	127	11,892	26,079	74	4,412	8,612

**TABLE F-7
PEDESTRIANS INJURED & KILLED BY AGE GROUP (2006-2015)**

Age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2010 Population	% Population by Age
<5	51	45	32	53	49	52	58	37	49	30	303,034	7%
5 - 14	191	209	142	165	224	157	175	142	141	142	596,246	15%
15 - 24	281	280	330	258	175	259	303	392	307	286	570,468	14%
25 - 34	201	181	153	145	140	181	186	208	203	187	580,435	14%
35 - 44	184	190	155	162	149	150	144	148	160	155	559,034	14%
45 - 54	178	175	152	144	152	159	167	180	174	131	531,678	13%
55 - 64	118	123	102	71	102	118	112	131	113	140	423,415	10%
>65	163	101	93	93	106	95	82	123	110	120	490,971	12%
Unknown	65	53	58	37	69	17	8	6	5	6		
Total	1,432	1,357	1,217	1,128	1,166	1,188	1,235	1,367	1,262	1,197	4,055,281	100%

**TABLE F-8
BICYCLISTS INJURED & KILLED BY AGE GROUP (2006-2015)**

Age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2010 Population	% Population by Age
<5	4	4	3	9	2	9	10	4	1	3	303,034	7%
5 - 14	218	218	216	212	201	182	156	135	95	94	596,246	15%
15 - 24	284	286	305	358	312	367	434	388	336	253	570,468	14%
25 - 34	150	158	166	182	173	194	275	222	210	170	580,435	14%
35 - 44	198	170	170	170	159	162	168	158	167	91	559,034	14%
45 - 54	174	157	170	174	172	210	201	214	156	164	531,678	13%
55 - 64	49	70	91	84	100	112	102	113	107	98	423,415	10%
>65	45	35	52	38	57	52	70	70	71	64	490,971	12%
Unknown	32	26	33	19	17	17	8	6	4	0		
Total	1,154	1,124	1,206	1,246	1,193	1,305	1,424	1,310	1,147	937	4,055,281	100%

