2045 Regional Mobility and Accessibility Plan

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2045 Regional Mobility and Accessibility Plan

The Pima Association of Governments' Regional Council adopted the 2045 Regional Mobility and Accessibility Plan in May 26, 2016.

The PAG Regional Council is represented by the chief elected officials of the Cities of South Tucson and Tucson, the Towns of Marana, Oro Valley and Sahuarita, Pima County, the Pascua Yaqui Tribe, the Tohono O'odham Nation and the Governor-appointed Pima County representative of the Arizona State Transportation Board.

PAG also manages the Regional Transportation Authority (RTA) and its 20-year, $2.1 billion RTA plan, which was approved by voters on May 16, 2006, along with a ½-cent regional excise tax to fund the projects. RTA projects must be listed in the 2045 Regional Mobility and Accessibility Plan.

2016 Pima Association of Governments Regional Council

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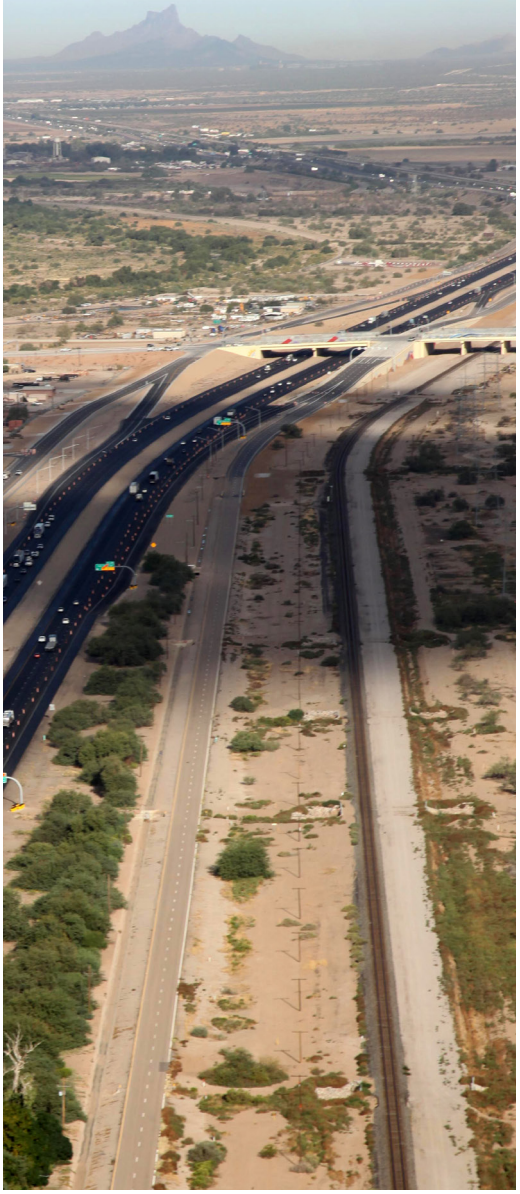
The 2045 Regional Mobility and Accessibility Plan guides planning efforts for a safe and reliable transporation system.



Disclaimer

This report has been prepared in cooperation with, and financed in part, by the U.S. Department of Transportation - Federal Highway Administration, the Federal Transit Administration - and the Arizona Department of Transportation. The contents of this report do not necessarily reflect the official views of the Arizona Department of Transportation, Federal Highway Administration or Federal Transit Administration. This report does not constitute a standard, specification, or regulation. This is not a legal document. Although much care was taken to ensure the accuracy of information presented in this document, PAG does not guarantee the accuracy of this information.

Executive Summary

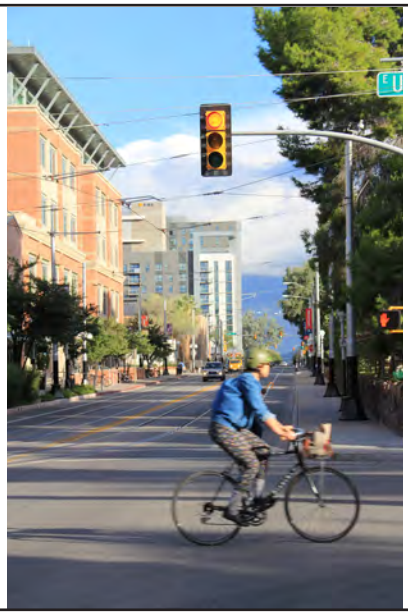
Long-term transportation planning is a federally required process that Pima Association of Governments conducts every four years as the region's designated metropolitan planning organization.

One of PAG's core functions is to coordinate with member jurisdictions and the community on developing a long-range regional transportation plan, which we call the Regional Mobility and Accessibility Plan, or RMAP.

The 2045 RMAP identifies the region's long-range transportation needs and anticipated revenues during the plan period. The plan is required to meet air quality standards as well.

PAG's planning area encompasses all of Pima County, an area of nearly 9,200 square miles, although the vast majority of the region's approximately 1 million residents live in and around the cities and towns of eastern Pima County.

Though originally developed under the regulatory framework of the 2012 national surface transportation bill, Moving Ahead for Progress in the 21st Century (MAP-21), the 2045 RMAP was revised during the planning process to be compliant with the more recent national surface transportation bill, Fixing America's Surface Transportation (FAST) Act of 2015.



The 2045 RMAP system goals, shown below, guided plan development:

Maintenance

Safety

Multimodal Choices

Performance

Environmental Stewardship

Land Use and Transportation

Freight and Economic Growth

The public participated in the development of the 2045 RMAP through a survey, online engagement, workshops and open houses, as well as 2045 RMAP Task Force involvement. Projects identified in the plan considered the anticipated availability of $17.3 billion in revenues.

Although our region's population growth has slowed due to the 2008 recession, our population is expected to reach 1.45 million by 2045. As the region continues to grow and funding sources diminish, we will need to explore new funding sources to meet future transportation demands.

We also will introduce new tools to measure performance of the 2045 RMAP implementation strategies to further ensure delivery of a quality transportation system that helps our region connect, move and thrive well into the future.

PAG's Mission

To address regional issues through cooperative efforts and pooled resources, and to provide accurate, relevant data that leads to effective regional planning decisions.

2045 Regional Mobility and Accessibility Plan Overview

Overview

Pima Association of Governments' 2045 Regional Mobility and Accessibility Plan is a blueprint for transportation solutions in the Tucson region over the next 30 years. PAG, the federally designated metropolitan planning organization for the Tucson transportation management area, updates its long-range transportation plan every four years to maintain a 30-year outlook of the region's transportation needs. We look ahead to identify efficient and affordable improvements to our transportation system so that we can build economically viable communities for ourselves and future generations.

PAG was established in 1973 as the nonprofit metropolitan planning organization (MPO) for the Tucson metropolitan region.

The 2045 RMAP provides a vision for our future transportation network and includes goals and implementation strategies to help reach the vision. The plan contains a list of roadway, transit, bicycle and pedestrian projects, along with programs and projects to improve mobility and safety for persons with disabilities. The plan also includes information on the projected growth in the region, areas of development, environmental considerations, financial projections and tools to address projected traffic congestion.

Purpose of the 2045 RMAP

The 2045 RMAP identifies priority transportation projects of PAG member jurisdictions and anticipated funding for those projects. Regional projects must be identified in the RMAP in order for jurisdictions to access any federal dollars to implement them. Projects also must be identified in PAG's short-range transportation plan, the Transportation Improvement Program, or TIP, to be eligible for federal funding. The five-year TIP is updated annually by PAG member jurisdictions and verifies the RMAP projects that will be built in the short-term.

Development of the 2045 RMAP

Development of the 2045 RMAP includes a public involvement process to engage members of the public, jurisdiction staff and elected officials. PAG established the 2045 RMAP Task Force, made up of public and private sector representatives, to help provide input into the development of the plan. The task force, which met regularly since January 2014, included jurisdiction, environmental, freight and economic development interests, among others. Information also was obtained through open houses, stakeholder sessions and online engagement tools. In total, more than 3,000 people provided feedback for the development of this plan.

Regional Planning Considerations

During development of the 2045 RMAP, multiple factors or conditions were considered, ranging from anticipated congestion levels to changes in demographics.

- **Infrastructure Condition:** Throughout the RMAP planning process, participants indicated that the condition of the region's roadways was the region's primary transportation issue. It is estimated that 37 percent of the region's major roadways are in poor condition. In order to bring the majority of these facilities up to good condition, the 2045 RMAP recommends nearly $3.2 billion in pavement repair and preservation over the 30-year plan horizon.

- **Economic Opportunities:** The Tucson region sits within the Sun Corridor megaregion at a critical nexus for national and international freight movement, providing opportunities for economic development and diversification. The recent expansion and modernization of the Mariposa Port of Entry in Nogales, Ariz., increases capacity for the movement of goods across the border with Mexico. The privately owned Port of Tucson provides onsite customs and intermodal connections to facilitate trade activities in the region. The 2045 RMAP supports these opportunities for economic growth through capacity improvements to Interstate 19 and Interstate 10 and inclusion of the proposed Sonoran Corridor, connecting the two interstates.

- **Population Growth:** The 2045 RMAP anticipates that our region's population will grow by more than 45 percent in the next 30 years. Population growth will continue to call for demands for improvements to our transportation network. We will follow performance-based strategies and use new technologies to continually improve regional traffic flow. It is projected that total vehicle travel will increase by 45 percent, even as vehicle miles traveled per capita remain flat or decrease.

- **Changing Transportation Needs:** In addition to population growth in our region, the make-up of our population is changing, with seniors representing an ever larger share of the region's population in the future. Considering that younger residents are demonstrating a change in travel preferences, the 2045 RMAP identifies significant funding for transit, pedestrian improvements, paratransit and bicycling to address future travel needs.

- **Air Quality:** Managing our congestion levels will continue to be important for our region, not only to ensure regional mobility but also to help reduce emission levels and keep our air clean. In October 2015, the U.S. Environmental Protection Agency lowered the National Ambient Air Quality Standard for ozone to 70 ppb from 75 ppb. Although the region is below the standard for now, we want to ensure that we are taking steps to continue to minimize congestion and stay below the ozone health standard.

- **Funding Challenges:** Another growing trend is the reduction of available federal and state resources. Available funding for projects identified in the 2045 RMAP is less than the funding available for the prior long-range plan. Although the 2045 RMAP factors in the half-cent excise tax that funds the 2006 voter-approved Regional Transportation Authority plan, the excise tax revenues continue to perform below original projections. The region will continue to explore new financial resources to close the ongoing funding gap and ensure our transportation system performs at a level that leads to mobility, sustainability and livability for all of us.

2045 RMAP Vision, Goals and Strategies

2045 RMAP Vision

The 2045 RMAP envisions a state-of-the-art, reliable, multimodal and environmentally responsible regional transportation system that is continuously maintained, interconnected and integrated with sustainable land use patterns to support a high quality of life and healthy, safe and economically vibrant region.

PROCESS GOALS

Public Involvement: *Outreach and involvement of all users in transportation decision-making.*

Advanced Technologies: *State-of-the-art, cost-effective delivery of transportation services and facilities.*

Funding and Implementation: *Revenue sources and strategies that ensure ample funding and timely project development.*

Accountability: *Transparency, responsiveness and coordination to meet transportation needs throughout the region.*

2045 RMAP System Goals

- **Maintenance:** Roadways, bike and pedestrian infrastructure, and transit systems that are rehabilitated, complete and maintained in a state of good repair.
- **Safety:** Safety and security for all transportation users across the region.
- **Multimodal Choices:** A variety of integrated, high-quality, accessible and interconnected transportation choices to meet all mobility needs and changing travel preferences.
- **Performance:** Improved regional mobility, congestion management and travel time reliability through reducing travel demand, enhancing operations and adding system capacity for all modes where necessary.
- **Environmental Stewardship:** Environmental stewardship, natural resource protection and energy efficiency in transportation planning, design, construction and management.
- **Land Use and Transportation:** Land use decisions and transportation investments that are complementary and result in improved access to important destinations, and vibrant and healthy communities.
- **Freight and Economic Growth:** Regional freight transportation infrastructure that supports global competitiveness, economic activity and job growth by providing for the efficient movement of goods within our region, giving access to national and international markets, and improving intermodal connections.

Implementation Strategies

The 2045 RMAP implementation strategies are action steps that can be taken by the nine jurisdictions in the region, PAG or the entire community to bring the concepts in the 2045 RMAP to reality. Each of the implementation strategies falls under one or more of the system and process goals for the 2045 RMAP.

The 2045 RMAP includes over 95 implementation strategies. Sample strategies include:

- Improve the connections between transit facilities and major destinations within and beyond the region to allow for easier travel for non-driving populations.
- Upgrade traffic signal control equipment, signal power supply and communications connections, and intersection and midblock detection equipment on arterial roadways.
- Develop meaningful incentives that encourage businesses to locate near transit hubs.
- Explore new sources of funding such as public and private partnerships, congestion pricing, vehicle miles traveled, etc., in order to develop a diversified funding stream that will adequately meet transportation needs in the future.
- Support the preservation of open spaces including undeveloped land, habitats for plants and animals, places of natural beauty and critical environmental areas.
- Support efforts to integrate freight movement and land use planning to encourage the development of regional, multimodal logistics hubs.
- Incorporate green infrastructure (GI) elements into transportation projects in order to enhance the aesthetics of the community, improve shade, encourage active transportation, and provide improved stormwater management.
- Increase the use of Intelligent Transportation System (ITS) strategies in work zones, such as dynamic message signs and dynamic lane merge systems, which provide real-time traveler information and real-time response to lane merging conditions. Use of ITS strategies in work zones is intended to improve safety and operations.
- Expand the network of enhanced bikeways, including bike boulevards, protected bike lanes, crossing opportunities, shared-use paths, wide paved shoulders on rural routes, and others.

Performance Measures

The 2045 RMAP is PAG's first performance-based, long-range transportation plan. Performance-based planning is a new requirement of the federal surface transportation bill, known as Moving Ahead for Progress in the 21st Century (MAP-21). Performance-based planning allows decision-makers to quantify and track the outcomes of a plan to ensure that investments are forwarding the region's transportation goals.

The 2045 RMAP includes more than 40 performance measures and targets, including six shown in the table below.

The full list of strategies and performance measures is located in Appendix 1.

2045 RMAP Performance Measures

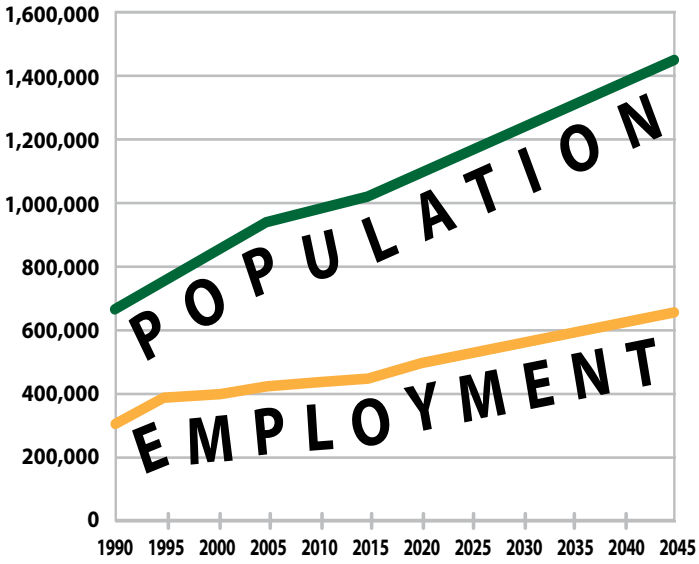
Goal	Objective	Performance Measure	Current	2020 Benchmark	2045 Plan Target
System Maintenance	Improve the condition of roadways in the Tucson region	Percentage of federal-aid roadways rated in "poor" condition	37% in poor condition	Under 30% in poor condition by 2020	Below 20% poor by 2045
Safety	Reduce total roadway injuries and fatalities	Total 5-year average of roadway fatalities	100	95	Reduce by 25%
Multimodal Choices	Increase the mode share of walking, biking and transit	5-year average walk, bike or transit to work rate (American Community Survey)	6.7%	7.25%	Increase to over 10%
System Performance	Minimize increase in congestion on the arterial and freeway network	Percent of peak hour VMT traveled under Level of Service E or F	1.15%	1.2%	1.8%
Land Use and Transportation	Improve regional access to jobs and other essential services, such as medical, shopping and recreation	Number of regional jobs the average person can reach in 30 minutes by automobile	240,221	Increase by 7%	Increase by 45%
Environmental Stewardship	Reduce per capita annual on-road greenhouse gas emissions	Annual per capita on-road greenhouse gas emissions	3.63 tons per person annually	Reduce by 5%	Reduce by over 30%

Population and Employment Projections

The 2045 RMAP includes projections for future population and jobs in order to develop estimates for future travel demand. The 2045 RMAP assumes a population of 1.47 million residents by 2045. Currently, the Pima County population is just over 1 million. While the region's population continues to increase at a projected average annual growth rate of 1 percent, the pace of growth was adjusted down from the growth rate considered in the previous long-range transportation plan. The recent change in growth patterns was considered in development of the 2045 RMAP and determining transportation projects that will reflect the new level of population demands.

Employment growth is largely expected to keep pace with population, adding between 200,000 and 220,000 jobs over the next 30 years. The most substantial job growth is anticipated to be in professional and business services, health care, transportation and warehousing, trade and hospitality.

Population and Employment Projections, Pima County, 1990-2045

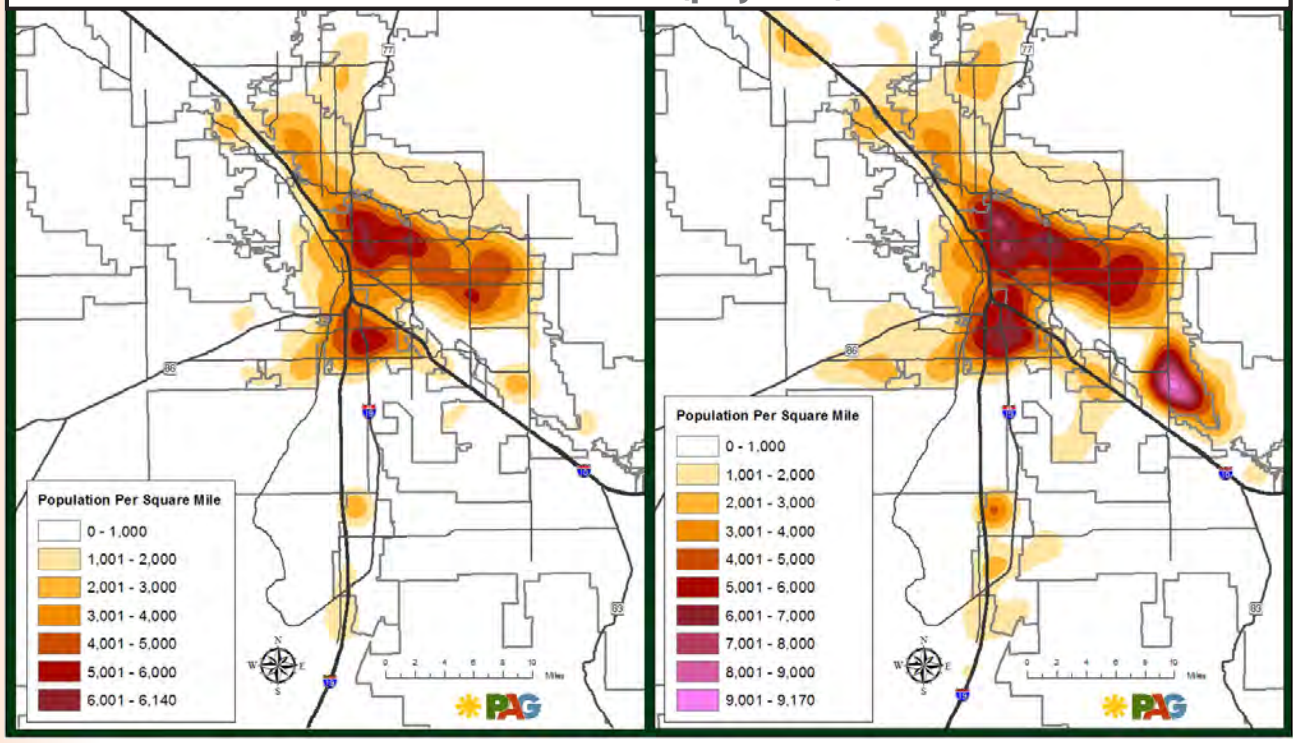


Sources: ADOA, EBR

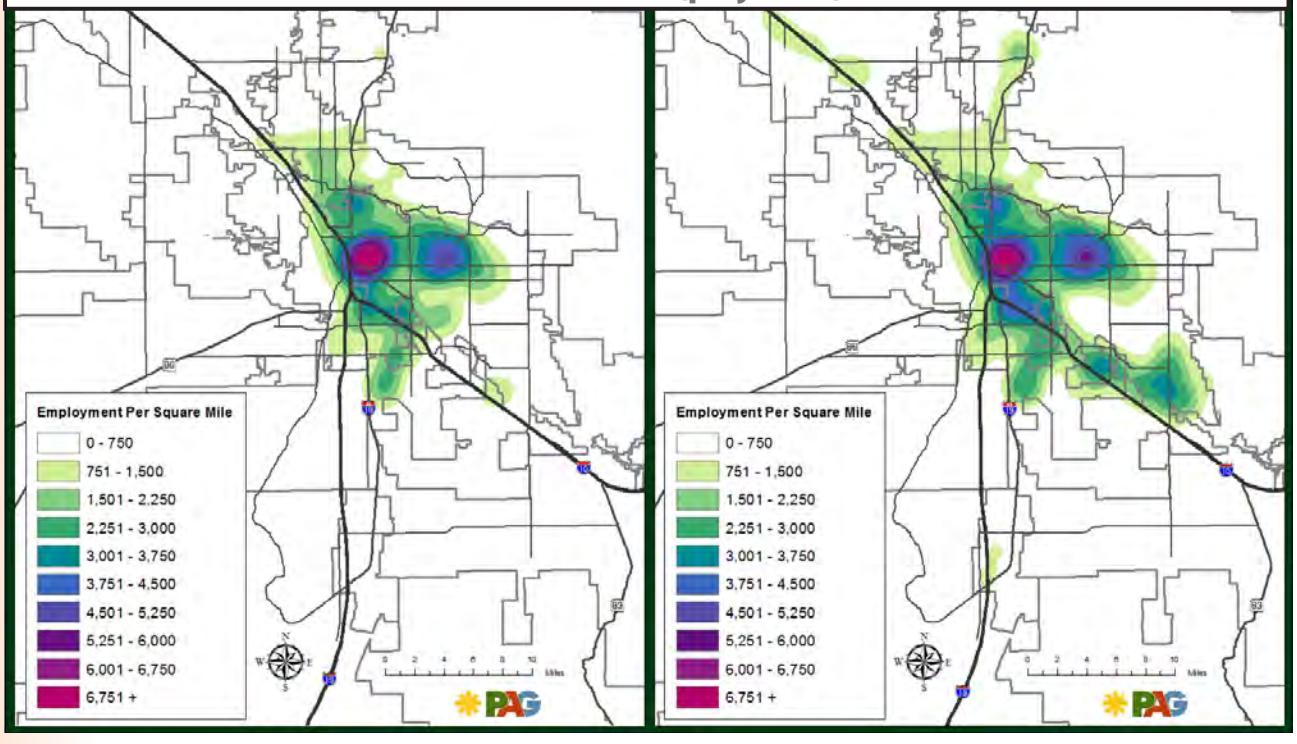
A projection is simply a snapshot in time based on current trends that are subject to change.

At any time in the future, population growth rates may diverge from current assumptions due to economic changes, technological advances, shifting preferences or resource shortages.

Comparison of population density in the Tucson metropolitan region 2015 and 2045 (projected)



Comparison of employment density in the Tucson metropolitan region 2015 and 2045 (projected)



The 2045 RMAP includes multimodal projects to help meet the mobility needs of all users of our transportation system.

Financial Plan

2045 RMAP Revenue Projections

The 2045 RMAP must be financially constrained to match the transportation revenues that can be reasonably expected over the next 30 years. Nearly $17.3 billion in funding for the 2045 RMAP comes from federal, state, regional and local revenue sources as well as private investments. The pie chart below shows the funding sources by percentages.

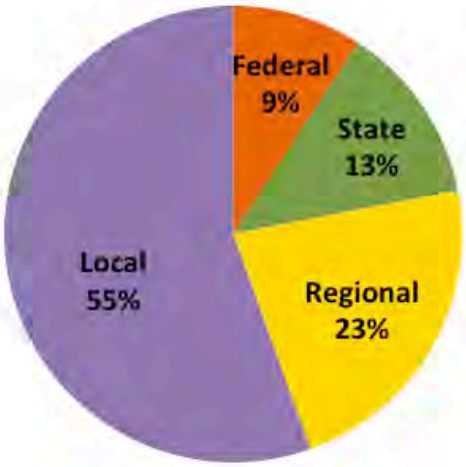
FUNDING CHALLENGES

Transportation funding is necessary to build new projects, maintain the current system, and run regional transportation programs. The primary sources of funding for transportation have traditionally been gasoline taxes. However, gas taxes are not indexed to inflation and, as the cost of construction increases and vehicles become more fuel efficient, real funding for transportation improvements has declined.

The voter-approved, half-cent excise tax in Pima County that funds the 20-year Regional Transportation Authority (RTA) plan through fiscal year 2026 is helping to complete needed transportation projects.

However, the overall transportation funding situation is likely to get worse, and new sources of funding will be needed to meet the future transportation needs of the region.

Anticipated Funding Sources by Percentages for the 2045 RMAP



Source: PAG

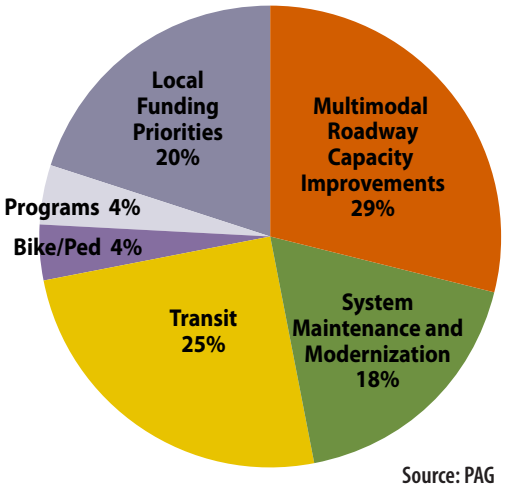
Projects and Modal Split

Transportation stakeholders, jurisdictions and the public identified transportation needs of approximately $32 billion over the next 30 years. Since the long-range plan must be fiscally constrained, not all needs can be included in the plan. Thus, projects designated as "In Plan" are higher priority and may be funded by 2045. Projects on the "Reserve" list are identified needs through 2045, but funding is not expected to be available for those projects. Approximately $15 billion worth of unfunded needs are on the "Reserve" list.

The 2045 RMAP recognizes the importance of improving all modes of travel within the region – vehicular, transit, bicycle, pedestrian and aviation. Over the next 30 years, the 2045 RMAP anticipates an increase of more than 45 percent in vehicular traffic.

Identified funding was dedicated to the modes based on regional needs, trends and public input.

Percent of Funds by Transportation Element



Source: PAG

2045 RMAP Transportation Elements and Funding Levels

Transportation Element	Funding Level
Multimodal Roadway Capacity Improvements	$4,991,000,000
System Maintenance and Modernization	$3,180,000,000
Transit	$4,333,000,000
Bike/Pedestrian	$602,000,000
Regional Programs	$685,000,000
Local Funding Priorities	$3,498,000,000
Total	$17,283,637,000

Note: Numbers may not add up due to rounding. Table does not include aviation funding.

2045 RMAP Project Elements

The 2045 RMAP includes more than 220 projects in the categories of multimodal roadway capacity improvements; system maintenance and modernization; transit; bicycle/pedestrian; regional programs and local funding priorities. In the next section, an overview is provided of the projects that will be considered over the next 30 years.

To see the complete 2045 RMAP project list, please see Appendix 3.

Multimodal Roadway Capacity Improvements

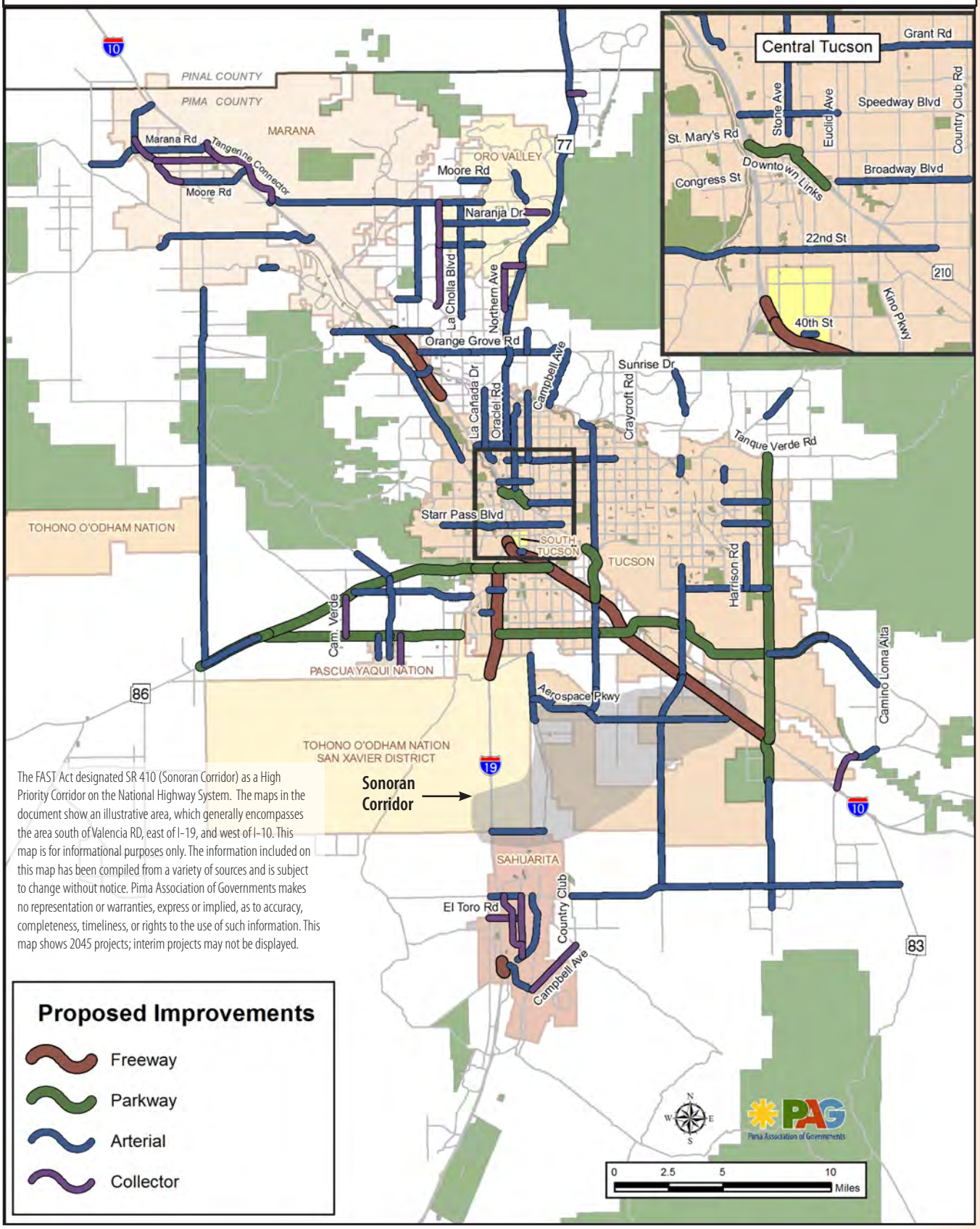
Over 90 individual roadway projects are identified in the 2045 RMAP to meet the needs of the region. In addition to capacity improvements, nearly $3.2 billion is identified for improving the condition of the region's infrastructure.

Maintaining existing roadways emerged as a major theme of the 2045 RMAP public input process and is, therefore, a major investment emphasis of this plan. The table below shows examples of 2045 RMAP roadway projects.

2045 RMAP Sample Roadway Projects

Regional Roadway Projects	Description
System Maintenance	Invest $3.18 billion in repairing and maintaining roadways over the next 30 years.
I-10 East Corridor, I-19 to Houghton Road	Widen freeway to 6 or 8 lanes and reconstruct traffic interchanges.
I-10 West Corridor, Ruthrauff Road to Ina Road	Widen to 8 lanes and build new or reconstruct traffic interchanges.
I-19 Corridor, I-10 to San Xavier Road	Widen to 6 lanes, construct new traffic interchanges and bridges, and reconstruct existing interchanges.
SR 210: Barraza-Aviation Extension, Palo Verde Road to I-10	Obtain right-of-way and construct new parkway in Tucson extending the parkway to I-10.
SR 77: Oracle Road Corridor Project, Miracle Mile to County line	Widen to 6-8 lanes. Project is already underway.
Sahuarita Road, La Cañada Drive to La Villita Road	Widen to 6-lane roadway with bike lanes and sidewalks
Orange Grove Road, Corona Road to Skyline Drive	Widen to 4-lane roadway with bike lanes and sidewalks
Irvington Road, Kolb Road to Houghton Road	Widen to 4-lane roadway, bike lanes, sidewalks and drainage
Nogales Hwy, Old Vail Road to Los Reales Road	Widen to 6-lane roadway with bike lanes and sidewalks
Speedway Boulevard, I-10 to Euclid Avenue	Widen to 6-lane roadway, includes new railroad underpass
Sonoran Corridor	Construct new 4-lane freeway connecting I-19 to I-10 south of the Tucson International Airport

2045 RMAP Multimodal Roadway Projects



The FAST Act designated SR 410 (Sonoran Corridor) as a High Priority Corridor on the National Highway System. The maps in the document show an illustrative area, which generally encompasses the area south of Valencia RD, east of I-19, and west of I-10. This map is for informational purposes only. The information included on this map has been compiled from a variety of sources and is subject to change without notice. Pima Association of Governments makes no representation or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This map shows 2045 projects; interim projects may not be displayed.

Proposed Improvements

- Freeway
- Parkway
- Arterial
- Collector

Transit Improvements

Nearly $4.4 billion is identified in the 2045 RMAP for transit. Transit proposals focus on retaining the quality of the current transit system, which represents the single biggest transit funding category in the 2045 RMAP. This includes increasing bus frequency in the urban core and expanding high-capacity transit options for the region through projects such as the Sun Link streetcar and bus rapid transit improvements.

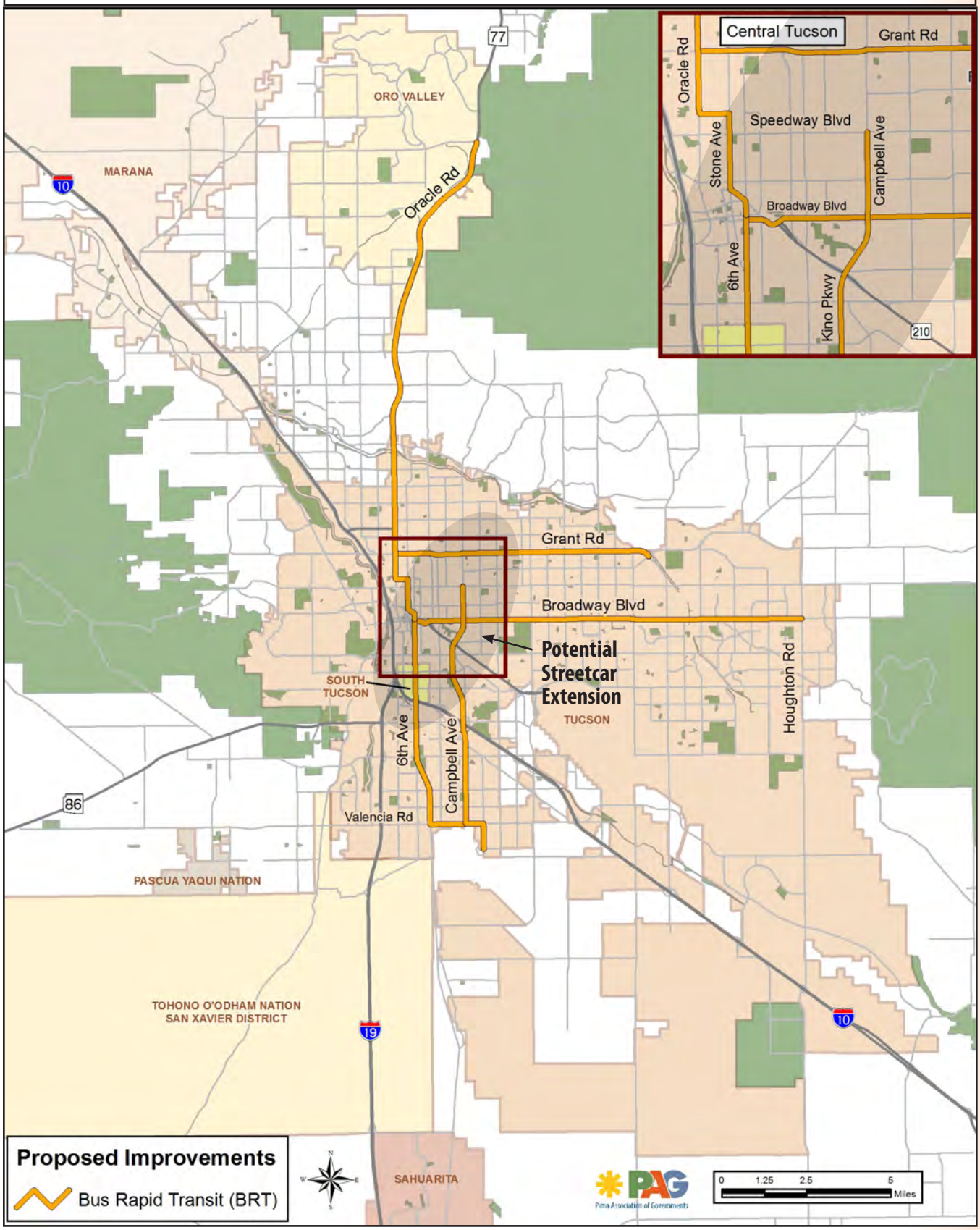
The table below provides examples of transit projects in the plan.

2045 RMAP Sample Transit Projects

Transit Projects	Description
Expand Fixed-Route Bus System, Regionwide	Increase the service area and frequency of the regional bus system.
Streetcar Extension – 3 potential routes under future consideration (S. 6th Ave., Broadway Blvd., and Campbell Ave.)	The Sun Link streetcar is a variation of light rail transit. Most streetcar lines operate along shared travel lanes with vehicular traffic operating at slow speeds with frequent stops. Streetcars often stimulate the economy in areas they run and, therefore, are typically applied in central cities.
Bus Rapid Transit on 5 Regional Corridors (Broadway Blvd., 6th Ave., Oracle Road, Grant Road, Campbell Ave./Kino Parkway)	Bus Rapid Transit (BRT) is enhanced bus service that has characteristics of light rail. BRT is different than regular bus service in that it may include enhanced stations, increased speed through greater stop spacing, signal priority for buses, bus lanes and off-board fare collection.
Paratransit Service Expansion, Regionwide	Expand special needs transit for elderly and disabled individuals in the region.

Expanding transit capacity helps the system deliver improved frequencies and service efficiencies.

2045 RMAP High-Capacity Transit Projects



Bicycle and Pedestrian Improvements

Bicycle and pedestrian projects are treated as project categories as opposed to specific project locations in order to retain jurisdictional flexibility in identifying specific needs. The 2045 RMAP bicycle and pedestrian project list is based on PAG's 2009 Tucson Regional Plan for Bicycling, PAG's 2014 Regional Pedestrian Plan and jurisdictional priorities. Examples of project categories are included in the table at right. The $600 million identified in the 2045 RMAP for bike and pedestrian projects represents an increase of $100 million over the previous long-range transportation plan.

The anticipated revenue dedicated toward standalone bicycle and pedestrian projects will be significantly supplemented by bicycle and pedestrian elements that are included as part of roadway improvement projects. An estimated 20 percent to 25 percent of roadway improvement costs can go toward bicycle and pedestrian elements.

New sidewalks and bike lanes provide added safety and mobility for pedestrians and bicyclists.

2045 RMAP Sample Bicycle and Pedestrian Projects

Project Name	Description
Pedestrian Mobility Improvements	A flexible category of projects that includes sidewalk construction, safety improvements, ADA ramps, lighting, landscaping, refuge islands and other pedestrian improvements. Candidate locations are identified in the PAG 2014 Regional Pedestrian Plan. The proposed investment level in this category would make significant progress on improving pedestrian conditions in the region.
Safe Routes to School	A category of projects that emphasizes making it safer for students to travel to and from school by bike or on foot.
Bike Lanes Connectivity	This project looks to fill gaps in the bike lane system, including protected bike lanes where appropriate. Locations are identified in the 2009 Tucson Regional Plan for Bicycling.
Urban Loop	The Loop is a collection of shared-use paths around Tucson that also connect Rillito River Park, Santa Cruz River Park and Pantano River Park with Julian Wash and the Harrison Greenway. This project represents a completion of the entire 131-mile Loop network.
Shared-Use Paths	Shared-use paths provide safe and comfortable recreational and mobility options for bicyclists, pedestrians and other non-motorized travelers. This project proposes to expand the network of shared-use paths throughout the region.
Signalized Pedestrian & Bike Crossings	One of the major safety challenges for bicyclists and pedestrians is having safe crossing opportunities. This project proposes improving bike and pedestrian safety by installing more than 150 additional bike and pedestrian crossing signals (such as HAWK lights) in the region over the next 30 years.
Less Stress Bike Routes	Bike boulevards are low-volume, low-speed streets optimized for bicycle travel with traffic reduction, traffic calming, signage and safe crossings at intersections with major streets. This project proposes adding over 150 additional miles of bike boulevards to provide a better connected low-stress bike network.

Regional Programs

Regional programs critical to the safety and performance of our transportation system were identified within three broad categories:

Safety and Intelligent Transportation Systems (ITS) – Programs that focus on improving safety and/or utilize new technologies to better manage the system, such as improving signal timing and responsiveness and providing real-time traveler information updates.

Travel Demand Management – Programs designed to encourage the use of alternative modes of transportation, shifting travel outside of the peak travel periods and eliminating work trips with telework or compressed work weeks.

Other – Programs including Business Assistance, Studies, Right-of-Way Preservation and Collection of Traffic Data.

2045 RMAP Sample Regional Programs

Regional Program	Description
Alternative Energy and Alternative Fuel Vehicle Infrastructure	Various clean energy programs including compressed natural gas facilities and electric charging station infrastructure.
Emergency and Incident Management System	A program to train, communicate and coordinate public safety agencies to respond to incidents (such as a traffic accident) or emergencies (such as a flood) that affect the transportation network.
Bus Pullouts	Construct bus pullouts at select transit stops. Pullouts improve safety and the flow of traffic by getting stopped buses out of through lanes.
Railroad Grade Separations	Construct railroad grade separations at several intersections throughout the region.