FIGURE F-1 TOTAL CRASHES BY FREEWAY CORRIDOR

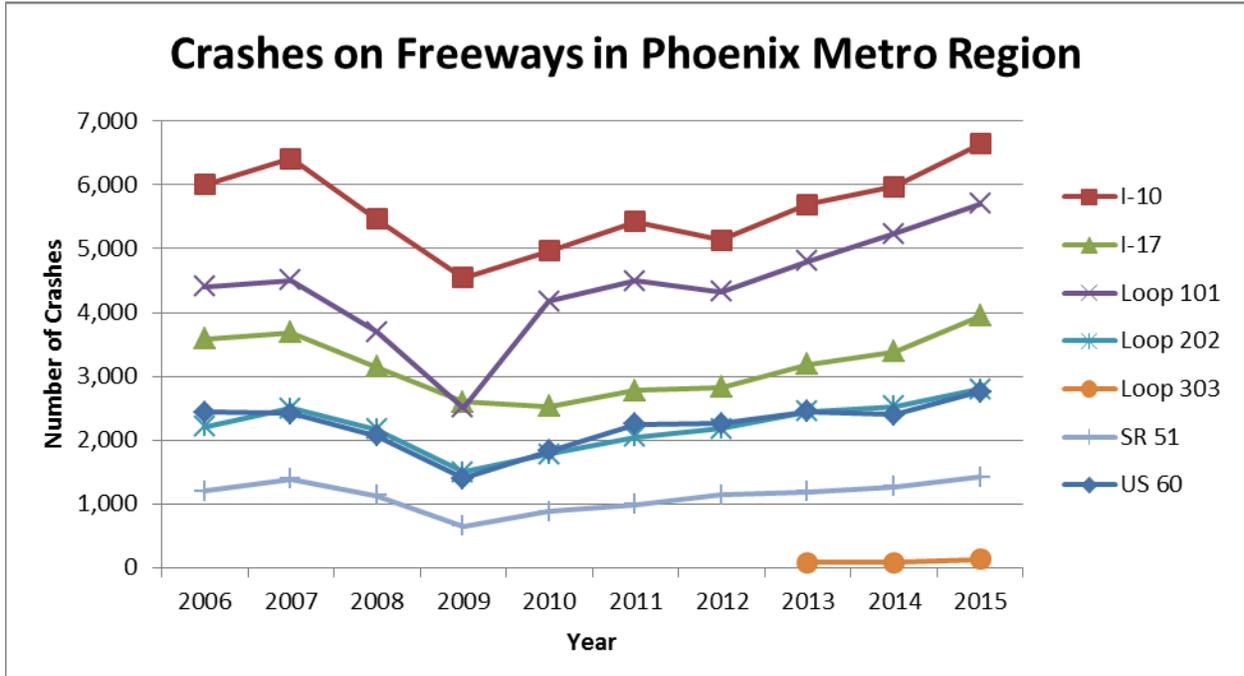


FIGURE F-2 NUMBER OF INJURIES BY FREEWAY CORRIDOR

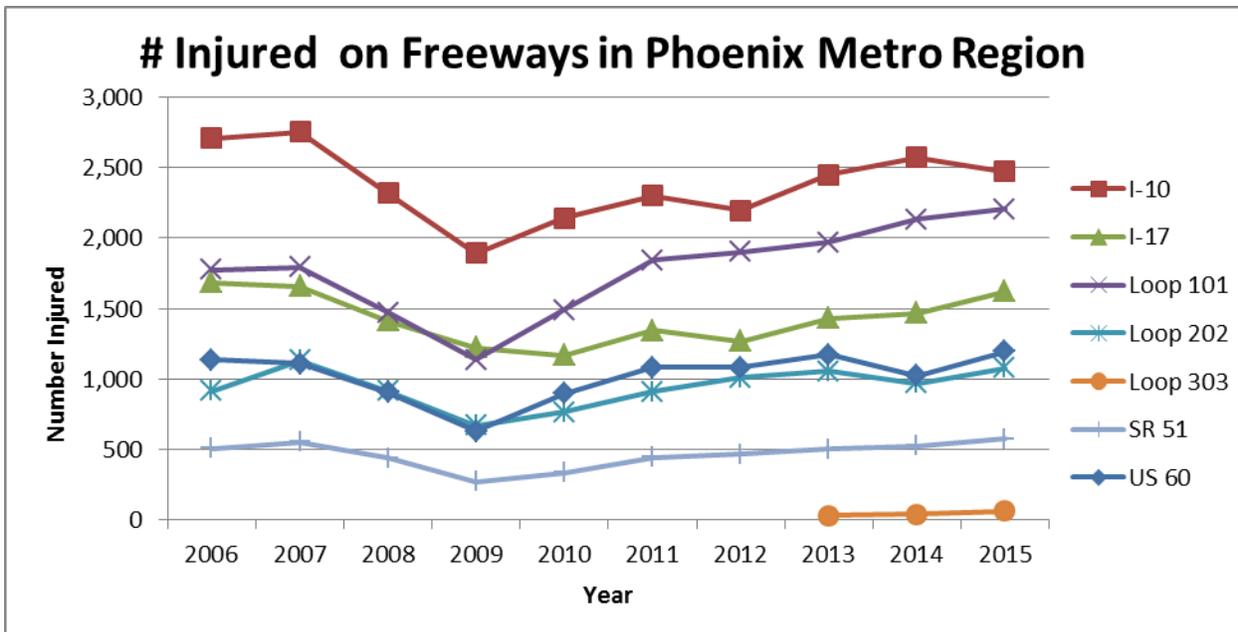


FIGURE F-3 NUMBER OF FATALITIES BY FREEWAY CORRIDOR