Bus pullouts help manage traffic flow through intersections to enhance transportation safety.

Chapter 1: Introduction

Pima Association of Governments' 2045 Regional Mobility and Accessibility Plan (RMAP) establishes the long-range framework for addressing the region's transportation needs within a fiscally constrained environment over the next 30 years. The 2045 RMAP is a performance-based, multimodal plan that considers needs and appropriate investments in roadways, public transportation, pedestrian and bicycle facilities, system operations, freight, aviation and transportation-related programs. The projects and programs included in the plan, once completed, are intended to minimize congestion, increase the region's economic vitality, expand transportation choices, improve safety, and enhance our environment and quality of life.

The 2045 RMAP is prepared, updated and approved by Pima Association of Governments (PAG), which is the federally designated metropolitan planning organization (MPO) for the Tucson metropolitan region. The 2045 RMAP was developed through a cooperative process involving representatives from PAG's member jurisdictions, the business community, higher education, stakeholder organizations and other community representatives. Public input obtained through public outreach was also critical to developing the plan.

Regional Transportation Planning

Transportation is fundamentally a regional issue: people regularly cross city and town boundaries to work, shop, visit friends and travel to other important destinations; goods must move efficiently to and through the region to be available to consumers at the checkout or delivered to their front door; locally made products need to have easy access to markets, both within the region and around the world, to grow the region's economy; and vehicle emissions, which do not respect borders, can contribute to air quality issues far from the source. These considerations require that transportation plans be regional in scope.

The federally required long-range transportation plan establishes the vision, goals and transportation strategies for addressing the region's transportation needs and serves as a statement for how the region wants to invest in transportation given a scarcity of funds. The long-range transportation planning process follows the three "c"s identified by federal transportation regulations. It is *continuous* in that it is updated frequently to respond to changing conditions. It is *cooperative* by involving multiple interest groups and planning across jurisdictional boundaries. Finally, it is *comprehensive* by including all aspects of the transportation system.

According to Title 23 of the U.S. Code Section 134(a)(1), long-range transportation plans should support the national interest to:

> *encourage and promote the safe and efficient management, operation, and development of surface transportation systems that will serve the mobility needs of people and freight and foster economic growth and development within and between States and urbanized areas, and take into consideration resiliency needs while minimizing transportation-related fuel consumption and air pollution through metropolitan and statewide transportation planning processes*

The long-range transportation plan does not assign specific funds to projects for imminent construction. Rather, it establishes how the region wishes to shape itself through transportation investments, given evolving needs, with the funds that are anticipated to be available over the long-range planning horizon.

The 2045 PAG Regional Mobility and Accessibility Plan

The 2045 Regional Mobility and Accessibility Plan builds upon the concepts and goals identified in previous planning efforts.

However, because transportation plans must evolve to reflect changing realities and regulatory structures, the 2045 RMAP differs in two significant ways from previous plans. First, the enactment of the federal surface transportation bill (Moving Ahead for Progress in the 21st Century or MAP-21) in October 2012 changed the regulatory requirements of the regional long-range transportation plan, which have been re-affirmed with the passage of the Fixing America's Surface Transportation Act (FAST) in December 2015. Second, regional circumstances require that assumptions about the future be revisited and incorporated into the regional transportation planning process.

*The name of Pima Association of Governments' long-range transportation plan was changed to the **Regional Mobility and Accessibility Plan,** or **RMAP,** to help clarify the difference between PAG's long-range transportation plan and the Regional Transportation Authority's 20-year multimodal plan approved by Pima County voters in May 2006. PAG manages the Regional Transportation Authority and the projects in the RTA plan are listed within the 2045 RMAP.*

Planning Background

MAP-21 and the FAST Act

The surface transportation bill, Moving Ahead for Progress in the 21st Century, or MAP-21, enacted in October 2012, was a two-year funding authorization for the nation's surface transportation system. Although MAP-21 did not significantly change federal funding for transportation, it did contain provisions that change the way in which long-range planning is conducted.

The primary change to long-range transportation planning, which is reflected in this document, is the new federal requirement to use a performance-based and outcome-based approach in plan development. The intent of moving to this approach is for states (and MPOs within states) to invest resources in projects that will collectively make progress toward the achievement of national goals.

National Transportation Goals

National Goal Area	Goal
Safety	To achieve a significant reduction in traffic fatalities and serious injuries on all public roads
Infrastructure condition	To maintain the highway infrastructure asset system in a state of good repair
Congestion reduction	To achieve a significant reduction in congestion on the National Highway System
System reliability	To improve the efficiency of the surface transportation system
Freight movement and economic vitality	To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
Environmental sustainability	To enhance the performance of the transportation system while protecting and enhancing the natural environment
Reduced project delivery delays	To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

Table 1 **Source: FHWA**

PAG's 2045 RMAP is the first long-range transportation plan developed in the Tucson region to contain performance measures, targets and a commitment to monitoring system performance on an ongoing basis. Using a performance-based approach will ultimately bolster planning decisions by improving the connection between goal setting and project implementation, thus strengthening the relationship between short-term actions and long-range plans.

The 2045 RMAP was developed within the regulatory framework of MAP-21. However, in December 2015, Congress passed the FAST Act, which authorizes federal funding, with a slight increase over MAP-21, for transportation until 2020. Additional elements, including a discussion of intercity bus service (a requirement introduced by the FAST Act), were included in the final 2045 RMAP to comply with the FAST Act.

Economic Recession

Regional impacts of the 2008 recession led to changes in population projections and other factors considered in developing the 2045 RMAP. Between the end of World War II and the beginning of the 21st century, Pima County typically grew by between 2 percent and 4 percent annually. In previous plans, this resulted in growth projections that maintained this historic growth trend. However, since 2008, population growth has slowed considerably – and perhaps even went negative during a few years – as a result of the national housing crisis, subsequent recession and slow recovery. The years of slow or no growth have caused considerable downward revisions to regional population and employment projections requiring that the region's transportation needs be re-assessed to respond to changed conditions.

This necessary revision validates why transportation planning needs to be a continuous process. The investment of scarce transportation resources must continue to match the needs of the community, even as those needs shift based on the most recent information.

Scope of Planning Process

In developing the 2045 Regional Mobility and Accessibility Plan, PAG is required to comply with, include or otherwise address eight factors in the planning process. The following summarizes how the projects and strategies included in 2045 RMAP address each of the eight factors. (23 CFR 450.306).

(1) Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity and efficiency.

The 2045 RMAP includes a number of projects and strategies that directly or indirectly support global competitiveness and productivity. Capacity improvements along Interstate 19 improve the movement of freight and people between the Tucson region and Mexico, the state's top global trading partner; infrastructure improvements near the Tucson International Airport (such as the Sonoran Corridor) support further development of the area's aerospace and defense cluster; improving and maintaining existing infrastructure, an emphasis of this plan, and increasing transportation choices to enhance our residents' quality of life, support tourism and make the region more attractive for private investment.

(2) Increase the safety of the transportation system for motorized and non-motorized users.

The 2045 RMAP includes goals and targets for improving safety in the region by reducing roadway fatalities by 30 percent over the next 30 years. This is the first step in achieving the region's vision of ensuring that everyone can get to their destinations safely with no more deaths on regional roadways. To reduce traffic injuries and fatalities, this plan recommends $50 million in safety funding over the next 30 years. The plan also includes a number of specific strategies for improving roadway safety, such as implementing Complete Streets policies and incorporating roadway safety assessments (RSAs) in the design of transportation projects.

(3) Increase the security of the transportation system for motorized and non-motorized users.

Safety and security are closely related, though distinct, aspects of all transportation modes. The 2045 RMAP addresses transportation security by promoting safe and efficient traffic incident response and clearance through development and implementation of a formalized regional incident management program, evaluating and encouraging the installation of applicable emergency traffic signal preemption equipment at signalized intersections, fire station roadway access points and other locations, and collaborating with emergency service agencies in the transportation planning and implementation processes in order to ensure delivery of transportation security to the traveling public.

(4) Increase accessibility and mobility of people and freight.

The 2045 RMAP includes over 90 road capacity projects (including investments in interstate capacity), five high-capacity transit projects, bus frequency improvements, and substantial investments in the bicycle and pedestrian networks. The investments are targeted at areas of highest need under various land use scenarios in order to reduce travel times, improve reliability for people and freight, and increase access to destinations throughout the Tucson metropolitan region.

(5) 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.

The 2045 RMAP seeks to enhance and preserve the environment and quality of life in a number of ways. The plan proposes significant investments in transit service enhancements and bike and pedestrian infrastructure,

which would expand future travel choices and potentially reduce vehicle emissions while also improving the quality of life in the region's cities and towns. The plan largely prioritizes improvements in already developed areas, but where there may be potential conflicts with important wildlife habitat, the 2045 RMAP recommends continuing funding for wildlife crossings in order to preserve the integrity of critical wildlife corridors and help keep motorists safe. A number of recommended strategies in the plan, such as integrating green infrastructure into corridor improvements, removal of non-native, highly invasive buffelgrass as part of right-of-way maintenance, and supporting alternative-fuel vehicle programs, are also consistent with this federal planning factor.

(6) Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.

Building on a network that already links roadway, rail and air transportation modes, the 2045 RMAP includes recommended funding for intermodal transit centers, a bike-share program, rail improvements near the Port of Tucson, and corridor improvements and traffic interchanges to improve access to Tucson International Airport.

(7) Promote efficient system management and operation.

The 2045 RMAP includes $150 million in recommended funding for arterial and freeway management systems. This includes projects such as electronic signage, signal optimization, cameras, detection systems and other technologies intended to improve the operation of the existing system. Continuation of the bus pullout program will reduce automobile/bus conflicts to improve traffic flow and reliability. The plan also identifies funding for Intelligent Transportation System (ITS) projects and new intersection safety and capacity improvements. The primary causes of delay in the region currently are tied to intersection capacity.

(8) Emphasize the preservation of the existing transportation system.

Preserving the existing transportation system is the main emphasis of the 2045 RMAP. Nearly $3.2 billion is recommended in funding to bring the pavement of the regional road network up to a state of good repair. This is consistent with the sentiment expressed by the community through the 2045 RMAP's public engagement efforts. Another $300 million is recommended for improving the pedestrian network by filling sidewalk gaps and bringing the network into compliance with the Americans with Disabilities Act (ADA).

Regional transportation accomplishments since 2005

Regionally significant transportation projects first appear in PAG's long-range transportation plans many years or decades before any project-level planning, design or actual construction can occur, meaning that a project can appear in multiple plans before being completed in our region. In recent years, with the injection of additional funding made available through the 2006 voter-approved RTA plan, a number of significant transportation projects have been completed, improving mobility and transportation choices for residents. The following pages include some examples of the projects or improvements that were completed in the region in the last 10 years.

Roadway:

- *Interstate 10 widened to eight lanes from I-19 to Ruthrauff Road – includes new or reconstructed traffic interchanges and railroad grade separations*
- *Twin Peaks Road construction of a 4-lane roadway with a bridge over the Santa Cruz River and a traffic interchange at I-10*
- *Sahuarita Road widened to 4-lane divided arterial between I-19 and La Villita Road – with bike lanes and sidewalks*
- *First phase of Grant Road widening to 6-lane arterial – includes bike lanes, sidewalks and an indirect left turn intersection at Oracle Road*
- *La Cholla Boulevard and La Cañada Drive widened to 6 and 4 lanes, respectively, with bikes lanes, sidewalks and paths*
- *Oracle Road widened from 4 to 6 lanes from Calle Concordia to Tangerine Road*

Transit:

- *Sun Link streetcar completed and fully operational*
- *Expansion of Sun Tran bus fleet from 189 to 240 vehicles*
- *Eight new or expanded express bus routes and service*
- *Expanded evening and/or weekend service on 23 existing bus routes*
- *More than tripled annual revenue miles on the neighborhood circulator system (renamed Sun Shuttle in 2009)*

Bicycle and Pedestrian:

- *Increased the mileage of bike lanes, routes and paths by nearly 200 percent*
- *Nearing completion of The Loop, a shared-use path*
- *More than 60 pedestrian activated signals installed*
- *Over 100 miles of fully accessible sidewalks constructed*
- *Added 6-foot paved shoulders to many rural routes*

Chapter 2: The Planning Process

The PAG 2045 RMAP was developed over a two-year process and involved members of the public, businesses, local organizations and jurisdiction staff.

Process Overview – the 2045 RMAP Task Force

The development of the 2045 RMAP was guided by a 30-member task force composed of a diverse range of community members. Task force members represented the following interests and groups.

- Arizona Department of Transportation
- Bicyclists and pedestrians
- Businesses and economic development
- City of South Tucson
- City of Tucson
- Environmental interests
- Freight
- Pima County Health Department
- Neighborhoods
- Pascua Yaqui Tribe
- Persons with disabilities
- Pima County
- Private development
- Seniors
- Tohono O'odham Nation
- Town of Marana
- Town of Oro Valley
- Town of Sahuarita
- Transit and alternative modes
- Tucson Electric Power
- University of Arizona

The task force guided every step of the development of the 2045 RMAP, including shaping the regional vision and goals, selecting projects and programs, and identifying performance measures. The task force met at key decision points throughout the planning process to review and refine all the elements of the RMAP by discussing regional transportation priorities and integrating concepts and

themes received through the public input process. Task force members also played a critical role in reaching out and encouraging members of the public to participate in the development of the plan.

Other planning steps:

PAG staff, 2045 RMAP Task Force members and local jurisdictional staff completed a number of other tasks to assist with transportation decision-making and support the plan, including:

- Analysis of existing travel conditions and infrastructure
- Forecast of future population and employment, including land use and potential growth corridors
- Alternative land use and growth scenario development
- Analysis of current and projected transportation needs
- Identification and prioritization of potential new projects and strategies to address identified needs
- Identification of project costs as well as current and future operating costs
- Development and selection of modal alternatives
- Analysis of the impact of future improvements to the transportation system, including congestion, air quality and Title VI compliance
- Development of a financial plan to estimate projected revenues and establish financial constraint

Public Involvement

PAG actively sought public input throughout the development of the 2045 RMAP. PAG used online and hardcopy surveys, workshops, open houses, presentations and online comment forms in order to provide a variety of ways in which members of the community could participate in plan development. PAG also made all of the 2045 RMAP information, such as alternative regional growth scenarios, detailed project information and transportation modeling results, available to the public through a dynamic, web-based interface and PAG's website so that everyone had the opportunity to be well informed about the region's transportation options.

Major efforts to solicit public input for the plan occurred in three phases: Phase 1: Goal Setting and Priority Identification; Phase 2: Project Selection and Phase 3: Open Houses and Public Comment. Opportunities for participation in both Spanish and English were available for all public involvement activities.

2045 RMAP feedback session

Phase 1: Goal Setting and Priority Identification (January-April 2014)

The first step in creating the 2045 RMAP was establishing the region's transportation goals and identifying investment priorities. These were established with significant public input provided through an online survey and at comprehensive, interactive workshop sessions, both of which were available in English and Spanish. In total, over 1,100 residents took the online survey and 65 people participated in workshops. Some of the dominant themes that came from survey responses and workshop results were:

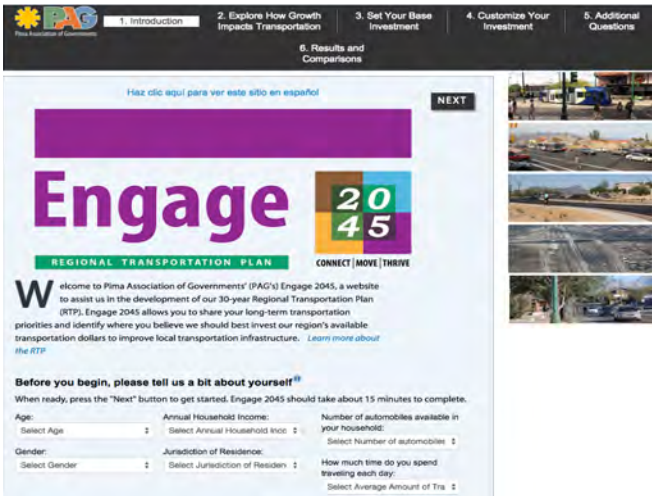
- The poor condition of roadways and other public infrastructure is seen as the biggest issue facing the region, followed by road congestion and the challenge of having adequate revenue to pay for needed improvements.
- Future priorities for participants include improving roadway conditions, increasing cross-town mobility, and enhancing high-use transit corridors.
- Transit, bicycle and pedestrian improvements are high priorities for respondents under the age of 34.
- Survey and workshop results show a mix of interest in pursuing both high-capacity transit projects and high-capacity roadway upgrades to improve regional mobility.
- Respondents expressed strong interest in exploring additional revenue options for meeting regional transportation needs.

Phase 1 input provided a framework from which 2045 RMAP plan goals were developed and potential projects evaluated.

Phase 2: Project Evaluation (Summer 2015)

For the second public input phase, PAG developed an online public engagement tool which allowed users to explore the trade-offs between land use scenarios and regional transportation investment strategies. The online tool, called Engage 2045, presented the public with a series of performance measures which were affected by land use and transportation investment choices. Whereas the first phase of public engagement simply asked people what they wanted, not considering costs or the trade-offs, the intent of the Engage 2045 tool was to challenge users to evaluate the impacts of their decisions in a cost-constrained environment, mirroring the broader planning process. The exercise helped to identify residents' transportation investment priorities.

The tool was online for six weeks from the beginning of June until mid-July 2015. During those six weeks, more than 1,900 people participated, sharing their preferred



Engage 2045 let users explore the impacts of different funding levels and investment strategies by presenting the performance outcomes of choices.

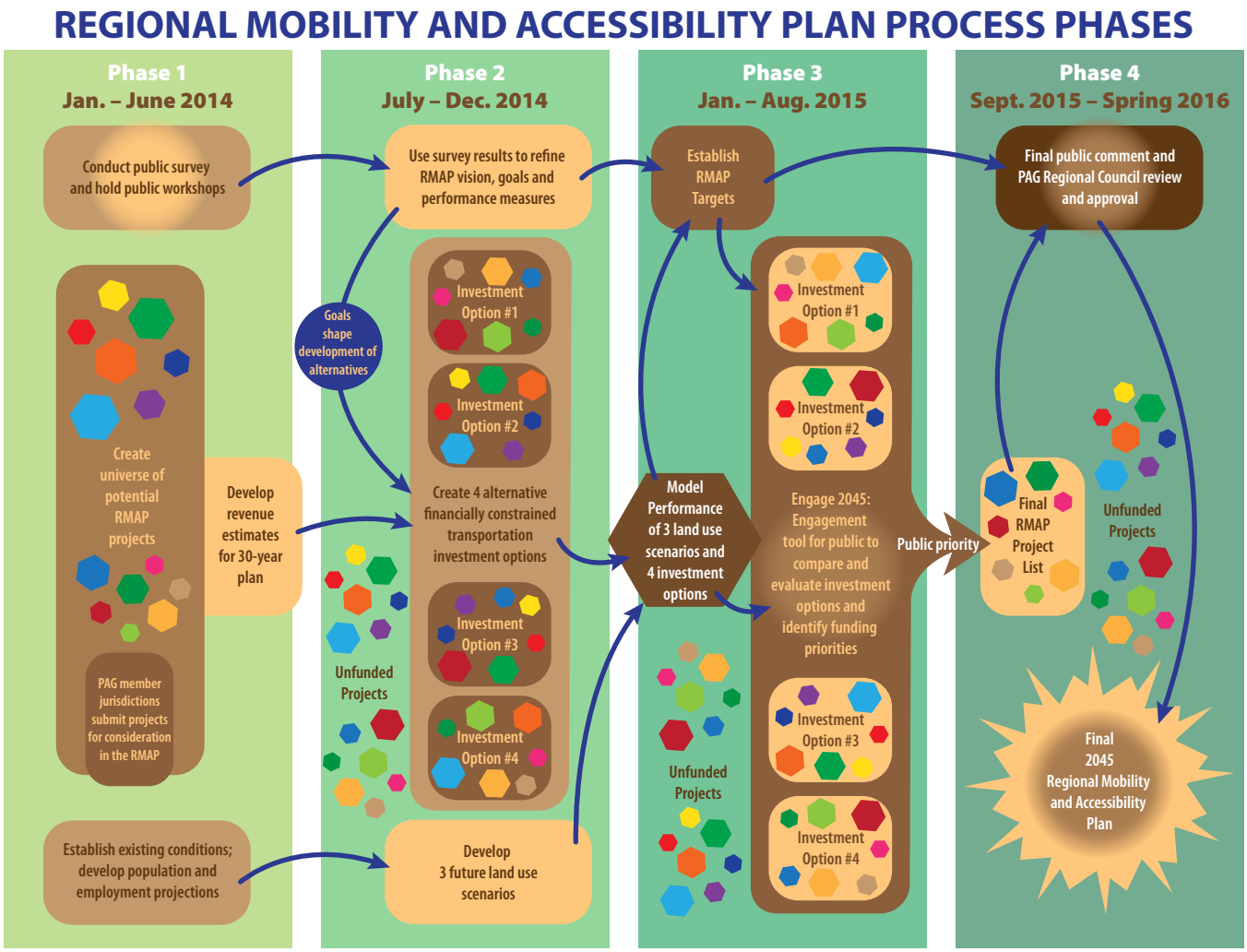


Figure 1

Source: PAG

growth and investment strategies. The dominant themes to emerge from the second phase emphasized maintaining current transportation assets, ensuring multimodal choices and recommending relatively more modest investments in capacity expansion to meet future mobility needs.

Phase 3: Open Houses and Public Comment

Following the completion of the draft 2045 RMAP, the draft plan was made available for public comment at four open houses and online. More than 70 people attended the open houses and comments were reviewed and integrated into the process for developing the final plan.

The 2045 RMAP update process took roughly two years to complete. Public engagement for the plan included surveys, public workshops, online engagement and open houses. Plan development included a scenario planning process to examine trade-offs and help address uncertainty in the long-range outlook. The 2045 RMAP looks out 30 years and includes projects totaling over $17.3 billion.

Pima Association of Governments held four open houses for public feedback on the 2045 RMAP.

Chapter 3: Financial Plan

The 2045 RMAP Financial Plan lays out the fiscal framework and constraints within which transportation projects will be realized over the next 30 years. The plan estimates future revenues available for multimodal transportation projects from all funding sources, identifies how much of those future revenues have already been committed to future projects and programs, and identifies restrictions on how transportation revenues may be invested.

Fiscal Constraint

Fiscal constraint is the basis for the Financial Plan. Not only is it a federal requirement for all long- and short-range transportation plans, it is also a good planning practice. In a fiscally constrained plan, the estimated cost of the included projects does not exceed the amount of reasonably expected transportation revenues.

In other words, the 2045 RMAP is not an expansive wish list of every project that would benefit the region. Rather, the plan is tailored to fit the expected economic realities of the next 30 years.

As anyone who has lived on a budget knows, achieving fiscal constraint requires hard choices. The 2045 RMAP anticipates those hard choices and reflects regional consensus on transportation priorities and values.

Transportation Revenue Sources

The Financial Plan of the 2045 RMAP forecasts revenues from five categories of transportation funding sources.

Federal funds

Federal funds come from federal gas tax receipts deposited into the federal Highway Trust Fund. The U.S. Congress authorizes spending from the trust fund through a multi-year bill. That authorization bill defines the rules for how those funds can be spent. The FAST Act, the authorization bill informing development of the 2045 RMAP, allocated funds to our region through three different programs. The largest is the Surface Transportation Block Grant Program (formerly the Surface Transportation Program) and is rather flexible in its allowed uses.

State Funds

State funds for transportation come from a variety of sources, including the state gas and diesel taxes, the vehicle license tax, and license and registration fees. Most of these funds are deposited in the state Highway User Revenue Fund (HURF). State law defines how these funds are distributed, with about half going to the State Highway Fund (SHF). The SHF, along with the state's share

2045 RMAP Revenue Projections

Transportation Revenue Source	Funding Program	Projected Revenue (2015 – 2045)
FEDERAL	STBGP	$ 700,418,000
	HSIP	$ 40,283,000
	FEDERAL TOTAL	$ 740,701,000
STATE	ASTP	$ 1,251,256,000
	ADEQ	$ 18,707,000
REGIONAL HURF	2.6% Funds	$ 142,174,000
	12.6% Funds	$ 764,100,000
	STATE TOTAL	$ 2,176,237,000
RTA	RTA	$ 1,200,000,000
	RTA Extension - requires voter approval	$ 2,700,000,000
	REGIONAL TOTAL	$ 3,900,000,000
LOCAL FUNDS	Construction Sales Tax	$ 400,000,000
	Development Impact Fees	$ 125,000,000
	Road Development Fees	$ 60,000,000
	Roadway Impact Fees	$ 410,000,000
	Private Developers' Funds	$ 425,000,000
	Clean Energy Funds	$ 10,000,000
	Local and County HURF	$ 4,488,064,000
	Transportation Bonds	$ 210,000,000
	Pima County VLT	$ 441,949,000
	Sonoran Corridor Funding	$ 600,000,000
	TOTAL LOCAL	$ 7,170,013,000
FEDERAL TRANSIT	5307	$ 503,488,000
	5339	$ 83,381,000
	5310	$ 28,973,000
	5311	$ 39,393,000
	Federal Transit Grants	$ 200,000,000
	TOTAL FED TRANSIT	$ 855,235,000
NON-FEDERAL TRANSIT	General Fund Investment	$ 1,475,483,000
	Farebox Revenues	$ 521,774,000
	IGA/MOE Revenues	$ 396,475,000
	Other Revenues	$ 28,169,000
	LTAF II	$ 19,550,000
	TOTAL NON-FED TRANSIT	$ 2,441,451,000
TOTAL		**$17,283,637,000**

Table 2

of federal funds, are primarily used on interstates, state routes and other state-owned facilities.

Some funds from the Highway User Revenue Fund are set aside for use in the larger urban areas of the state. In the PAG region, these funds are distributed as HURF 2.6% funds and HURF 12.6% funds. HURF 2.6% funds can only be spent on state-owned facilities, but HURF 12.6% are more flexible, and can be used on any arterial included in the 2045 RMAP.

The Arizona Department of Environmental Quality also provides the region with funding to administer programs that encourage residents to carpool or use alternative modes of transportation.

Regional Transportation Authority

The Regional Transportation Authority is funded by a countywide half-cent excise tax that was approved by Pima County voters in 2006. The RTA plan includes roadway, transit, safety, environmental and economic vitality improvements.

RTA funding provides more transportation funding than any other single funding source available to the PAG region. Although the plan is set to expire in fiscal year 2026, an extension of the RTA plan and excise tax would continue to provide significant amounts of funding for projects in the 2045 RMAP.

Local Funds

Local funds for transportation come from a variety of sources including construction sales taxes, development impact fees, roadway development fees, and direct distribution of HURF funds to cities, towns and counties.

Programming decisions for local funds are made by local governing bodies based on local priorities and needs. However, the Financial Plan assumes that some portion of these local funds will be used on regionally significant projects that will provide significant benefits to local jurisdictions.

Transit Funds

Federal transit grants, often referred to by the section of the U.S. Code where they are described (e.g., 5310), provide funds for transit programs in both rural and urban areas. Some of these federal grant programs are broad and very flexible, such as the 5307 program, which provides transit capital and operating assistance in urban areas. Others are targeted to a specific purpose, such as the 5310 program, which provides funding for assisting private nonprofit groups and public agencies in meeting the transportation needs of the elderly or persons with disabilities.

In addition to the formula grants referred to above, the PAG region has been successful in applying for and receiving discretionary grants for transit projects. In 2010, the City of Tucson was awarded $63 million through the Transportation Investment Generating Economic Recovery (TIGER) program for development and construction of the Sun Link streetcar. The Financial Plan assumes that the region will be able to compete for and successfully secure other competitive grants during the next 30 years.

Some transit funds come from non-federal sources. These include state and locally generated funds that support transit operations such as general fund investments from local jurisdictions, fare box revenues, and other revenues secured via intergovernmental agreements.

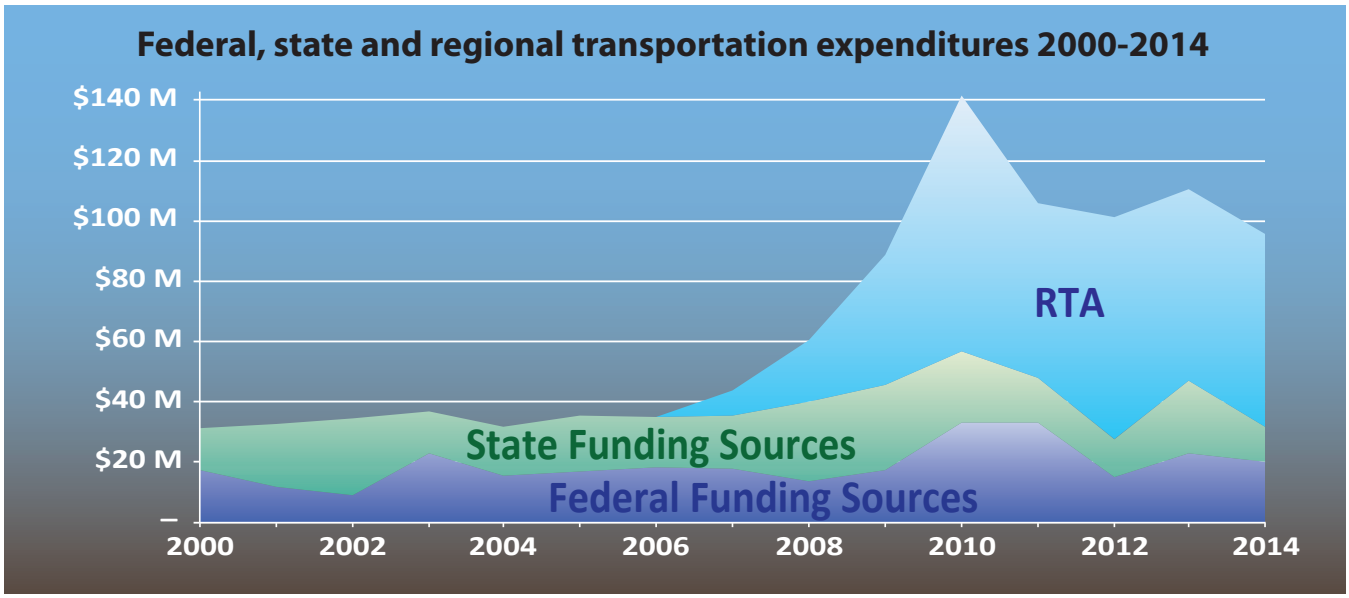


Figure 2 Sources: PAG/RTA

The RTA provides a substantial portion of the region's transportation funding when compared to two other funding sources that have traditionally provided for the majority of the region's transportation needs.

Revenue Projections

Calculation of the revenues available for transportation investments followed a four-step process.

1) Total Anticipated Revenues

First, a 30-year projection was calculated for each of the revenue sources listed in the last section. Based upon this projection, the region can reasonably expect to receive approximately $17.3 billion in transportation revenues over the next 30 years.

2) Committed Revenues

Some of those expected revenues, however, are already committed to specific projects or purposes. Some federal, state and RTA funds are committed to completing projects already in PAG's short-range 5-year Transportation Improvement Program or in the 20-year voter-approved RTA plan. Some local funds are assumed to be committed to local priorities over the next 30 years such as maintenance of neighborhood streets. Most of the expected transit funds are assumed to be committed to 30 years of maintenance and operations of the existing transit system.

After taking these committed funds into consideration, the Financial Plan estimates that the region can reasonably expect $8.2 billion of funds that have no prior commitments.

3) Restricted Revenues

Of those funds that are not currently committed to projects, some come from funding sources that restrict their uses. For example, certain federal funds have specific rules about the types of projects to which they can be applied, such as transit or bike and pedestrian improvements. In general, funds from the state's HURF can only be used on roadway improvements. Also, the RTA plan, based on technical staff guidance and public input, specifically describes how its funds may be used. Finally, transit funds are restricted to transit uses.

In addition to these restrictions, the Financial Plan assumes that local jurisdictions will set aside a portion of their local transportation revenues for pavement preservation purposes or as matching funds for federal dollars. For the purposes of the Financial Plan, this voluntary set-aside is counted as restricted funds.

Of funds available for the 2045 RMAP, $4.5 billion of transportation revenues will be restricted to specific purposes.

4) Flexible Funds

Once committed and restricted funds are accounted for, the remaining funds are flexible. The region is free to plan for these funds in a variety of ways. The ability of the RTA to provide additional funds for flexible use is contingent upon approval of an extension of the RTA past fiscal year 2026.

Overall, the 2045 RMAP anticipates a total of $4.3 billion in flexible funds that can be reasonably expected in the next 30 years.

2045 RMAP Projects and Modal Split

Transportation stakeholders, jurisdictions and the public identified transportation needs of approximately $29 billion over the next 30 years. Since the long-range plan must be fiscally constrained, not all needs can be included in the plan. Thus, projects designated as "In Plan" are higher priority and may be funded by 2045. Projects on the "Reserve" list are identified needs, but funding is not expected to be available for those projects. An estimated $15.2 billion in identified projects will be on the "Reserve" list.

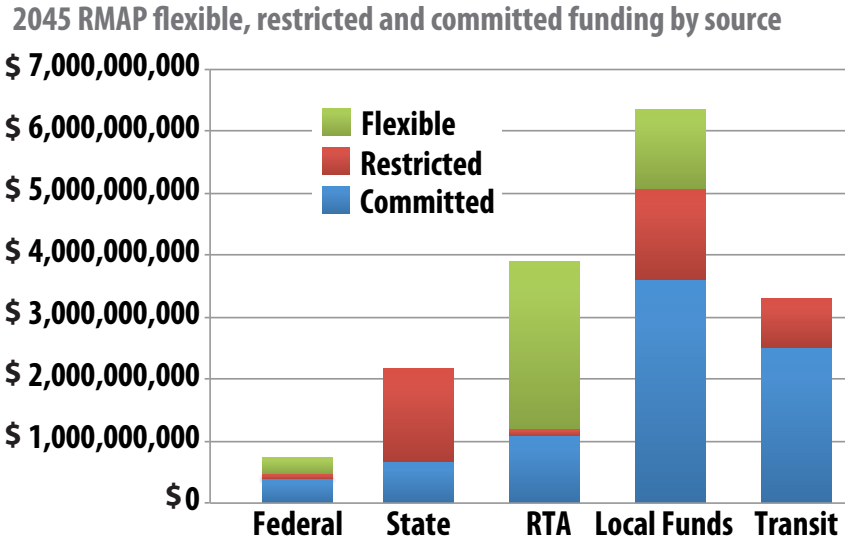


Figure 3

The 2045 RMAP recognizes the importance of improving all modes of travel within the region – vehicular, transit, bicycle, pedestrian and aviation. Aviation revenues and needs were identified separately by airports and airport authorities and are not included in this summarized project list. Funding was dedicated to the other modes based on regional needs, trends and public input using a modal split similar to the voter-approved breakdown in the RTA plan: 29% for Multimodal Roadway Capacity Improvements, 25% for Transit, 18% for System Maintenance and Modernization, 4% for Regional Programs, 4% for Bicycle and Pedestrian Projects, and 20% for local funding priorities of the region's jurisdictions (which are not detailed in the regional plan).

Percent of planned expenditures by element

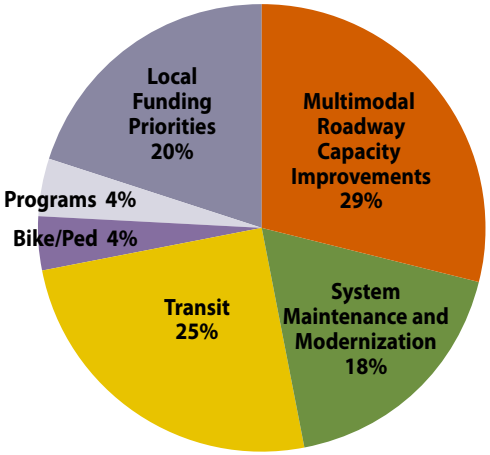


Figure 4

The Future of Transportation Finance

In general, transportation revenues continue to follow an unsustainable trajectory as multiple factors force the funding available for transportation to continue a downward trend. For example, both the Arizona and federal gas tax rates are fixed on a per-gallon basis, and therefore gas tax revenues are not responsive to inflation. As the cost of transportation infrastructure projects increases, the amount of revenue generated from the gas tax remains static. Also, the state gas tax has been at $0.18 cents a gallon since 1991. Gas tax revenues collected in 1991 equaled about $79 per capita compared to collections today of $70 per capita. It is not possible to maintain past levels of transportation investments as per capita collections continue to decline. Additionally, as cars become more fuel efficient, drivers pay less in gas taxes. At the same time, the wear and tear on roadways caused by these vehicles remains the same. For example, an owner of a 1992 Toyota Corolla paid $13.48 in gas taxes for every 1,000 miles the car was driven. Today, an owner of a 2014 Toyota Corolla pays $11.38 in gas taxes for every 1,000 miles the car is driven, or 15 percent less. When adjusted for inflation, the 2014 car owner only pays about half of what his or her 1992 counterpart did.

2045 RMAP planned expenditure amount by element

Transportation Element	Proposed Funding Level (000s)
Roadway Expansion	$ 4,991,000
System Maintenance and Modernization	$ 3,180,000
Transit	$ 4,333,000
Bike/Pedestrian	$ 602,000
Programs	$ 685,000
Local Funding Priorities	$ 3,498,000
Total	**$ 17,283,000**

Table 3

2045 RMAP funded and unfunded project amounts

2045 RMAP Components	Projects and Programs with Identified Funding (000s) (excluding local funding priorities)	Projects and Programs without Identified Funding (000s) (Estimate)
Regional Freeways and Parkways	$ 2,300,000	$ 3,900,000
Regional Arterials and Collectors	$ 2,700,000	$ 2,700,000
Pavement Preservation	$ 3,200,000	$ 400,000
Bicycle and Pedestrian Elements	$ 600,000	$ 400,000
Regional Technology, Safety and Environmental Programs and Projects	$ 600,000	$ 1,400,000
Bus Rapid Transit, Streetcar, Light Rail, and Intercity Rail	$ 1,300,000	$ 5,900,000
Transit Management, Operations, and Maintenance	$ 3,100,000	$ 700,000
Total	**$ 13,800,000**	**$ 15,200,000**

Table 4

Funded projects column does not include local funding priorities.

Transportation as an Investment

Many local and statewide leaders believe that transportation spending is an investment in the future health of our economy. Arizona is uniquely positioned to take advantage of recent trends in nearshoring and increased trade with Mexico. Transportation infrastructure improvements are needed if the Arizona economy and the Tucson region are going to take advantage of this unique position and diversify the local economy.

Chapter 4: Population, Employment and Scenario Planning

The Tucson region has long been a popular destination for families, students and retirees, causing the population of Pima County to more than double between 1975 and 2005. Today, an estimated 1 million people reside in the region.

Up until 2009, it was largely expected that the region would continue to grow near the historic rate. The previous long-range transportation plan, the 2040 RTP, was developed under the assumption that population would again double within the 30-year planning horizon, taking the region to nearly 2 million residents. However, with the housing crash and subsequent economic recession, which hit Arizona particularly hard, population growth has slowed considerably, leading to a significant downward revision of projections. Therefore, current projections assume a much more modest growth rate than was used just a few years ago. The 2045 RMAP is based on an assumed population of 1.47 million residents by 2045. This is based on an annual growth rate of about 1.5 percent, well below the assumptions of previous long-range transportation plans.

The employment rate is largely expected to keep pace with population, adding between 200,000 and 220,000 jobs over the next 30 years. The most substantial job growth is anticipated to be in professional and business services, health care, transportation and warehousing, trade and hospitality.

Any projection is simply a snapshot in time, based on current trends that may change. As evidenced by recent revisions, population growth rates are strongly affected by economic conditions and, in the future, may diverge from current assumptions due to further economic changes, technological advances, shifting preferences or resource shortages. The future cannot be predicted with certainty, particularly the farther we look beyond the present.

Current population and employment assumptions are based on the best available data and provide valuable information for considering future transportation needs. The 2045 RMAP will continue to be reviewed and updated every four years to ensure consistency with the latest assumptions and to continue to align the region's transportation investments with anticipated needs and the community's evolving goals.

Aging Population and Changing Transportation Needs

One thing that hasn't changed with the revision to population trends is the expectation that the composition of the region's population will continue to change. Like many areas of the country, the Tucson metropolitan region is expected to become older and more diverse. By 2045, the number of people living in the region who are 65 or older is projected to double. Increasing age frequently results in higher levels of varied disabilities, which have

Population and employment projections, Pima County 1990-2045

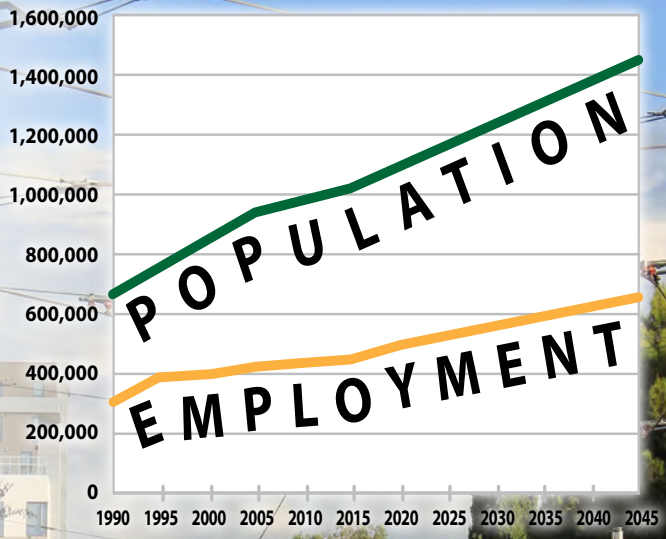


Figure 5

Data from the Arizona Department of Administration (medium series population projections 2012-2050) and the University of Arizona Eller College of Management.

multiple affects on a community, the individual, and his or her immediate family. Transportation is crucial to keeping older adults independent, healthy and connected to friends, family and health providers. However, older residents' transportation needs differ based on their health, income, marital status, age, race and whether they live in an urban area or in low density suburbs outside the urban area.

We will need to plan for increased demand for public transportation services, including special needs and wheelchair accessible rides currently provided by the City of Tucson (Sun Van), Pima County and Oro Valley (RTA paratransit) and nonprofit organizations.

Where are we growing?

Through a combination of in-migration and natural increase, the entire Tucson region is expected to add roughly a half million new residents by 2045. The distribution of future population will be as important as the total amount of growth in helping to determine transportation demand. Based on current projections, the Towns of Marana and Sahuarita are expected to more than double in population, while the Town of Oro Valley, the City of Tucson and unincorporated Pima County may grow by around 40 percent.

2045 RMAP population projections for Pima County compared to 2040 RTP

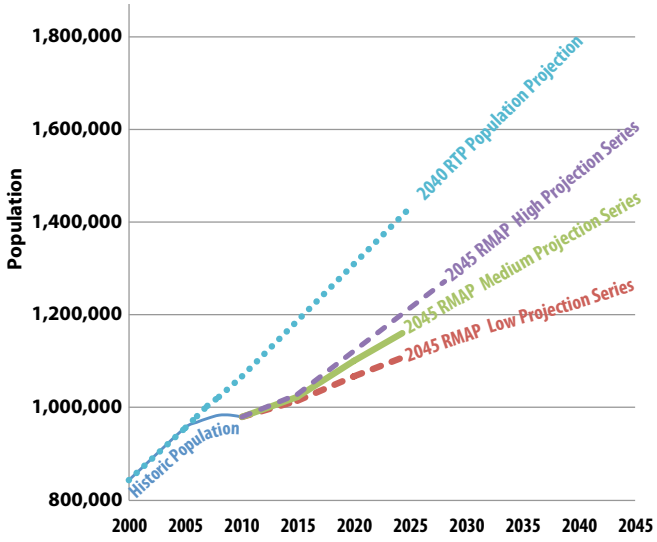


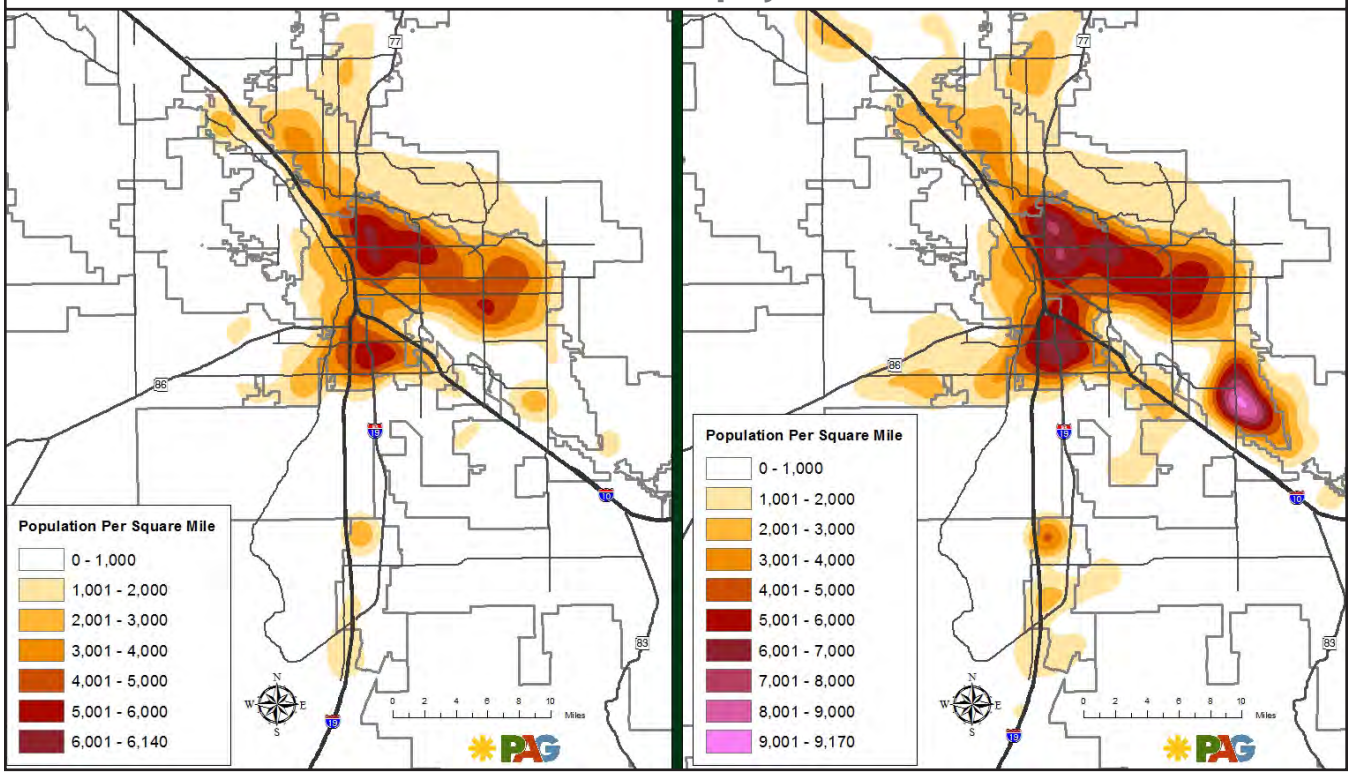
Figure 6 Sources: 2040 RTP and ADOA

Projected population growth by jurisdiction

Year	Marana	Oro Valley	Sahuarita	South Tucson	Tucson	Unincorporated Pima County
2010	34,961	41,011	25,259	5,652	520,116	353,264
2015	41,019	42,259	28,483	5,670	537,129	367,519
2020	48,324	44,811	34,529	5,637	572,636	394,085
2025	55,287	47,405	41,276	5,585	610,374	412,587
2030	61,988	49,784	45,403	5,550	647,118	433,256
2035	68,859	52,072	48,527	5,544	683,038	454,061
2040	75,741	54,271	51,637	5,601	718,187	474,185
2045	82,714	56,453	54,729	5,727	753,472	494,309
Total Projected Population Growth	47,753	15,442	29,470	75	233,356	141,045
Percent Growth	137%	38%	117%	1%	45%	40%

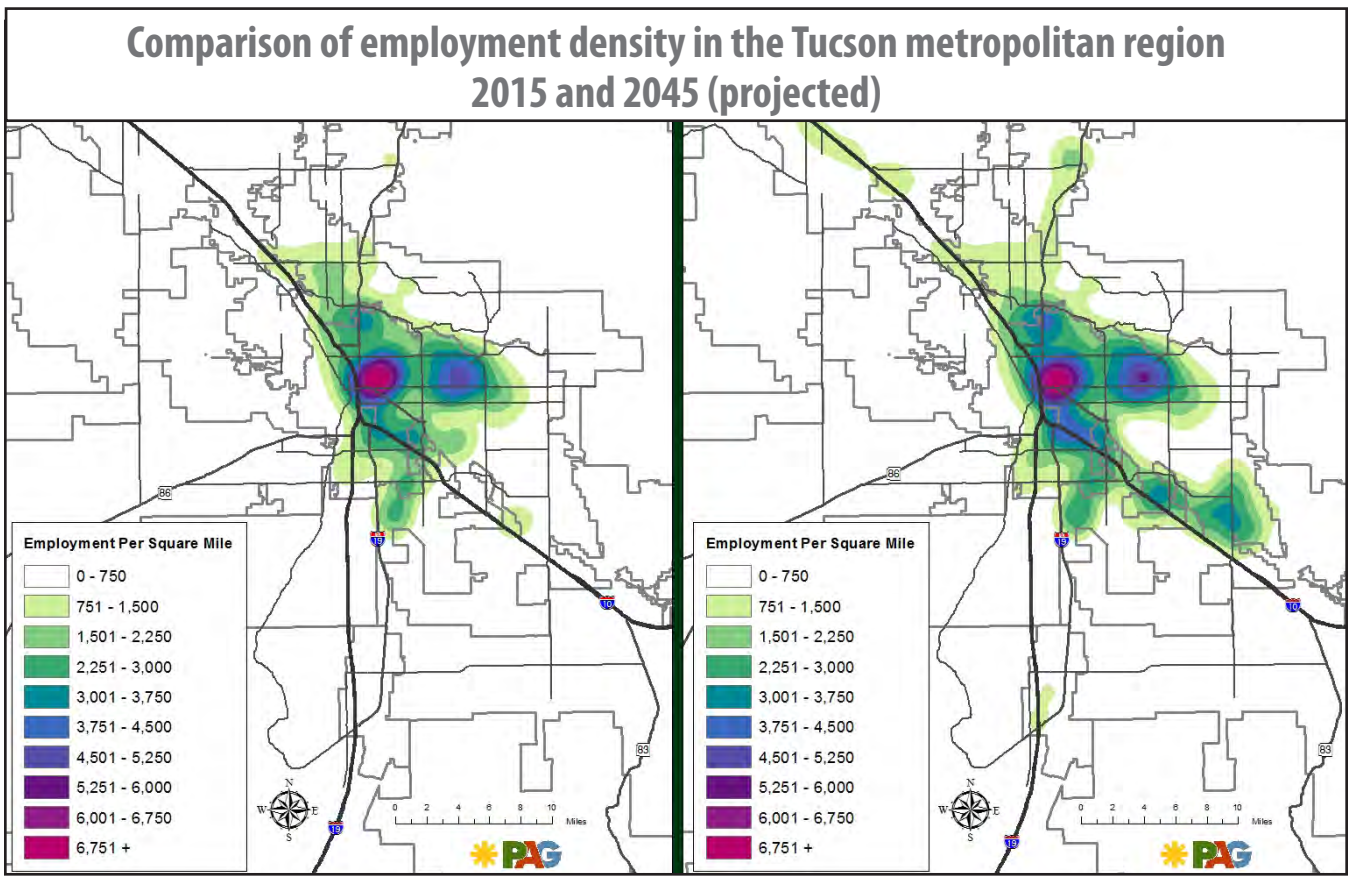
Table 5 Source: ADOA 2012-2050 medium series population projections

Comparison of population density in the Tucson metropolitan region 2015 and 2045 (projected)



Map 1

Comparison of employment density in the Tucson metropolitan region 2015 and 2045 (projected)



Map 2

Impacts of Population Growth on Transportation

Traditionally, miles traveled by private automobile (measured in Vehicle Miles Traveled or VMT) have far outpaced population growth. National research shows that between 1977 and 2001, for example, the population of the United States grew by an estimated 30 percent, while household VMT grew by 150 percent. This was mostly a result of the rapid suburbanization and increased car ownership during the period. Similar trends were apparent in Pima County as well.

However, since at least the mid 1990s, there is evidence that the growth of VMT is becoming less directly responsive to population growth. VMT per capita has been largely flat, even declining somewhat over the past 15 years, and total VMT in 2013 was below its 2009 peak for Pima County. While the total decrease in VMT in the last few years can at least, in part, be attributed to the economic slowdown and stagnant population growth (and in fact, there is evidence that VMT has begun to increase again in the last years with the economic recovery), the longer term trend suggests slower future growth in miles driven than was historically the case. Factors that have changed the historic relationship between VMT and population growth have included:

- An aging population
- Smaller household size
- Increase of female participation in the labor force
- Saturation of automobile ownership
- More online commerce
- Decreasing rate of suburbanization
- Increased work from home rate
- Changing travel behavior
- Changing land use patterns and living preferences

How these factors will continue to change travel demand over the coming decades is uncertain. Yet, in the shorter term as the economy recovers and growth returns to Pima County, it is likely that the region will see an increase once again in total VMT even as VMT per capita remains flat.

Until the 2008 recession, VMT growth had far outpaced the region's ability to add capacity to the transportation system leading to increased congestion. And while VMT growth has recently slowed, the region can't build its way out of the problem in the long run. In reality, if the region is to have a well-performing transportation system that supports a high quality of life for all residents, a variety of strategies will need to be employed, such as improving alternatives to driving, promoting land use and growth patterns that reduce vehicle dependency, and increasing roadway capacity through operational enhancements, in addition to constructing new facilities.

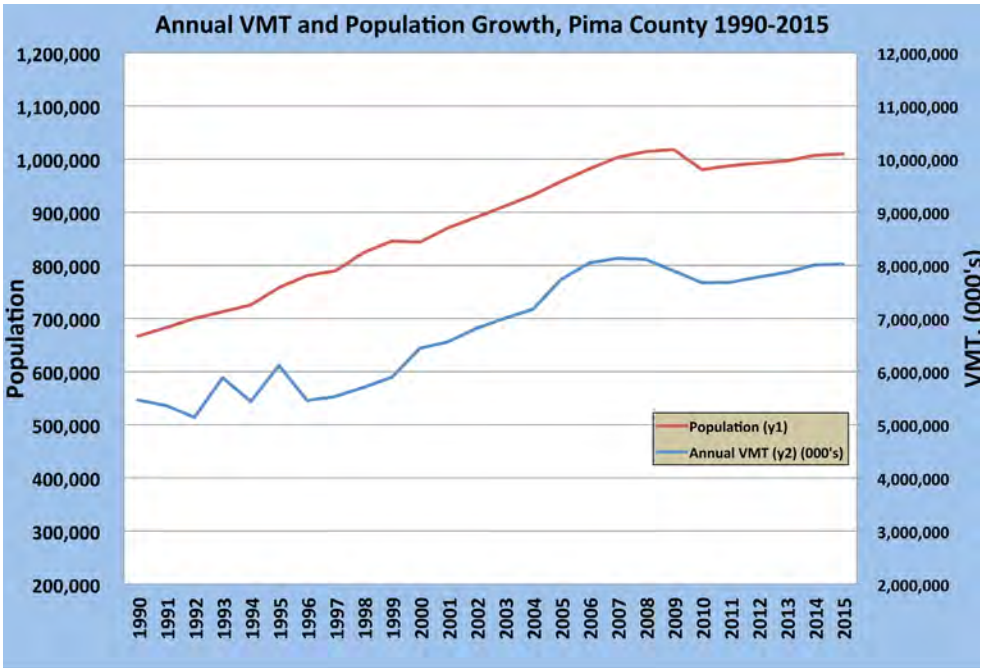


Figure 7 Source: ADOT Highway Performance Monitoring System

The chart shows how growth in VMT has tracked with population. Both have been flat, or declined, since the recession.

Working with Uncertainty – Scenario Planning in the 2045 RMAP

In the development of the 2045 RMAP, PAG used a scenario planning process. There are a number of reasons to use a scenario planning approach in this effort. Primarily, scenario planning addresses some of the uncertainty with regard to the impact of changing conditions on the transportation system. This helps to control for the risk inherent in large infrastructure investments. Comparing the relative performance of a variety of transportation investments allows the plan to isolate and prioritize the investments that best achieve regional goals under different conditions. This supports a performance-based planning approach in that it assists in understanding the range of potential outcomes for the system. Scenario planning also provides a useful tool for comparing the trade-offs of different decisions and the complex relationships between those decisions. Understanding these trade-offs is necessary for supporting more informed decision-making by the public, planners and the region's leadership.

Focus on Land Use

While there are many uncertainties that will affect the future of transportation, the 2045 RMAP has restricted scenario development exclusively to changes in land use and the regional development pattern. Land use policy was chosen as the framework for analysis because it supports a direct comparison between the transportation outcomes of land use policy decisions, which can be shaped locally and fairly well predicted. Broadening the scope of analysis to include additional factors could diminish the ability to draw comparisons and present a challenge with regard to relevance and what can be gauged by the tools that are currently available.

The 2045 RMAP considers three distinct development scenarios in order to evaluate how well various transportation investments perform under different distributions of population and employment. All three scenarios assume the same number of future jobs and population, but change the distribution and the density of where jobs and people are located within the region.

Uncertainty in Transportation Planning

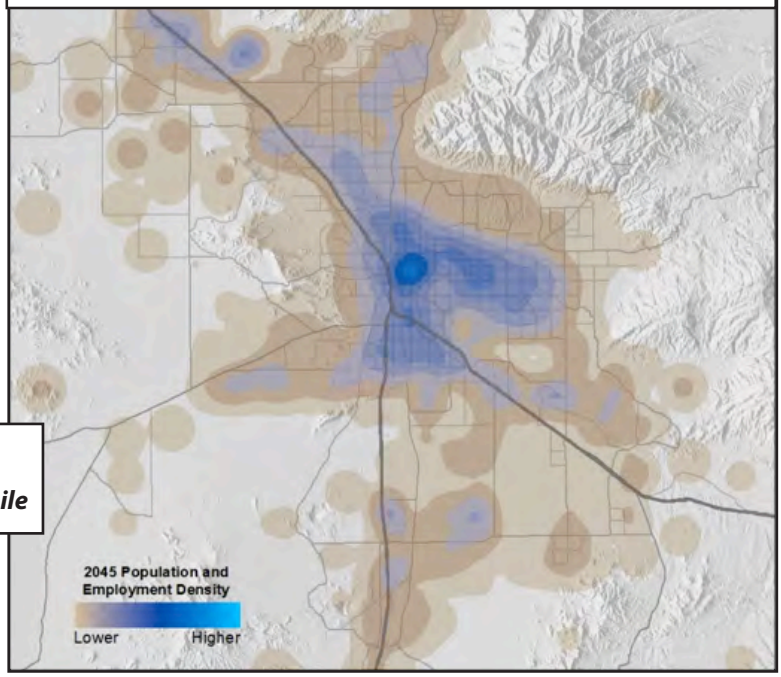
Technological advances, such as the evolution of how transportation services are delivered through ride sharing and the growth of autonomous vehicle systems; climate change; economic growth or recession, and a myriad of other potential changes, will have considerable impacts on regional development and the region's transportation system. Each deserves further exploration in terms of how it may upend current assumptions. However, this is outside the scope of the current planning effort. Until there is a better understanding of the quantifiable effects of these changes, attempting to predict would be far too speculative to draw meaningful conclusions given the resources available.

SCENARIO 1:
Mostly Suburban – Grow outward at a lower density

Of the three scenarios tested, Scenario 1 is the most similar to the historic development pattern of the Tucson region. Growth is focused outward in traditional low-density, fast growing suburbs. The urban core has little redevelopment, and infill is very limited. Under this scenario, an additional 315 square miles would come under development, and residential density would remain at about its current level.

New Land Developed -	***315 sq. miles***
Population Density -	***2,113 people/sq. mile***

Combined population and employment density and distribution of Scenario 1: Mostly Suburban



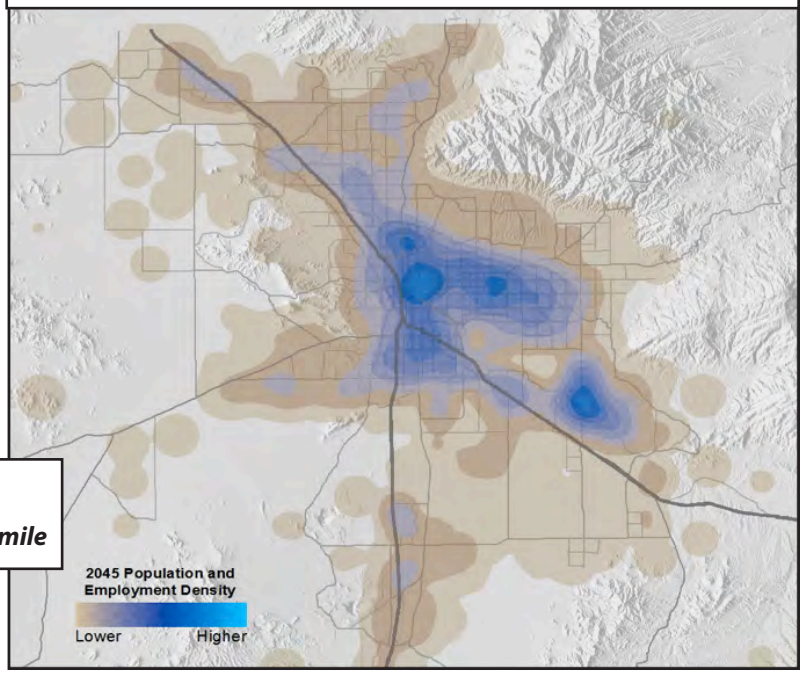
Map 3

SCENARIO 2:
Mixed Urban and Suburban – Mix of urban density and outward growth

Scenario 2 is the official growth scenario for the 2045 RMAP. This option is based on the adopted general and comprehensive plans of each jurisdiction in Pima County. Growth is a mix of suburban development on the edges balanced with targeted infill and redevelopment in the core. Growth at the edges will be similar to current, suburban-style development patterns, while growth in the core will be higher density, emphasizing a mix of uses. Under this scenario, an additional 234 square miles would come under development and residential density would increase somewhat over its current level.

New Land Developed -	***234 sq. miles***
Population Density -	***2,360 people/sq. mile***

Combined population and employment density and distribution Scenario 2: Mixed Urban and Suburban



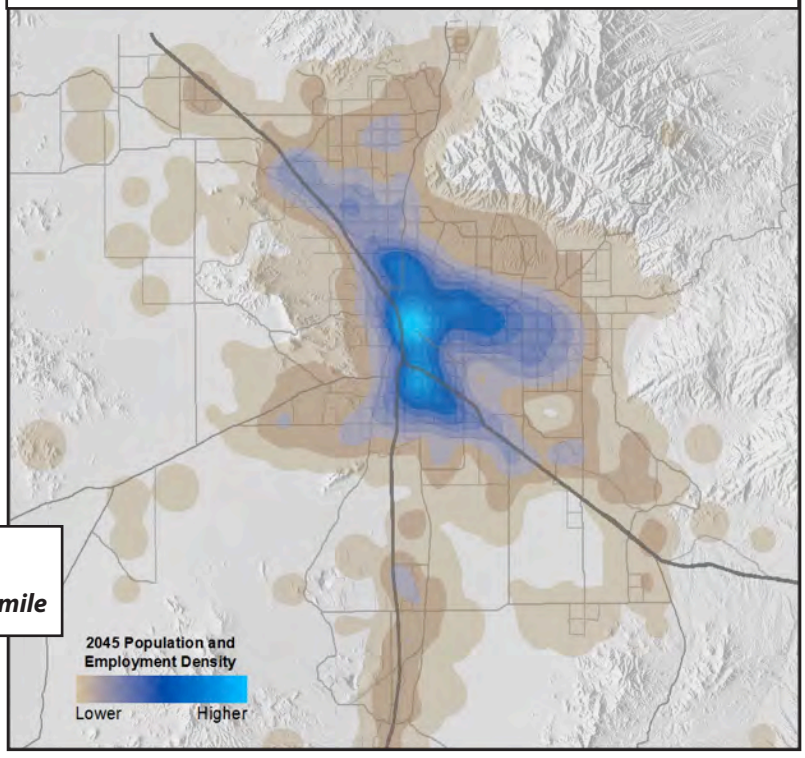
Map 4

SCENARIO 3:
Mostly Urban – Higher-density development focused in the core

Scenario 3 is based on the Imagine Greater Tucson Vision, an extensive, multi-year regional visioning exercise conducted for the Tucson region from 2010 to 2012. This is the most compact and dense of the three growth options. The region's urban core sees significant redevelopment, infill, increased density and more mixed land uses. This scenario still includes suburban-style lower density growth in some areas, but not as much as the other two scenarios. Under this scenario, an additional 98 square miles of land would come under development and residential density would increase considerably over its current level.

New Land Developed -	***98 sq. miles***
Population Density -	***3,240 people/sq. mile***

Combined population and employment density and distribution Scenario 3: Mostly Urban



Map 5

Scenario Performance

PAG modeled the three scenarios using the regional travel demand model to compare the impacts each growth pattern may have on the transportation system. The impacts were compared initially using a "No-Build" analysis, that is a comparison of future travel conditions if no new transportation facilities are built beyond what already exists. The purpose of conducting a No-Build analysis is to understand how population growth without investment might affect transportation and to isolate how different land use patterns influence performance of the system. This allows us to consider which transportation goals may be met or improved through land use decisions and how land use and transportation interact.

One of the values of this approach is to allow planners to isolate those corridors and areas in the transportation system that don't meet future needs under multiple scenarios. These are the locations that, no matter how the region grows, should be considered for improvement.

Comparison of daily VMT assumptions between 2040 RTP and 2045 RMAP "No-Build" scenarios

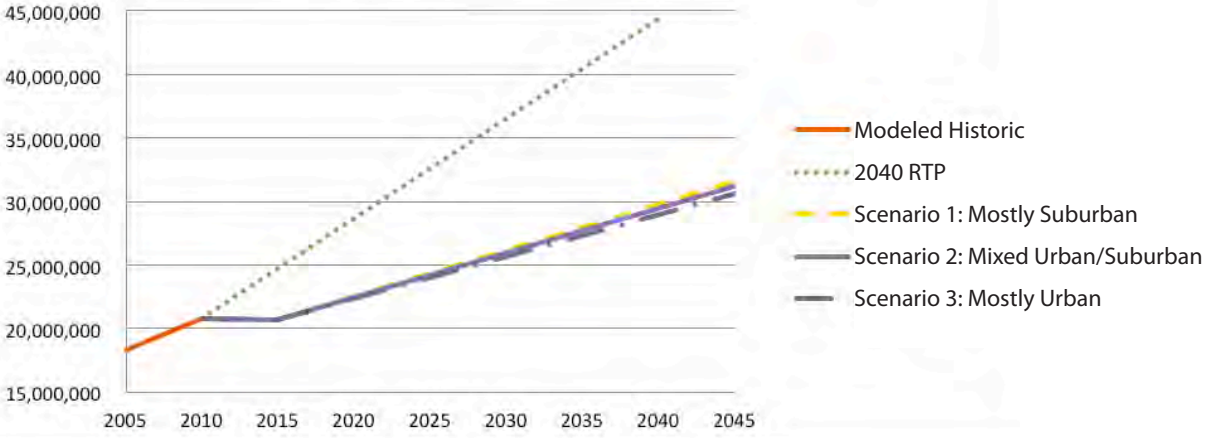


Figure 8 **Source: PAG**

The table shows the performance of the transportation system today compared to three No-Build land use scenarios. It demonstrates the effects of alternative land uses on the transportation system.

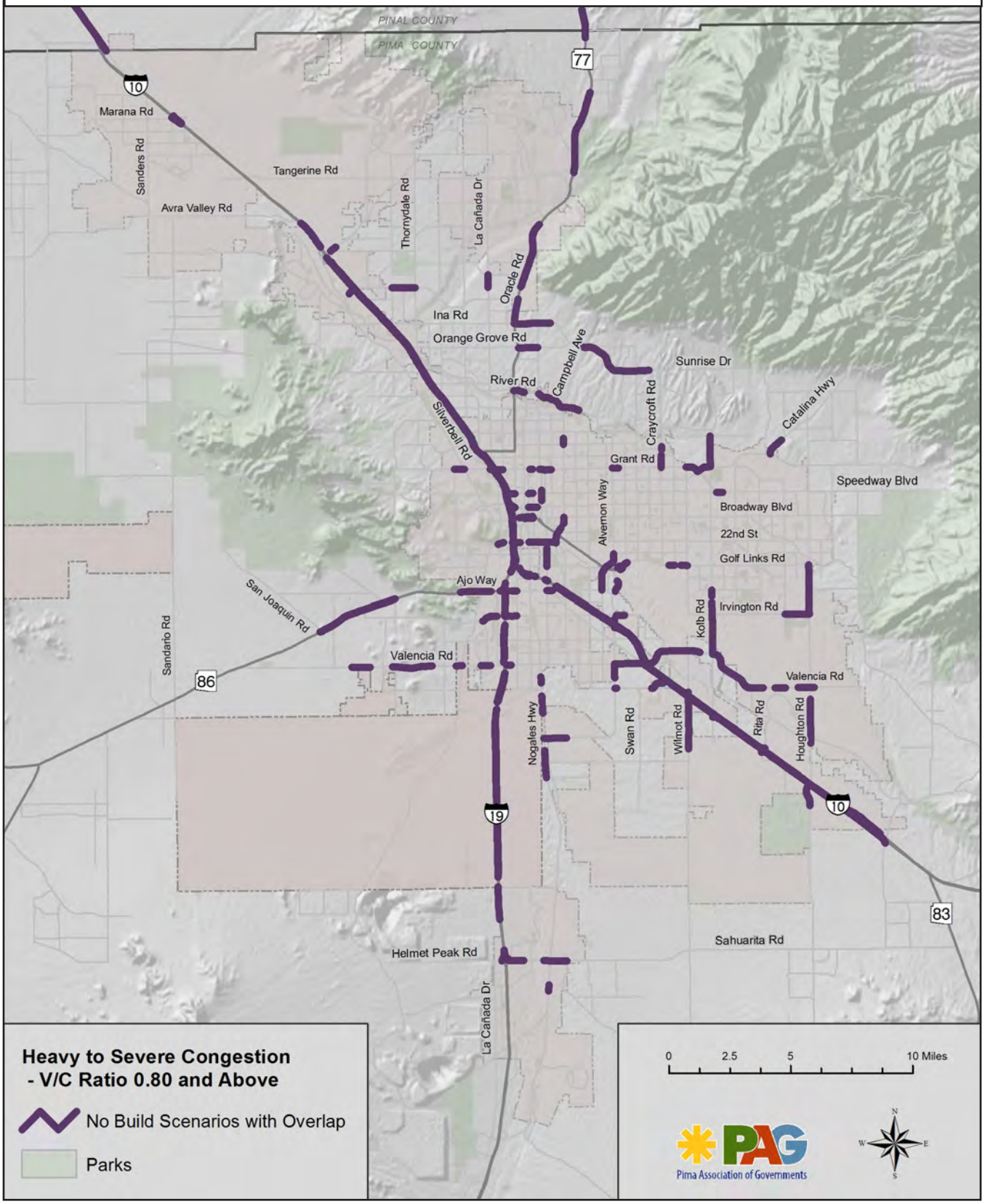
Comparison of performance for select measures of no-build scenarios

Performance Measure	Current	2045 RMAP Scenario 1: Mostly Suburban	2045 RMAP Scenario 2: Mixed Urban and Suburban	2045 RMAP Scenario 3: Mostly Urban
Average Daily Vehicle Miles Traveled per Capita	23.37	21.37	21.09	20.69
Average Daily Vehicle Hours/Minutes Traveled per Capita	35:42	35:12	35:32	35:52
Bike, Pedestrian, and Transit Mode Share	16.4%	16.2%	16.7%	16.7%
Percent of VMT Traveled in Heavy or Severe Congestion	1.25%	3.01%	4.06%	4.86%
Annual Transit Passenger Trips	19.7 million	20.7 million	22.6 million	27.8 million
Accessibility Index*	57,900	49,300	55,900	71,200

Table 6 **Source: PAG**

**The Accessibility Index is a way of quantifying, for the purpose of comparison, how easily residents can travel to destinations, such as employment, shopping and services. The higher the Accessibility Index value, the more destinations a resident can reach in a shorter amount of time by both automobile or transit.*

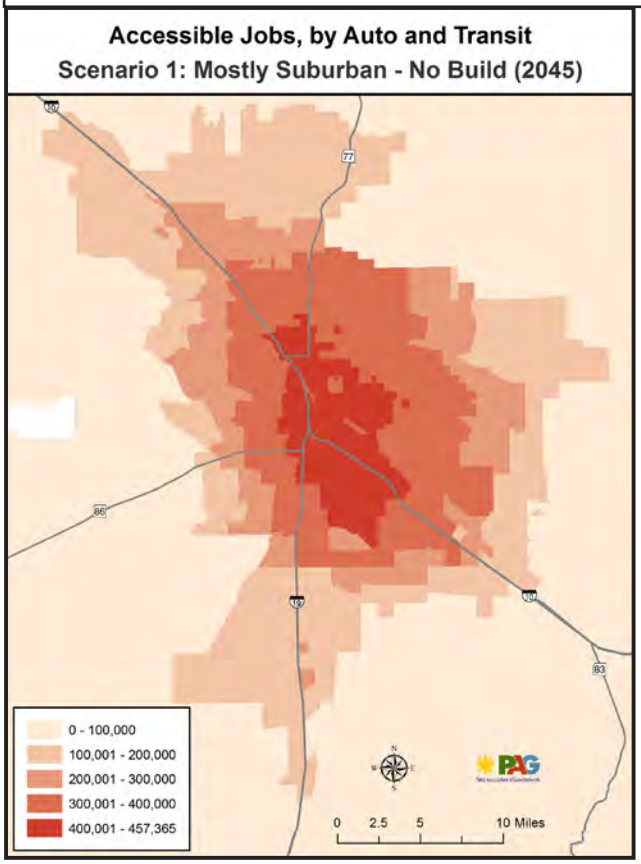
Road segments with heavy future peak-hour congestion under three land use scenarios

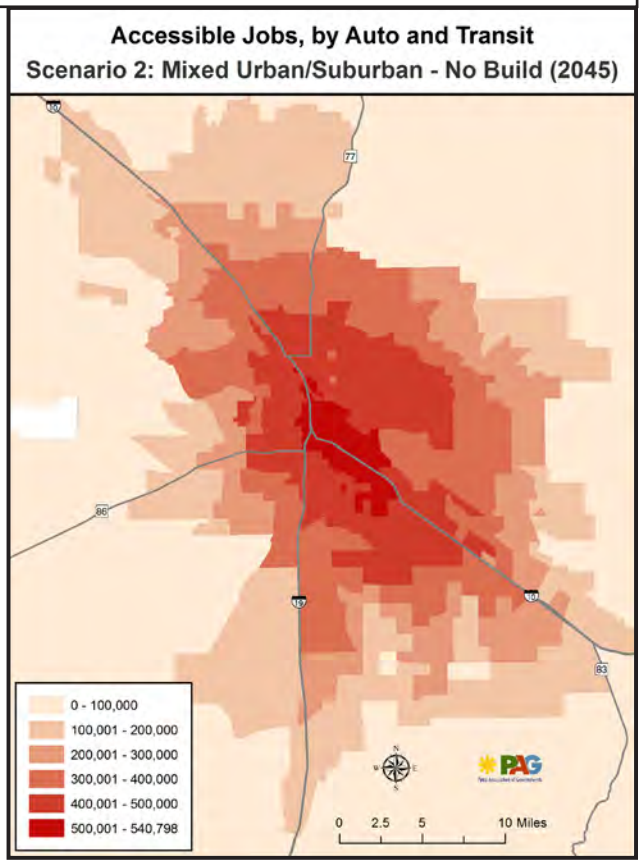


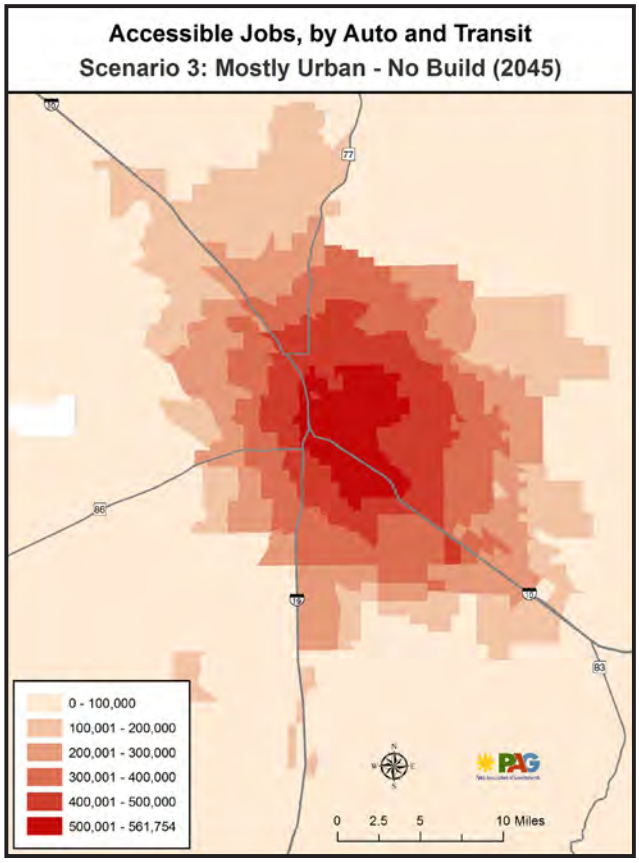
Map 6

Purple lines indicate where future congestion is predicted to be heavy under all three land use scenarios if no capacity were added. These were looked at as high priority locations for improvements.

Automobile and transit access to jobs - comparison of scenarios







Map 7

The three maps show how many employment opportunities can be reached from certain locations in the region by automobile and public transportation for the three scenarios.

Investment Options

The second step of the 2045 RMAP scenario analysis was to consider the performance of multiple transportation investment options (IO) and how those investment options interacted with the land use scenarios. The 2045 RMAP looked at four options, each emphasizing a different set of goals and performance outcomes for the system, but using the same revenue constraints. It should be noted that none of the investment options eliminates funding for any element of the transportation system. Instead, the investment options allocate funding by shifting only within flexible funding sources to emphasize a certain element of the system.

INVESTMENT OPTION 1: Maintain current approach to funding

This investment option is the most similar to the prior long-range transportation plan recommendations. By maintaining the current approach to funding, the region significantly expands the arterial and collector network (45% of expenditures), adds additional rapid transit lines (34%), continues progress on bicycle and pedestrian infrastructure (3.4%), and commits minimal regional funding to roadway preservation (15.0%).

INVESTMENT OPTION 2: Invest more in repairing and maintaining roadways

This investment option focuses on committing more regional funding to preserving the existing transportation system at a high level. By focusing on system preservation, the region has funding available to expand roadway capacity on the most congested or deficient corridors (33% of expenditures), add additional rapid transit lines and transit service (32%), maintain progress on bicycle and pedestrian infrastructure (3.5%), and bring the majority of pavement on the region's roadways up to good condition (28%).

INVESTMENT OPTION 3: Invest more in bike, pedestrian and transit service

This investment option increased funding for the bike, pedestrian and transit categories. By increasing funding for bike and pedestrian infrastructure and transit, regional funding for roadway expansion and modernization is minimal (29% of expenditures), there are multiple additional rapid transit lines and service improvements included with transit increases (38%), bike and pedestrian funding is nearly doubled (6.1%), and the funding commitment to system preservation is substantial (23%).

INVESTMENT OPTION 4: Invest more in higher-speed cross-town corridors

This investment option focuses on investments connecting to Tucson International Airport and on upgrading key corridors to higher-capacity "regional arterials" as defined in PAG's Regionally Significant Corridors Study. This alternative keeps roadway expansion and modernization funding similar to the baseline, but instead of expanding the arterial network it emphasizes regional corridors (43% of expenditures). The alternative adds a few additional rapid transit lines for cross-town travel (28%), makes some progress on bicycle and pedestrian infrastructure (2.8%), and commits regional funding to roadway preservation (23%).

2045 RMAP Investment Options

CONTINUE REGIONAL FUNDING	OPTION 1 Maintain our current approach to funding.	OPTION 2 Invest more to repair and maintain roads.	OPTION 3 Invest more in bike, pedestrian, and transit infrastructure.	OPTION 4 Invest more in higher-speed cross-town corridors.
ROAD REPAIR AND MAINTENANCE	**$2 billion** Funding level likely leads to further deterioration of roadways.	**$3.6 billion** Funding level brings most major roads up to good condition.	**$3 billion** Significant improvement in road conditions.	**$3 billion** Significant improvement in road conditions.
ROADWAY EXPANSION	**$5.7 billion** Adds substantial capacity and new roads. Largest expansion of road network of the 4 options.	**$4.3 billion** Adds moderate capacity and some new roads, but fewer new lane miles than Option 1.	**$3.7 billion** Fewest new roadway lane miles of 4 options.	**$5.5 billion** Focuses on adding capacity and reducing travel times on major cross-town corridors.
BIKE AND PEDESTRIAN IMPROVEMENTS	**$450 million** Funding adequate to address about ½ of identified bike and pedestrian needs.	**$450 million** Funding adequate to address about ½ of identified bike and pedestrian needs.	**$800 million** Funding meets most identified needs.	**$365 million** Funding adequate to improve bike and pedestrian conditions in the most critical locations.
TRANSIT OPERATIONS AND UPGRADES	**$4.3 billion** Adds rapid bus service on 5 routes, includes 2 streetcar extensions, and commits $150 million to improve existing bus services.	**$4.1 billion** Adds rapid bus service on 5 routes, includes 1 streetcar extension, and commits $150 million to improve existing bus services.	**$4.9 billion** Adds rapid bus service on 5 routes, includes 2 streetcar extensions, 1 light rail project, and commits $200 million to improve existing bus services.	**$3.6 billion** Adds rapid bus service on 4 routes.

Table 7

Scenario Performance

The following table shows the results of 15 model runs comparing the performance of the future of the transportation system under the three land use scenarios and the four different investment options. The modeling results quantify the trade-offs of different investment approaches and show how those investments interact with different land use decisions. In general, investing more in road capacity on a more dispersed development pattern reduces congestion and vehicle travel times but increases VMT and decreases use of transit and active transportation modes. Conversely, a more compact development pattern with more investments in pavement preservation and alternative modes results in more alternative mode usage and lower VMT but also increased congestion.

Comparison of transportation performance for select measures across different scenarios and investment options

Performance Measure	Current	Investment Option (IO)	Scenario 1: Mostly Suburban	Scenario 2: Mixed Urban and Suburban	Scenario 3: Mostly Urban
Average Daily Vehicle Miles Traveled per Capita	20.58	No Build	21.37	21.09	20.69
		IO1: Current approach to funding	22.5	22.0	21.3
		IO2: Repairing and maintaining roadways	22.2	21.9	21.2
		IO3: Bike, pedestrian, and transit focus	22.1	21.8	21.2
		IO4: Crosstown Corridors	22.6	22.1	21.4
Average Daily Vehicle Hours Traveled per Capita (minutes)	32:23	No Build	35:12	35:32	35:52
		IO1: Current approach to funding	33:39	33:52	34:20
		IO2: Repairing and maintaining roadways	33:53	34:05	34:31
		IO3: Bike, pedestrian, and transit focus	33:59	34:12	34:37
		IO4: Crosstown Corridors	33:31	33:49	34:06
Bike, Pedestrian and Transit Mode Share	16.3%	No Build	16.2%	16.7%	16.7%
		IO1: Current approach to funding	16.0%	16.4%	16.7%
		IO2: Repairing and maintaining roadways	16.1%	16.5%	16.7%
		IO3: Bike, pedestrian, and transit focus	16.2%	16.6%	16.8%
		IO4: Crosstown Corridors	15.9%	16.3%	16.6%
Percent of VMT Traveled in Heavy or Severe Congestion	1.15%	No Build	3.01%	4.06%	4.86%
		IO1: Current approach to funding	1.4%	1.6%	2.8%
		IO2: Repairing and maintaining roadways	1.8%	2.0%	3.1%
		IO3: Bike, pedestrian, and transit focus	1.9%	2.1%	3.2%
		IO4: Crosstown Corridors	1.3%	1.6%	2.6%
Annual Transit Passenger Trips	19.7 million	No Build	20.7 million	22.6 million	27.8 million
		IO1: Current approach to funding	23.8 million	27.4 million	32.2 million
		IO2: Repairing and maintaining roadways	24.2 million	27.7 million	31.8 million
		IO3: Bike, pedestrian, and transit focus	24.7 million	28.4 million	33.3 million
		IO4: Crosstown Corridors	23.3 million	25.9 million	31.3 million
Accessibility Index (Larger numbers correspond with greater accessibility)	57,000	No Build	49,300	55,900	71,200
		IO1: Current approach to funding	57,000	65,700	79,400
		IO2: Repairing and maintaining roadways	55,500	63,700	78,400
		IO3: Bike, pedestrian and transit focus	54,900	63,200	77,900
		IO4: Crosstown Corridors	58,400	66,300	81,400
Percent of Pavement in Poor Condition	37%	No Build	N/A	N/A	N/A
		IO1: Current approach to funding	60%	60%	60%
		IO2: Repairing and maintaining roadways	15%	15%	15%
		IO3: Bike, pedestrian, and transit focus	30%	30%	30%
		IO4: Crosstown Corridors	30%	30%	30%

Table 8 Source: PAG

The impacts of the different land use and investment choices were presented to the public through the Engage 2045 decision tool (discussed in Chapter 2). The tool allowed participants to evaluate how the different choices affected the future of the region's transportation system and asked them to identify how limited dollars should be spent.