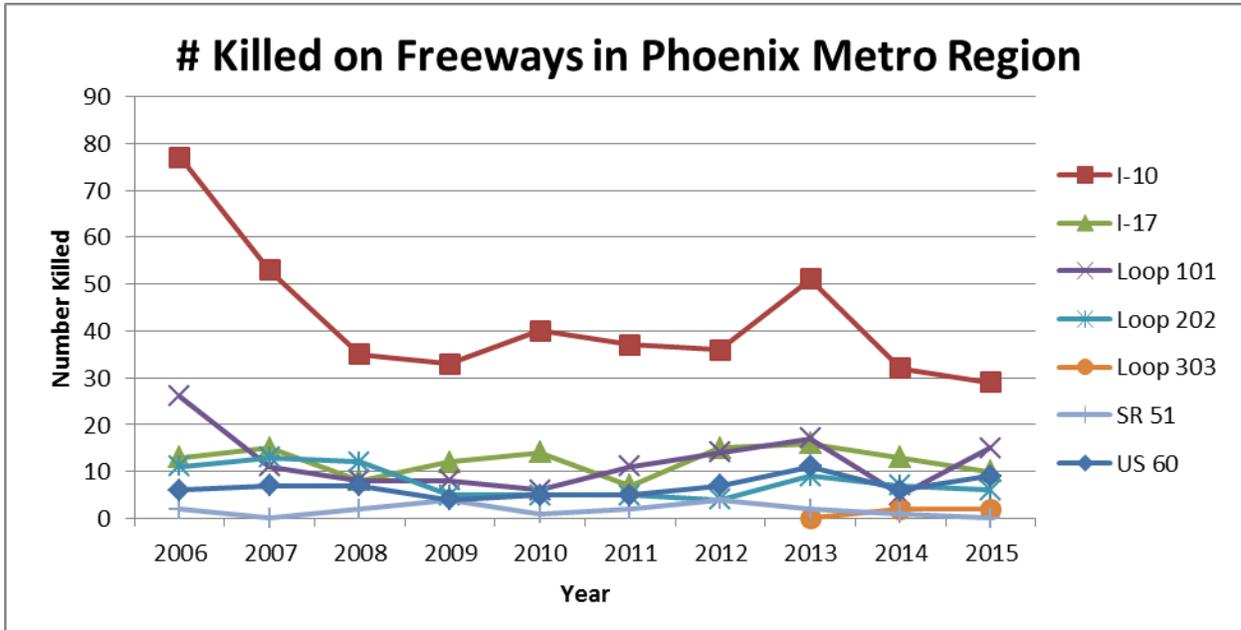
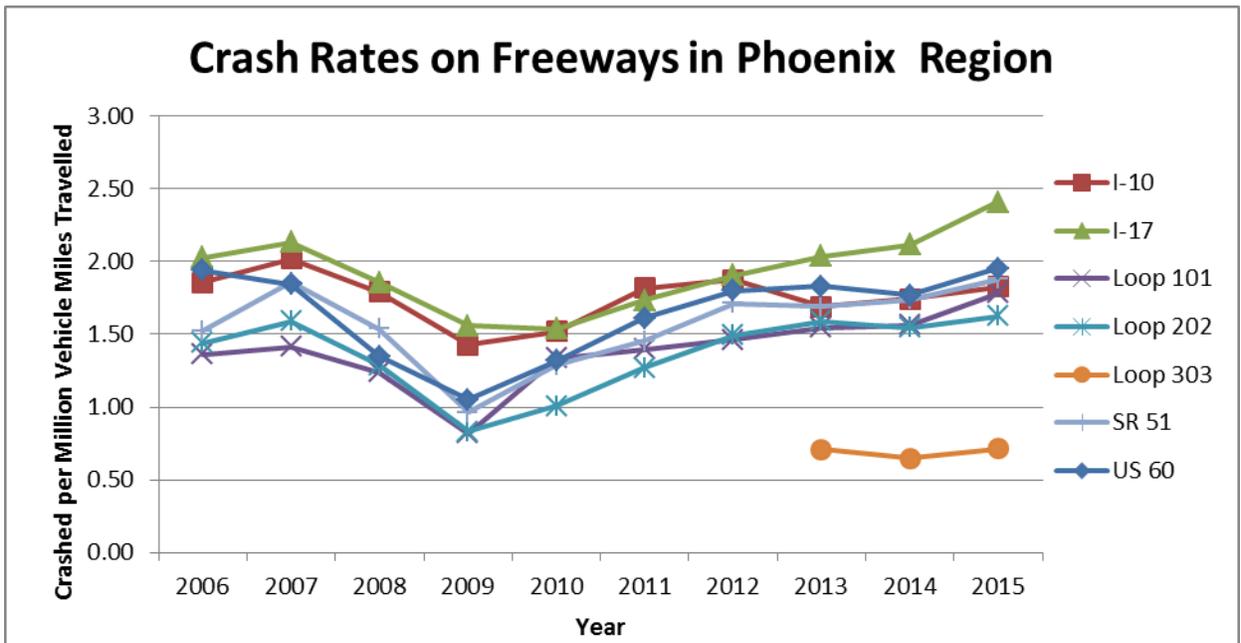


FIGURE F-4 CRASH RATES BY FREEWAY CORRIDOR



Note: Figure F-1 through F-4 depict Freeway Corridors in service during 2006-2015; Loop 303 opened as a limited access freeway in 2013.