The input received through the scenario process resulted in a hybrid of the four investment options, leading to the identification of funding priorities, objectives and targets, and a final list of 2045 RMAP projects and programs. The hybrid investment option was closest to Investment Option 2 in terms of funding priorities, with additional recommended increases in funding for transit and bicycle and pedestrian infrastructure.

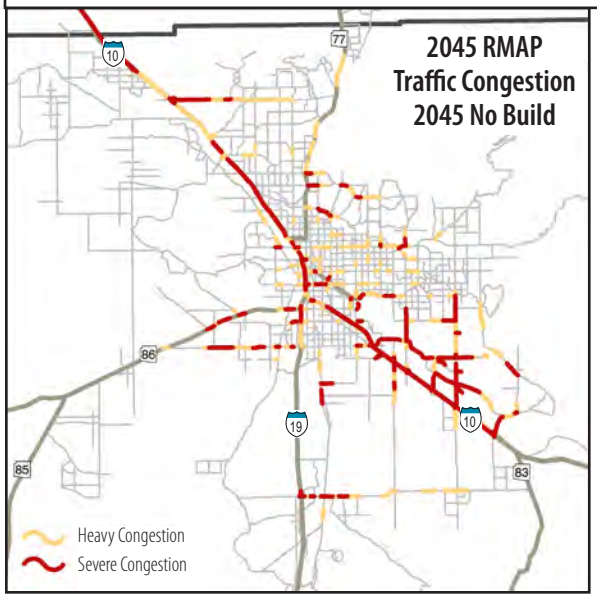
Table 8 and the following maps show how the performance of the final RMAP project list compares against current conditions and a 2045 no-build future. 2045 RMAP investments improve infrastructure condition, minimize congestion growth, reduce per capita emissions, improve accessibility and increase transit ridership, all of which is consistent with the input received through the scenario process.

Performance of 2045 RMAP projects compared to current (2015) performance and future performance with no additional transportation investments

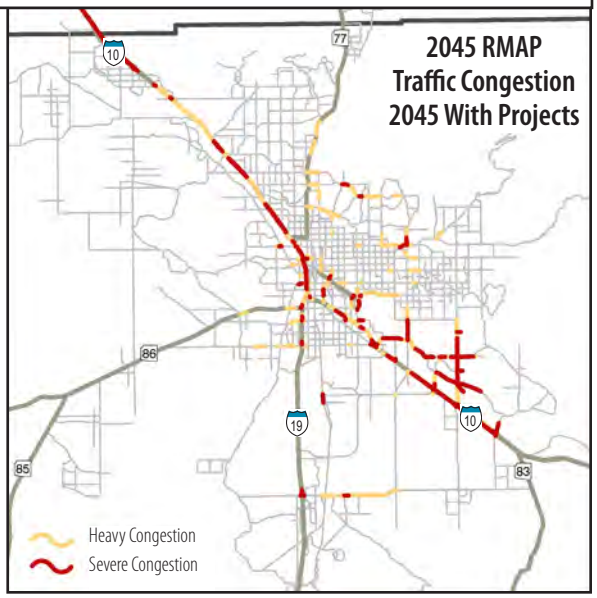
Performance Measure	Current	2045 No-Build	2045 with RMAP Investment
Percent of Pavement in poor condition	37%	NA	20%
Average Daily Vehicle Miles Traveled per Capita	20.58	20.71	21.32
Average Daily Vehicle Hours Traveled per Capita (minutes)	32:23	35:26	34:06
Bike, Pedestrian, and Transit Mode share	16.3%	16.5%	16.2%
Percent of Daily Vehicle Miles Traveled in Heavy or Severe Congestion	1.15%	4.13%	1.86%
Annual Transit Passenger Trips	19.7 million	20.6 million	26 million
Annual per Capita On-Road Co2 Emissions (U.S. Tons)	3.63	2.48	2.51
Accessibility Index (Larger numbers correspond with greater accessibility)	57,000	56,000	64,500

Table 9

Comparison of estimated peak-hour congestion in 2045 with and without RMAP projects

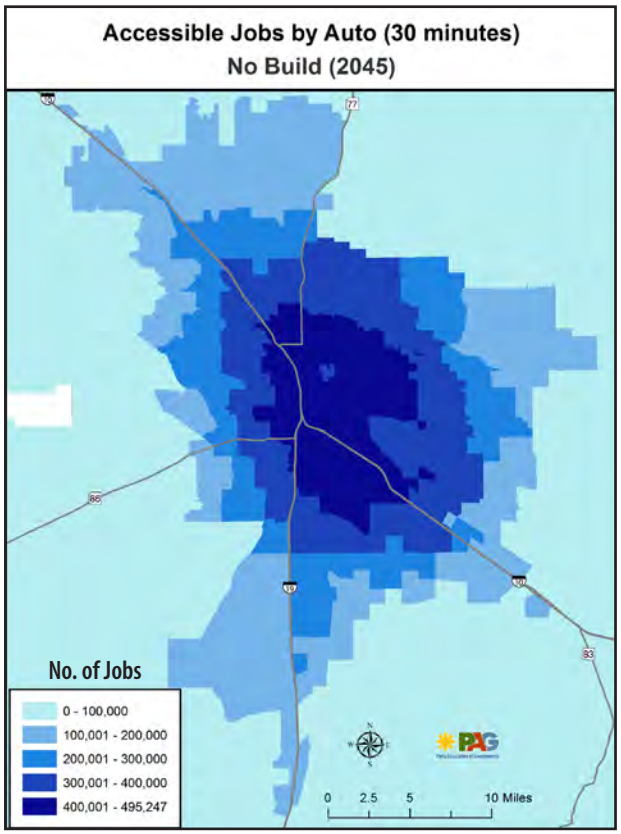


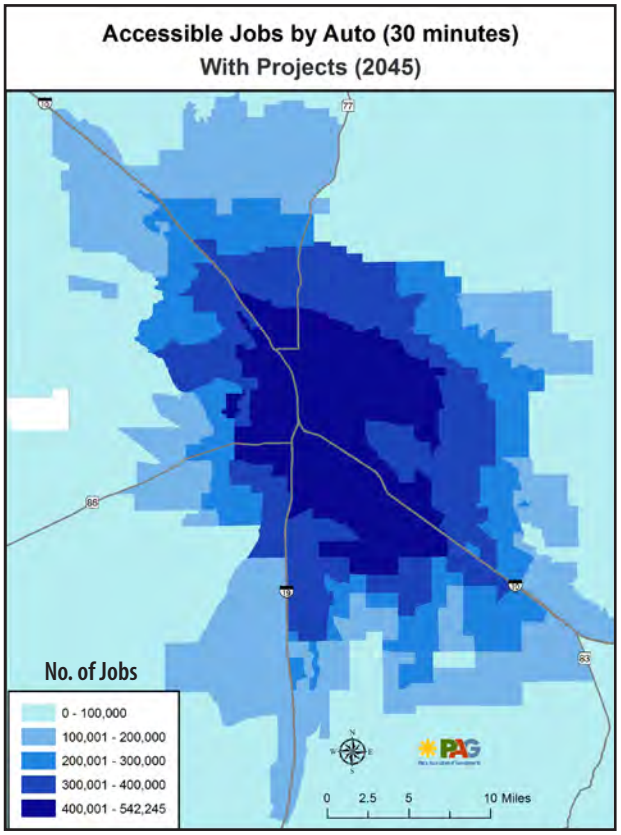
Map 8 Source: PAG

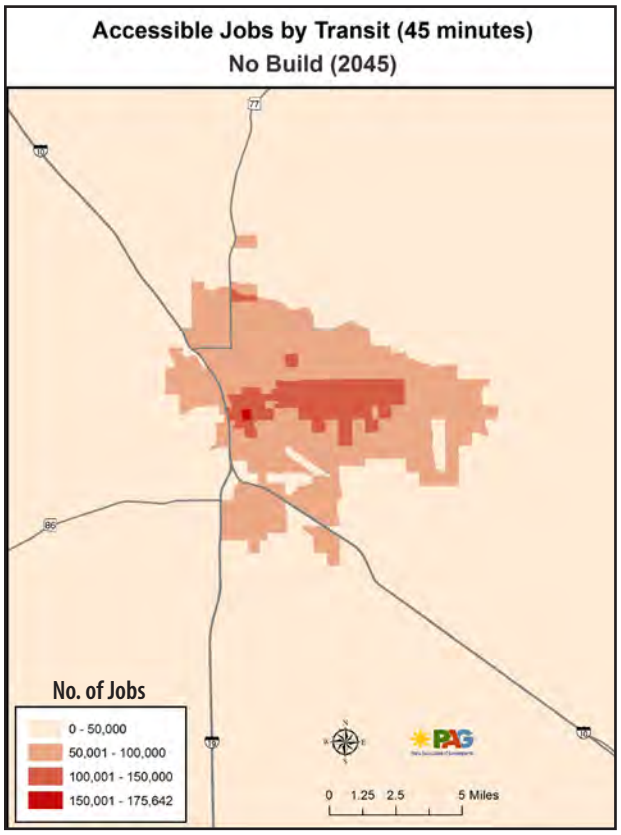


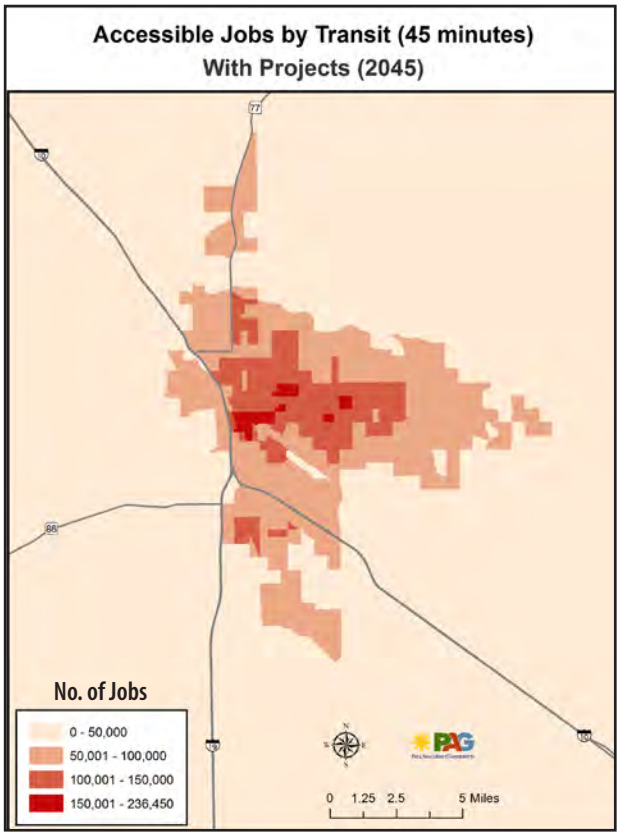
Source: PAG

Comparison of automobile and transit access to jobs with and without RMAP projects









Map 9

Maps show the estimated number of jobs that can be accessed from home by automobile or transit. Both automobile and transit access is improved with 2045 RMAP projects.

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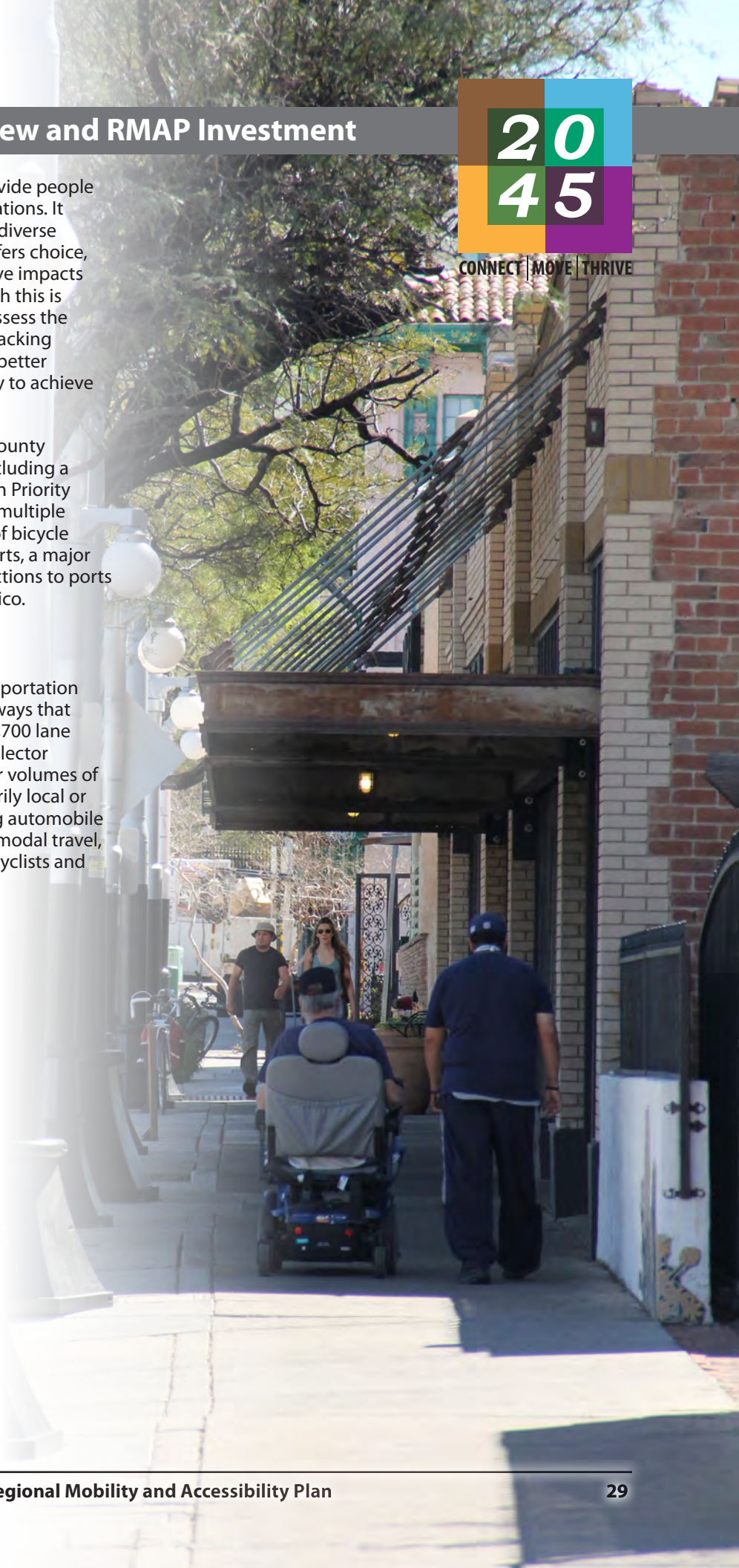
Chapter 5: System Overview and RMAP Investment

An effective transportation system must provide people and goods access to a number of key destinations. It should do so in a way that is safe, meets the diverse transportation needs of a variety of users, offers choice, supports the economy and limits the negative impacts of the system. To evaluate the extent to which this is being achieved, it is necessary to regularly assess the transportation system. By quantifying and tracking transportation performance, the region can better understand which investments are necessary to achieve transportation goals.

The current transportation system of Pima County includes an extensive roadway network – including a portion of a Congressionally designated High Priority Corridors of the National Highway System – multiple transit services, an ever-increasing number of bicycle and pedestrian facilities, three types of airports, a major national railroad corridor, and critical connections to ports of entry between the United States and Mexico.

Existing Roadway Network

The foundation of the existing regional transportation system is approximately 9,000 miles of roadways that make up the road network. Of that, nearly 4,700 lane miles of freeways, parkways, arterials and collector streets serve longer regional trips and higher volumes of traffic. The remaining roadways serve primarily local or neighborhood traffic. More than just serving automobile traffic, the road network also supports multimodal travel, including facilities for buses, pedestrians, bicyclists and the movement of goods.



Freeways

Freeways are limited access, divided highways that use grade-separated intersections and exit/enter ramps with no driveways to safely carry high volumes of high-speed traffic. The normal posted speed limit is 55-75 mph. The region has two freeways, both of which are part of the national Interstate System. I-10 runs to the west and south of the City of Tucson and is over 2,460 miles long, connecting Los Angeles to Jacksonville, Fla. Interstate 19 intersects with I-10 just south of downtown Tucson and runs 64 miles to Nogales, Ariz. Despite their differences in dimensions, both I-10 and I-19 are critical national freight and passenger vehicle corridors. Interstate 10 and I-19 form the southern connection of the CANAMEX Corridor, a Congressional High Priority Corridor, and an important connection with Mexico, Arizona's largest international trading partner. Interstate 10 is the commercial tether to the ports of Long Beach and Los Angeles, the largest container port facilities in the United States and a major destination for goods coming from Asia.

In addition to their importance as national freight corridors, the regional portions of I-10 and I-19 also have a local function, supporting daily commuter travel between the region's cities and towns and connecting many regional employment centers and other destinations. It is estimated that 52 percent of miles traveled on I-10 and I-19 come from vehicles traveling wholly within the region, while 10 percent is from vehicles passing through the region to and from locations outside of Pima County.

In spite of the importance of I-19 and I-10 in the region's growth and economic future, one of the Tucson region's defining characteristics is the relatively limited number of freeway miles. According to the Texas Transportation Institute's (TTI) 2012 Annual Mobility Report, the Tucson region ranked 30th out of 33 medium-sized metropolitan areas in terms of freeway lane miles per capita. Many areas of the region, particularly in the northeast, do not have easy access to a freeway, slowing cross-town travel for some travelers.

The Tucson region has struggled for decades with the idea of adding new freeways. An east-west, loop freeway within the Tucson Basin is often raised in transportation planning-related discussions. Supporters and opponents both submit passionate arguments for and against expanding the freeway network with reasons related to regional mobility, economic development, environmental considerations, community character and others.

Future Needs

Given their importance as national and international commerce corridors, as well as critical regional and interregional commuter routes, it is anticipated that I-10 and I-19 will see considerable growth in traffic volumes over the next 30 years, from both commercial and passenger vehicles. If no additional capacity were added to I-10 for example, the region would be predicted to see stop-and-go traffic at peak hours along the entire corridor stretching from Tangerine Road in the north to Colossal Cave Road on the east side of Tucson. I-19 from Sahuarita Road to the I-10 interchange also would see heavy levels of peak-hour congestion, reducing reliability of the Congressionally designated High-Priority Corridor and potentially slowing commercial traffic from Mexico, the region's largest international trading partner.

VMT by trip origin and destination on regional interstate network

Interstate Trip Type	VMT	% of Total VMT
External-External	545,658	10%
External-Internal	1,097,655	19%
Internal-External	1,108,639	19%
Internal-Internal	2,946,141	52%
Total	5,698,093	100%

Table 10 **Source: PAG Travel Demand Model**

Current and future traffic volumes at select regional interstate locations

Freeway	From	To	2015 Daily Traffic Volume	2045 Daily Traffic Volume with RMAP Projects
I-10	Congress St	22nd St	172,000	219,000
I-10	Speedway Blvd	Congress St	170,000	212,000
I-10	22nd St	I-19 Interchange	150,000	196,000
I-10	Grant Rd	Speedway Blvd	154,000	192,000
I-10	Miracle Mile	Grant Rd	153,000	189,000
I-10	Prince Rd	Miracle Mile	138,000	173,000
I-10	Ruthrauff Rd	Prince Rd	134,000	167,000
I-10	Alvernon Way	Valencia Rd	73,000	153,000
I-10	Valencia Rd	Craycroft Rd	71,000	141,000
I-10	Craycroft Rd	Wilmot Rd	70,000	139,000
I-19	I-10 Interchange	Ajo Way	90,000	111,000
I-19	Ajo Way	Irvington Rd	78,000	93,000

Table 11 **Source: PAG**

In descending order by 2045 traffic volume.

Identified Improvements

The largest projects included in the 2045 RMAP are those that seek to improve the performance of the Interstate System. The 2045 RMAP recommends $2.3 billion to improve the interstate system. Funded projects include:

- I-10 West – The 2045 RMAP includes reconstruction of four traffic interchanges, with grade separations and railroad tracks, along I-10 between I-19 and the northern Pima County line.
- I-10 East – The 2045 RMAP includes a widening of I-10 East from I-19 to Houghton, including five traffic interchanges.
- I-19 – The 2045 RMAP includes a widening of I-19 from 4 to 6 lanes from San Xavier Road to Ajo Way, including two traffic interchanges.
- State Route 210 – The 2045 RMAP includes an extension of State Route 210 to connect with I-10 near Alvernon Way.
- State Route 410/Sonoran Corridor – The 2045 RMAP includes a new 4-lane freeway connecting I-10 to I-19. The Sonoran Corridor has been identified by Congress in the most recent surface transportation bill as a High Priority Corridor of the National Highway System.
- Freeway management system – The 2045 RMAP also includes a freeway management system program, which includes message boards, detection cameras, and traffic control strategies for maximizing the operational performance of available interstate capacity.

Given a reduction in assumed transportation revenue forecasts from the previous long-range transportation plan, a number of identified critical needs on the region's interstate or freeway system are not projected to be financially feasible within the 2045 RMAP's 30-year horizon. These include:

- Widening of I-10 to 10 travel lanes from Prince Road to the northern Pima County line
- Two additional lanes of I-10 east of Kino Parkway to Houghton Road
- Widening of I-19 to 6 lanes from Continental Road to San Xavier Road
- 14 traffic interchange improvements

Taken together, these projects account for at least $1.5 billion in unfunded needs. These projects can be undertaken if additional transportation funding is made available, or at a point in the future beyond 2045.

Arterials and Parkways

Arterial roads and parkways are surface streets that largely serve traffic moving within the region. The difference between the two types of facilities is that parkways typically have higher speed limits (45 to 55 mph), longer distances between traffic signals, fewer driveways and occasionally grade-separated intersections. Arterials tend to have speed limits between 35 to 45 mph, more frequent signalized intersections, and more driveway access points. Parkways and arterials are intended to move approximately 40,000 to 60,000 vehicles per day.

The arterial and parkway network is especially important in this region due to the limited coverage of the freeway system. In fact, the vast majority of vehicle travel occurs on the region's arterial road network. According to TTI's 2015 Urban Mobility Scorecard, approximately 75 percent of regional vehicle miles traveled occur on arterial roadways, a share well above the national average for urban areas of 52 percent. This makes the arterial network a particularly important component of the Tucson region's transportation network presenting a unique set of challenges for regional mobility and accessibility.

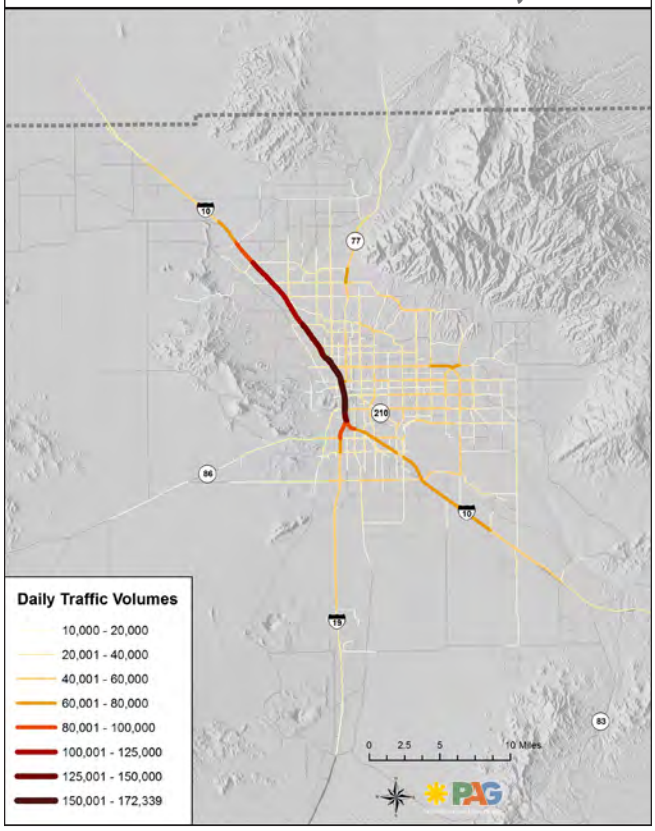
Current and future traffic volumes at select regional road network locations

Roadway Name	From	To	2015 Daily Traffic Volume	2045 Daily Traffic Volume with RMAP Projects
Houghton	Drexel Rd	Valencia Rd	23,000	109,000
Speedway	Main Ave	I-10	79,000	102,000
Valencia	Nexus Rd	Houghton Rd	15,000	101,000
Houghton	Valencia Rd	Rita Rd Extension	19,000	100,000
Valencia	Kolb Rd	Old Vail Rd	25,000	95,000
Houghton	Rita Rd Extension	Mary Ann Cleveland Way	18,000	93,000
Kolb	Irvington Rd	Valencia Rd	49,000	91,000
Valencia	Little Town Rd	I-10	41,000	90,000
Valencia	Wilmot Rd	Kolb Rd	41,000	90,000
Houghton	Mary Ann Cleveland Way	I-10	12,000	85,000
Valencia	Swan Rd	I-10	36,000	80,000
Valencia	Old Vail Rd	Nexus Rd	21,000	81,000
Oracle	Ina Rd	Magee Rd	64,000	74,000
Kino Pkwy	Winsett St	Aviation Pkwy	60,000	72,000
Kolb	Escalante Rd	Irvington Rd	42,000	72,000
Tanque Verde	Kolb Rd	Sabino Canyon Rd	68,000	71,000
Houghton	Drexel Rd	Irvington Rd	24,000	70,000
Valencia	Calle Santa Cruz	I-19	49,000	69,000
Grant	Craycroft Rd	Wilmot Rd	63,000	68,000
Oracle	Hardy Rd	Calle Concordia	58,000	68,000
Grant	Wilmot Rd	Craycroft Rd	63,000	68,000
Oracle	Calle Concordia	Hardy Rd	55,000	68,000
Valencia	Houghton Rd	Old Spanish Tr	10,000	67,000

Table 12 Source: PAG

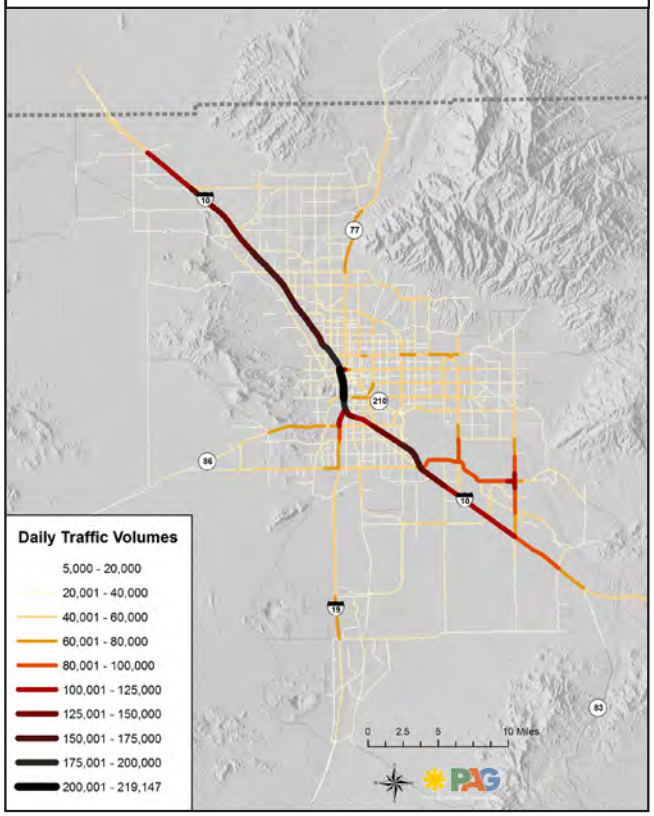
Comparison of current and future traffic volumes

Current traffic volumes in Pima County



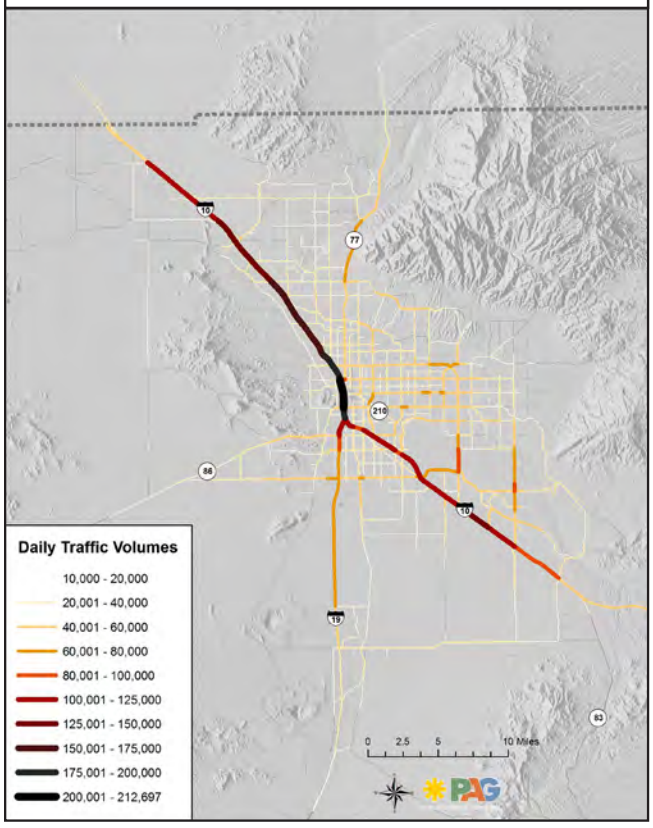
Map 10

Future traffic volumes in Pima County – with RMAP projects



Map 11

Future traffic volumes in Pima County – No Build



Map 12

Maps show current (2015) daily traffic volumes compared to 2045 daily traffic volumes with and without RMAP projects. PAG projects that vehicle travel will increase by as much as 45 percent regionally, with some segments of I-10 moving as many as 220,000 vehicles per day in 2045.

Urban arterials present a particular set of challenges because in addition to serving a regional mobility purpose of moving people, they also are often commercial corridors and destinations for major shopping and services. Thus, multiple user needs, such as business access, transit service, safe pedestrian crossings and bike facilities, need to be accommodated along with the movement of traffic. This can lead to potential conflicts, safety issues and a struggle to find the right balance to meet all needs. This challenge is especially acute at signalized intersections, where most traffic congestion and conflicts on the regional street network are concentrated and which, therefore, provide the capacity limitations of the roadway.

Widening a roadway in an urban area may add needed capacity to improve the flow of automobiles, buses and commercial vehicles. However, a road widening project may require property condemnation, and wider, faster streets, if not designed for all users, can present increased safety challenges for vulnerable users. On the other hand, if travel demand increases, failure to improve traffic flow and add capacity may lead to corridors failing to fulfill their mobility role, potentially leading to greater traveler frustration and negative economic consequences for the region. The negative economic consequences include lost traveler time and delayed goods movement.

Below are strategies that can improve the operational performance of the region's roads:

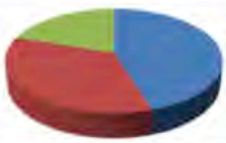
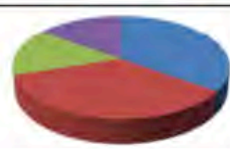
Signal Timing Improvements: The region has roughly 600 traffic signals and each signal has a significant impact on how safely and efficiently we share the space of intersections as we travel to our destinations. Optimizing signal timing and synchronization and maintaining the functioning of the system can reduce traveler delay on the arterial network. However, traffic flow must be balanced across intersecting corridors with the safety of all users. Signal preemption by emergency vehicles (where signal operation is interrupted to give right of way to emergency vehicles), for example, improves response times and saves lives, but also disrupts normal signal phasing. Following emergency preemption, it can take several cycles for a signal to be fully integrated back into the phasing of the signal network, complicating synchronization. Similarly, when pedestrian signals are actuated at intersections, more time is allocated to the pedestrian crossing, again changing the timing of the signal phases.

Intersection Capacity Improvements: Since the majority of congestion on the arterial network is concentrated at intersections, focusing on intersections can be a more cost effective means of improving traffic flow than widening entire corridors. The main ways in which intersection throughput can be increased are by:

- Adding lanes for turning movements.
- Reducing the number of signal phases. This includes, but is not limited to, turn restrictions that reduce the number of movements being served.
- Constructing grade-separated intersections (GSI) for uninterrupted flow in all directions.

Wider intersections can present safety challenges, particularly for pedestrians, as exposure is increased with longer crossing distances and more potential vehicle conflicts. This can be mitigated through installation of pedestrian refuge islands, the use of protected left-turn signal phasing, turn restrictions and other potential safety treatments. Although intersection improvements have been made in recent years, the need for more improvements has been identified as part of this plan.

Capacity of Intersections by Type

Intersection Type	Description	Ratio of Green Time/Cycle Length for Major Street Through	Major Street Through Capacity (veh/hr/ln)
Grade Separated	Uninterrupted flow	100% 	1,900
Signalized - 2 Phases	No protected left turn phases	60% 	1,140
Signalized - 3 Phases	One protected left turn phase (either major street or minor street lefts have protected phase)	45% 	855
Signalized - 4 Phases	Two protected left turn phases (both major and minor street lefts have a protected phase)	35% 	665

Major Street Thru Movement
Minor Street Thru Movement
Major (or Minor) Street Left Turn Movement
Minor (or Major) Street Left Turn Movement

Table 13 Source: PAG

***Bus pullouts**:* A bus pullout is a designated location on the roadside where a bus may exit the flow of traffic to pick up and drop off passengers. Bus pullouts improve traffic flow by removing the obstruction posed by transit vehicles when stopped in the travel lane. Also, bus pullouts can serve as turn lanes at driveways to reduce driveway congestion. Bus pullouts improve corridor safety by reducing rear-end collisions and providing greater separation between roadside bus stops and travel lanes. However, bus pullouts can reduce transit reliability where vehicles have difficulty merging back into the flow of traffic. Placing pullouts at the far side of signalized intersections may increase the ability of transit vehicles to merge by creating longer breaks in traffic flow.

Access Management: Access management refers to the design, implementation and management of entry and exit points, such as driveways, between roadways and adjacent properties. Effective access management reduces safety conflicts caused by turning vehicles and improves the flow of traffic. Some strategies for managing access include constructing continuous raised medians, consolidating driveway access, locating access at side streets, and including frontage roads where appropriate and feasible. Caution should be taken to avoid excessive access restrictions because this may pose a challenge for commercial properties, particularly in more urban areas.

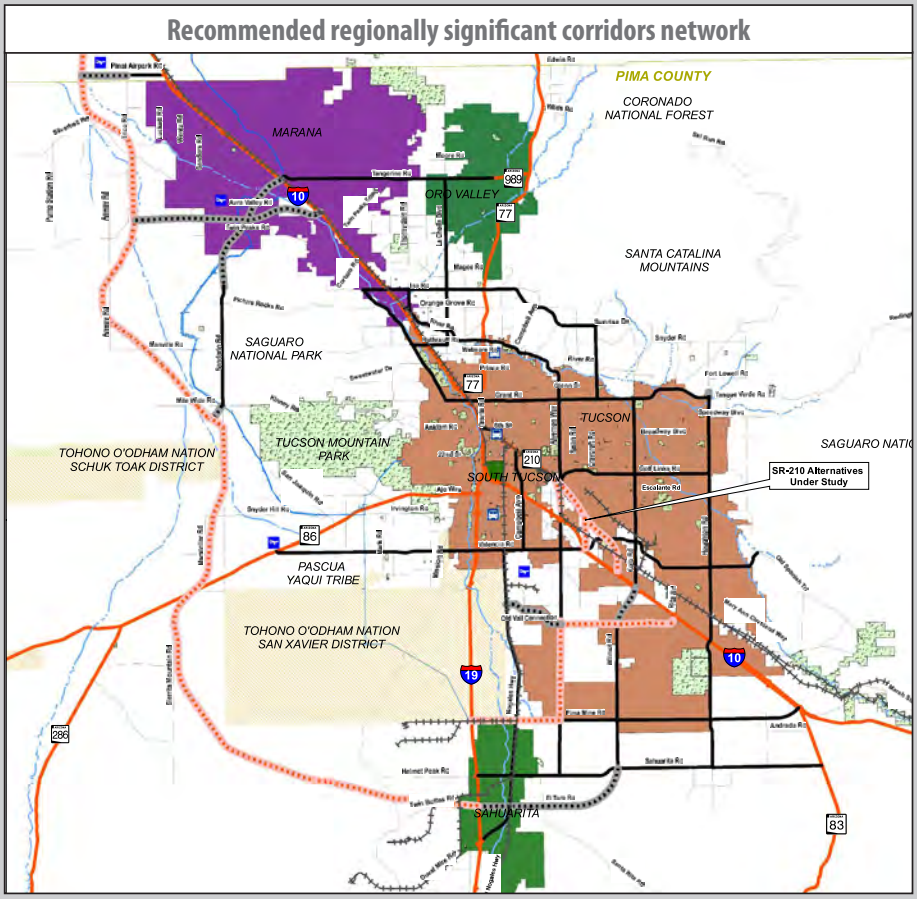
***Travel Demand Management**:* Travel Demand Management (TDM) is a term used to indicate a range of strategies that aim to make more efficient use of the existing transportation system. In particular, this includes reducing trips by single-occupancy vehicles (SOV) or by redistributing the timing of SOV trips to flatten spikes in peak hour demand. Travel demand management includes a host of strategies such as supporting flexible work schedules and working from home, expanding carpooling and vanpooling incentives, establishing guaranteed ride home programs, building park-and-ride lots, improving alternatives to driving, promoting car sharing, and pursuing land use approaches that improve accessibility, among many others.

The 2014 Regionally Significant Corridors Study

In 2014, PAG completed the Regionally Significant Corridors (RSC) Study. The RSC Study is a technical assessment of existing, planned and proposed major transportation corridors in and around the PAG region that achieve broad regional objectives.

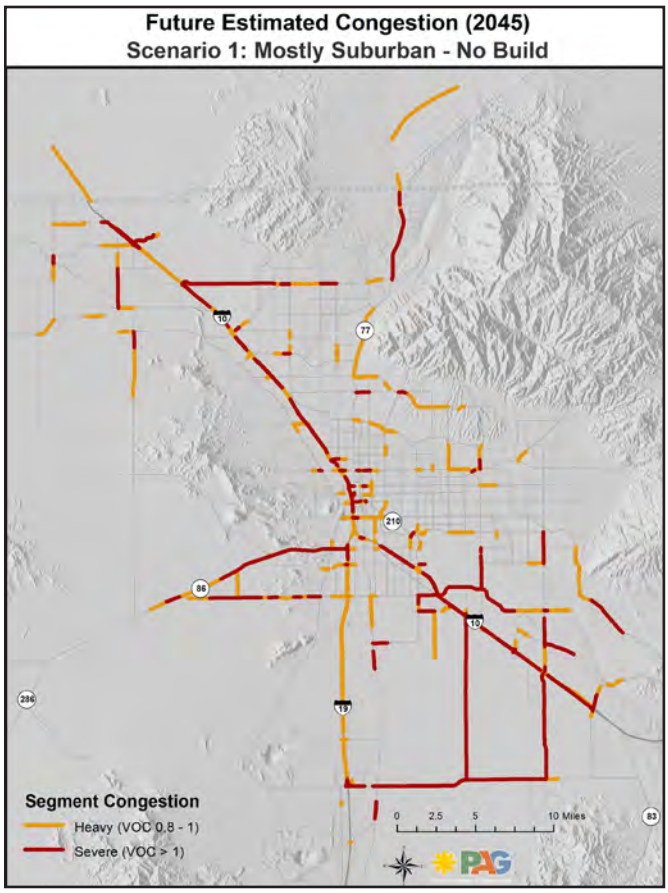
In particular, the RSC Study discussed "regional arterials," conceived as roadways that fill the gap between fully access controlled freeways and local arterials. Regional arterials utilize access management strategies, alternative intersection configurations, reduced signal phases and increased speed limits to serve longer trips and improve road capacity and regional mobility. Since regional arterial improvements focus on intersections and access, major improvements to mobility and capacity can be achieved at lower costs and with fewer impacts on adjacent properties. Examples of these types of improvements can already be seen in the indirect left turns on Grant Road and Oracle Road and at Ina Road and Oracle Road.

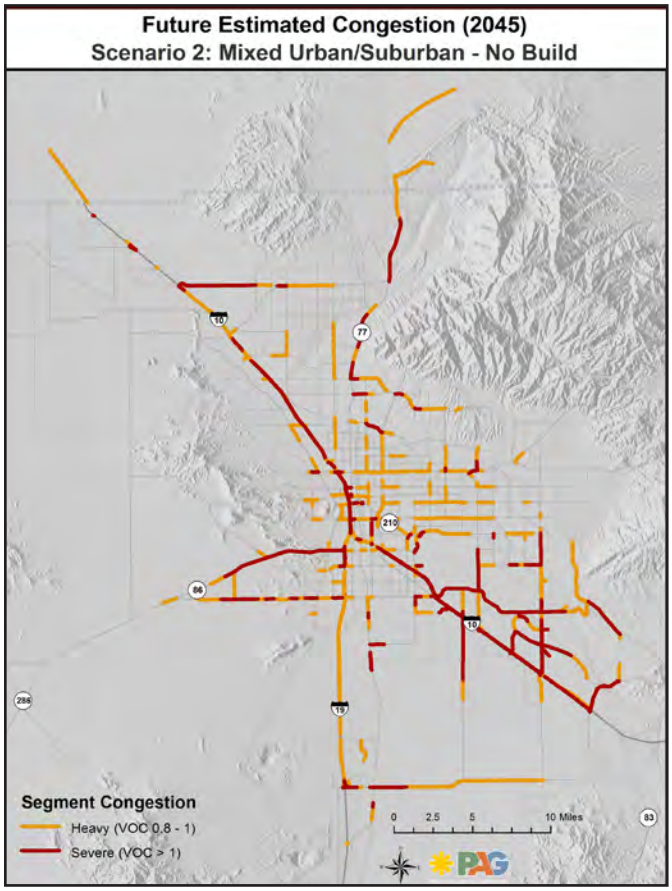
No specific regional arterial projects are included in the 2045 RMAP, but regional arterial elements can be included in road capacity projects, where appropriate, to increase regional mobility.

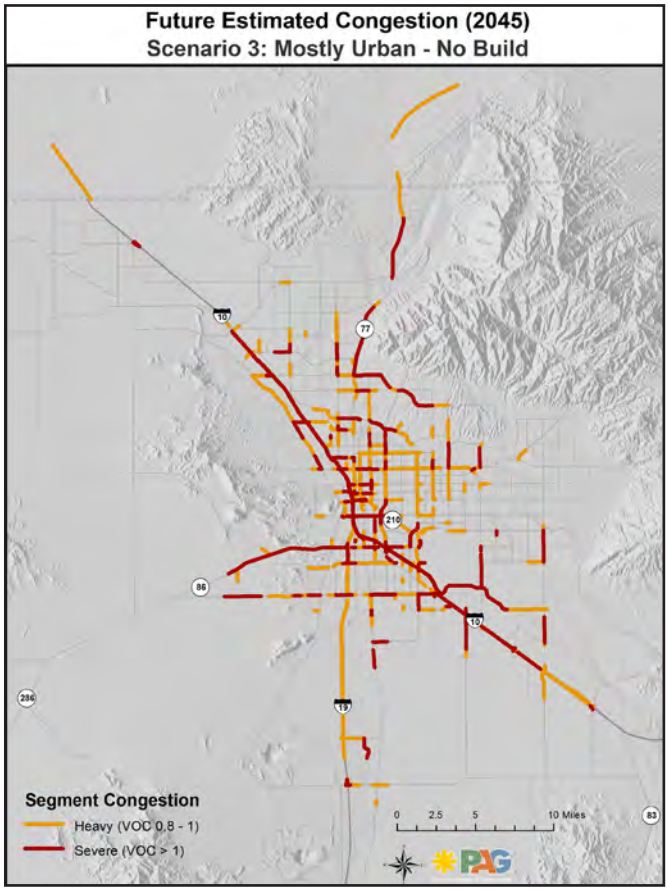


Map 13 Source: PAG

Current and future estimated peak-hour congestion across three future scenarios







Map 14

Smart Growth: A Smart Growth approach means encouraging new development that improves accessibility to daily needs and expands transportation choices for people. Some strategies of Smart Growth include increasing density, particularly near transit; mixing land uses, and improving street connectivity, among others. While Smart Growth may increase the intensity of congestion at specific locations, these strategies have been shown to reduce per capita travel delay since overall VMT is reduced through shorter trips and a shift to non-SOV travel modes. Increased congestion is often an anticipated outcome of Smart Growth, but it is balanced by the number of people who will have better access to daily goods. This is especially true for the 80 percent of trips which are non-work trips.

Roadway Capacity Improvements: Roadway capacity can be improved by building new roads to increase network connectivity and through adding travel lanes to existing facilities. Increasing roadway connectivity provides more route options and, in some cases, more direct travel to destinations, thereby relieving demand on parallel corridors. Widening existing corridors adds additional lane capacity where current or future anticipated travel demand is greater than can be reasonably accommodated through the strategies outlined above or where the corridor is critical for meeting regional mobility needs. The 2045 RMAP used a scenario planning approach to identify and prioritize corridors that are showing high future travel demand across three different future growth scenarios. This is to reduce the risks associated with costly capital investments by targeting limited funds to where they would have the greatest impact across multiple alternative futures.

Future Needs

If no additional improvements were made to the region's road network, it is anticipated that peak hour congestion would increase threefold over current conditions. While some congestion is certainly expected at certain times in certain locations (such as dense downtown districts), failure to improve the arterial network would result in traffic gridlock on many of the region's major corridors. This would lead to significantly reduced access and mobility, ultimately negatively affecting residents' quality of life and the region's economy.

Identified Improvements

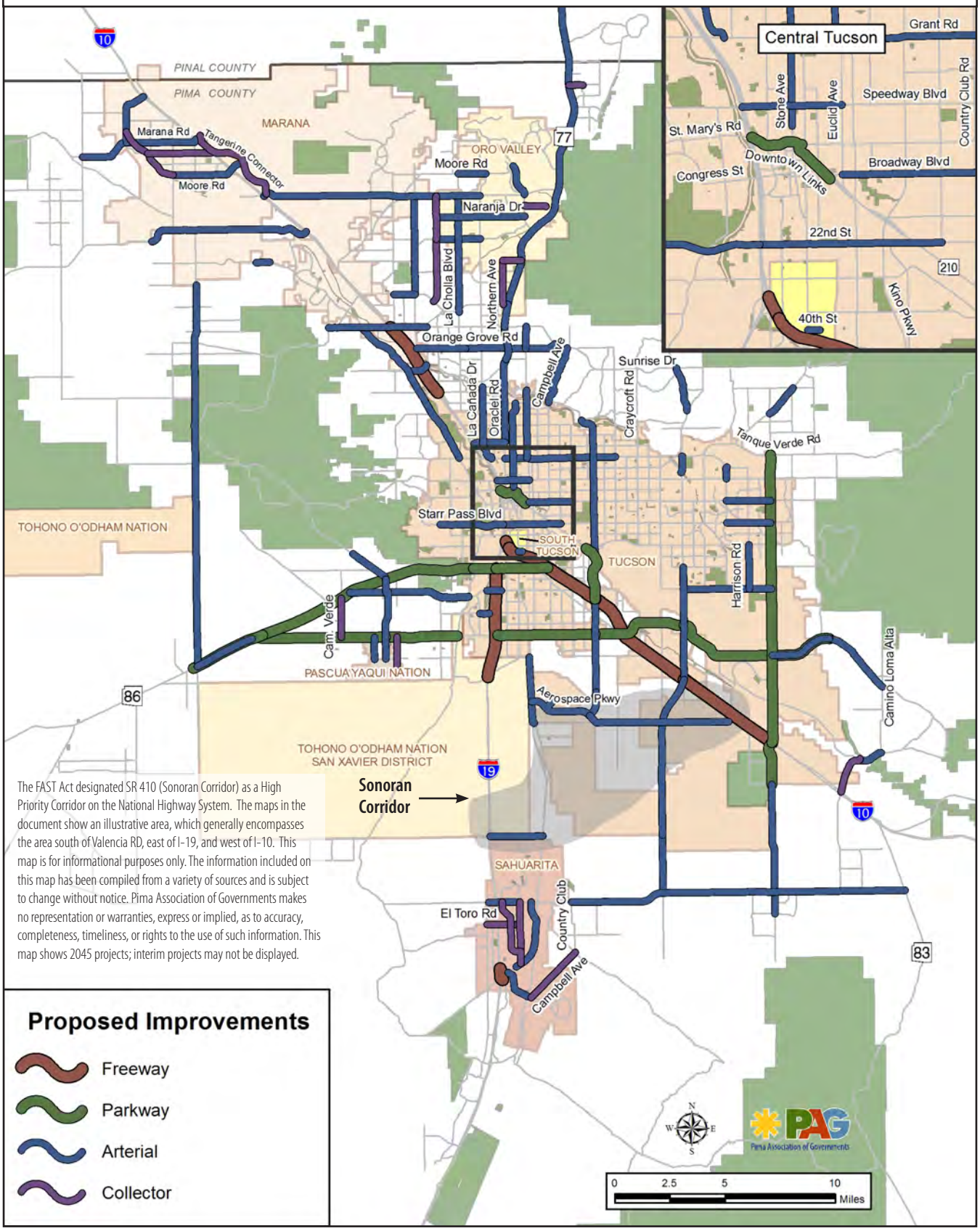
The 2045 RMAP proposes more than 80 roadway capacity improvements on the arterial network. This is estimated to cost over $2.4 billion over the next 30 years. These would primarily address critical network bottlenecks or improve the connectivity of the road network. The 2045 RMAP also proposes over $200 million for programs that would help to alleviate congestion and maximize the current system, such as bus pullouts, intersection improvements, arterial management systems, ITS improvements, and other projects and programs.

Example 2045 RMAP corridor projects and programs

Project Name	Location	Description
Luckett / Moore Rd	Luckett Rd to Sanders Rd	Construct 4-lane roadway
Speedway Blvd	I-10 to Euclid Ave	Widen to 6-lane roadway, includes new railroad underpass
SR 77: Oracle Rd	Rudasill Rd to Magee Rd	Widen to 8-lane roadway with bike lanes and sidewalks
SR 86: Ajo Way	Kinney Rd to I-10	Widen to 6-lane roadway with bike lanes and sidewalks
Sahuarita Rd	La Cañada Dr to La Villita Rd	Widen to 6-lane roadway with bike lanes and sidewalks
Orange Grove Rd	Corona Rd to Skyline Dr	Widen to 4-lane roadway with bike lanes and sidewalks
Irvington Rd	Kolb Rd to Houghton Rd	Widen to 4-lane roadway, bike lanes, sidewalks & drainage
Nogales Hwy	Old Vail Connection Rd to Los Reales Rd	Widen to 6-lane roadway with bike lanes and sidewalks
Arterial Traffic Management System	Regionwide	Improve the operation of traffic signal systems and traffic flow
Bus Pullouts	Regionwide	Construct transit pullouts at select bus stops
Intersection Improvements	Regionwide	Improve intersections throughout the region

Table 14 (For full project list see Appendix 3)

2045 RMAP Multimodal Roadway Projects



The FAST Act designated SR 410 (Sonoran Corridor) as a High Priority Corridor on the National Highway System. The maps in the document show an illustrative area, which generally encompasses the area south of Valencia RD, east of I-19, and west of I-10. This map is for informational purposes only. The information included on this map has been compiled from a variety of sources and is subject to change without notice. Pima Association of Governments makes no representation or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This map shows 2045 projects; interim projects may not be displayed.

Sonoran Corridor

Proposed Improvements

- Freeway
- Parkway
- Arterial
- Collector

Map 15

Condition of Roads and Bridges

In addition to increasing transportation capacity to meet anticipated future demand, the region must also maintain current and future transportation facilities. An investment in operations and maintenance of the system is an investment in both mobility and safety.

Preserving the transportation system has emerged as a national and regional transportation priority. Aging infrastructure continues to deteriorate, reducing the quality of the system and increasing maintenance costs. In fact, public input received during the 2045 RMAP update indicates that the condition of the region's roadways is the No. 1 transportation concern for those who provided input. As such, the 2045 RMAP recommends an increased regional financial commitment to system preservation.

All roads deteriorate over time due to environmental conditions and the volume and type of traffic using the roadway. Without proper maintenance, roadways wear out prematurely. The rate at which deterioration occurs is a function of these factors, as well as the nature and frequency of preventative maintenance activities. Investing in repair and preservation actively reduces the scale of future costs. According to the American Association of State Highway and Transportation Officials (AASHTO), every $1 spent to keep a road in good condition avoids $6 to $14 needed later to rebuild the same road once it has deteriorated significantly. [1]

Deferred maintenance drives up long-term taxpayer costs and accelerates the need for complete roadway rehabilitation, which can be four times as costly. Deferred rehabilitation also compounds the problem, often leading to pavement failure and the need to reconstruct the whole roadbed, at what can reach 10 times the cost.

During the 2008 recession, preventative maintenance activities were often delayed due to reduced availability of funds, resulting in underfunding of the system and further roadway deterioration over that period.

More recently, however, the region's jurisdictions have increased their funding for improving roadway conditions. The voters of the City of Tucson approved Proposition 409, Pima County increased general fund contributions, and the Towns of Oro Valley, Sahuarita and Marana continue to actively manage their pavement assets, using state-shared funds and local general funds.

Currently, nearly 40 percent of the region's major roadways are estimated to be in poor condition.

[1] *American Association of State Highway and Transportation Officials (AASHTO) and The Road Information Project. (2009). "Rough Roads Ahead: Fix Them Now or Pay for It Later." http://roughroads.transportation.org , as cited in http://www.smartgrowthamerica.org/documents/repairpriorities.pdf*

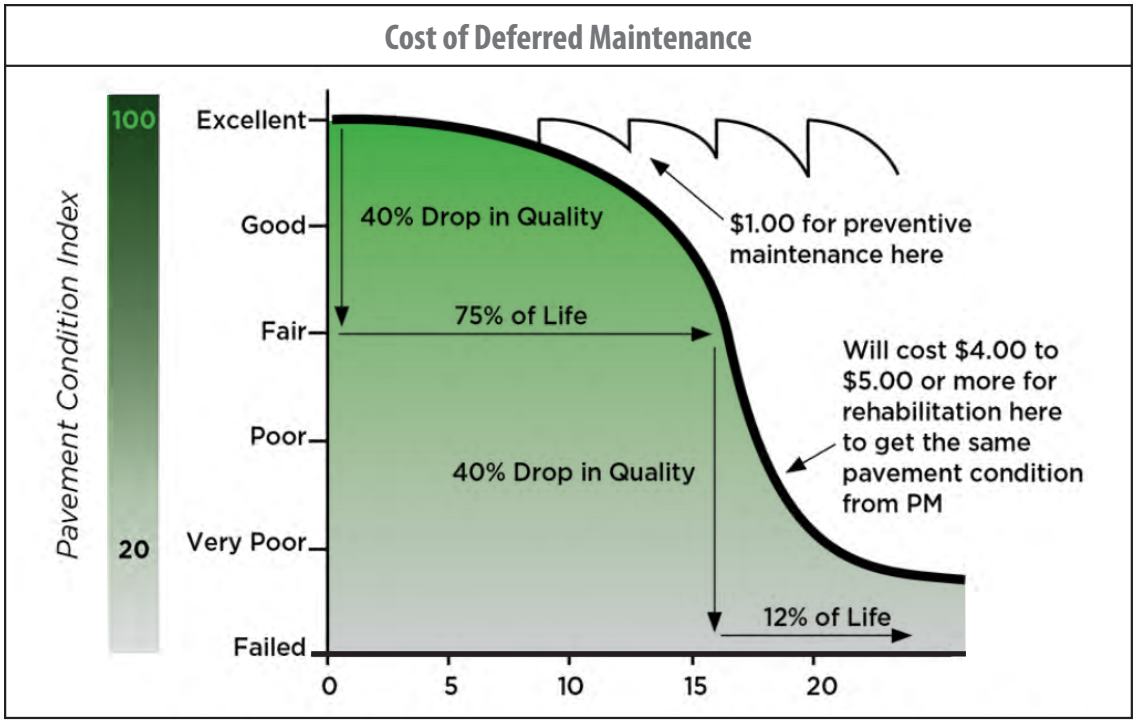
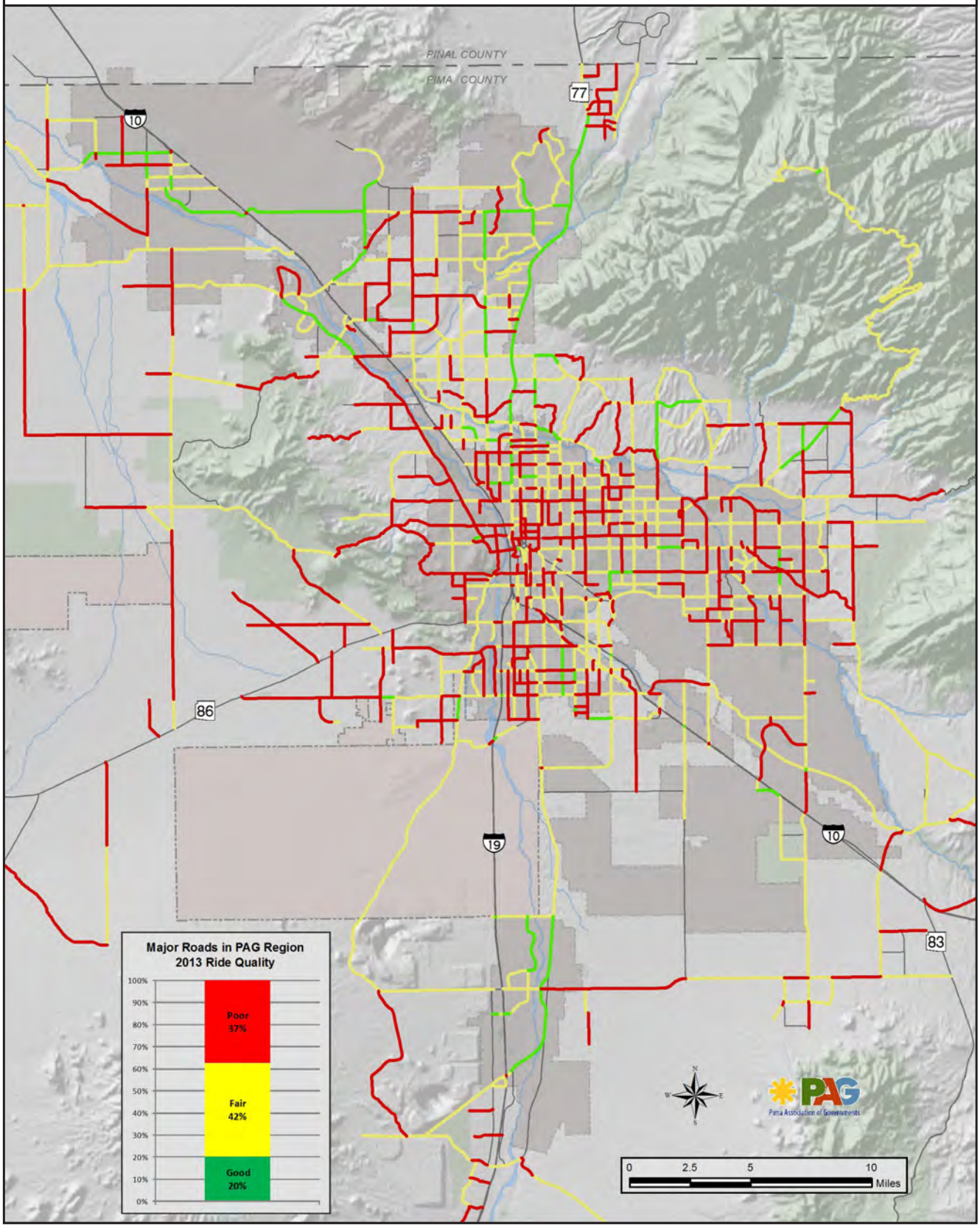


Figure 9 **Source: FHWA**

The figure shows how an active program of preventative maintenance reduces the long-term costs to keep a roadway in good condition.

Current pavement condition of the regional road network (2013)



Map 16

PAG estimates that it would cost the region roughly $3.6 billion over 30 years to bring most of the region's roadways up to good condition and maintain them in a state of good repair. This includes the large, one-time costs to rehabilitate or reconstruct roadways as well as the ongoing expense of maintaining the assets over the life of the plan through pavement preservation. This estimate does not consider the condition of local and neighborhood streets, which are the sole responsibility of the owning jurisdictions and outside the scope of this plan.

Pavement Preservation in the RMAP

This plan recommends that the region commit $3.18 billion over the next 30 years for pavement preservation. While this does not fully address the estimated need, this amount represents a significant increase over past plans and reflects the public's concern about the state of the region's roadways. Failure to proactively address pavement needs will lead to increased future costs, higher vehicle repair bills for drivers, a reduction in the region's economic competitiveness and decreased function of the transportation system overall.

City of Tucson's Automated Road Analyzer (ARAN) van is used to collect pavement condition data for the entire region.

Bridge Condition

The planning area of the 2045 RMAP has more than 1,000 bridges and culverts, structures that are critical for regional mobility. These structures enable vehicles, bicycles, pedestrian and wildlife to cross an obstacle. More specifically, culverts are structures designed to increase water flow, while bridges are structures that span more than 20 feet between supports.

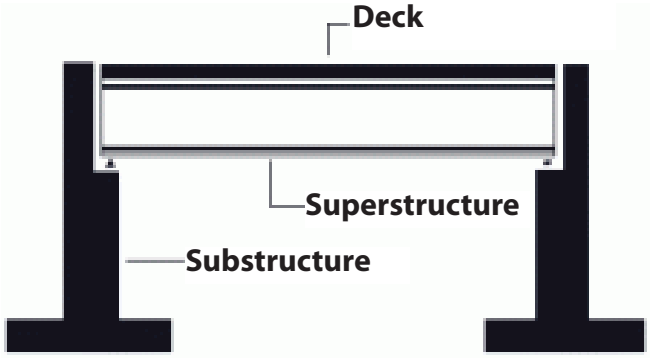
Like roads, bridges and culverts deteriorate over time due to weather and normal wear-and-tear with the passage of vehicles. To ensure safety and minimize disruption to the transportation network these structures undergo regular inspections by qualified engineers. Inspections help locate and identify potential problems early and trigger protection mechanisms when a problem is found.

One such mechanism is setting a weight limit. Much of the wear and tear on a bridge or culvert is the result of repeated stress from heavy loads. Lowering the maximum allowable weight across the structure maintains its safety and usefulness for most users. A consequence of a weight limit is the rerouting of heavier vehicles, typically commercial trucks and buses, resulting in longer travel times and more miles traveled for the affected users. The added functional life that is gained by posting a weight limit also helps the owning agency secure the funding necessary to make the needed repairs or replace the structure. Currently, 23 non-federally owned posted weight limit structures are in this region.

The bridges and culverts in this region vary greatly in their age, averaging 40 years. Approximately 120 bridges and culverts have been replaced or constructed since 2000. Due to the mild nature of our region's climate, bridges have a long life span and can easily exceed 50 years of service.

Of the more than 1,000 bridges and culverts in the region, approximately 40 percent of those are federally owned and maintained. A recent review of non-federally owned or maintained bridges and culverts found that 36 are potentially in need of replacement. This figure was arrived at by including the proposed federal condition rating classifications for deck, substructure and superstructure, posted weight limit structures and one-lane structures. Approximately 20 of the 36 bridges and culverts were identified in more than one of the above conditions. For instance, of the 14 single-lane structures, five also were included in the sub and superstructure categories and of the 23 posted weight limit structures, 12 were also in the sub and superstructure categories.

In addition to the bridges and culverts that may need replacement, approximately 200 bridges and culverts are currently deficient in safety features, such as railings. These safety features can be fitted onto existing structures and do not require bridge or culvert replacement. An additional 15 bridges have been identified as in need of scour mitigation.



Source: http://www.huroncountyengineer.org

Bridges are composed of three basic parts: deck, superstructure and substructure. If any of these components receives a condition index value of 4 or less in the National Bridge Index, it is considered structurally deficient.

Transit

Transit is a general term that encompasses all major forms of public transportation, including buses and streetcars. For users of the system, transit services provide affordable mobility options and can positively benefit the environment by reducing traffic congestion and air pollution. During 2045 RMAP public engagement phases, participants expressed strong support of transit improvements. The 2045 RMAP recommends building upon recent transit improvements to retain the quality of the current system while expanding services to include more high-capacity transit options and improved bus frequency.

Existing Transit

During the development of the Regional Transportation Authority (RTA) plan, transit emerged as a regional priority, and 27.5 percent of the plan, or $534 million, in transit investments were approved by voters. Now almost 10 years into the RTA plan, substantial progress has been made in implementing the transit element and increased the quality of the current transit system. Specific accomplishments include:

- Began operations of the Sun Link streetcar.
- Extended evening and weekend hours on existing Sun Tran routes.
- Added peak hour buses on overcrowded Sun Tran routes.
- Constructed a new bus storage and maintenance facility.
- Expanded volunteer transit reimbursement program for seniors.
- Expanded service area for special needs transit.
- Launched new express bus service to Marana, Oro Valley and Rita Ranch.
- Initiated Sun Shuttle neighborhood circulator bus service.
- Established park-and-ride facilities in Sahuarita, Oro Valley, Marana, Rita Ranch and Green Valley.

Public Transportation Services

The recent improvements to the transit system have made an award-winning system even better. Since 2000, Sun Tran ridership has grown at a faster rate than the population, reaching an all-time high of 21.6 million passenger trips in fiscal year 2009 at the height of the recession. Since 2009, ridership has leveled-off at around 20 million passenger trips per year. According to the National Transit Database, Tucson is in the middle of the pack when it comes to transit ridership per capita, trailing some denser, transit-rich communities such as Honolulu or Portland, but comparing favorably with some other mid-sized urban areas (Table 14 shows Tucson's transit ridership per capita in comparison to a mix of mid- and large-sized urban areas).

Transit trips per capita of comparison metropolitan regions

Urban Area	Population	Annual One-Way Transit Trips	Annual Transit Trips per Capita
Honolulu, HI	802,459	69,244,582	86.3
Portland, OR-WA	1,849,898	111,628,723	60.3
Salt Lake City, UT	1,021,243	36,418,879	31.5
Rochester, NY	720,572	19,744,868	27.4
Austin, TX	1,362,416	36,418,879	26.7
Tucson, AZ	843,168	20,983,299	24.9
Phoenix-Mesa, AZ	3,629,114	76,656,837	21.1
Fresno, CA	654,628	13,388,094	20.5
Albuquerque, NM	741,318	14,289,930	19.3
El Paso, TX-NM	803,086	12,892,942	16.1
Bakersfield, CA	523,994	6,289,242	12.0

Table 15 Sources: 2013 National Transit Database – UZA Allocation Table Annual Database

The 2045 RMAP focuses on retaining the quality of the regional transit network and its many services which are outlined below:

- **Sun Tran** – The primary fixed-route bus system is operated by Sun Tran, which includes 30 fixed routes and 13 express routes, covering an area of 230 square miles and traveling over 28,000 miles each day. All Sun Tran buses use cleaner burning fuels, are fully accessible to persons with disabilities and contain bike racks. Ridership on Sun Tran has increased by 21 percent since 2005, growing nearly twice as fast as the region's population, though it has hit a plateau in the last few years. Sun Tran was named America's Best Transit System for 2005, as well as Arizona's Best Transit System for 2012.

- **Sun Link** – The Sun Link streetcar began passenger service in July 2014 and is the region's first high-capacity transit line. The 3.9-mile streetcar line runs from the University of Arizona area, through downtown Tucson and to the west of Interstate 10. In its first year of operation, the streetcar carried more than 3,500 passengers per weekday, totaling more than 1 million riders for the year and exceeding early expectations. In addition to providing another local transit option, the streetcar has supported extensive redevelopment and revitalization in Tucson's downtown core.

- **Sun Van** – Sun Van is the City of Tucson's complementary paratransit service for elderly and disabled persons qualified under the Americans with Disabilities Act (ADA) who are unable to use the Sun Tran fixed-route system. Sun Van provides service to and from points within three-quarters of a mile along each Sun Tran fixed route, excluding express routes, during the days and times that Sun Tran operates. In addition to the ADA-required three-quarters of a mile service area, Sun Van also provides an optional ADA service within the remainder of the City of Tucson. Ridership on Sun Van has increased by 34 percent since 2005, growing three times faster than the population.

- **Sun Shuttle** – Sun Shuttle is a neighborhood circulator transit service in Marana, Oro Valley, Catalina, Sahuarita, Green Valley and rural western Pima County that provides rides within neighborhoods. Sun Shuttle also connects passengers to other Sun Tran routes, providing transit access to the entire Tucson metropolitan area.

Regional Challenge: Funding Transit Operations

Transit operations and maintenance are funded from a variety of sources, including fares paid by riders, Federal Transit Administration (FTA) grant programs, the Regional Transportation Authority (RTA), advertising revenue, contributions from regional jurisdictions, and the City of Tucson general fund.

A major challenge facing the region is that costs for providing transit services are increasing faster than some sources of revenue. The shortfall is often made up through Tucson general fund contributions, already the largest single source of transit funding in the region.

For the region to continue to maintain and improve service in the future, it may be necessary to explore additional revenue sources. This would reduce the burden on the general fund, where transit competes with other essential city services.

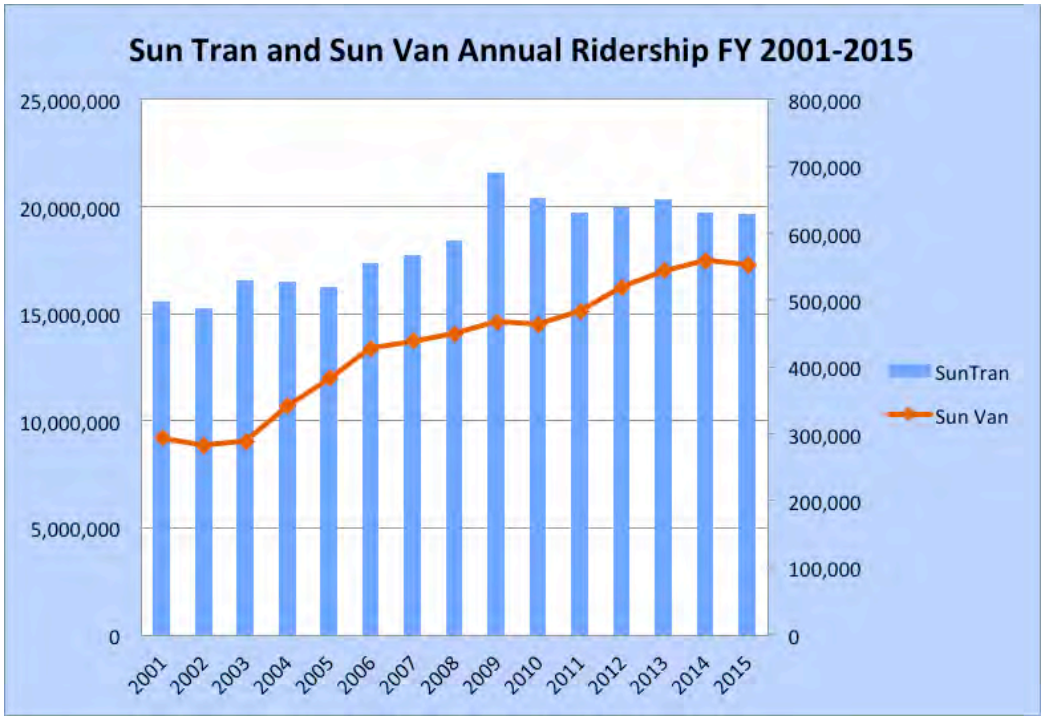


Figure 10 Source: Sun Tran

Regional Transit Vision

As part of the 2045 RMAP process, PAG contracted with Jarrett Walker and Associates, a transit visioning consulting firm, to develop a transit vision for the Tucson region. The vision was based on a series of workshops conducted in April and May 2015 with additional analysis of the system by Jarrett Walker and Associates, considering:

- Stakeholder Preference
- Current Ridership
- Development and Street Pattern
- Network Continuity
- Location of Major Destinations

The results of the analysis were presented to elected officials, staff and stakeholders in June 2015. The key outcomes are priority sequences for expanding the frequent service network and beginning high-capacity network planning. The vision is necessarily high level, setting a general direction for the desired system.

The vision emphasizes building the system around a core grid network of frequent service as the foundation of future transit mobility in Tucson. The frequent service network consists of those routes where a bus arrives every 15 minutes or better. This is associated with minimal waiting times for passengers providing the freedom to travel spontaneously, not determined by the bus schedule. Frequency is especially effective when it creates grid patterns. This is because every time two frequent lines cross, transfers are easy and fast, so each line becomes useful for reaching all the destinations on the other line. Due to the effectiveness of frequent service, these routes tend to be the most productive of the transit system, generating the highest ridership.

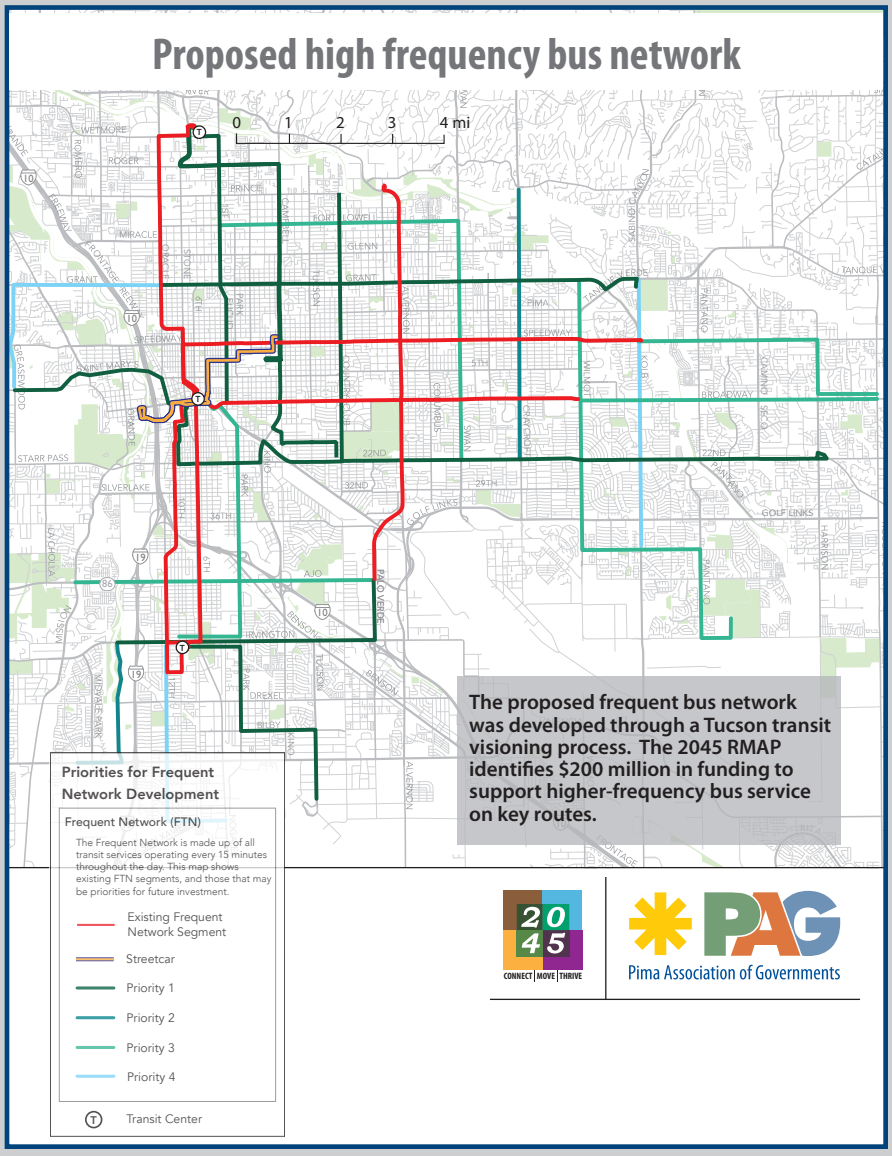
Generally, the vision recommends priorities for future frequent network development that:

- Maintain and expand existing east-west high frequency service
- Increase the number of high frequency routes on north-south corridors in the central areas to intersect with existing high frequency east-west service
- Expand the high-frequency grid by adding higher frequency east-west service in southern Tucson
- Move toward a more standard high frequency grid by eliminating some radial service

The transit vision also recommends some locations for future study of potential high-capacity transit service. These include:

- East-west route originating in downtown Tucson
- A route running north from downtown Tucson
- A route running south from downtown Tucson

The intent is to use the priorities as a starting point to develop a more detailed and comprehensive long-range transit plan that will identify specific corridors, phasing and frequencies.



Map 17 Map prepared by Jarrett Walker and Associates for PAG

2045 RMAP Transit Projects

To retain the quality of the transit system, adequate funding is required for operations and maintenance. It is also important to regularly evaluate, modify and expand the services offered to ensure they are providing efficient, cost effective solutions that are meeting our changing transportation needs.

The majority of transit funding in the 2045 RMAP, about 68 percent or $3 billion, is for maintaining current levels of transit service for the next 30 years. This includes maintaining existing Sun Tran fixed-route bus service, Sun Van paratransit (both required complementary service and optional service areas), RTA-funded Sun Shuttle circulator service, and RTA regional paratransit. It should be noted that if the RTA ½-cent excise tax expires in FY 2026, some existing transit services would need to be reduced or eliminated or other revenue sources identified to fill the funding gap.

Examples of 2045 RMAP projects that will retain the quality of existing services:

- **Operate Sun Tran, Sun Van, Sun Shuttle, RTA Paratransit and Sun Link** at current service levels for the life of the plan.
- **Sun Tran bus and support vehicle replacements:** Replace roughly 19, 40-foot buses every year and support vehicles as needed.
- **Regional Comprehensive Transit Operations Analysis Study:** Conduct a comprehensive operations analysis study (COA) of the entire regional transit system every five years.
- **Transit Center Updates:** Rehabilitate and update existing regional transit centers.

2045 RMAP Proposed Regional Transit Improvements:

In addition to maintaining the existing transit system, the 2045 RMAP proposes roughly $1.3 billion in transit improvements over the next 30 years to increase transit access, convenience and expand transportation choices in the region.

- **Bus Frequency Improvements** – The 2045 RMAP recommends improving frequency of fixed-route bus service in the urban core consistent with improvements outlined in the regional transit vision.
- **Bus Rapid Transit** – Bus Rapid Transit (BRT) is enhanced bus service which, depending on how it is implemented, has many of the operating characteristics of light rail, but at a lower capital investment and offers greater operational flexibility. Several enhancements that can be included in BRT projects include level-boarding, enhanced stops, greater stop spacing, off-board fare collection, signal priority or queue jumps, real-time arrival signs and dedicated lanes.

  The 2045 RMAP includes five BRT routes to be located on Broadway Boulevard, Grant Road, Oracle Road, South 6th Avenue/Old Nogales Highway and Campbell Avenue/ Kino Parkway. These routes were included in the PAG 2009 High Capacity Transit (HCT) System Plan and were consequently recommended in the prior long-range regional transportation plan. However, the priority corridors may change as the region develops a high-capacity transit implementation plan. This will build on the 2009 HCT system plan to provide more detail about the operating characteristics of proposed BRT corridors and may potentially re-prioritize preferred routes.
- **Streetcar Extension** – The 2045 RMAP proposes building on the success of the recently launched Sun Link streetcar by extending the existing route by four additional miles. While a specific location has yet to be identified, potential routes include north on or around Campbell Avenue, east on Broadway Boulevard, or south on 6th Avenue.

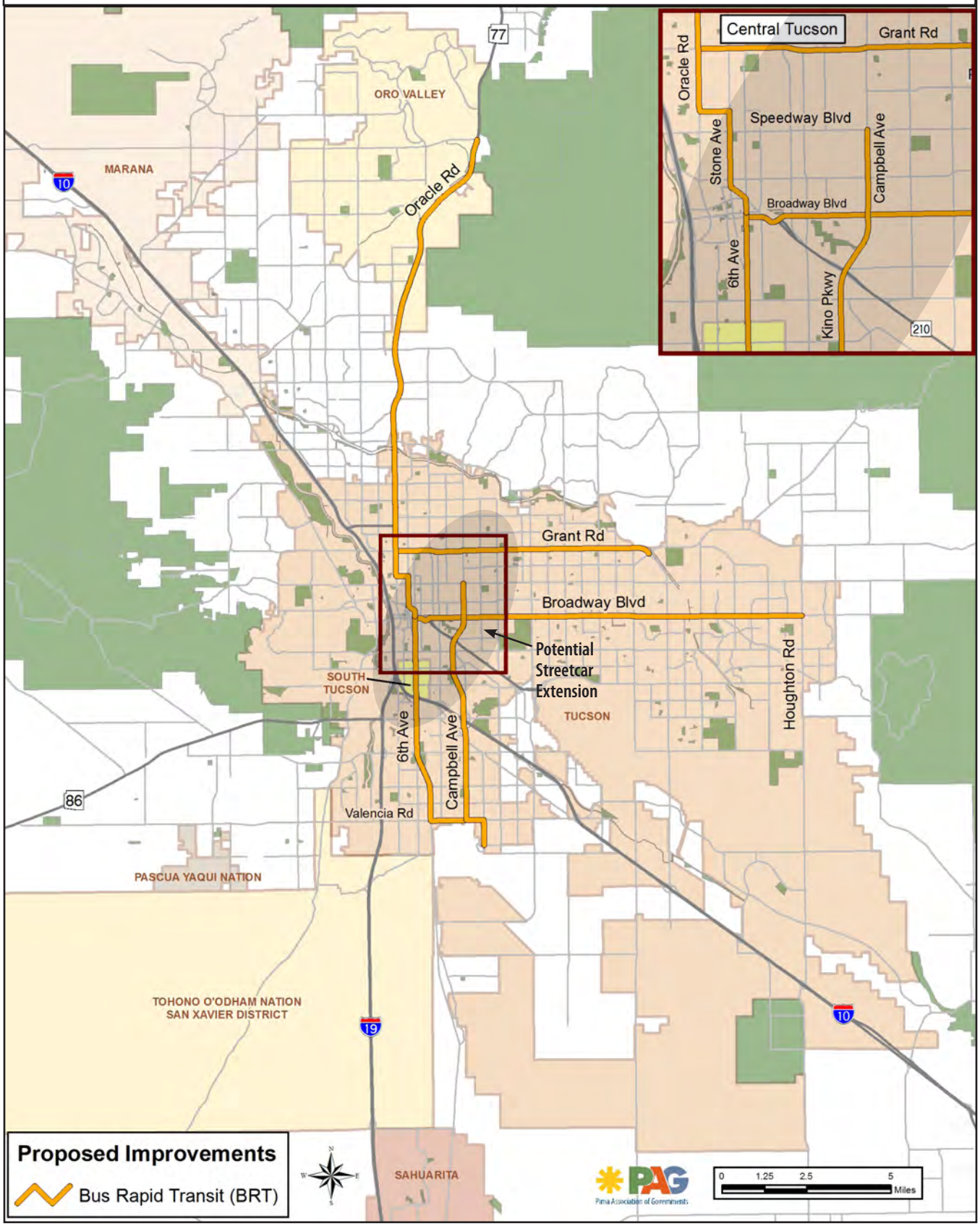
Ladders of Opportunity

In 2014, U.S. Secretary of Transportation Anthony Foxx announced the Ladders of Opportunity Initiative "to help build and restore connections, develop workforce capacity, and catalyze neighborhood revitalization." A goal of the initiative is to build a "multimodal transportation system that provides people with reliable and affordable connections to employment, education, services and other opportunities."