Appendix G
Performance Monitoring

**TABLE G-1
TRAVEL TIME INDEX FOR SELECTED FREEWAY CORRIDORS (GENERAL PURPOSE LANES)**

Freeway	Direction	From	To	AM Peak Period TTI			PM Peak Period TTI		
				2013	2014	% change	2013	2014	% change
I-10	EB	AZ 85	Loop 303	1.067	1.053	-1.27%	1.032	1.013	-1.89%
	WB	Loop 303	AZ 85	1.031	1.034	0.33%	1.025	1.033	0.84%
I-10	EB	Loop 303	Loop 101 Agua Fria	1.063	1.094	2.95%	1.025	1.029	0.36%
	WB	Loop 101 Agua Fria	Loop 303	1.043	1.040	-0.28%	1.040	1.047	0.74%
I-10	EB	Loop 101 Agua Fria	I-17	1.774	1.855	4.59%	1.065	1.041	-2.31%
	WB	I-17	Loop 101 Agua Fria	1.050	1.043	-0.61%	1.333	1.385	3.93%
I-10	EB	I-17	SR 51	1.339	1.440	7.56%	1.309	1.315	0.40%
	WB	SR 51	I-17	1.067	1.084	1.62%	2.506	2.359	-5.86%
I-10	EB	SR 51	US 60	1.096	1.100	0.38%	1.600	1.588	-0.76%
	WB	US 60	SR 51	1.168	1.216	4.10%	1.205	1.217	0.95%
I-10	EB	US 60	Loop 202 Santan	1.052	1.051	-0.05%	1.220	1.232	0.95%
	WB	Loop 202 Santan	US 60	1.507	1.594	5.76%	1.110	1.089	-1.88%
I-17	NB	I-10 Maricopa	I-10 Papago	1.072	1.077	0.40%	1.409	1.424	1.08%
	SB	I-10 Papago	I-10 Maricopa	1.335	1.379	3.34%	1.092	1.106	1.31%
I-17	NB	I-10 Papago	Peoria Ave	1.074	1.087	1.19%	1.441	1.429	-0.83%
	SB	Peoria Ave	I-10 Papago	1.400	1.523	8.77%	1.114	1.113	-0.09%
I-17	NB	Peoria Ave	Loop 101 Agua Fria	1.075	1.087	1.08%	1.134	1.151	1.46%
	SB	Loop 101 Agua Fria	Peoria Ave	1.272	1.272	0.00%	1.077	1.090	1.20%
I-17	NB	Loop 101 Agua Fria	Loop 303	1.047	1.037	-1.02%	1.037	1.035	-0.16%
	SB	Loop 303	Loop 101 Agua Fria	1.039	1.036	-0.33%	1.027	1.015	-1.20%
US 60	EB	I-10	Loop 101 Price	1.061	1.053	-0.74%	1.203	1.205	0.18%
	WB	Loop 101 Price	I-10	1.354	1.456	7.53%	1.084	1.074	-0.95%
US 60	EB	Loop 101 Price	Val Vista Dr	1.062	1.055	-0.63%	1.158	1.174	1.35%
	WB	Val Vista Dr	Loop 101 Price	1.289	1.320	2.41%	1.062	1.055	-0.62%
US 60	EB	Val Vista Dr	Loop 202 Santan	1.061	1.048	-1.19%	1.043	1.044	0.06%
	WB	Loop 202 Santan	Val Vista Dr	1.041	1.049	0.71%	1.039	1.035	-0.38%
US 60	EB	Loop 202 Santan	Goldfield Rd	1.058	1.049	-0.87%	1.073	1.072	-0.11%
	WB	Goldfield Rd	Loop 202 Santan	1.049	1.042	-0.67%	1.040	1.032	-0.80%
SR 51	NB	I-10	Glendale Ave	1.098	1.108	0.92%	1.335	1.317	-1.28%
	SB	Glendale Ave	I-10	1.326	1.406	6.03%	1.161	1.197	3.15%
SR 51	NB	Glendale Ave	Loop 101 Pima	1.084	1.075	-0.79%	1.096	1.099	0.29%
	SB	Loop 101 Pima	Glendale Ave	1.165	1.185	1.77%	1.058	1.052	-0.57%

TABLE G-1 (continued)
TRAVEL TIME INDEX FOR SELECTED FREEWAY CORRIDORS (GENERAL PURPOSE LANES)