Ladders of Opportunity in the 2045 RMAP:

- *Including bus rapid transit corridors serving major employment centers and lower-income areas*
- *Promoting safe and well-connected pedestrian and bicycle facilities*
- *Expanding the frequency service bus network in the core*
- *Improving roadway capacity and connectivity region-wide*

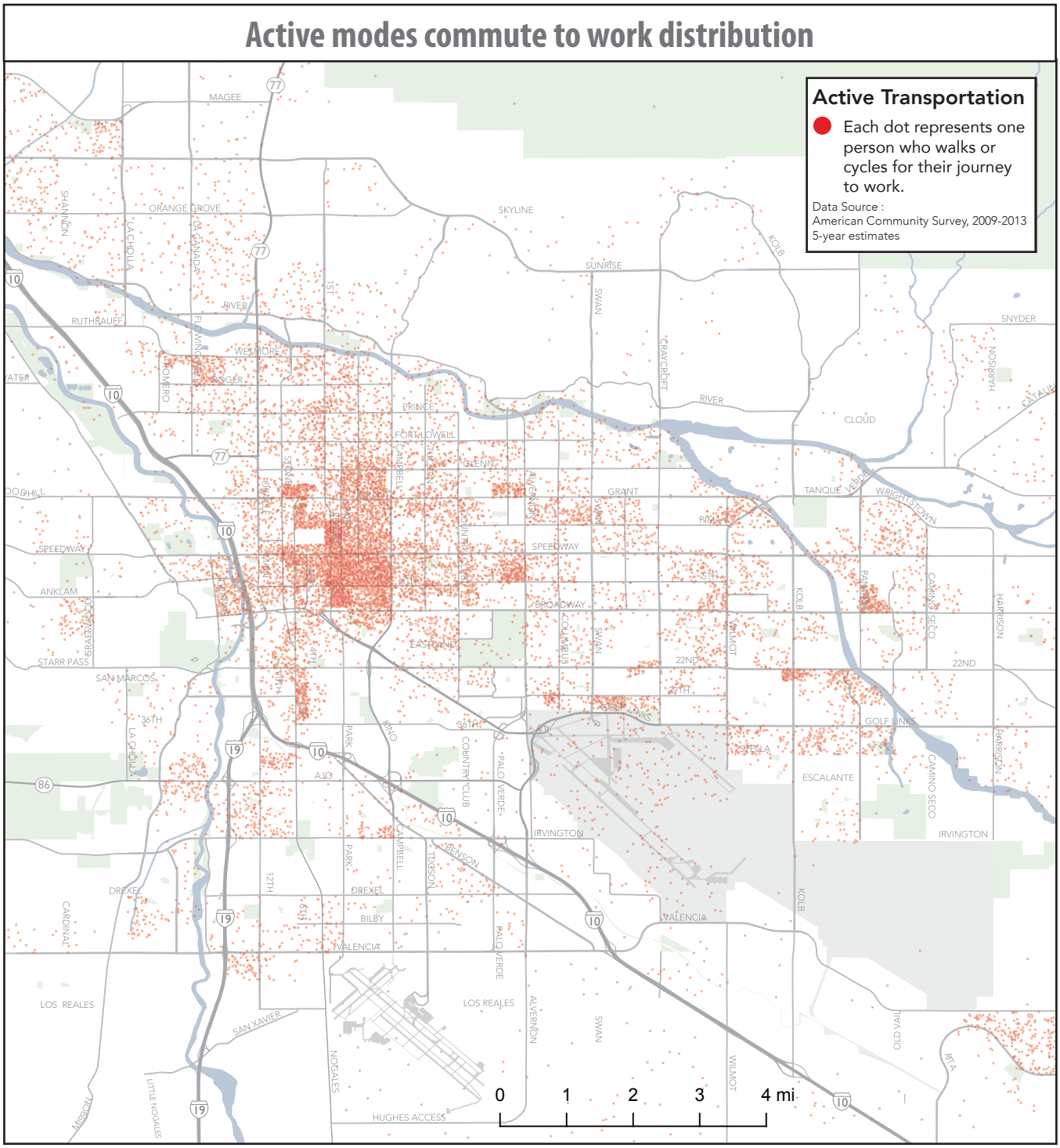
2045 RMAP High-Capacity Transit Projects



Map 18

Bicycle and Pedestrian

Bicycle and pedestrian facilities are essential for building a truly multimodal transportation system. Ensuring that bike and pedestrian options are available, well-connected, safe and comfortable gives people better transportation choices, improves quality of life, benefits public health and reduces congestion. Currently, around 10.5 percent of all trips are made on foot and 2 percent by bicycle, meaning a significant share of the region's population uses an active mode to make at least some of their weekly trips.



Map 19

Map prepared by Jarrett Walker and Associates for PAG

Distribution of residents commuting to work by bicycle or on foot. Most active mode commuters live in the urban core and the neighborhoods surrounding the University of Arizona.

Existing Bicycling Conditions

The Tucson region is nationally recognized as a great place for bicycling. The League of American Bicyclists has designated the region a gold-rated bicycle friendly community for the extensive bikeway network and model bicycle safety programs. At the time, it was the only region in the country with a gold-rated designation.

The mileage of bike facilities, including striped bike lanes, shared-use paths, signed bike routes and bike boulevards, has grown by nearly 200 percent since 2004; there are now over 1,000 miles of identified bike facilities in Pima County. Bike commuting has increased substantially in the past decade, with the number of bike commuters growing by 122 percent between 2006 and 2014.

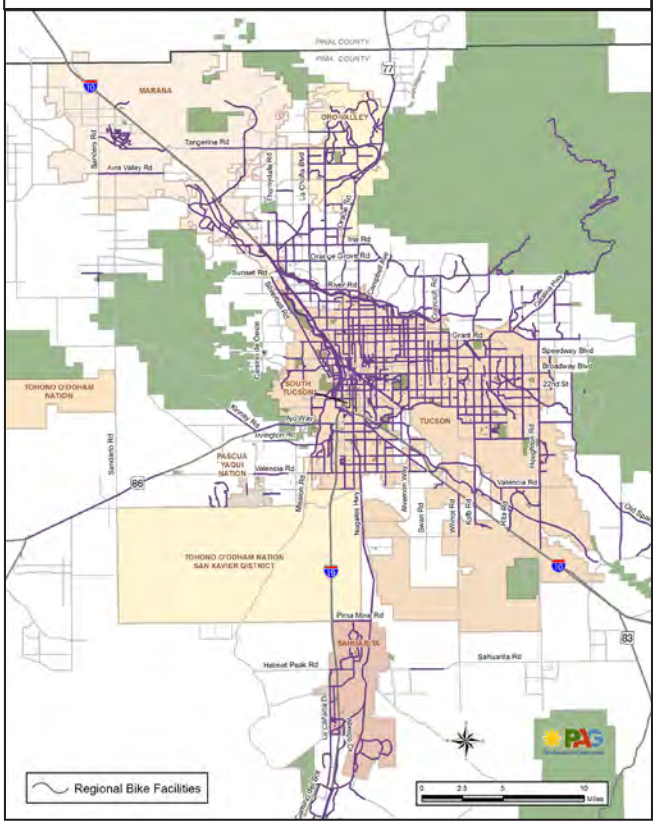
The PAG 2009 Regional Plan for Bicycling includes many projects aimed at improving safety and increasing bicycle ridership. The bicycle projects selected for the 2045 RMAP come primarily from the regional bike plan update.

Commute to work by bicycle rates of comparison metropolitan regions

Metropolitan Area	Metropolitan Area Population (2014 Estimate)	Total Number of Bicycle Commuters	Percent of Commuters Traveling by Bicycle
Portland, OR-WA	2,347,127	23,637	2.2%
Tucson, AZ	1,004,516	6,797	1.7%
Honolulu, HI	991,788	5,553	1.2%
Albuquerque, NM	905,213	3,887	1.0%
Austin, TX	1,943,299	7,271	0.8%
Phoenix-Mesa, AZ	4,489,109	14,860	0.8%
Salt Lake City, UT	1,153,340	4,195	0.8%
Fresno, CA	965,974	2,723	0.8%
Rochester, NY	1,083,393	2,338	0.5%
Bakersfield, CA	874,589	1,399	0.5%
El Paso, TX-NM	836,444	396	0.1%

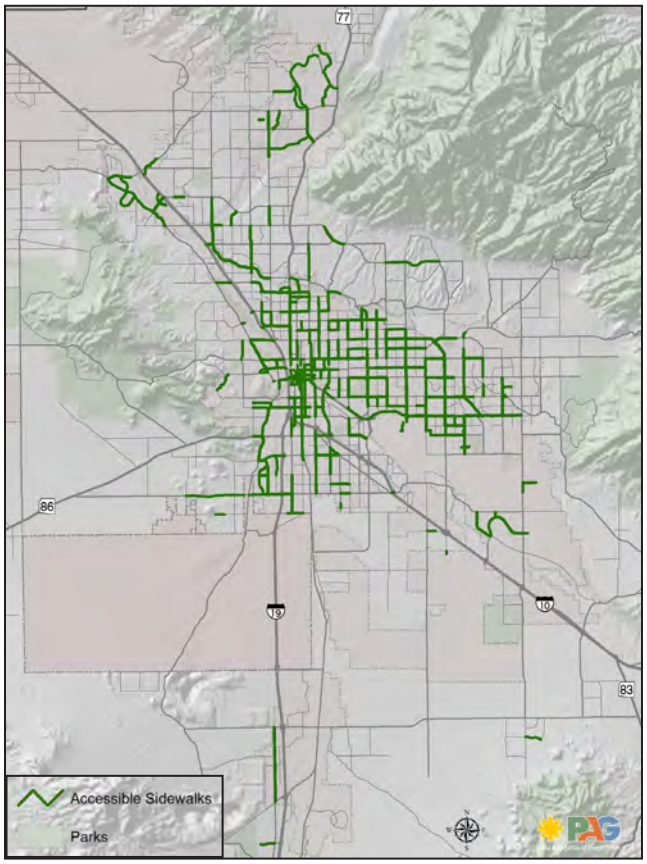
Table 16 Sources: U.S. Census Bureau; American Community Survey, 2009-2013 American Community Survey 5-Year Estimates; Table B08301; generated using American FactFinder

Existing regional bicycle network (2015)



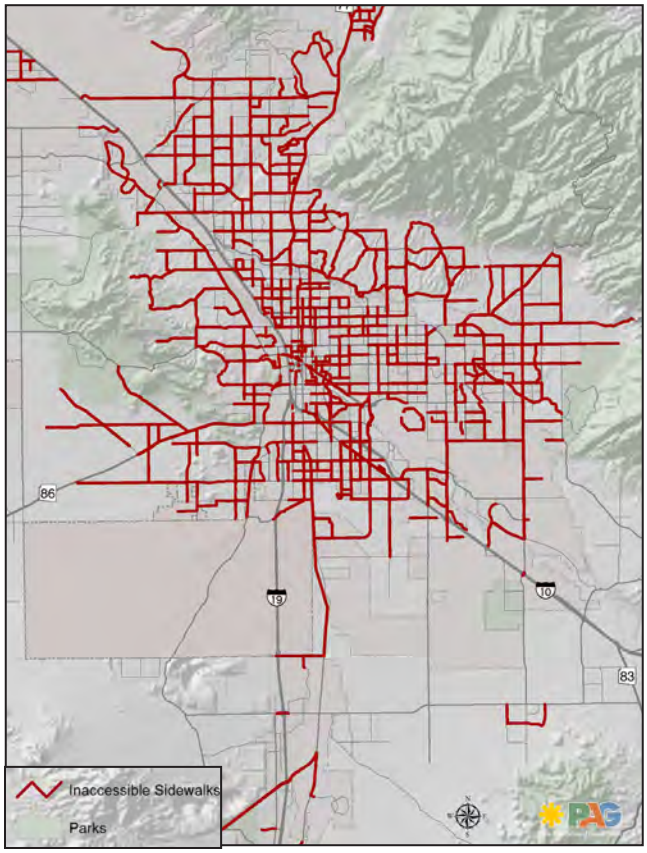
Map 20

Complete and accessible sidewalks on major roadways



Map 21

Major roadways without accessible sidewalks



Map 22

Existing Pedestrian Conditions

According to the 2009 National Household Travel Survey, walking accounts for over 10 percent of all trips taken in the Tucson region. Whereas the region has made great strides in becoming a first rate bicycle-friendly community, the pedestrian network, however, continues to have many gaps. As of 2012, it was estimated that roughly 75 percent of roadsides on major roadways in the urban area were either inaccessible to persons with disabilities or they lacked sidewalks entirely.

Moreover, the City of Tucson was recently identified as a pedestrian safety focus city by the Federal Highway Administration as a result of its higher-than-average number of pedestrian fatalities.

Over 250 pedestrians are struck by motor vehicles on average each year in the region, and more than 20 people are fatally injured as a result. Regionwide, pedestrians account for 1 in 5 roadway fatalities. In the City of Tucson it is closer to 1 in 4.

The BikeHAWK crossing serves both pedestrians and bicyclists.

Pedestrian crashes by injury severity in Pima County – 2008-2013

	2008	2009	2010	2011	2012	2013	TOTAL
Fatal	13	19	19	29	18	25	123
Incapacitating Injury	90	71	65	47	72	43	388
Non-Incapacitating Injury	113	112	104	110	91	79	609
Possible Injury	62	63	49	43	40	62	319
No Injury	21	23	24	8	12	18	106
Unknown	1	5	8	7	16	33	70
TOTAL	300	293	269	244	249	260	1615

Table 17 Source: ADOT Crash Statistics

Pedestrian crashes by injury severity in Pima County – 2000-2013

Many of the region's pedestrian challenges are the legacy of earlier practices in which pedestrian comfort, safety and access were an afterthought, if considered at all, in the development of neighborhoods and roadways. More recently, this has begun to change. Now, most roadway improvements include pedestrian improvements and the region's jurisdictions have made considerable progress in retrofitting the existing system to close gaps in the pedestrian network. The RTA also funded installation of more than 50 High Intensity Activated Crosswalk (HAWK) lights in the past 10 years to provide safer crossing opportunities on the region's high-speed, high-volume roadways.

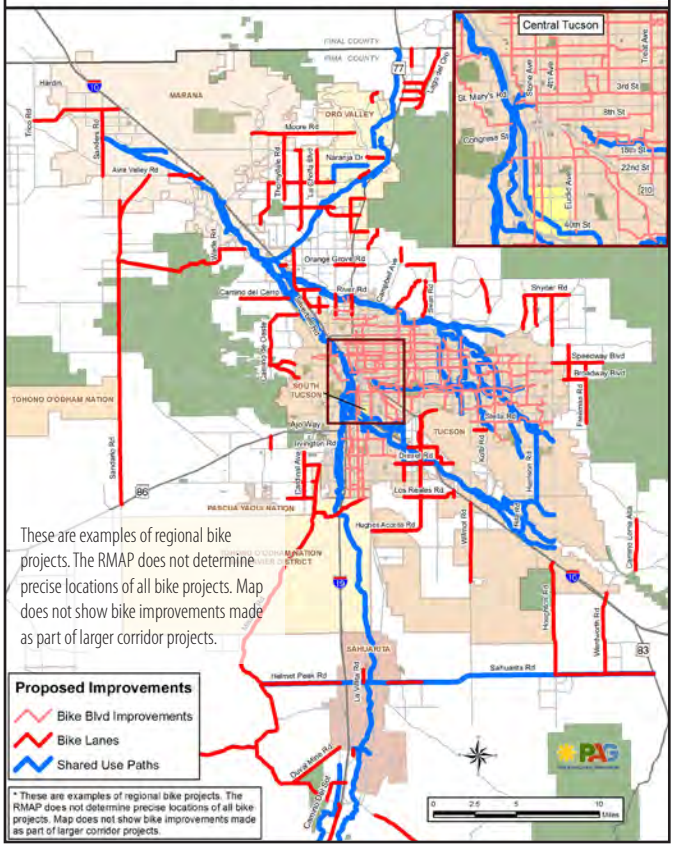
Bike and Pedestrian Projects in the 2045 RMAP

The 2045 RMAP seeks to improve bike and pedestrian conditions by identifying funding to implement the recommendations from the 2009 Regional Plan for Bicycling and the 2014 Regional Pedestrian Plan. Bike and pedestrian projects in the 2045 RMAP are described in less detail than some of the other types of projects, being addressed through a preferred level of investment instead of as specific projects. This allows the 2045 RMAP to identify the scale of needed improvements in specific categories, but leaves maximum flexibility for implementing agencies to fund specific improvements in response to needs as they emerge.

In addition to the standalone bike and pedestrian investments recommended in the 2045 RMAP, the majority of roadway capacity projects include bike and pedestrian improvements, such as new fully accessible sidewalks, bike lanes, center medians and landscaping. As much as 20 percent to 25 percent of the total cost of corridor improvement projects is estimated to go toward ensuring that corridor improvements include bike and pedestrian infrastructure.

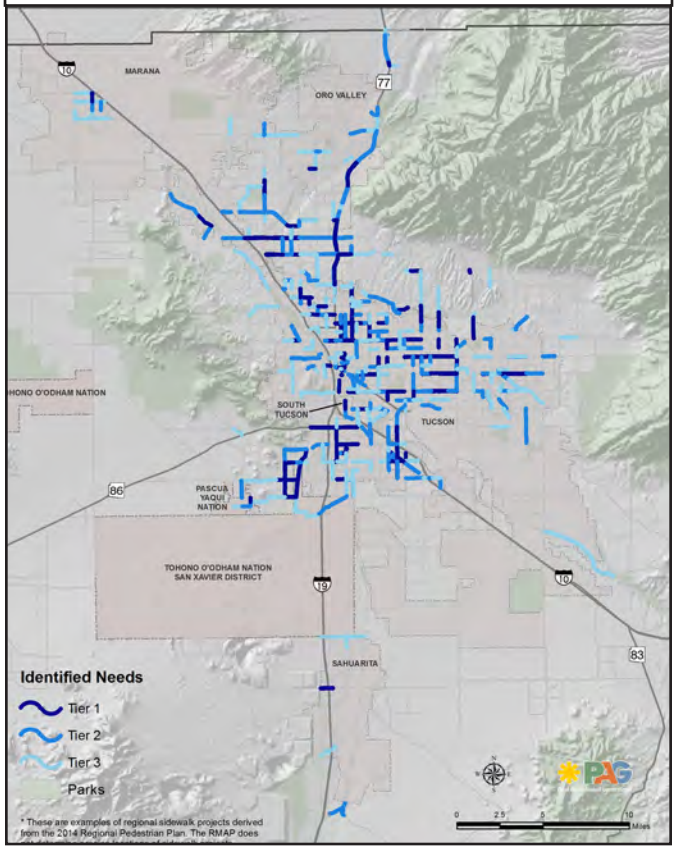
The 2045 RMAP proposes a significant regional investment in improving walking conditions in the region.

2045 RMAP Bicycle Improvement Projects



Map 23

2045 RMAP Sidewalk Improvement Projects



Map 24

2045 RMAP example bicycle and pedestrian improvements

Project Name	Description	Funding ($000s)
Pedestrian Mobility Improvements	A flexible category of projects that includes sidewalk construction, safety improvements, Americans with Disability Act (ADA) ramps, lighting, landscaping, refuge islands, and other pedestrian improvements. Candidate locations are identified in the PAG 2014 Regional Pedestrian Plan. The proposed investment level in this category would make significant progress on improving pedestrian conditions in the region.	$ 305,000
Safe Routes to School	A category of projects that emphasizes making it safer for students to travel to and from school by bike or on foot.	$ 20,000
Bike Lanes Connectivity	This project looks to fill gaps in the bike lane system, including protected bike lanes where appropriate. Locations are identified in the 2009 Tucson Regional Plan for Bicycling.	$ 73,000
The Loop	The Loop is a collection of shared-use paths around Tucson and connecting Rillito River Park, Santa Cruz River Park, and Pantano River Park with Julian Wash and the Harrison Greenway. This project represents a completion of the entire 131-mile Loop network.	$ 12,000
Shared Use Paths	Shared-use paths provide safe and comfortable recreational and mobility options for bicyclists, pedestrians and other non-motorized travelers. This project proposes to expand the network of shared-use paths throughout the region.	$ 85,000
Signalized Pedestrian & Bike Crossings	One of the major safety challenges for bicyclists and pedestrians is having safe crossing opportunities. This project proposes improving bike and pedestrian safety by installing more than 150 additional bike and pedestrian crossing signals (such as HAWK lights) in the region over the next 30 years.	$ 25,000
Bike Boulevards	Bike boulevards are low-volume, low-speed streets optimized for bicycle travel with traffic reduction, traffic calming signage, and safe crossings at intersections with major streets. This project proposes adding over 150 additional miles of bike boulevards to provide a better connected enhanced bike network.	$ 35,000

Table 18

Considering Green Infrastructure in our transportation network

Green infrastructure as it relates to transportation is a practice whereby streets and roadsides are designed to capture stormwater on site in order to sustain trees and other vegetation. This approach reduces flooding from heavy rainfall while increasing shade, enhancing the streetscape and improving community resilience against climate extremes. Maintaining a healthy urban streetscape defines our "sense of place" and supports a thriving regional economy. Green streets provide social and economic benefits by supporting alternate modes of transportation, improving aesthetics of major travel corridors, attracting businesses and jobs through environmental branding, and increasing the physical and mental well-being of our citizens.

Incorporating green infrastructure elements into roadsides has been found to calm neighborhood traffic, benefitting people whose primary mode of transportation is biking and walking by creating a buffer from traffic and providing tree shade to reduce heat exposure. This helps populations that are especially vulnerable to heat mortality, including those with low mobility, low community accessibility and low income. Given that Arizona has the highest cumulative number of heat-related mortalities of any U.S. state, efforts to combat urban heat islands are important to our region.

Water harvesting curb cut.

Growing investments in green infrastructure bring quantifiable benefits to projects by increasing the use of stormwater flows to support vegetation instead of relying on other valuable water resources in the desert. PAG works with partners to gather quantitative data locally to improve design and decision making tools. Return-on-investment tools evaluate the benefits that vegetation elements provide to infrastructure projects, such as removing air pollutants, mitigating heat impacts, increasing property values, and filtering and cleaning stormwater, which result in both immediate cost savings, as well as long-term return on investment for our community, municipalities and the welfare of vulnerable populations.

In March 2015, the PAG Regional Council reaffirmed the region's commitment to green infrastructure by approving the "Green Infrastructure for Regional Vibrancy" resolution, which highlights the economic, transportation and health benefits of green infrastructure as an approach to stormwater management. By emphasizing the return on investment of green infrastructure for roadway projects and encouraging the development of guidelines and policy, the resolution provides next steps and supports regional coordination on green streets planning efforts.

Freight

Importance of Freight

Inside the trucks, rail cars, shipping containers and cargo airplanes that many see in our region every day are the products and raw materials that keep our economy moving. Since the movement of goods impacts quality of life, economic vitality, safety, congestion and air quality, freight planning is required as part of the long-range transportation planning process. The efficient movement of goods not only determines the price of the goods sold, but also affects how competitive our region is for businesses that rely on freight. Proximity to large markets, access to major transportation networks, and freight travel time and reliability are all factors that businesses consider when deciding where to locate.

Freight transportation network and national corridors

In terms of trade and goods movement, eastern Pima County is a transportation infrastructure nexus, located at a freight junction of national and international significance. The interstate highways that pass through Tucson, I-10 and I-19, move vast quantities of goods in all directions. One of the state's two Class I railroads, Union Pacific Railroad, serves Tucson as it traverses the southern portion of the United States. Its "Nogales sub" line provides a vital freight connection to cities in the Mexico state of Sonora and further south as it connects with Ferromex rail lines in Nogales.

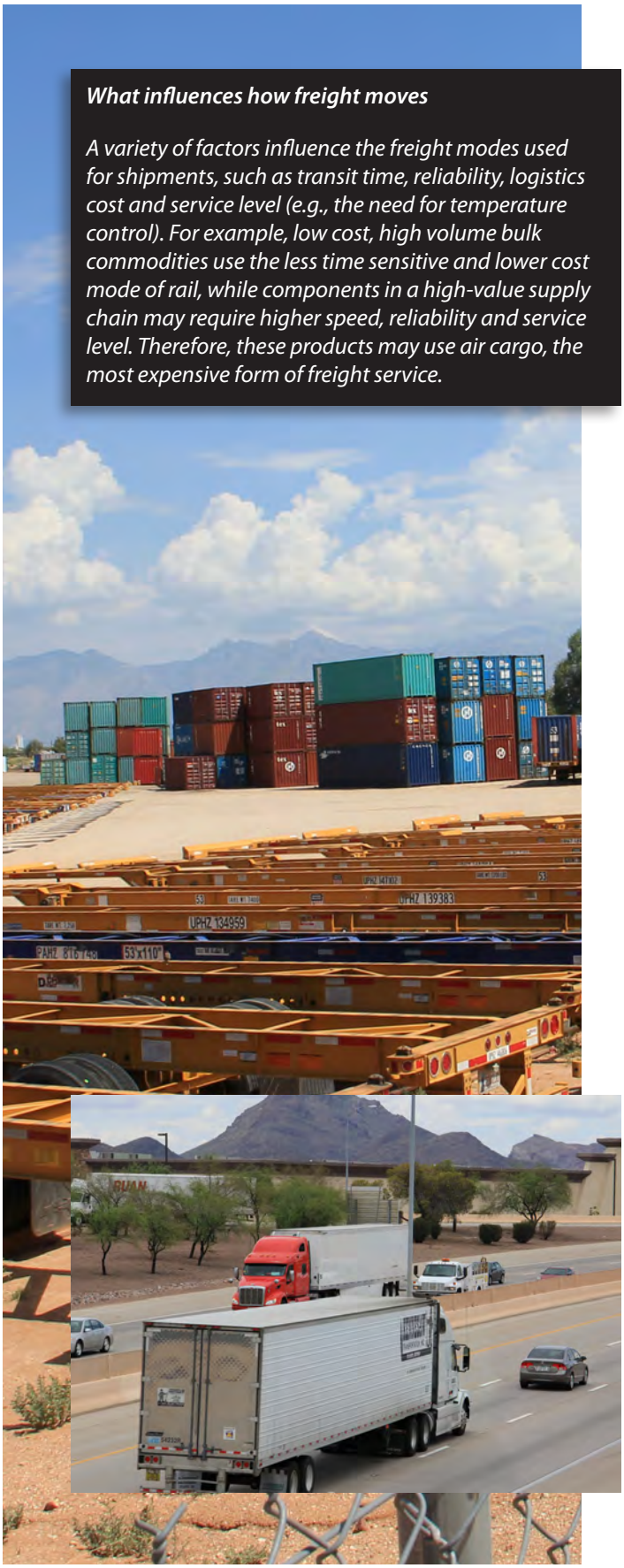
Adjacent to the confluence of two freeways and two railroad lines is the Tucson International Airport (TIA), with cargo facilities and operations occurring 24 hours a day, seven days per week. South of eastern Pima County, the land ports of entry between the United States and Mexico process vast quantities of goods. All of these infrastructure assets contribute to the economic vitality of this unique geographic location.

The privately owned Port of Tucson intermodal ramp is located along the Union Pacific Sunset Route, with efficient access to I-10 south of Davis-Monthan Air Force Base. Trains exit the mainline to siding at the Port of Tucson where containers are lifted onto trucks that take them to their final destinations. Freight also moves in the reverse direction at the Port of Tucson, where containers on trucks are loaded onto trains that may be destined for international markets. As intermodal rail volume increases, the Port of Tucson continues to expand, most recently having opened its international rail loop in 2013. Providing service for fresh produce shipments is also part of recent Port of Tucson developments.

Rail also provides the benefit of reduced traffic congestion and, consequently, less air pollution in the community. According to Union Pacific, peak volumes of trains occurred in 2006 at about 65 trains per day on the Sunset Route. Currently, the average is about 45-50 trains per day. Based upon economic conditions, Union Pacific is double-tracking the Sunset Route, with segments from El Paso to Tucson completed.

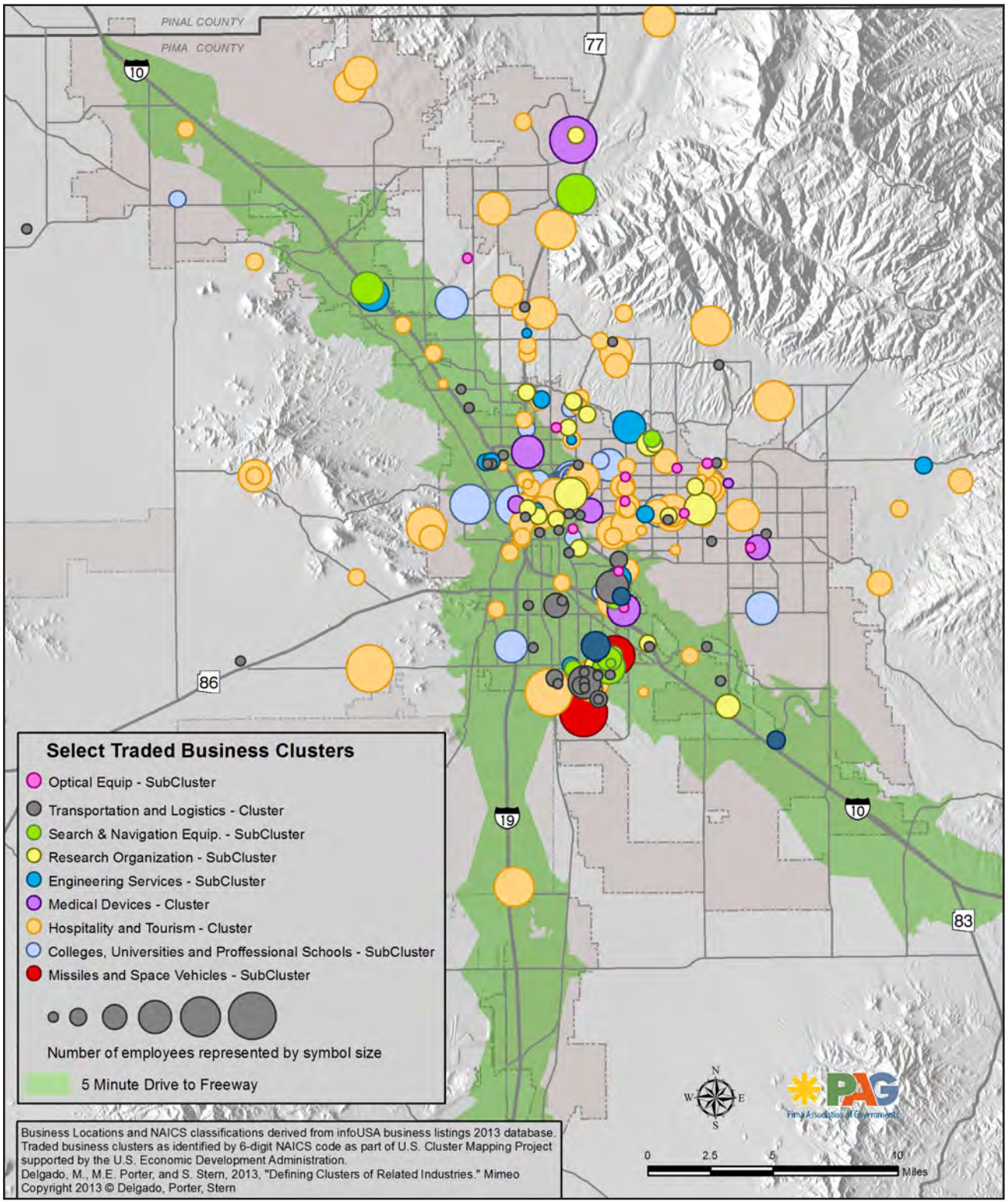
What influences how freight moves

A variety of factors influence the freight modes used for shipments, such as transit time, reliability, logistics cost and service level (e.g., the need for temperature control). For example, low cost, high volume bulk commodities use the less time sensitive and lower cost mode of rail, while components in a high-value supply chain may require higher speed, reliability and service level. Therefore, these products may use air cargo, the most expensive form of freight service.



Located on Union Pacific's Sunset Route, the Port of Tucson is a full service inland port, rail yard and intermodal facility

Tucson region business clusters



Map 25

Consistent with federal metropolitan planning requirements to provide for consideration of projects and strategies that will support the economic vitality of the metropolitan area, PAG staff developed a map of business clusters and freeway access in our region. The map helps provide a spatial inventory of businesses in our region, symbolized by industry sector and employment levels. Also, since interstate highway access can be an important consideration for businesses as they consider expanding or relocating, the map includes the approximate five-minute travel time buffer to and from interstate access. PAG will continue to explore ways to share data that can inform economic vitality strategies in the region.

Draft Comprehensive Primary Freight Network

Map 26 Source: FHWA

Under the MAP-21 Act, the Primary Freight Network (highway only) mileage was originally capped at 27,000 to meet the statutory requirements of the authorizing law, resulting in a network that was unconnected with major gaps in the system, including components of the global and domestic supply chains. To address this shortfall, the Department of Transportation developed and proposed a draft 41,518-mile comprehensive highway freight network that links directly to other freight modes and better represents the complex multimodal freight system in the United States. The FAST Act continues this effort by requiring the establishment of a National Highway Freight Network, which consists of the 41,518-mile primary highway freight system, critical rural freight corridors, critical urban freight corridors, and portions of the Interstate system not originally included.

Transportation and Economic Development

The recession that began in 2008 hit Arizona's economy especially hard and highlighted the need to diversify the state's economy. A number of efforts were initiated in response to this need, including the establishment of the state Transportation and Trade Corridor Alliance, the Arizona Department of Transportation's I-11 and Intermountain West Corridor Study, and the PAG Economic Vitality Advisory Committee.

Transportation and Trade Corridor Alliance (TTCA)

Since 2012, the TTCA has brought together public and private sector leaders to develop strategies that maximize trade development for the State of Arizona. Led by three state agencies – the Arizona Department of Transportation, the Arizona Commerce Authority and the Arizona-Mexico Commission – the outcome of the TTCA's efforts is a strategic planning document, called the TTCA Roadmap. Completed in June 2014, the Roadmap describes strategies focused on high-value trade and investment, market connectivity, and alignment of policy and actions. Throughout the development of the Roadmap, PAG senior leaders served on the TTCA Steering Committee along with representatives of the Port of Tucson, the University of Arizona, UPS, Knight Transportation, BNSF, Maricopa Association of Governments, and many others.

ADOT I-11 and Intermountain West Corridor Study

In late 2014, the Arizona Department of Transportation, in cooperation with the Nevada Department of Transportation, completed the Interstate 11 and Intermountain West Corridor Study. The study includes corridor planning of an interstate link between the Phoenix and Las Vegas metropolitan areas, as well as potential extension of the corridor from Mexico to Canada. The final Corridor Concept Report acknowledges the importance of international trade for Arizona's economic future and recommends routing a critical link of the Intermountain West Corridor through southern Arizona and Pima County to the Nogales international border.

PAG Economic Vitality Advisory Committee (EVAC)

The PAG Economic Vitality Advisory Committee, established in early 2014, works to identify ways to align the region's transportation planning efforts with economic development opportunities. The committee, which has a transportation emphasis, explores various topics of regional significance that affect the community's economic vitality, such as in the areas of land use, tourism and trade in order to evaluate how transportation projects and policies influence economic development outcomes. Committee members are representatives of PAG-member jurisdictions, including city and town managers, as well as representatives of higher education institutions, economic development-focused organizations, and many other organizations and agencies.

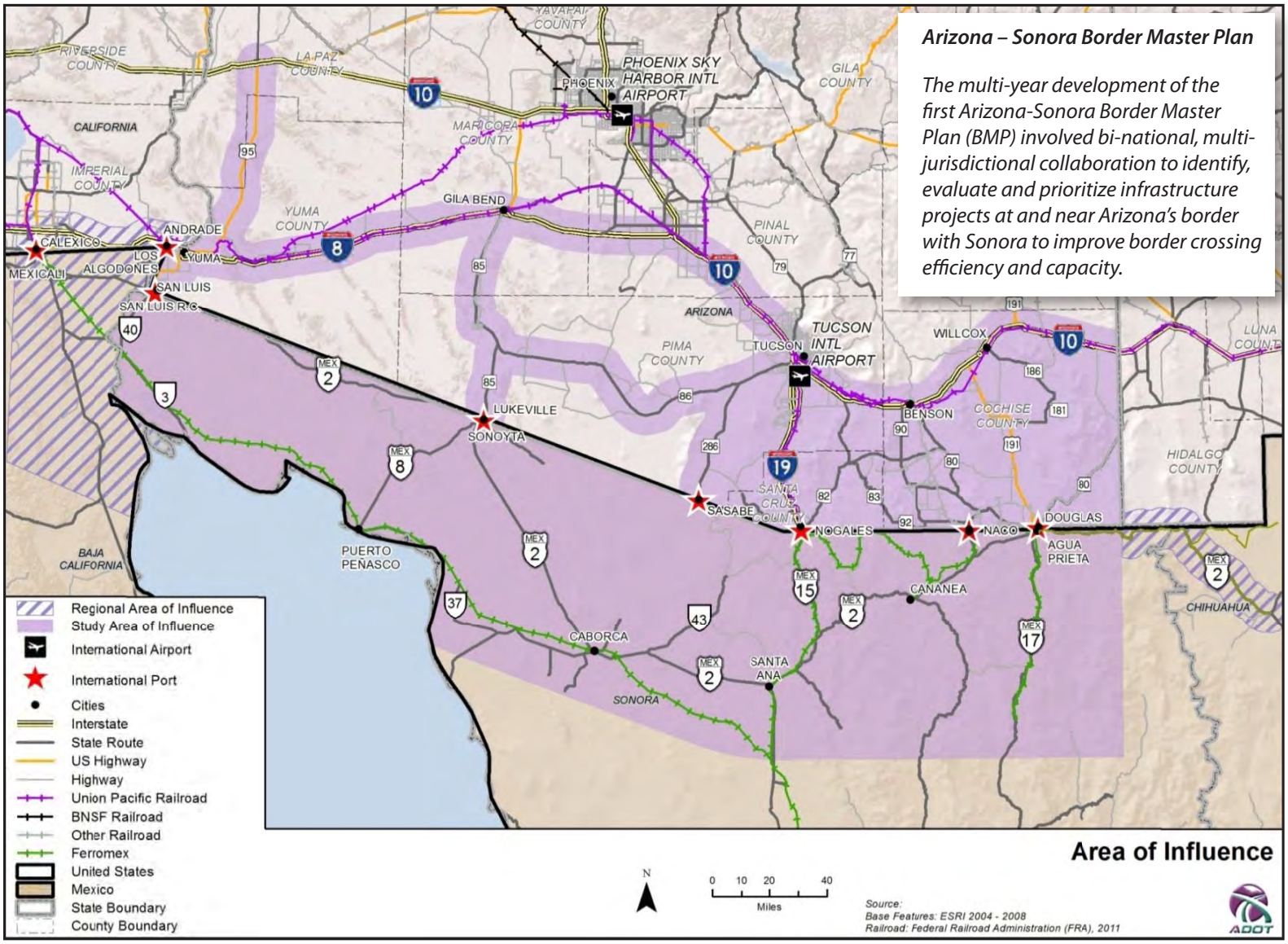
Organizations composing PAG's Economic Vitality Advisory Committee

Figure 12

Trade with Mexico

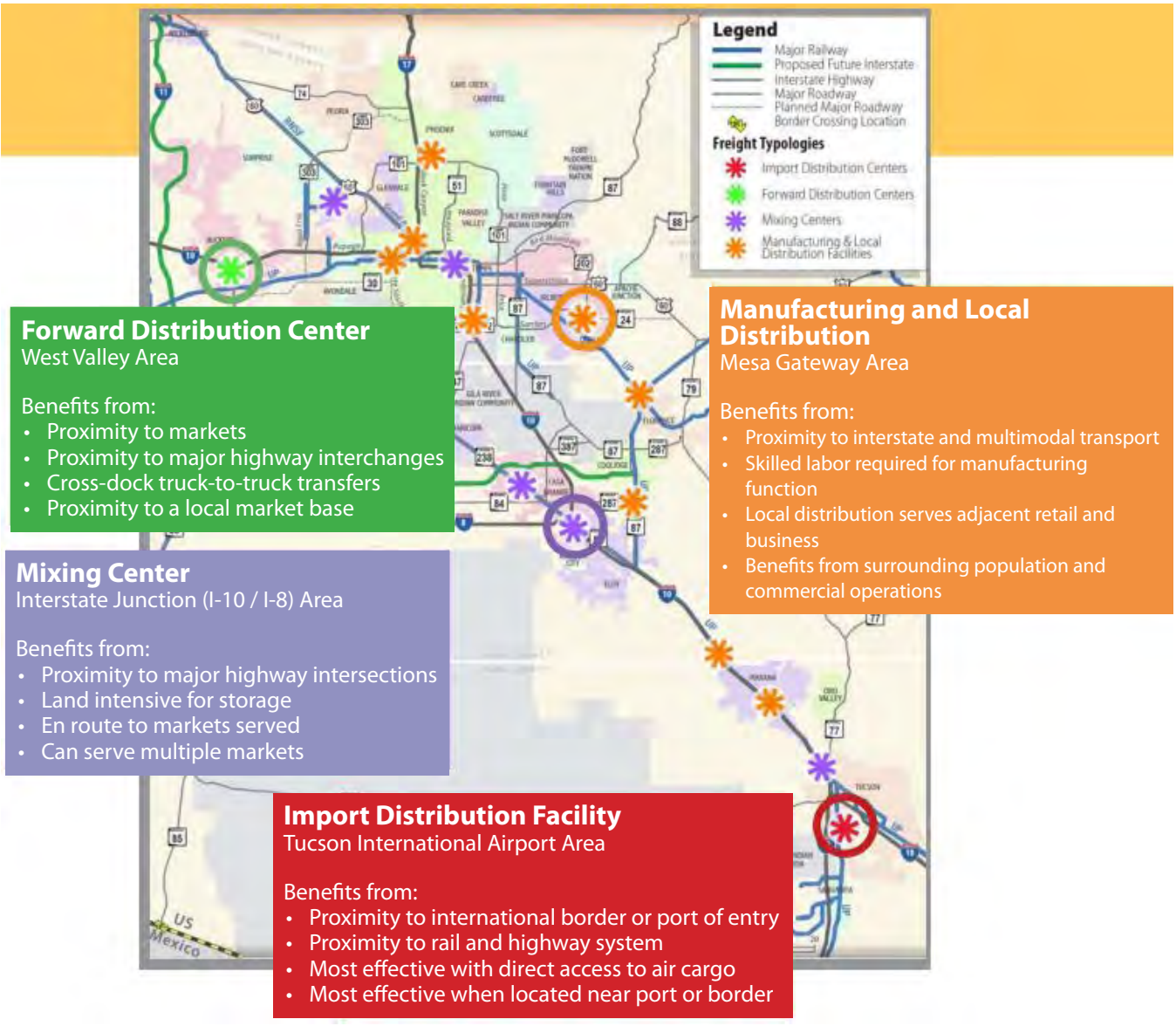
According to the International Trade Administration, "Arizona's export shipments of merchandise in 2014 totaled $21.1 billion. The state's largest market was Mexico. Arizona posted merchandise exports of $8.6 billion to Mexico in 2014, representing 40.9 percent of the state's total merchandise exports." Imports from Mexico are equally important. Nogales, Ariz., has a long-standing tradition of serving as an import gateway for fresh produce from Mexico.