Freeway	Direction	From	To	AM Peak Period TTI			PM Peak Period TTI		
				2013	2014	% change	2013	2014	% change
SR 143	NB	I-10	McDowell Rd	1.085	1.070	-1.40%	1.072	1.059	-1.23%
	SB	McDowell Rd	I-10	1.083	1.062	-1.95%	1.206	1.213	0.60%
Loop 101 Agua Fria	NB	I-10	Union Hills Dr	1.076	1.067	-0.91%	1.067	1.056	-0.99%
	SB	Union Hills Dr	I-10	1.067	1.055	-1.15%	1.067	1.067	0.03%
Loop 101 Agua Fria	NB/EB	Union Hills Dr	I-17	1.188	1.224	3.02%	1.042	1.028	-1.26%
	WB/SB	I-17	Union Hills Dr	1.048	1.047	-0.13%	1.130	1.152	1.96%
Loop 101 Price	NB	Loop 202 Santan	US 60	1.324	1.343	1.41%	1.099	1.093	-0.56%
	SB	US 60	Loop 202 Santan	1.100	1.087	-1.19%	1.221	1.235	1.12%
Loop 101 Price	NB	US 60	Loop 202 Red Mountain	1.312	1.310	-0.17%	1.077	1.082	0.46%
	SB	Loop 202 Red Mountain	US 60	1.085	1.073	-1.06%	1.724	1.668	-3.30%
Loop 101 Pima	NB	Loop 202 Red Mountain	Pima Rd / 90th St	1.289	1.374	6.61%	1.152	1.140	-0.99%
	SB	Pima Rd / 90th St	Loop 202 Red Mountain	1.086	1.097	1.07%	1.437	1.440	0.26%
Loop 101 Pima	NB	Pima Rd / 90th St	Pima Rd / Princess Dr	1.072	1.072	0.02%	1.099	1.099	0.03%
	SB	Pima Rd / Princess Dr	Pima Rd / 90th St	1.089	1.099	0.96%	1.119	1.118	-0.13%
Loop 101 Pima	NB/WB	Pima Rd / 90th St	SR 51	1.050	1.046	-0.37%	1.222	1.265	3.48%
	EB/SB	SR 51	Pima Rd / 90th St	1.199	1.249	4.12%	1.041	1.044	0.30%
Loop 101 Pima	WB	SR 51	I-17	1.062	1.066	0.37%	1.374	1.480	7.71%
	EB	I-17	SR 51	1.479	1.537	3.91%	1.065	1.063	-0.15%
Loop 202 Red Mountain	EB	I-10	Washington St	1.081	1.073	-0.72%	1.081	1.084	0.35%
	WB	Washington St	I-10	1.230	1.282	4.19%	1.328	1.289	-2.99%
Loop 202 Red Mountain	EB	Washington St	Loop 101 Price	1.068	1.046	-2.08%	1.186	1.205	1.62%
	WB	Loop 101 Price	Washington St	1.263	1.312	3.94%	1.049	1.043	-0.53%
Loop 202 Red Mountain	EB	Loop 101 Price	McDowell Rd	1.097	1.073	-2.14%	1.084	1.093	0.80%
	WB	McDowell Rd	Loop 101 Price	1.118	1.132	1.27%	1.056	1.047	-0.81%
Loop 202 Red Mountain	EB/SB	McDowell Rd	US 60	1.113	1.079	-3.13%	1.020	0.996	-2.31%
	NB/WB	US 60	McDowell Rd	1.041	1.035	-0.57%	1.039	1.027	-1.10%
Loop 202 Santan	EB	I-10	Loop 101 Price	1.078	1.053	-2.30%	1.047	1.030	-1.59%
	WB	Loop 101 Price	I-10	1.057	1.060	0.28%	1.047	1.044	-0.27%
Loop 202 Santan	EB	Loop 101 Price	Lindsay Rd	1.087	1.065	-2.01%	1.188	1.204	1.42%
	WB	Lindsay Rd	Loop 101 Price	1.187	1.212	2.13%	1.053	1.047	-0.56%
Loop 202 Santan	EB/NB	Lindsay Rd	US 60	1.087	1.053	-3.12%	1.037	1.037	0.04%
	SB/WB	US 60	Lindsay Rd	1.070	1.052	-1.61%	1.028	1.021	-0.66%