Study area for the Arizona-Sonora Border Master Plan



Map 27 Source: ADOT

JPAC Freight Transportation Framework Study freight typologies and locations in the Sun Corridor



Map 28 Source: JPAC

Joint Planning Advisory Council (JPAC) Freight Transportation Framework Study

The Joint Planning Advisory Council (JPAC) is a coalition created through a cooperative planning agreement among Maricopa Association of Governments (MAG), Central Arizona Governments (CAG), Sun Corridor Metropolitan Planning Organization and Pima Association of Governments (PAG). JPAC recognizes that Arizona's Sun Corridor Megapolitan area is one of the fastest growing areas in the country and that the economic and environmental futures of each region are integrally linked. A key JPAC study is the Freight Transportation Framework Study, undertaken to understand the Sun Corridor's role in the global supply chain and to establish a unified plan for goods movement and related economic development. The study identified freight-related economic development opportunities and focus areas, one of which is the area around the Tucson International Airport (TIA).

Aviation

Tucson International Airport (TIA) is one of nine primary commercial service (PCS) airports in Arizona and the only PCS in the Pima County. Ryan Airfield and Marana Regional Airport are general aviation reliever airports in Pima County.

Anticipated Aviation Demand

Aviation demand forecasting is the foundation for determining future airport facility needs. For air carrier airports, like TIA, the number of anticipated annual enplanements (passengers boarding an aircraft at an airport) is a useful predictor of facility needs. For general aviation airports, such as Ryan Airfield, the number of anticipated annual operations is the most useful predictor. Operations are the total number of takeoffs, landings or touch-and-go procedures by an aircraft on an airport.

The aviation industry has seen numerous changes over the last 5 to 7 years due to the Great Recession. Airline consolidation and changes to airline business practices have generally resulted in slower growth in the aviation industry for the United States than has been traditionally seen. Therefore, the 2045 RMAP's 30-year planning horizon projects that TIA's annual enplanements are expected to grow at a relatively modest rate of 1.6 percent from 1,600,000 in 2014 to 2,600,000 in 2045.

Future Aviation Development

The "roadmap" for designing and constructing future facilities as well as maintaining and enhancing existing facilities is established through the airport master planning process. The Master Plan Update for TIA was approved by the TAA Board of Directors in 2014 while the Ryan Airfield Master Plan Update was approved in 2009. The master plan includes a 20-year capital improvement program that connects projected demand levels to facility improvements.

The 20-year Capital Improvement Programs for both the TIA and Ryan Airfield Master Plans focus on maintaining existing facilities, enhancing airfield safety and security, and developing excess property for non-aeronautical compatible land uses. Approximately 85 percent to 90 percent of the planned airport projects are eligible for federal and state funding while the balance of these projects will be paid for with TAA funds (TAA does not collect local taxes but is funded through airfield leases, concessions, landing fees, etc.). In total, the major projects, with regular maintenance efforts and other airport development activities, will require approximately $1.1 billion in anticipated federal and state funding for the two airports during the 2045 RMAP's planning horizon.

The TIA's 20-year program includes over 100 major projects, representing approximately a $1 billion investment over that time period. The list below shows a representative list of future projects and anticipated costs through the year 2045.

Projects:

- Terminal Optimization Program - $33M
- Extend Taxiways - $8.5M
- Construct new taxiways/Relocate Runway - $180M
- Pavement Preservation for Public Roadways & Parking - $40M
- Pavement Rehabilitation/Reconstruction for Runways/Taxiways - $50M
- Upgrade Expand Security Monitoring Capabilities - $5M
- Airfield Drainage Projects- $20M
- Expand Air Freight Facility - $2.6M

Ryan Airfield's 20-year program includes over 50 major projects, representing approximately a $40 million investment over the time period. The list below shows a representative list of future projects and anticipated costs through the year 2045.

Projects:

- Construct Apron to Facilitate Aeronautical Development – $2.6M
- Expand Apron and Construct Remaining Apron - $5.3M
- Airfield Drainage Projects - $8M
- Pavement Rehabilitation/Reconstruction for Runways/Taxiway - $10M
- Land Acquisition for Runway Approach Protection – $2.2 M
- Primary Runway Extension - $2M

Intercity Bus Facilities

The Tucson region is home to three privately operated bus providers: Greyhound, Tufesa and TAP Royal.

Greyhound

The Tucson Greyhound bus station provides service to nearly 1,800 destinations across the United States, including four daily trips to Phoenix. As of the writing

of the 2045 RMAP, a temporary Greyhound bus station is located in downtown Tucson on Congress St. near I-10. Meanwhile, the City of Tucson and the Rio Nuevo Multipurpose Facilities District are working with Greyhound to relocate the station in order to clear the way for the ongoing development of downtown Tucson.

Tufesa

Tufesa is a Mexican intercity bus carrier that serves destinations in the U.S. states of Arizona, Nevada and California as well the west coast of Mexico as far south as Guadalajara, in the state of Jalisco. Tufesa connects Tucson to 15 cities within the western United States, including two daily buses to Phoenix, and 13 destinations in Mexico. The Tufesa station in Tucson is located at S. 12th Avenue, just north of the intersection with Drexel Road and close to I-19.

TAP Royal

TAP Royal is another Mexican bus carrier, which began operating in the United States in 2012. TAP Royal currently connects Tucson with the cities of Los Angeles, Nogales, AZ, Phoenix, and Las Vegas, as well as 16 locations in Mexico. The TAP Royal Tucson station is located on W. Irvington Rd. near the I-19 interchange.

Mexican bus carriers provide an important connection with Mexico, supporting tourism on both sides of the border, and allowing easy access for Mexican visitors who, according to a 2009 study from the Eller College of Management's Economic and Business Research Center, contribute an estimated $1 billion annually to the Tucson region's economy.

Safety

As required in MAP-21, the metropolitan transportation planning process shall provide for consideration and implementation of projects, strategies and services to increase the ability of the transportation system to support homeland security and to safeguard the personal security of all motorized and non-motorized users.

These provisions are included in the planning factors outlined by MAP-21, which states that the development of transportation system projects through a long-range transportation plan will:

Increase the safety of the transportation system for motorized and non-motorized users

Increase the security of the transportation system for motorized and non-motorized users

Consideration of these planning factors was incorporated, as appropriate, in all aspects of the PAG planning process, including activities such as the formulation of goals, objectives, performance measures and evaluation criteria for use in developing the long-range transportation plan; identification of prioritization criteria for projects and strategies reflected in the TIP; and development of short-range planning studies, strategic planning studies, or transportation needs studies.

PAG regularly coordinates regional traffic incident and emergency management planning in close coordination with department of transportation personnel and first responders. These efforts include workshops to help identify and address incident and emergency service issues, needs and actions related to response during normal conditions and major construction projects, evacuation planning coordination and transportation involvement in emergency operations center coordinated incidents.

The vulnerability of a region's transportation system and its use in emergency evacuations are issues receiving new attention with the threat of intentional damage or destruction caused by vandalism, criminal activity, terrorist events and natural disasters. Therefore, security goes beyond safety and includes the planning to prevent, manage or respond to threats toward a region and its transportation system and users. There are many programs to help manage security concerns and emergency issues. PAG and its member jurisdiction transportation and emergency service staff are regular participants in security planning and preparation activities, including development of the State of Arizona Emergency Response and Recovery Plan, Pima County Emergency Operations Plan, and the Pima County Multi-Jurisdictional Hazard Mitigation Plan. Ongoing participation in these planning activities helps the region prepare for and to better manage transportation security situations.

An important consideration during the selection of projects for the long-range transportation plan was the ability of the project to ultimately help improve safety conditions for the region. It is critical to develop transportation improvements that reduce the number of injuries and fatalities so that people can safely travel throughout the region, no matter the mode of transportation. To help address these issues, potential long-range plan projects were ranked, in part, based on a history of known safety issues along identified corridors. Additionally, the RMAP includes identified funding for safety improvements, though no specific project locations are part of the plan.

It should be noted that traffic fatalities have fallen considerably in the last decade and a half. Since 1997, the 5-year average of total roadway fatalities are down 20 percent, while the fatality rate per 100 million miles driven is down 33 percent.

MAP-21 continued the Highway Safety Improvement Program (HSIP) as a Federal Highway Administration (FHWA) core program and provided a significant increase in the funding available for infrastructure-related highway safety improvement projects, as established in Section 148 of Title 23 USC. The purpose of the HSIP as stated in Section 148(b)(2) is "to reduce traffic fatalities and serious injuries on public roads."

To address safety issues for a transportation system, MAP-21 requires that all states prepare and annually evaluate their Strategic Highway Safety Plan (SHSP) as federally required in 23 U.S. Code (U.S.C.) § 148. A SHSP is a statewide, coordinated safety plan that provides a comprehensive framework for reducing highway fatalities and serious injuries on all public roads. A SHSP strategically establishes statewide goals, objectives and key emphasis areas developed in consultation with federal, state, local and private sector safety stakeholders. More information on the Arizona SHSP can be found on the ADOT website (https://www.azdot.gov/about/transportation-safety/arizona-strategic-highway-safety-plan).

The PAG region is currently in the process of developing a regional safety plan that is consistent with and complementary to the Arizona SHSP. The PAG Strategic Transportation Safety Plan (STSP) includes focus on the PAG region to provide data-driven regional safety goals, objectives and key emphasis areas to improve safety for all transportation users in the region.

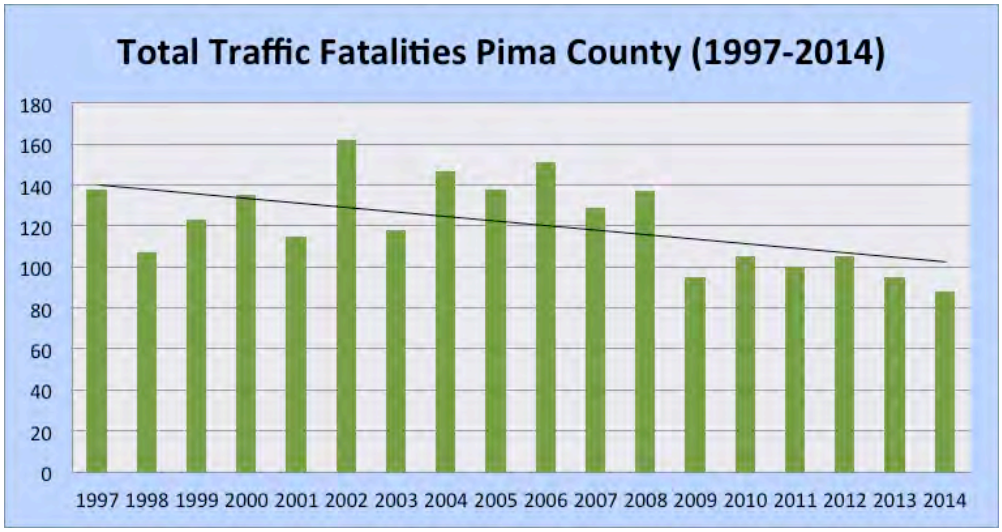


Figure 12 Source: ADOT

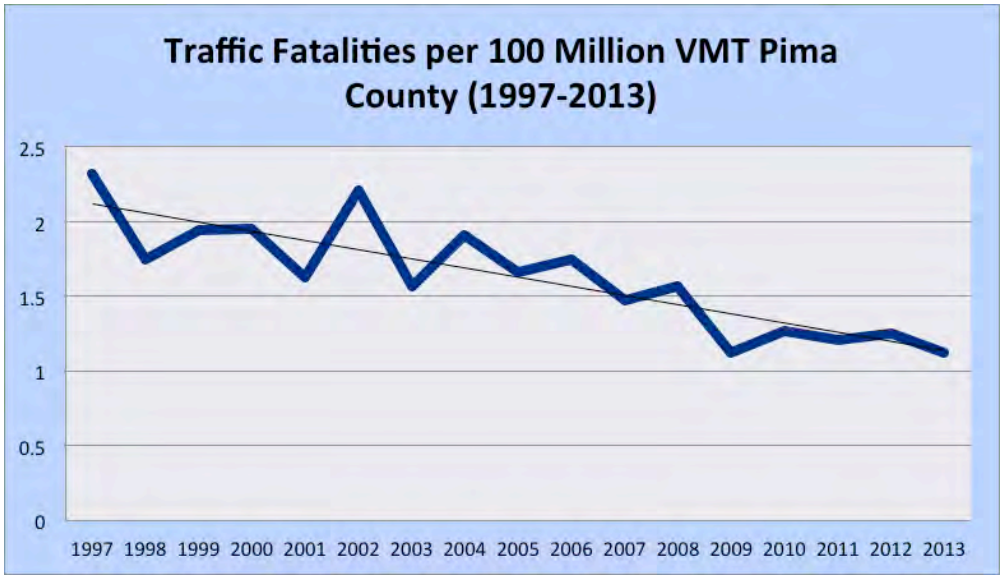


Figure 13 Source: ADOT

The vision and goals of the AZ SHSP and the draft vision and goals of the PAG STSP are listed below.

Arizona SHSP Vision:

"Toward Zero Deaths by Reducing Crashes for a Safer Arizona"
--Arizona 2014 Strategic Highway Safety Plan

PAG STSP DRAFT Vision:

"Working Together Toward Zero Deaths, Everyone Gets Home Alive"
--PAG DRAFT Strategic Transportation Safety Plan

Arizona SHSP Goal:

"Reduce the number of fatalities and serious injuries in Arizona (region) by 3 percent to 7 percent during the next 5 years."
--Arizona 2014 Strategic Highway Safety Plan

PAG STSP DRAFT Goal:

"Reduce the number of fatalities and serious injuries in the PAG region by 7 percent to 10 percent during the next 5 years."
-- PAG DRAFT Strategic Transportation Safety Plan

PAG DRAFT Emphasis Areas:

The PAG STSP draft emphasis areas are based on a data-driven approach which included a full regional network safety review to identify areas of safety performance. Potential safety emphasis areas are emerging as the data analysis is summarized.

Strategic Transportation Safety Plan Emphasis Areas

The following potential emphasis areas were selected based on number of crashes, crash rates, historic trends and percentage of overall crashes:

Intersections

- Crash rate is higher in PAG region than statewide
- Over 40 percent of all serious crashes are intersection-related (highest contributing factor)

Young Drivers

- Crash rate is higher in PAG region than statewide
- Higher percentage of serious crashes in PAG region (35%) than statewide (33%)

Nighttime Crashes

- Includes all nighttime (lit or unlit) crashes
- 3rd highest crash rate in region of all contributing factors
- 25 percent of serious crashes are fatal
- Crash rate for nighttime crashes at unlit locations is higher in PAG region than statewide
- 34 percent of serious crashes at unlit locations are fatal

Impaired Driving

- Crash rate for non-state facilities in PAG region is higher than statewide crash rate
- Crash rate for overall PAG region matches statewide rate
- 6th highest crash rate in region of all contributing factors
- 30% of serious crashes related to impaired driving in PAG region are fatal (28% statewide)

Findings from PAG Strategic Transportation Safety Plan crash data analysis – contributing factors

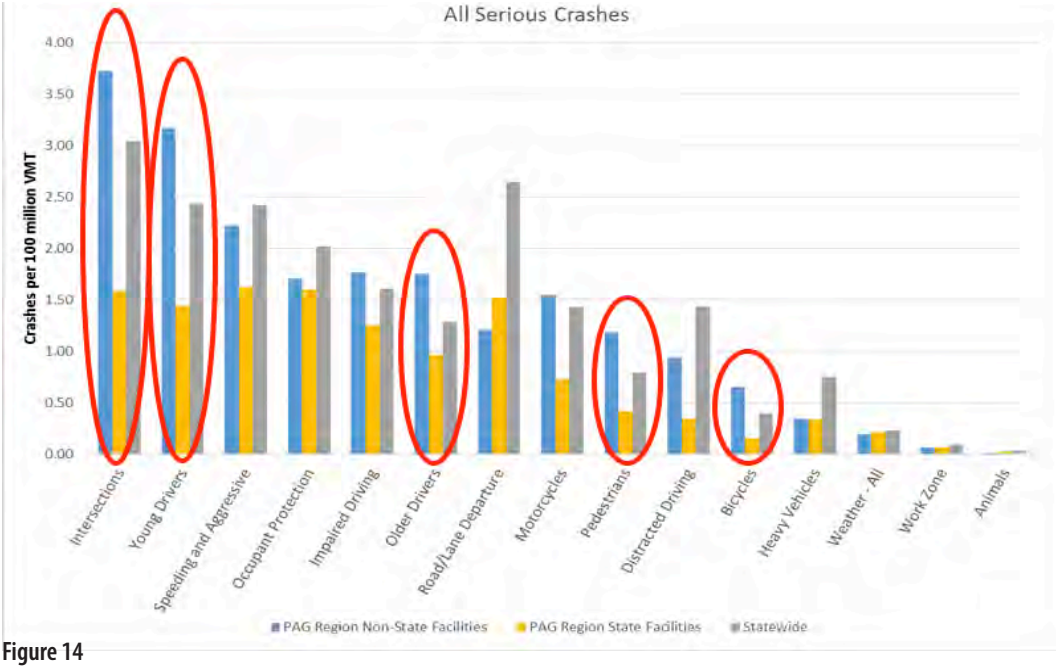


Figure 14

Older Drivers

- Crash rate is higher in PAG region than statewide
- Higher percentage of serious crashes in PAG region (20%) than statewide (17%)
- Number of crashes has been generally increasing during five-year study period

Road/Lane Departure

- 31 percent of crashes are fatal

Motorcycles

- Number of crashes has been generally increasing during five-year study period
- Crash rate for non-state facilities in PAG region is higher than statewide crash rate

Vulnerable Users (Pedestrians and Bicycles)

- Both areas have crash rates higher in the PAG region than statewide
- Higher percentage of serious crashes related to both areas in PAG region than statewide – bicyclists and pedestrians account for 25 percent of roadway fatalities regionwide
- As bicycle and pedestrian facilities are added and improved throughout the region, it is expected that bicycle and pedestrian volumes (and therefore, exposure,) will increase

The PAG STSP will result in the establishment of near-term safety emphasis areas and related strategies to provide positive impacts in the selected emphasis areas. The region is making new commitments to standardize

Data used in the identification of candidate contributing safety factors

Contributing Factor	Total # of Crashes (2009-2013)	Crash Rate			% of Total Related		Trend	% of Serious Crashes which are Fatal	
		PAG region	PAG region non-state facilities	Statewide	PAG region	Statewide		PAG region	Statewide
Intersections	1,286	3.08	3.73	3.04	41%	41%	Decreasing	8%	10%
Young Drivers	1,101	2.64	3.17	2.43	35%	33%	Decreasing	13%	14%
Nighttime - All	991	2.38	2.57	N/A	32%	N/A	Decreasing	25%	N/A
Nighttime - No Lighting	395	0.95	0.94	0.78	13%	11%	Decreasing	34%	33%
Speeding and Aggressive	851	2.04	2.22	2.42	27%	33%	Decreasing	19%	18%
Occupant Protection	699	1.68	1.71	2.02	22%	27%	Decreasing	26%	27%
Impaired Driving	673	1.61	1.77	1.61	21%	22%	Decreasing	30%	28%
Older Drivers	631	1.51	1.75	1.29	20%	17%	Increasing	16%	19%
Road/Lane Departure	544	1.30	1.21	2.65	17%	36%	Decreasing	31%	24%
Motorcycles	542	1.30	1.55	1.43	17%	19%	Increasing	15%	16%
Pedestrians	397	0.95	1.19	0.79	13%	11%	Decreasing	28%	29%
Distracted Driving	316	0.76	0.94	1.43	10%	19%	Decreasing	5%	11%
Bicycles	210	0.50	0.66	0.40	7%	5%	Decreasing	7%	9%
Heavy Vehicles	142	0.34	0.34	0.76	5%	10%	Increasing	22%	22%
Weather - All	85	0.20	0.20	0.23	3%	3%	Increasing	13%	17%
Weather - Precipitation	81	0.14	0.19	0.21	3%	3%	Increasing	12%	16%
Work Zone	26	0.06	0.06	0.10	1%	1%	Decreasing	12%	13%
Animals	7	0.02	0.01	0.03	0%	0%	Flat	0%	12%
Weather - Dust/Wind	4	0.01	0.01	0.03	0%	0%	Flat	25%	23%

Table 19

Source: PAG

This table includes data for all of the contributing factors as a reference. Those discussed as potential emphasis areas are highlighted in light yellow, with the reasons for their selection highlighted in bright yellow. The last two columns show what percentage of the total serious crashes (fatal and incapaciting injury) were fatal for the PAG region and statewide.

Note that statewide data were not available for all nighttime crashes, but were available for nighttime crashes at locations with no lighting. Data for the latter subcategory were included in the table to allow for comparisons between region and state trends, but the selected emphasis area includes all nighttime crashes, regardless of lighting.

its safety analysis procedures to support all jurisdictions and streamline the inclusion of safety features within projects during scoping, design and post design. PAG plans to continue its efforts started through the Strategic Transportation Safety Plan to focus on implementation of safety strategies throughout the region by providing services to its member jurisdictions in safety data analysis, crash modification selection, project scoping and funding. PAG's continued commitment also will provide positive benefits to its long-range transportation plan. By providing ongoing tracking of safety performance through data analysis as well as project implementation assistance to bring project and program concepts from the long-range plan into the near term, the region will maintain a focus on improved safety and security as prescribed in federal regulations.

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Chapter 6: Environment

The Sonoran Desert, rich in biodiversity, has been identified by the Nature Conservancy as one of the top eco-regions worldwide. The unique natural environment in the Tucson region has fostered a longstanding consciousness and strong commitment for environmental protection by planners and the public. In keeping with the 2045 RMAP's vision and goals, the projects in the plan incorporated the public interest in preserving our environment and sustaining our quality of life.

The region's transportation infrastructure affects the region's environment in many ways, both directly and indirectly. About 45 percent of the air pollution in the Tucson region comes from on-road motor vehicles. Paved roads can increase stormwater runoff and cause flooding, which negatively impacts our water quality, safety and mobility. Wildlife and habitat are impacted through land consumption, habitat fragmentation and road kill.

The 2045 RMAP recommends projects and programs that can help alleviate the potential negative effects of transportation on the environment and sustain the flora and fauna of the Sonoran Desert region.

Environmental Coordination

In addition to the environmental representatives on the 2045 RMAP Task Force, many other environmental agencies and community groups provided input on the 2045 RMAP. PAG staff also contacted federal, state, and local land management and natural resource agencies to consult on potential issues and conflicts with the 2045 RMAP. Upon completion of the draft 2045 RMAP, PAG sent copies of the plan and environmental maps to different federal, state and local environmental agencies, including the Bureau of Land Management and the National Forest Service, asking for additional feedback.

The importance of environmental protection to the region is reflected in the overarching vision for the 2045 RMAP:

"The 2045 RMAP envisions a state-of-the-art, reliable, multimodal and environmentally responsible regional transportation system that is continuously maintained, interconnected and integrated with sustainable land use patterns to support a high quality of life and a healthy, safe and economically vibrant region."

Implementation Strategies

Given the strong emphasis on environmental protection in the 2045 RMAP vision and goals, many of the implementation strategies provide information on mitigation activities that can help alleviate some of the negative consequences of transportation projects. Some sample implementation strategies that relate to the environment are to:

- Incorporate green infrastructure elements into transportation projects in order to enhance the aesthetics of the community, improve shade, encourage active transportation and provide improved stormwater management.
- Pave dirt roads with average daily traffic greater than 500 vehicles per day in order to abate dust pollution.
- Improve monitoring to assess the impacts of wildlife crossing projects to better gauge effectiveness.
- Monitor greenhouse gas (GHG) emissions and develop strategies to reduce the effect of transportation-related GHG emissions; currently, it is estimated one-third of all GHG come from transportation sources.
- Adopt environmentally sensitive roadway design guidelines.
- Explore a funding mechanism to better mitigate the environmental impacts of transportation investments.
- Support expansion of alternative fuel vehicles to reduce regional on-road emissions.
- Provide alternate mode options, such as bike, pedestrian and transit to decrease vehicle miles traveled and reduce air pollution.
- Continue implementation of Complete Streets practices in the region.

2045 RMAP Projects and Programs

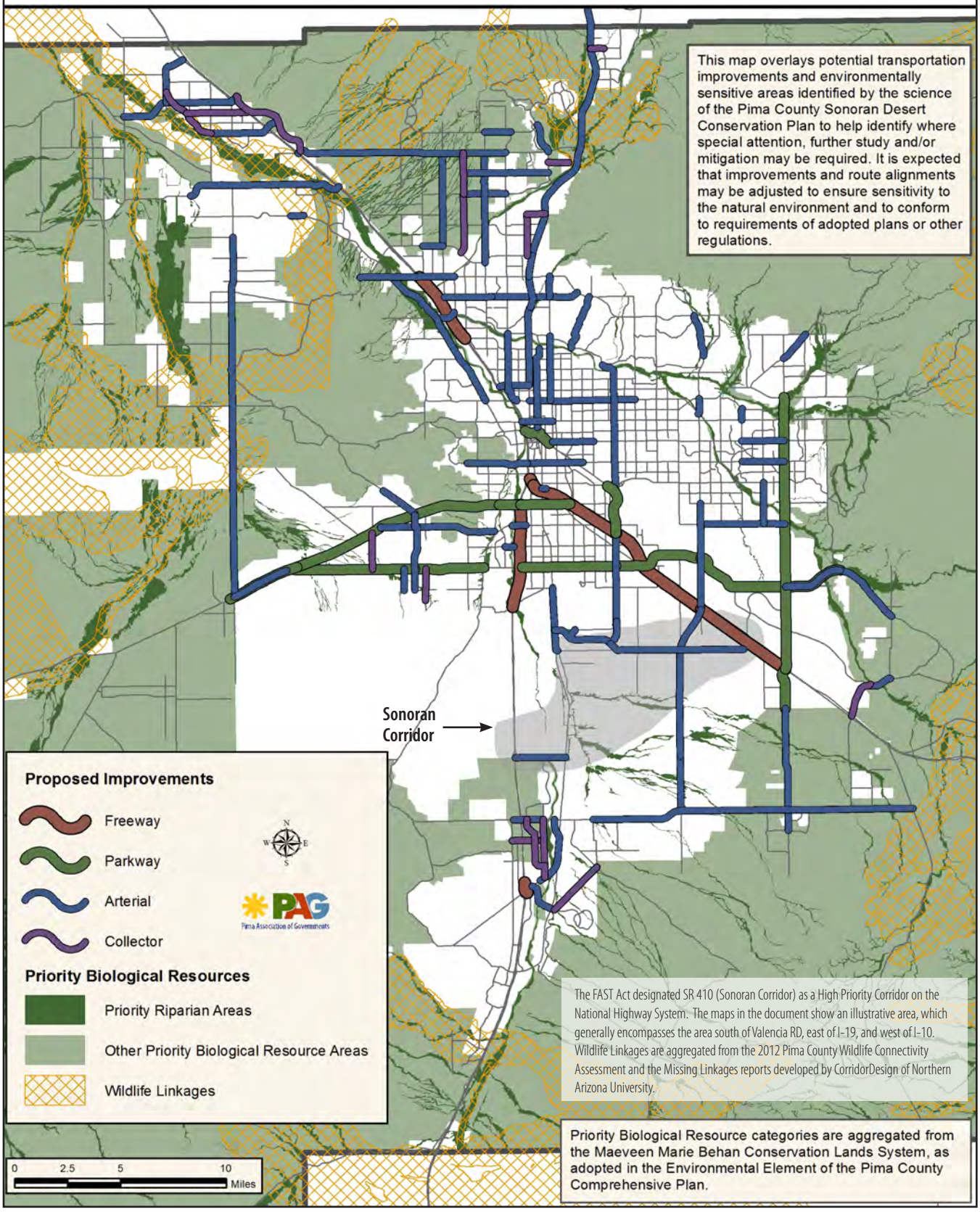
Many projects and programs in the 2045 RMAP, if implemented, will directly and indirectly help preserve the natural environment. A critical starting point was a greater emphasis on transit and bicycle/pedestrian projects that are designed to reduce single-occupancy vehicle use than in any prior regional plan. Additionally, the plan incorporates major regional programs that establish critical wildlife linkages and support air quality planning. There are several alternative energy and fuel vehicle infrastructure programs including adding public electric vehicle charging stations and biofuel infrastructure. Programs are available for education and encouragement of alternative modes of transportation.

Sonoran Desert Conservation Plan and 2045 RMAP projects

During the update to the prior long-range transportation plan, the task force received information to help make informed decisions, including presentations on the Sonoran Desert Conservation Plan (SDCP). The SDCP is a comprehensive planning initiative developed by Pima County to maintain or improve the region's critical ecosystems while accommodating future development and transportation needs. The plan directs growth toward areas with the least natural, historic and cultural resource values. The SDCP is not about whether Pima County continues to grow but rather where the county will grow. Development of the SDCP included participation from broad-based community groups, including federal and state agencies.

As part of the project selection and analysis phase of the 2045 RMAP process, PAG mapped the list of preferred projects to be included in the 2045 RMAP and superimposed the project map over a map of regional biological resources identified in the SDCP. Projects that appear within the sensitive areas were flagged to help identify where special attention, further study and/or mitigation may be required. It is expected that improvements and route alignments may be adjusted to ensure sensitivity to the natural environment and to conform to requirements of adopted plans or other regulations. Environmental clearances and mitigation requirements will be assessed on an individual project basis as part of the design and engineering of those individual projects. Corridor projects located wholly outside of the SDCP, or those that included mitigation strategies, received additional points through the project prioritization process.

2045 RMAP corridor projects compared to important biological resources



Map 29

Overview of Climate Change in the Region

Climate change resulting from natural fluctuations and human activity can involve temperature and precipitation changes along with increased weather variability. Average daily temperatures in the Southwest over the 2001–2010 period were the highest recorded during the last century. Also, fewer cold waves and more heat waves occurred in the Southwest from 2001-2010, as compared to other decades in the 20th century. Scientists predict that the Southwest warming trend will continue with longer and hotter heat waves in summer. Predicting precipitation trends is less certain but studies suggest that the Southwest will remain susceptible to unusual wet spells in some areas while others will be prone to occasional drought episodes. (Assessment of Climate Change in the Southwest United States, University of Arizona Institute of the Environment, 2013).

Federal and State Levels

Anticipated higher temperatures, flooding and an increase in wildfires can all compromise the integrity of our road network. Increased climate variability requires federal, state and local agencies to understand and plan for potential short- and long-term effects of climate change.

The major human-caused factor contributing to climate change is greenhouse gas (GHG) emissions produced from burning fossil fuels for power generation, industrial production and vehicle travel. Nationally, transportation emissions were responsible for over 30 percent of U.S. GHG emissions in 2012. (U.S. GHG Inventory Report: 1990-2012, April 2015, US EPA# 430-R-15-00). To reduce the impact of climate change, the federal government is developing standards and regulations to lower GHG emissions from motor vehicles, electricity generating facilities and industrial sources.

At the state level, the Arizona Department of Transportation (ADOT) participated in a 2013/2014 Federal Highway Administration's pilot study to assess the potential climate change impacts to the interstate system extending from Nogales to Flagstaff. Results from this study indicate that the Tucson region's transportation network will likely be adversely affected by extreme temperatures and flooding events. Also, secondary factors such as wildfires and dust storms also may impair the transportation system.

As a follow up to this pilot study, ADOT continues to coordinate with other state and federal agencies, and university, local government and MPO partners to gather more detailed climate data, particularly regarding the climate change vulnerability on state highways and routes, hydrologic runoff and flooding patterns and tracking changes in biotic community composition.

Regional Partnerships to Address Environmental Challenges

PAG and the local jurisdictions collaborate in the development of programs and policies that address climate change impacts and GHG emissions to create a more sustainable community. For transportation projects, jurisdictions are adapting roadway planning to reduce traffic congestion and vehicle idling. Some jurisdictions also use recycled materials such as shredded tires for rubberized asphalt when constructing roadways. Sun Tran, the public transportation system, is committed to expanding its fleet of alternative-fuel vehicles which includes biodiesel, compressed natural gas (CNG) and hybrid electric-powered buses. As older buses are decommissioned, Sun Tran plans to replace them with CNG-fueled buses.

PAG's regional planning activities address the issues of climate change and sustainability on many levels, such as Transportation, and Air Quality planning, Travel Demand Management, Clean Cities and the Regional Solar Partnership programs. There is a strong spirit of coordination and collaboration in the Tucson region that supports these environmental programs, which includes participation from local jurisdictions, environmental organizations and businesses.

Regional Transportation Planning

PAG is the regional transportation planning agency for the Tucson region and develops five and 30-year plans for the regional roadway network. The transportation planning process is designed to reduce vehicle emissions through several strategies. PAG Transportation Planning evaluates potential road projects for congestion relief benefits since free-flowing traffic reduces idling, fuel use and lowers air pollution emissions. Additionally, PAG coordinates the review and retiming of traffic signals throughout the region on a regular basis. Signal timing improvements reduce stops and idling traffic, which also reduces fuel consumption and emission and helps to keep our air healthy.

Air Quality Planning

In order to assess regional greenhouse gas emissions over time, PAG conducts a biennial regional greenhouse gas emissions inventory. These area wide inventories provide baseline information and measure the region's overall progress in achieving jurisdictional GHG emission reduction goals. Inventories also serve as a resource for the jurisdictions to track and design their reduction programs and policies.

The results of the most recent PAG inventory completed in 2014 indicate that over one-fourth of GHG emissions are generated by vehicle travel. (Figure 16). PAG plans to update the regional GHG inventory in 2016.

Although vehicle travel is a significant source of GHG, recent and future emissions are trending downward. Figure 17 shows historic and projected GHG emissions from regional onroad vehicle travel estimated using the EPA's MOVES 2014 emissions model. The emissions shown in 2045 represent those associated with the 2045 build scenario in RMAP. A similar downward trend in vehicle GHG emissions has been noted nationally (U.S. Climate Action Report .U.S. State Department, 2014).

2012 Eastern Pima County GHG Emissions by Source

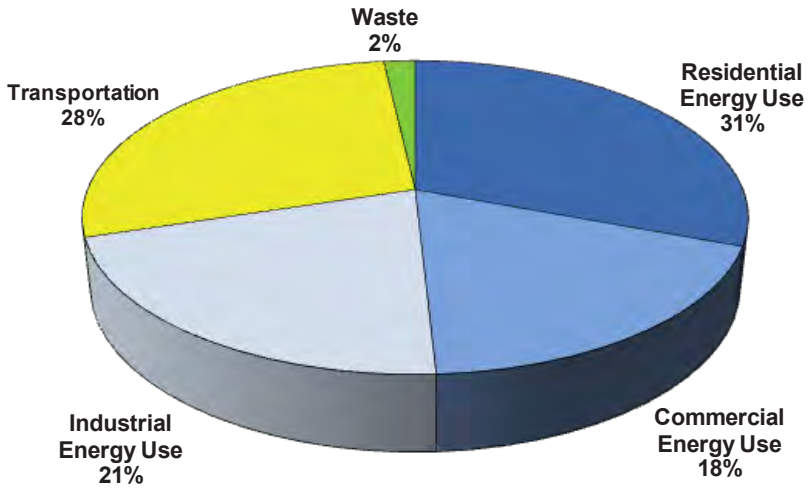


Figure 15

Source: Regional Greenhouse Gas Emissions Inventory, 1990-2012 (PAG, 2012)

Regional Historic and Projected Transportation Greenhouse Gas Emissions

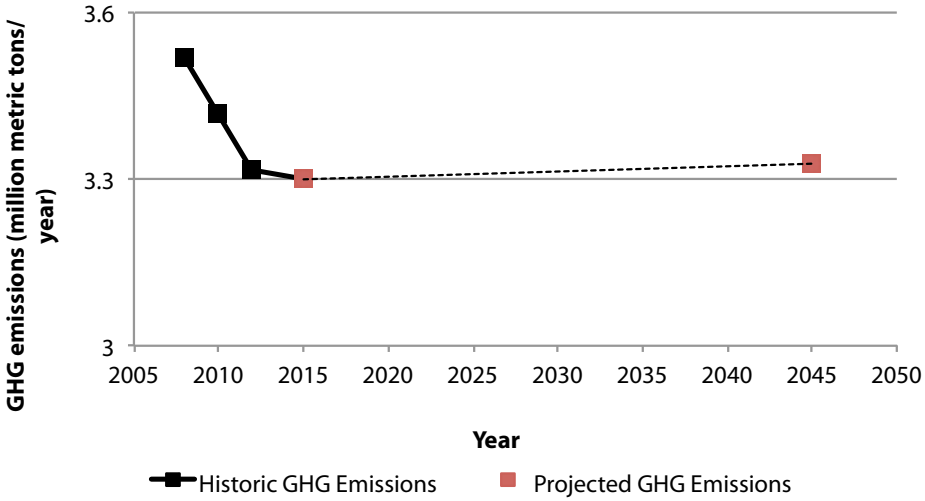


Figure 16

Source: PAG

Addressing Climate Change in the 2045 RMAP

The 2045 RMAP includes many projects and programs that will help reduce GHG emissions, such as transit frequency improvements, bicycle and pedestrian projects, travel demand programs, alternative fuels and others.

The 2045 RMAP also includes various implementation strategies, several of which address environmental and sustainability issues. These include recommendations to provide bike lanes or paved shoulders on all principal roadways, develop incentives to promote non-vehicular trips, monitor GHG emissions and ensure consistency between regional transportation plans, local circulation plans and adopted conservation plans.

Travel Demand Management

PAG's Travel Demand Management (TDM) program includes Sun Rideshare, a regional transportation assistance program, and the Travel Reduction Program, an employer assistance program for commuters, with an emphasis on reducing congestion and improving air quality. TDM promotes the use of alternative transportation for daily trips to reduce energy consumption, pollution and traffic congestion in the region.

- The TDM program reaches more than 200 major area companies and hundreds of thousands of residents to encourage residents to drive less, carpool, ride the bus or bicycle, or walk to work and school.
- Since 2010, more than 127 million miles have been reduced by alternative transportation, preventing the production of over 63,000 tons of GHG emissions.

Clean Cities

Tucson Clean Cities, through its regional coalition, works with local businesses and governments to establish alternative fuels markets. Cleaner, alternative fuels such as natural gas, ethanol (E-85) biodiesel and electricity generate less GHG emissions than traditional fuels such as gasoline and diesel.

- The coalition works with electric equipment vehicle suppliers to install fast-charging stations along the freeways and throughout the city and collaborates with federal agencies, private companies and local school districts to replace traditional vehicles and with those that use alternative fuels.
- The coalition continues to investigate technologies that will reduce truck idling. Truck stop electrification has been installed in several truck stops along Interstate 10, and future installations are anticipated.

Southern Arizona Regional Solar Partnership

With over 300 days of sunshine each year, the Southern Arizona Regional Solar Partnership encourages the expansion of solar-based systems in businesses, nonprofit organizations and schools and educates the public on solar energy and its benefits, which include the reduction of GHG emissions.

Air Quality Assessment

The federal Clean Air Act Amendments of 1990 require that the 2045 RMAP conform with regional air quality plans and ensure that it will not cause or contribute to air quality violations of the National Ambient Air Quality Standards (NAAQS). Under the federal transportation conformity rule (40 Code of Federal Regulations Parts 51 and 93), conformity determinations for transportation plans and programs must include an emissions budget test, use of the latest planning assumptions and models, timely implementation of transportation control measures (TCMs) specified in the applicable air quality implementation plans and consultation. The final determination of conformity for the 2045 RMAP is the responsibility of the Federal Highway Administration and the Federal Transit Administration.

Prior to 2000, the Tucson region was designated in nonattainment with the carbon monoxide (CO) health standard. This nonattainment status required that federally supported transportation plans, programs and projects do not adversely affect air quality. A conformity determination on the short- and long-range plans included modeling results showing that future on-road mobile emissions from motor vehicles did not exceed those of the base year, assumed in our region to be 1990 levels.

Approval of the Carbon Monoxide Limited Maintenance Plan (CO LMP) for the Tucson Air Planning Area (TAPA) in July 2000, and the second 10-year CO LMP in January 2010, removed the conformity determination requirement for an emissions cap. However, modeling of the regional CO emissions is used for comparative purposes, and compliance is determined by monitoring of the existing system.

Air Quality Conformity of the 2045 RMAP

The Tucson area continues to be well below the health standard for carbon monoxide (CO) under the CO Limited Maintenance Plan (CO LMP). The region's current levels are less than 11 percent of the standard. Improved emission and fuel economy standards and newer vehicle fleets have helped to significantly reduce the CO emissions in the region. These low concentrations serve to emphasize that CO is no longer considered a health concern in the Tucson metropolitan area. The following mobile source emissions control measures in the CO LMP for the Tucson Air Planning Area (TAPA) are currently in effect:

- Federal Motor Vehicle Control Program
- State Vehicle Emissions Inspection Program
- State Oxyfuels Program

- PAG's Travel Reduction Program including the Sun Rideshare program
- Pima County Department of Environmental Quality's (PDEQ) Voluntary No-Drive Days Program

These programs represent the permanent and enforceable commitments (as required under § 107(d) (3) (E) (iii) of the Clean Air Act) that will help keep the area in attainment.

Transportation conformity determination is required by the Clean Air Act section 176(c) (42 U.S. Code 7506(c) to ensure that federal funding and approval are given to transit projects that are consistent with the air quality goals in the state air quality implementation plan (SIP). Conformity ensures that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the national ambient air quality standards (NAAQS). Although the Tucson region currently meets all federal air quality standards, it violated the CO standards in the late 1970s early 1980s. Approval of the CO LMP for the Tucson Air Planning Area (TAPA) in 2000, and the second 10-year CO LMP in 2010, removed the conformity determination requirement. However, modeling of the regional CO emissions is used for comparative purposes and compliance is determined by air polluting monitoring of the region.

The regional CO emissions from motor vehicle travel were analyzed for the 2045 RMAP projects. Outputs from the travel demand forecasting model, and the EPA's air quality model, MOVES2014 were used by PAG staff to estimate the CO emissions from motor vehicles for the start year, and the 2045 build and 2045 no-build scenarios for the transportation network. The MOVES2014 model takes into account regulatory changes that affect emissions, including changes to tailpipe and fuel efficiency standards and fuel sulfur content. Details on the local inputs used for MOVES modeling can be found in Appendix 8.

The modeling results shown in Table 19 demonstrate that the CO emissions generated in the build scenario (2045B) are lower than the base year 2015 CO emissions. Thus the new transportation projects planned in the 2045B scenario will not worsen current air quality levels. As previously mentioned, current CO concentrations are well below the EPA's standards.

Despite VMT increases in 2045, total CO emissions and average emissions per vehicle continue to decline. This primarily can be attributed to stricter federal vehicle tail pipe emission standards (Tier 2 and 3 Emissions standards), fleet turnover and improved vehicle fuel efficiency requirements.

Other Pollutants of Regional Concern

In addition to monitoring for CO concentration, five other pollutants are monitored by the PDEQ for adherence to EPA air quality standards. Two of these are of particular concern to the region:

Ozone: In October 2015, the EPA lowered the ozone standards from 75 ppb to 70 ppb to further protect human health and the environment based on the most recent research. The Tucson region remains in attainment with the new ozone standards but local concentrations are at 99 percent of reaching the standard (PDEQ, 2015).