TABLE G-2
AVERAGE AM PEAK PERIOD SPEED FOR SELECTED FREEWAY CORRIDORS

Freeway Corridor	Dir	From	To	Average AM Peak Period Speed (mph)							
				General-purpose Lanes				HOV Lanes			
				2013	2014	2015	% Change 2014 to 2015	2013	2014	2015	% Change 2014 to 2015
I-10 Papago	EB	83rd Ave	I-17	46.9	47.8	40.3	-15.7%	52.2	52.3	46.4	-11.3%
	WB	I-17	83rd Ave	67.2	66.1	65.6	-0.8%	68.2	68.0	67.3	-1.0%
I-10 Papago	EB	I-17	SR 51/Loop 202	52.1	55.2	45.7	-17.2%	62.3	63.8	62.4	-2.3%
	WB	SR 51/Loop 202	I-17	63.1	63.8	63.7	-0.2%	70.7	71.3	70.6	-0.9%
I-10 Maricopa	EB	SR 51/Loop 202	US 60	62.0	62.4	60.9	-2.4%	68.3	68.3	67.8	-0.8%
	WB	US 60	SR 51/Loop 202	57.9	58.4	56.5	-3.3%	63.8	64.7	62.7	-3.0%
I-10 Maricopa	EB	US 60	Chandler Blvd	65.1	65.7	65.0	-1.1%	71.9	72.9	72.6	-0.4%
	WB	Chandler Blvd	US 60	43.8	47.9	39.7	-17.2%	60.1	63.3	57.6	-8.9%
I-17	NB	Maricopa TI	I-10	61.4	62.5	61.8	-1.0%	n/a	n/a	n/a	n/a
	SB	I-10	Maricopa TI	49.5	49.7	44.5	-10.4%	n/a	n/a	n/a	n/a
I-17	NB	I-10	Peoria Ave	58.7	58.4	58.0	-0.8%	59.7	59.4	59.2	-0.3%
	SB	Peoria Ave	I-10	50.9	50.2	46.1	-8.2%	53.4	54.8	51.0	-7.0%
I-17	NB	Peoria Ave	Loop 101	not available	63.7	63.0	-1.0%	not available	74.1	72.9	-1.6%
	SB	Loop 101	Peoria Ave	not available	56.6	54.8	-3.0%	not available	68.7	67.5	-1.7%
SR 51	NB	I-10/Loop 202	Glendale Ave	62.7	62.3	61.3	-1.6%	63.1	63.6	62.9	-1.1%
	SB	Glendale Ave	I-10/Loop 202	55.1	55.3	not available	not available	54.9	61.2	not available	not available
SR 51	NB	Glendale Ave	Loop 101	66.7	67.1	67.5	0.5%	71.9	73.7	74.1	0.5%
	SB	Loop 101	Glendale Ave	61.4	63.8	62.1	-2.7%	66.9	70.3	69.1	-1.7%
Loop 202 Red Mountain	EB	I-10/SR 51	Loop 101	66.9	66.7	66.2	-0.7%	71.2	72.9	71.8	-1.5%
	WB	Loop 101	I-10/SR 51	57.1	58.4	53.9	-7.7%	64.4	65.7	62.9	-4.3%
Loop 202 Red Mountain	EB	Loop 101	Gilbert Rd	not available	67.4	not available	not available	not available	not available	not available	not available
	WB	Gilbert Rd	Loop 101	not available	66.3	not available	not available	not available	not available	not available	not available
US 60	EB	I-10	Loop 101	63.4	64.7	64.5	-0.3%	66.9	69.3	69.3	0.0%
	WB	Loop 101	I-10	51.4	52.1	44.0	-15.5%	not available	not available	not available	not available
US 60	EB	Loop 101	Val Vista Dr	64.9	65.2	64.4	-1.2%	67.6	67.8	68.8	1.5%
	WB	Val Vista Dr	Loop 101	60.7	60.2	58.2	-3.4%	69.6	69.4	69.3	-0.2%
US 60	EB	Val Vista Dr	Loop 202	67.4	67.5	67.6	0.2%	70.0	70.8	72.9	3.0%
	WB	Loop 202	Val Vista Dr	69.7	69.6	69.2	-0.5%	71.6	73.9	73.4	-0.8%
SR 143	NB	I-10	Loop 202/McDowell Rd	not available	55.5	56.1	1.2%	n/a	n/a	n/a	n/a
	SB	Loop 202/McDowell Rd	I-10	not available	61.6	61.2	-0.6%	n/a	n/a	n/a	n/a
Loop 101 Price	NB	Loop 202 Santan	US 60	54.3	57.7	51.8	-10.2%	66.6	68.6	65.6	-4.4%
	SB	US 60	Loop 202 Santan	67.3	67.7	66.2	-2.1%	74.9	75.6	74.8	-1.1%
Loop 101 Price	NB	US 60	Loop 202 Red Mountain	57.1	60.2	55.2	-8.4%	70.4	73.0	71.5	-2.1%
	SB	Loop 202 Red Mountain	US 60	68.0	62.1	68.0	9.5%	75.5	75.9	76.0	0.2%
Loop 101 Pima	NB	Loop 202 Red Mountain	90th St	52.8	not available	not available	not available	64.6	not available	not available	not available
	SB	90th St	Loop 202 Red Mountain	65.4	not available	not available	not available	72.2	not available	not available	not available
Loop 101 Pima	NB	90th St	Pima Rd	66.4	not available	not available	not available	70.7	not available	not available	not available
	SB	Pima Rd	90th St	66.9	not available	not available	not available	73.0	not available	not available	not available
Loop 101 Pima	EB	SR 51	Pima Rd	59.9	61.4	58.3	-5.0%	63.4	70.8	69.0	-2.6%
	WB	Pima Rd	SR 51	70.2	70.8	70.9	0.1%	74.5	75.4	75.5	0.1%
Loop 101 Pima	EB	I-17	SR 51	49.9	52.2	46.1	-11.7%	not available	not available	not available	not available
	WB	SR 51	I-17	69.4	69.6	69.3	-0.4%	not available	not available	not available	not available
Loop 101 Agua Fria	EB	Union Hills Dr	I-17	not available	not available	58.0	not available	not available	not available	69.0	not available
	WB	I-17	Union Hills Dr	not available	not available	70.7	not available	not available	not available	76.8	not available
Loop 101 Agua Fria	NB	Northern Ave	Union Hills Dr	not available	not available	64.2	not available	not available	not available	not available	not available
	SB	Union Hills Dr	Northern Ave	not available	not available	66.2	not available	not available	not available	not available	not available
Loop 101 Agua Fria	NB	I-10	Northern Ave	not available	not available	66.3	not available	not available	not available	75.7	not available
	SB	Northern Ave	I-10	not available	not available	65.9	not available	not available	not available	not available	not available

Source: ADOT FMS
n/a = not applicable

TABLE G-3
AVERAGE PM PEAK PERIOD SPEED FOR SELECTED FREEWAY CORRIDORS

Freeway Corridor	Dir	From	To	Average PM Peak Period Speed (mph)							
				General-purpose Lanes				HOV Lanes			
				2013	2014	2015	% Change 2014 to 2015	2013	2014	2015	% Change 2014 to 2015
I-10 Papago	EB	83rd Ave	I-17	66.4	66.5	65.7	-1.2%	67.6	67.7	67.7	0.1%
	WB	I-17	83rd Ave	57.3	57.7	52.6	-8.8%	61.0	61.2	56.8	-7.2%
I-10 Papago	EB	I-17	SR 51/Loop 202	56.0	54.0	49.6	-8.1%	63.3	62.2	60.0	-3.4%
	WB	SR 51/Loop 202	I-17	36.9	40.1	30.3	-24.5%	43.8	46.6	36.0	-22.8%
I-10 Maricopa	EB	SR 51/Loop 202	US 60	46.7	48.3	40.7	-15.6%	54.3	54.6	47.4	-13.3%
	WB	US 60	SR 51/Loop 202	58.0	57.6	54.6	-5.2%	64.3	63.8	62.1	-2.6%
I-10 Maricopa	EB	US 60	Chandler Blvd	55.2	57.9	54.9	-5.0%	65.9	67.3	65.0	-3.4%
	WB	Chandler Blvd	US 60	61.4	61.9	60.4	-2.3%	68.0	70.1	69.9	-0.4%
I-17	NB	Maricopa Tl	I-10	48.3	47.9	40.8	-14.9%	n/a	n/a	n/a	n/a
	SB	I-10	Maricopa Tl	60.6	59.7	57.7	-3.4%	n/a	n/a	n/a	n/a
I-17	NB	I-10	Peoria Ave	45.3	47.4	44.6	-6.0%	50.4	51.3	49.5	-3.4%
	SB	Peoria Ave	I-10	60.5	59.5	58.4	-1.9%	59.7	61.0	59.8	-1.9%
I-17	NB	Peoria Ave	Loop 101	not available	59.9	59.1	-1.4%	not available	70.1	68.7	-2.1%
	SB	Loop 101	Peoria Ave	not available	62.7	60.9	-2.8%	not available	73.1	71.7	-1.9%
SR 51	NB	I-10/Loop 202	Glendale Ave	53.9	55.2	50.3	-8.8%	59.6	60.3	57.7	-4.3%
	SB	Glendale Ave	I-10/Loop 202	61.2	59.1	not available	not available	57.8	63.2	not available	not available
SR 51	NB	Glendale Ave	Loop 101	64.3	65.3	63.4	-2.8%	70.0	71.9	70.3	-2.2%
	SB	Loop 101	Glendale Ave	67.6	68.4	68.0	-0.6%	70.3	73.4	73.1	-0.4%
Loop 202 Red Mountain	EB	I-10/SR 51	Loop 101	62.1	61.3	58.1	-5.3%	69.1	70.1	66.3	-5.4%
	WB	Loop 101	I-10/SR 51	60.2	60.7	59.1	-2.7%	67.4	68.0	69.2	1.7%
Loop 202 Red Mountain	EB	Loop 101	Gilbert Rd	not available	65.4	not available	not available	not available	not available	not available	not available
	WB	Gilbert Rd	Loop 101	not available	68.8	not available	not available	not available	not available	not available	not available
US 60	EB	I-10	Loop 101	59.3	60.8	57.3	-5.7%	65.6	67.7	65.7	-3.0%
	WB	Loop 101	I-10	65.1	65.0	64.0	-1.6%	not available	not available	not available	not available
US 60	EB	Loop 101	Val Vista Dr	62.5	63.4	59.1	-6.8%	68.9	68.7	67.6	-1.5%
	WB	Val Vista Dr	Loop 101	66.2	66.8	66.5	-0.5%	68.2	70.2	70.8	0.8%
US 60	EB	Val Vista Dr	Loop 202	67.8	68.1	67.7	-0.6%	70.6	70.8	72.2	2.0%
	WB	Loop 202	Val Vista Dr	69.5	69.9	69.5	-0.5%	70.5	72.5	73.3	1.1%
SR 143	NB	I-10	Loop 202/McDowell Rd	not available	55.0	55.3	0.6%	n/a	n/a	n/a	n/a
	SB	Loop 202/McDowell Rd	I-10	not available	56.2	55.7	-0.9%	n/a	n/a	n/a	n/a
Loop 101 Price	NB	Loop 202 Santan	US 60	65.5	66.4	65.2	-1.8%	72.3	73.0	72.5	-0.8%
	SB	US 60	Loop 202 Santan	58.2	58.9	56.2	-4.5%	68.0	69.7	66.5	-4.7%
Loop 101 Price	NB	US 60	Loop 202 Red Mountain	67.4	67.0	66.5	-0.8%	75.6	76.5	77.3	1.1%
	SB	Loop 202 Red Mountain	US 60	42.7	41.8	37.0	-11.7%	60.5	63.2	56.5	-10.5%
Loop 101 Pima	NB	Loop 202 Red Mountain	90th St	60.4	not available	not available	not available	68.6	not available	not available	not available
	SB	90th St	Loop 202 Red Mountain	50.7	not available	not available	not available	62.7	not available	not available	not available
Loop 101 Pima	NB	90th St	Pima Rd	63.7	not available	not available	not available	69.5	not available	not available	not available
	SB	Pima Rd	90th St	66.0	not available	not available	not available	72.6	not available	not available	not available
Loop 101 Pima	EB	SR 51	Pima Rd	69.0	69.9	69.9	0.1%	68.2	76.0	76.2	0.3%
	WB	Pima Rd	SR 51	58.8	59.0	52.3	-11.3%	67.9	68.0	62.5	-8.1%
Loop 101 Pima	EB	I-17	SR 51	66.6	66.5	65.0	-2.3%	not available	not available	not available	not available
	WB	SR 51	I-17	54.0	53.5	47.6	-11.0%	not available	not available	not available	not available
Loop 101 Agua Fria	EB	Union Hills Dr	I-17	not available	not available	68.2	not available	not available	not available	75.7	not available
	WB	I-17	Union Hills Dr	not available	not available	60.4	not available	not available	not available	68.9	not available
Loop 101 Agua Fria	NB	Northern Ave	Union Hills Dr	not available	not available	64.9	not available	not available	not available	not available	not available
	SB	Union Hills Dr	Northern Ave	not available	not available	63.5	not available	not available	not available	not available	not available
Loop 101 Agua Fria	NB	I-10	Northern Ave	not available	not available	66.0	not available	not available	not available	74.1	not available
	SB	Northern Ave	I-10	not available	not available	60.5	not available	not available	not available	not available	not available

Source: ADOT FMS
n/a = not applicable