Ozone is formed by a complex set of chemical reactions between two ozone precursors: volatile organic compounds (VOC) and oxides of nitrogen (NOx) in the presence of sunlight. On-road vehicle emissions are sources of both precursors.

Particulate Matter (PM): The Tucson region is currently in attainment for both fine ($PM_{2.5}$) and coarse particulates (PM_{10}). Tailpipe emissions and dust from paved and unpaved roads are sources of these particulates.

A MOVES modeling summary of average weekday emissions for VOC, NOx and PM_{10} and $PM_{2.5}$ for the various 2045 RMAP scenarios can be found in the Technical Addendum.

Summary

Nationally, CO concentrations have consistently declined over the past 30 years, despite increases in VMT in the United States. Similar trends for CO are observed in the PAG region; however, the major pollutant of regional concern is ozone, with concentrations at 99 percent of the new health standard. In order to ensure compliance with the federal health standards, continuing current programs to reduce vehicle miles of travel, and promoting the use of alternate modes of transportation and clean fuels, will be important regional components for maintaining healthy air.

Modeling Summary of the 2045 RMAP Scenarios for Carbon Monoxide

Scenario	Average Weekday Vehicle Miles Traveled (VMT)	Carbon Monoxide emissions (metric tons/ weekday)
2015 Base year	22,346,800	164.3
2045 Build	34,071,600	50.3
2045 No Build	32,835,900	49.3

Table 20

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APPENDIX 1

Vision, Goals, Performance Measures and Strategies

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2045 VISION

The 2045 RMAP envisions a state-of-the-art, reliable, multimodal and environmentally responsible regional transportation system that is continuously maintained, interconnected and integrated with sustainable land use patterns to support a high quality of life and a healthy, safe and economically vibrant region.

System Maintenance: Roadways, bike and pedestrian infrastructure, and transit systems that are rehabilitated, complete, and maintained in a state of good repair

Objective	Performance Measure	Current	2020 Benchmark	2045 Plan Target
Improve the condition of roadways in the Tucson region	Percentage of federal-aid roadways rated in "poor" condition based on International Roughness Index	37% in poor condition	Under 30% in poor condition by 2020	Below 20% poor by 2045
Maintain the share of structurally deficient bridges	Percentage of bridges rated as structurally deficient	8%	8%	Maintain below 10%
Maintain the regional transit fleet in a state of good repair	Average age of buses	6.5 years	6.5 years	Maintain under 7 year average age

System Maintenance Strategies

1) *Develop and support uniform system performance planning tools that assist local agencies and establish consistent reporting standards region-wide.*

2) *Incorporate best practices in pavement management systems and encourage communication across jurisdictions about successful strategies.*

3) *Encourage the programming of regional funding for pavement preservation.*

4) *Explore sustainable local funding solutions to maintain the region's transportation assets.*

Safety: Safety and security for all transportation users across the region

Objective	Performance Measure	Current	2020 Benchmark	2045 Plan Target
Reduce total roadway injuries and fatalities	Total 5-year average of incapacitating injuries	675	640	Reduce by 25%
	Rate of 5-year average incapacitating injuries per 100 million Vehicle Miles Traveled (VMT)	8.09	7.75	Reduce by 45%
	Total 5-year average of roadway fatalities	100	95	Reduce by 25%
	Rate of 5-year average fatalities per 100 million VMT	1.2	1.11	Reduce by 45%
Reduce pedestrian injuries and fatalities	Total 5-year average of pedestrian incapacitating injuries	59.6	56	Reduce by 33%
	Rate of 5-year average incapacitating pedestrian injuries per 10,000 walk commuters	57.12	51	Reduce by 70%
	Total 5-year average of pedestrian fatalities	22	20	Reduce by 33%
	Rate of 5-year average pedestrian fatalities per10,000 walk commuters	21.08	18.5	Reduce by 70%
Reduce bicyclist injuries and fatalities	Total 5-year average of bicyclist incapacitating injuries	39.2	37	Reduce by 33%
	Rate of 5-year average incapacitating bicyclist injuries per 10,000 bike commuters	57.67	51	Reduce by 70%
	Total 5-year average of bicyclist fatalities	2.8	2.6	Reduce by 33%
	Rate of 5-year average bicyclist fatalities per 10,000 bike commuters	4.12	3.65	Reduce by 70%
Maintain a low rate of transit vehicle crashes	Vehicle accidents per 100,000 miles	1.7	1.5	Reduce by 10%

Safety Strategies

1) *Integrate Vision Zero into all levels of transportation planning with the aim of ultimately eliminating all roadway fatalities.*

2) *Promote safe and efficient incident response and clearance through development and implementation of a formalized regional incident management program.*

3) *Maintain the roadways, sidewalks, bicycle and transit facilities through filling potholes, sweeping debris and maintaining traffic signals. Execute timely responses to safety concerns regarding the transportation network.*

4) *Support the development of a comprehensive performance measurement program for the region whereby safety and security issues are identified and addressed promptly.*

5) *Incorporate emergency service agencies in the transportation planning and implementation processes in order to ensure delivery of transportation security to the traveling public.*

6) *Evaluate and encourage the installation of applicable emergency traffic signal preemption equipment at signalized intersections, fire station roadway access points and other locations.*

7) *Include Roadway Safety Assessments (RSA) as part of projects addressing safety issues. RSAs should be addressed during the scoping and design process to incorporate safety features in all projects as early as possible and in order to avoid project retrofits.*

8) *Increase the use of Intelligent Transportation System (ITS) strategies in work zones, such as dynamic message signs and dynamic lane merge systems that provide real-time traveler information and real-time response to lane merging conditions. Use of ITS strategies in work zones are intended to improve safety and operations.*

9) *Prioritize funding for safety improvement projects as a key component of transportation project development through the TIP and RMAP processes and ensure that HSIP funding is fully utilized in the region consistent with the emphasis areas of the regional Strategic Transportation Safety Plan.*

10) *Develop strategies to improve safety for drivers, bicyclists and pedestrians at major intersections. Add more bicycle and pedestrian friendly features, such as islands and where appropriate, to slow traffic and provide pedestrian refuge and bikeways in large intersections.*

11) *Investigate reducing vehicle travel speeds in areas where drivers and pedestrians interact and where older drivers and pedestrians need more time to make decisions.*

12) *Make it easier for drivers and pedestrians to notice, read and understand visual information by reducing the clutter of signs, creating better access management, and improving signs and lighting to make the roadway more intuitive.*

13) *Support an education and outreach campaign that creates a serious dialogue about "traffic safety culture" within the region with a goal toward affecting behavior and improving safety by reducing indifference or complacency.*

14) *Improve roadway lighting, particularly in areas with high levels of bicycle and pedestrian activity, using dark sky compliant luminaires such as full cut-off fixtures where appropriate.*

15) *Continue to expand the use of bike and pedestrian signals (such as HAWKs) in order to improve road safety and increase crossing opportunities on arterial roads.*

Multimodal Choices: A variety of integrated, high-quality, accessible and interconnected transportation choices to meet all mobility needs and changing travel preferences

Objective	Performance Measure	Current	2020 Benchmark	2045 Plan Target
Increase the mode share of walking, biking and transit	5-year average walk, bike or transit to work rate (American Community Survey)	6.7%	7.25%	Increase to over 10%
	Walk, bike and transit mode share for all trips (National Household Travel Survey)	16.4%	17%	Increase to over 20%
Increase transit ridership	Annual unlinked passenger trips	19.7 million	22 million	Increase by 75%
Reduce transit travel time	Average transit travel time for all trips door-to-door (minutes)	50.81	50.5	Below 50
	Average transit travel speed	13.25	13.75	Over 15 mph
Increase availability of bike and pedestrian infrastructure	Total miles of complete and accessible pedestrian facilities on major urban roadways	442	560	1200
	Pedestrian accessibility ratio (ratio of accessible to inaccessible sidewalks on major roadways in urban area)	33%	40%	80%
	Total miles of bike facilities by type	1010	1130	1720
	Bike Route/Signed Bike Route	92	100	150
	Bike Route with Striped Shoulder / Signed Bike Route w/On-Street Bike Lane	707	760	1000
	Shared-use Path	203	220	350
	Bicycle Boulevards	8	35	170
	Protected Bike lanes	0.5	8	50
	Bike facility miles per 100,000 residents	1	1.05	1.2

Multimodal Strategies

1) *Continue implementation of Complete Streets practices in the region.*

2) *Retain the quality of the current public transit system, expand access and services, and implement high capacity transit.*

3) *Implement a seamless regional transit system and identify a regional dedicated revenue source for transit.*

4) *Fill gaps in the region's sidewalk network.*

5) *Expand the variety of transit services and other modes of transportation available to meet the needs of non-driving populations, including children, disabled and older adults, such as volunteer driver programs, carpooling and paratransit services.*

6) *Improve bicycle planning efforts by focusing on the League of American Bicyclists' critique of the region's 2012 platinum application for bicycle-friendly communities.*

7) *Expand the network of enhanced bikeways, including bike boulevards, protected bike lanes, crossing opportunities, shared use paths, wide paved shoulders*

on rural routes, and others.

8) *Develop a regional Safe Routes to School Plan.*

9) *Develop incentives to promote non-vehicular trips.*

10) *Expand the ADA sidewalk network and include features that assist persons with disabilities such as 5-foot wide sidewalks, curb ramps, detectable warnings in the sidewalk surface to alert individuals to driveways and intersections, and reduced obstructions such as poles and signage.*

11) *Elevate pedestrian amenities to become a priority in sidewalk projects and roadway projects that include sidewalk elements. Pedestrian amenities include street lighting, shading, seating, traffic signalization, and incorporating national best practices for pedestrian crossing treatments, such as HAWK signals.*

12) *Improve the quantity and quality of bus shelters and bus stop facilities including lighting, seating, bicycle parking, public art, drinking fountains, real time arrival signs, etc. in order to increase the convenience, accessibility and comfort of transit.*

13) *Consider new shared-use path development, with an emphasis on creating links from residential to employment, commercial and recreation areas. Support new development areas at trail nodes, in conjunction with transit station development.*

14) *Incorporate green infrastructure elements into transportation projects in order to enhance the aesthetics of the community, improve shade, encourage active transportation and provide improved stormwater management.*

System Performance: Improved regional mobility, congestion management, and travel time reliability through reducing travel demand, enhancing operations, and adding system capacity for all modes where necessary

Objective	Performance Measure	Current	2020 Benchmark	2045 Plan Target
Reduce the number of miles and hours that the average resident in the region drives	VMT per capita	20.6	No Change	Reduce by 10%
	Daily Vehicle Hours Traveled per Capita (minutes)	32:23	No Change	Reduce by 5%
Improve (maintain) reliability of the transportation system on major roadways	Planning Time Index on NHS	Data Currently Unavailable	Data Currently Unavailable	Data Currently Unavailable
Minimize increase in congestion on the arterial and freeway network	Weighted Travel Time Index	1.44	1.48	Minimize increase to below 10%
	Percent of peak hour VMT travelled under Level of Service E or F	1.15%	1.2%	1.8%

System Performance Strategies

1) *Support a comprehensive performance measurement program of the transportation network whereby mobility issues are identified and addressed promptly through a program of expanded data collection and analysis.*

2) *Evaluate and incorporate applicable Intelligent Transportation System features for all transportation projects during project scoping or early design process.*

3) *Include evaluation of applicable telecommunications equipment and infrastructure for all projects during the project scoping and early design process. Installation of conduit for fiber optic cable and other telecommunications can provide cost effective improvements in transportation and other public services.*

4) *Include traffic signal timing review and adjustment as part of the construction process of corridor road projects.*

5) *Include regional service patrols as part of major construction projects to assist stranded motorists, remove debris from the roadway and ensure smooth flow of the selected network corridors during construction.*

6) *Encourage appropriate funding levels for system management and operations. Optimal mobility only can be maintained when the components of the system are in good repair and operating as intended.*

7) *Support multi-agency coordination for large-scale work zones through construction planning and phasing which limits the impacts of construction on parallel routes.*

8) *Consider alternative congestion management strategies such as bike, pedestrian, transit, ridesharing, signal coordination and various operational strategies that best address the causes and impacts of congestion. Such strategies should be considered as part of the project development process so that congestion mitigation features can be included as part of larger projects. Congestion management strategies also should be considered prior to determination of capacity increasing projects as part of the regional project development process.*

9) *Improve the existing arterial roadway network to meet the needs and desires of the driving public, including expansion and maintenance of roadways as well as operational improvements.*

10) *Encourage the region to set aside funds to conduct corridor studies to determine the best strategies to improve safety and optimize performance including better access management practices, widening or reducing lanes, and lane widths and intersection improvements.*

11) *Regularly update PAG plans and studies such as the Regionally Significant Corridors Study, the High Capacity Transit Study, and the Regional Plan for Bicycling, to ensure continual improvements to the transportation network. Coordinate the timing of plan updates to increase planning effectiveness.*

12) *Develop and promote access management policies, standards and strategies that can be adopted and implemented by jurisdictions throughout the region and incorporated into corridor projects and local design review processes for development and land use plans. Promote opportunities for jurisdictions, developers, businesses and the public to better understand the benefits of and support the implementation of access management principles.*

13) *Consider additional strategies, such as identifying additional corridors, transit, travel demand management, and others, to address the projected future travel demand of people and freight between Tucson and Phoenix.*

14) *Continue to identify future potential grade-separated rail crossings and determine long-term funding for their construction.*

Environmental Stewardship: Environmental stewardship, natural resource protection and energy efficiency in transportation planning, design, construction and management

Objective	Performance Measure	Current	2020 Benchmark	2045 Plan Target
Reduce per capita annual on-road greenhouse gas emissions	Annual per capita on-road greenhouse gas emissions	3.63 tons per person annually	Reduce by 5%	Reduce by over 30%
Reduce on-road emissions	Weekday metric tons of NOx emissions	22.8	Reduce by 13%	Reduce by 80%
	Weekday metric tons of VOC emissions	18.3	Reduce by 12%	Reduce by 75%
	Weekday metric tons of CO emissions	164	Reduce by 12%	Reduce by 70%
	Weekday metric tons of $PM_{2.5}$ emissions	0.5	Maintain Current	Maintain Current
	Weekday metric tons of PM_{10} emissions	1.3	Maintain Current	Maintain Current

Environmental Stewardship Strategies

1) *Pave dirt roads with average daily traffic greater than 500 vehicles per day in order to abate dust pollution.*

2) *Include removal of buffelgrass, and other invasive species, as part of jurisdictions' road improvement and maintenance efforts.*

3) *Support rainwater harvesting efforts along roadways and at commercial sites to reduce stormwater peak flows and reduce stormwater pollution.*

4) *Provide alternate mode options, such as bike, pedestrian and transit to decrease vehicle miles traveled and reduce air pollution.*

5) *Protect the movement of wildlife and connect critical habitat areas by pursuing local initiatives to create wildlife crossings on major roadways especially along wildlife corridors between mountain ranges.*

6) *Improve monitoring to assess the impacts of wildlife crossing projects to better gauge effectiveness.*

7) *Use recycled materials including rubberized asphalt for constructing roadways.*

8) *Incorporate environmental enhancements to preserve*

open space, create urban pathways and improve bicycle and pedestrian connectivity throughout the region.

9) *Ensure consistency between PAG region transportation plans, such as the RMAP and local circulation plans, and adopted conservation plans, such as the Sonoran Desert Conservation Plan and others, so that they may avoid further habitat fragmentation.*

10) *Monitor greenhouse gas (GHG) emissions and develop strategies to reduce the effect of transportation-related GHG emissions; currently, it is estimated 1/3 of all GHG come from transportation sources.*

11) *Support the preservation of open spaces including undeveloped land, habitats for plants and animals, places of natural beauty and critical environmental areas.*

12) *Adopt environmentally sensitive roadway design guidelines.*

13) *Explore a funding mechanism to better mitigate the environmental impacts of transportation investments.*

14) *Support increased use of renewable energy sources to power roadside infrastructure, such as lighting and signage.*

15) *Support expansion of alternative fuel vehicles to reduce regional on-road emissions.*

Land Use and Transportation: Land use decisions and transportation investments that are complementary and result in improved access to important destinations and vibrant and healthy communities

Objective	Performance Measure	Current	2020 Benchmark	2045 Plan Target
Improve regional access to jobs and other essential services, such as medical, shopping, and recreation	Number of regional jobs the average person can reach in 30 minutes by automobile	240,221	Increase by 7%	Increase by 45%
	Accessibility index for all modes	57,142	Increase 3%	Increase by 15%
Improve access by transit	Number of regional jobs the average employee can reach in 45 minutes by transit	26,332	Increase by 10%	Increase by 50%
	Percent of residents living within ¼ mile of a transit stop	42.6%	43%	More than 45%
	Percent of jobs within ¼ mile of a transit stop	58.9%	59%	More than 60%

Land Use and Transportation Strategies

1) *Encourage development practices that provide direct access from neighborhoods and subdivisions to arterial streets, commercial centers and community facilities by expanding the network of safe and convenient bicycle, pedestrian and other facilities.*

2) *Support the creation of neighborhood-oriented retail development with pedestrian access from surrounding neighborhoods as well as pedestrian shopping districts that encourage a walkable environment.*

3) *Commit to future development patterns that provide safe, easy and convenient access to alternative mode transportation options and support high-capacity transit investment.*

4) *Develop a regional strategy that links land use and transportation by targeting transportation investment in designated growth areas in jurisdictions' adopted land use plans.*

5. *To increase commerce while also enhancing livability, continue to support projects and initiatives that increase pedestrian activity near commercial nodes and corridors.*

6) *Support the development of a range of housing options during new construction to provide quality housing for people of all income levels.*

7) *Promote Transit-Oriented Development (TOD) by building higher-intensity mixed-use communities near transit centers and locating new transit facilities along major corridors. Work with jurisdictions to customize TOD facilities and features to meet community needs.*

8) *Promote the mixture of land uses and higher density development, where appropriate, to create livable neighborhoods so that housing, work and shopping destinations are in close proximity to each other and residents have alternatives to driving such as walking, biking or transit. Activities include:*

- *Develop neighborhood-oriented commercial centers on minor, not major, arterials.*
- *Create nodes of development that are recognizable, high density hubs.*
- *Increase density on targeted transit corridors to increase convenient use for more people.*
- *Provide assistance to communities to plan for and develop mixed use areas that can serve as models for the region.*
- *Assist communities with corridor planning projects efforts that help to improve selected commercial corridors into desirable environments.*

Freight and Economic Growth: Regional freight transportation infrastructure that supports global competitiveness, economic activity and job growth by providing for the efficient movement of goods within our region, giving access to national and international markets, and improving intermodal connections

Objective	Performance Measure	Current	2020 Benchmark	2045 Plan Target
Minimize commercial vehicle delay on the interstate system	Commercial vehicle delay on the interstate system	Data Currently Unavailable	Data Currently Unavailable	Data Currently Unavailable
	Share of commercial vehicles on the interstate	Data Currently Unavailable	Data Currently Unavailable	Data Currently Unavailable
Maintain reliable travel times for commercial vehicles on the interstate system	80th percentile travel time of commercial vehicles on the interstate system	Data Currently Unavailable	Data Currently Unavailable	Data Currently Unavailable

Freight and Economic Growth Strategies

1) *Recognizing the connection between transportation infrastructure and economic activity, continue to foster broad political alignment and support of freight, trade and economic development priorities across the region, interregionally, statewide and binationally.*
2) *Continue to support transportation infrastructure studies, initiatives and projects that could ultimately increase job opportunities in the community.*
3) *Continue to coordinate transportation planning with adjoining counties, regions and councils of government for transportation needs and improvements beyond those in our region.*
4) *As a decision support input, consider economic benefits when prioritizing transportation projects. New or enhanced transportation facilities can stimulate commercial activity, increase tourism revenue and/or increase export-related trade.*
5) *Support efforts to integrate freight movement and land use planning to encourage the development of regional, multimodal logistics hubs.*
6) *Identify and designate routes and connectors with heavy freight movements as freight priority corridors.*
7) *Work with airports to facilitate connections between air and ground travel both to address infrastructure gaps as well as to improve efficient mobility of people and goods.*
8) *Support the collection of high quality commercial vehicle data including that for trucks, trains and cargo airplanes to inform decision making.*
9) *Support infrastructure improvements, such as road improvements and expanded utility lines, near existing or potential businesses to increase their business capacity and public access to facilities.*
10) *Develop meaningful incentives that encourage businesses to locate near transit hubs.*
11) *Continue efforts to provide assistance to businesses impacted by transportation projects.*

Public Involvement: Continued outreach and involvement of all users in transportation decision-making

Strategies

1) *Include broad, geographically dispersed populations in developing plans and projects, including significant participation from traditionally under-represented groups.*

2) *Support PAG and jurisdictional efforts to offer repeated opportunities for substantive public input during project planning and development.*

3) *Encourage project planners to provide public input results to decision-makers in a timely manner and to explicitly consider and respond to public comments.*

4) *Work with neighborhoods to take ownership of transportation projects and programs within their community. For example, expand the "Adopt-a-Road" program and work with neighborhood associations to initiate new projects and elements of the system such as landscaping within traffic circles.*

5) *Develop strategies to gain more buy-in and use of the public transit system. For example, if schools are teaching a module about geography or transportation, they can include a session on teaching students (of a certain age) how to ride the bus.*

6) *Support the development of educational programs to teach the public about sustainable land use, transit-oriented development and successful, mixed-use communities.*

7) *Conduct education and outreach to youth and adults on the value of the region's transportation network and the importance of transportation improvements, including the importance of the Regional Transportation Authority's ½-cent excise tax.*

Advanced Technologies: State-of-the-art, cost-effective delivery of transportation services and facilities

Strategies

1) *Upgrade traffic signal control equipment, signal power supply and communications connections, and intersection and midblock detection equipment on arterial roadways.*

2) *Innovate and pilot new technologies that have potential for creating a safer and better performing system. An example of how this has already been done in Tucson is the HAWK (High Intensity Activated Cross Walk) pedestrian signals. They were created by a City of Tucson engineer and are now included in the manual for uniform traffic control devices (MUTCD) and are used nationally.*

Funding and Implementation: Revenue sources and strategies that ensure ample funding and timely project development

Strategies

1) *Monitor the proposed extension of the half-cent excise tax and the Regional Transportation Authority (RTA) past its current expiration in 2026 and continue to provide information on the value of dedicated transportation funding sources.*

2) *Explore new sources of funding such as public and private partnerships, congestion pricing, vehicle miles traveled fees, etc. in order to develop a diversified funding stream that will adequately meet transportation needs in the future.*

3) *Set targets for project delivery and the implementation of the projects in the 5-year Transportation Improvement Program (TIP).*

4) *Establish a structure for tracking performance measures to assess the progress of the implementation of the 2045 Regional Mobility and Accessibility Plan.*

5) *Develop jurisdiction-specific alternatives to regional policies and programs, particularly for land use, so that jurisdictions are a part of developing the programs that affect their communities. In regional plans, include choices and opportunities to suggest modifications that fit jurisdictions' needs. While suggested modifications may ultimately deviate too much from the overall goal, there is value in proposing creative alternatives.*

6) *Encourage proper maintenance and upkeep of the existing transportation network by setting aside a sufficient funding allocation for maintenance in regional plans, as well as encourage jurisdictions to do so in their annual budgets. As pavement degrades, repairs become exponentially more costly; one of the best uses of transportation funds is to protect the investment made in the existing system, which also will build public support for future expansions of the network as needed.*

Accountability: Continued transparency, responsiveness and coordination to meet transportation needs throughout the region

Strategies

1) *Track the implementation of projects and regularly update the public on the status of projects, programs and finances.*

2) *Encourage jurisdictions to provide information on recently completed projects when conducting public outreach on developing projects. Explain the benefits of completed projects to better educate the public about transportation improvements and solicit input on developing projects.*

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APPENDIX 2

Congestion Management Process

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The CMP and the planning process

PAG's Congestion Management Process (CMP) is a tool to address congestion by enabling PAG and its partners to identify and measure congestion and develop and select appropriate strategies to reduce it. However, the CMP is not intended to be a standalone process. At PAG, the CMP is intimately linked to both the 2045 RMAP and TIP. The CMP furthers the goals and objectives of the 2045 RMAP through performance monitoring in the years following the 2045 RMAP's completion. Likewise, the CMP informs the TIP process of system performance and appropriate congestion management strategies. The CMP, 2045 RMAP and TIP act together to bring into fruition the long-range goals of the 2045 RMAP via the construction of projects and funding of programs. This model aids in ensuring investment decisions are made with a clear focus on desired outcomes.

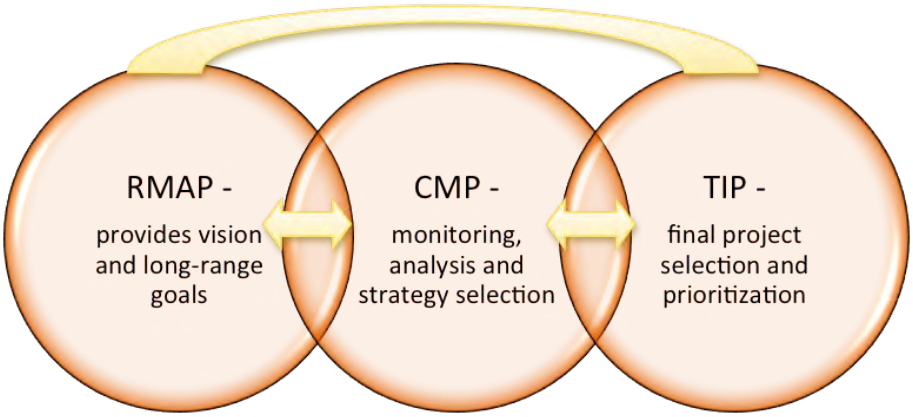
The CMP is aimed specifically at transportation performance and reliability, nevertheless, the CMP and 2045 RMAP share a considerable amount in terms of overall structure and purpose. They are both performance-based and outcome-oriented approaches that include multimodal goals, objectives, targets and performance measures. They both strive to effectively utilize the region's resources to manage congestion through a variety of tools.

On the performance measurement side, the CMP differs from the 2045 RMAP in the level of detail it contains in order to address congestion. In general, the 2045 RMAP has a system or regionwide view of congestion. The CMP, while including the systemwide view, adds specifics for sub-regions, corridors and site specifics. Additionally, the CMP continually tracks the progress toward targets using performance measures. On the implementation side, the CMP contains necessary detail to select appropriate congestion management strategies and to apply the desired changes to the network. Thus the CMP is a continuation of the 2045 RMAP with a refined focus on performance and reliability management and strategy implementation.

The CMP and 2045 RMAP have a reciprocal relationship with goals, objectives and congestion management strategies. The CMP incorporates the 2045 RMAP goals and objectives as the 2045 RMAP incorporates the CMP congestion management strategies. The benefits of the CMP incorporating the RMAP goals and objectives are that they reflect the region's most current desired outcomes derived from the most recent public outreach. The 2045 RMAP objectives are written generally. However, when coupled with the targets and performance measures associated with them they become SMART objectives. The benefits of the 2045 RMAP incorporating the CMP's congestion management strategies include the development of a pool of options to draw from that are eligible for programming in the TIP. Therefore, CMP is a primary mechanism for assessing and recommending management and operations strategies for planning and programming.

The CMP is also one of the devices that coordinates the 2045 RMAP and the TIP. The performance measures identified in the RMAP and the more specific performance measures in the CMP are updated annually and presented to the TIP Subcommittee during the project development phase. This analytical information shows the current condition of the region with respect to each performance area and how the region is performing in relation to the targets established in the RMAP. This is a critical step in tracking to target process.

Due to the linkages between the CMP, 2045 RMAP and TIP, the CMP updates its performance measures annually in coordination with the TIP cycle. The CMP receives a thorough review every four years with the long-range

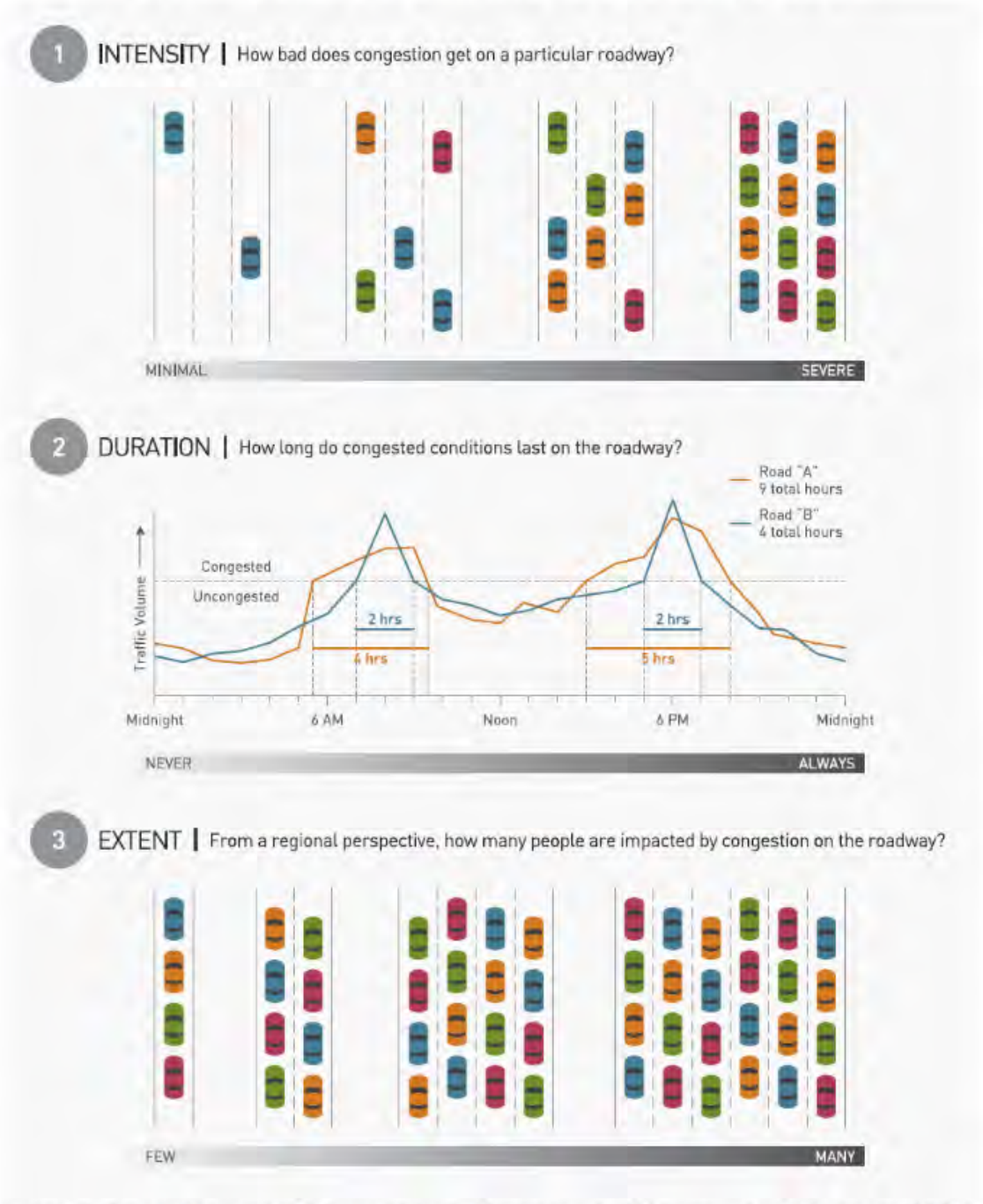


plan cycle. This process of revisiting and re-evaluating the CMP is crucial as regional priorities, technologies and methodologies change. The review of the CMP with this 2045 RMAP has resulted in enhanced integration of the CMP and 2045 RMAP via targeted performance measures, goals and objectives. Additionally, enhanced integration of the CMP and TIP has occurred via a refined annual performance update, updated recurring and non-recurring delay identification, more strategy implementations, more trackable objectives performance tracking via online data visualization and improvement in the evaluation of strategy effectiveness.

CMP specifics:

The PAG CMP tracks the system level performance measurement established in the 2045 RMAP in addition to tracking other corridor and site specific congestion-

Three Dimensions of Congestion



Source: Atlanta Regional Commission, Congestion Management Process, 2006

PAG CMP PERFORMANCE MEASURES

AREA	DESCRIPTION	DETAILS	DATA & DATES
Congestion	Person hours of delay	On selected corridors, occupancy rate from NHTS 09	PAG, needs data: Annual
	Congestion Extent: vehicle measures	Percent of peak hour VMT travelled under LOS 'x' 2	Modeled: Annual
	Congestion duration	Annual hours of travel at LOS 'x' 2 Annual per capita hours of travel at LOS 'x' 2	Modeled: Annual
	Congestion intensity	Mapped, & Percent of roadways or intersections operating at LOS 'x' 2	Modeled: Annual
	Extent of congestion (spatial)	Mapped, & Percent of lane miles operating at or below LOS 'x' 2	Modeled: Annual
	Congestion Costs	Mapped, & Percent of intersections operating at or below LOS 'x' 2 Wasted fuel (Fleet mpg * excess delay) Wasted money (fuel +value of travel time)	Modeled: Annual
	Average transit speed	Separate express, local and selected corridors	Modeled: Annual
Variability and Reliability	Travel time – transit to Auto	During peak travel times, along specified corridors	Modeled: Annual
	Reliability	PTI: (95th percentile travel time /free-flow travel time) On selected corridors1 % network above PTI of 'x' 2	PTI needs data: possibly HERE (NPMRDS) aggregated to biweekly or month only on NHS
	Variability	TTI: (peak travel time/free flow travel time) On selected corridors % network above TTI of 'x'	TTI Modeled: Annual for selected corridors and % of CMP network with TTI > 'x'
	Crash Totals Crash Rate	Severity 4 and above Regional severity 4 and above by 1 million vmt	FARS and ALICE HPMS, FARS and ALICE
Travel time	Average travel time	On selected corridors/routes	Modeled: Annual
		Commute travel time	ACS by mode
	Vehicle Hours of travel per capita	Hours of vehicle travel/population	Modeled: Annual
	Average transit time	Selected Routes, door-to-door For all trips, door-to-door	Modeled: Annual
Volume and capacity	Demand and Volume to Capacity Ratio	Demand shows need or desire over current use	Modeled: Annual
	Person Throughput	On selected corridors, all modes, Automated intersection counts, vehicle occupancy rate from NHTS 09	PAG: Annual
Accessibility	Pedestrian accessibility ratio	Ratio of accessible to inaccessible sidewalks on major roadways in urban areas	Special Collection: 5yr
	Accessibility Index	Impedance and opportunities by TAZ	Modeled: Annual
Multi-modal availability	Ridership	As percent of population (all boardings, not unique)	Sun Tran: Annual
	5yr avg walk, bike or transit to work	As percent of population	ACS data 5yr avg: Annual
	Miles of pedestrian facilities	Total miles of complete and accessible pedestrian facilities on major roadways (Per 100,000 residents?)	Special Collection: 5yr
	Bicycle lane miles	Per 100,000 residents	PAG : Annually
	Bike and Pedestrian usage	Volunteer and Automated count data	PAG: Annual
Land use	Jobs-housing ratio of urban TAZs	Historic trends coupled with population projections	Modeled: Annual
Freight	Ton miles of delay	FAF 3.4: tonnage, by rail, truck and air	Corresponding to FAF updates
Incident duration	Mean clearance time	Scene cleared-arrival on scene	TIM
Mode Color Code	SOV and transit	Transit / Freight / ALL	Pedestrian and Bicycle

related performance measures and monitoring system for regional multimodal transportation planning, programming and reporting for congestion management. The table at left lists CMP specific performance measures, the performance areas they cover and details about each. PAG has begun tracking many of these performance measures. However, other performance measures require additional processing and/or data and will be the subject of ongoing work with the CMP.

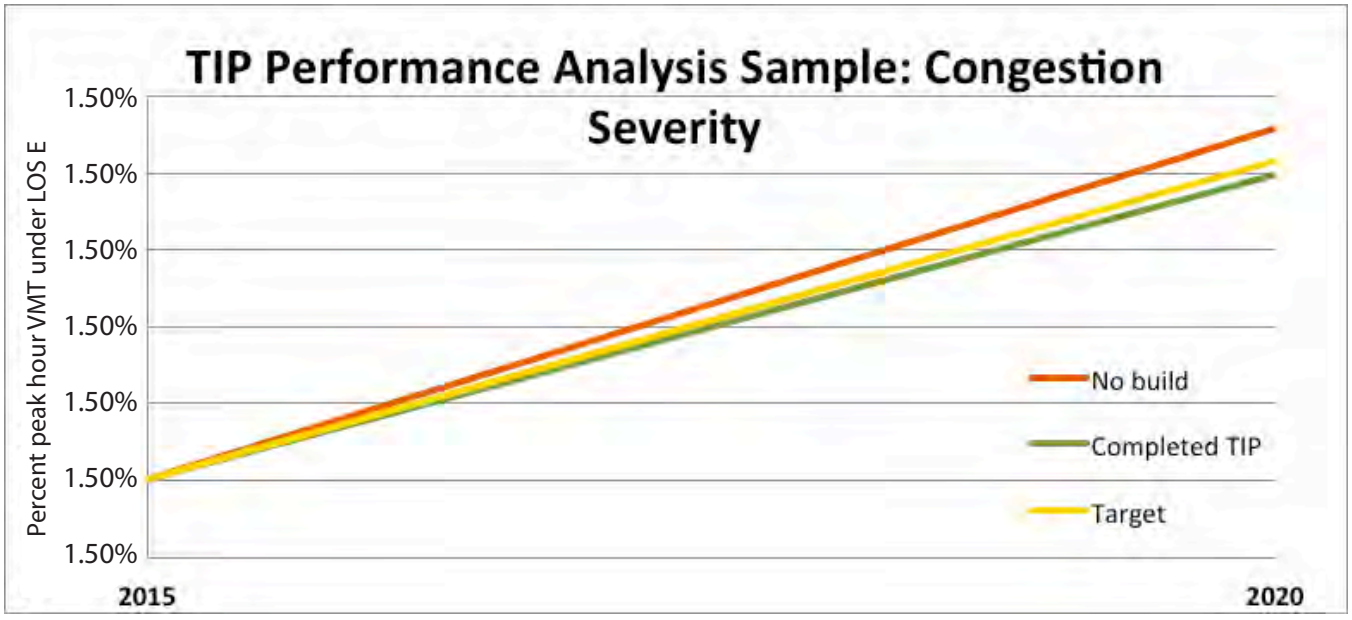
Many of the performance areas include several performance measures. These are needed due to the complexity of particular areas. For instance, as illustrated by Atlanta Regional Council's graphic (page A16), congestion has three dimensions. It is necessary to monitor each of these aspects of congestion (intensity, duration and extent) to better System performance monitoring needs to go beyond when and where to include additional metrics such as how long, how many travelers are affected, and whether is it recurring or non-recurring and so forth.

One area that PAG is focused on improving is the identification of causes of recurring and non-recurring delay. Recurring delay is typically the result of demand exceeding the network's capacity as it is currently designed and operated. Although problematic and inefficient, travelers generally are prepared to experience some recurring delay especially near an urban center. Non-recurring delay can be more problematic for the traveling public. Non-recurring delay may be caused by a special event, construction, traffic incident, adverse weather, etc. To the typical traveler, this is challenging because s/he is uncertain about how much extra time to plan into their trip to arrive on time. For this reason, PAG continues to explore opportunities to improve its process for identifying causes of both types of delay in order to appropriately address them. Current efforts include the logging of traffic incidents and construction projects, and monitoring of speed data.

The PAG CMP has developed regional congestion management and operations' objectives that are directly linked back to the vision and goals of the 2045 RMAP and linked to specific performance measures that are part of the CMP. Ultimately, the objectives-driven, performance-based process for managing congestion of the regional transportation system will lead to more efficient use of transportation dollars and result in a reduction of transportation network congestion.

The goal of the CMP is effective management of new and existing transportation facilities using both operational and travel demand management strategies. For example, the improvement of a congested corridor might incorporate strategies that augment or reduce the need to widen the roadway by providing more transit and alternate mode options, utilizing new technologies such as signal timing or managing access to business and residential areas to make the existing facility work better.

The following chart is illustrative of the TIP briefing process. This chart represents the monitoring of one performance measure and graphically depicts the region's current performance and what performance could be expected with the completion of the current TIP and the performance that could be expected with a no-build scenario. Additionally, the chart shows where, according to the 2045 RMAP targets, the region should be in five years from tracking to the 2045 RMAP target. Accordingly, this chart shows that the current projects in the TIP are reducing the growth of congestion severity but are slightly off target to track to the 2045 RMAP objective. This process assists in identification of system deficiencies, and analysis and selection of alternative strategies to address congestion for inclusion in the long-range regional



Source: PAG

mobility and accessibility plan (RMAP) and the short-range transportation program (TIP).

Congestion management strategies in our region:

In recent years, the PAG region has completed several projects aimed at improving system performance and reliability. Below are brief summaries of a few of these projects.

Indirect left turn intersection geometry at Oracle and Ina roads:

- An alternatives assessment found that an indirect left turn in addition to other improvements would increase movement through the intersection and improve safety.

Transit boarding efficiencies

- Sun Tran's adoption of a smart card system allows for prepaid fare usage reducing stop time while providing additional rider information.
- Sun Link allows front and rear boardings, increasing boarding and alighting efficiency, reducing stop time and improving headways.
- Sun Tran has launched a Smartphone application as an additional means of pre-purchasing fares.

Corridor signal timing with observed data

- The use of passively collected vehicle speed data is being tested to supplement modeled data and further improve signal timing along key corridors.
- This has resulted in improved corridor throughput by reducing intersection delay without adversely impacting intersecting cross streets.
- Resulting data allow for improved model runs and validation of signal timing changes with observed vehicle speeds.

Nearly 100 bus pullouts built region wide

- Bus pullouts reduce corridor congestion.
- Bus pullouts were installed on arterials and collectors with both high vehicular volume and bus boardings and alightings.

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APPENDIX 3

In Plan Project Summaries

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APPENDIX 3: In-Plan Project Summaries

Appendix 3 of the 2045 Regional Mobility and Accessibility Plan includes projects for which funding is expected to be available by or before 2045. A plan performance assessment was completed for these projects, including analysis of traffic flows (i.e. travel modeling), fiscal constraint and air quality, and its associated effects on protected populations (i.e. Title VI) and on the environment. Appendix 4 includes projects that are on the RESERVE list and were not considered during the plan performance assessment. The general project lists for both appendices contain similar information which is described below.

Projects are sorted alphabetically. The tables present information in columns that cover the following:

RMAP ID#: Each project has an ID number that is used to identify and track the project. Numbers after the decimal point indicate the year the project was originally added to PAG's regional project database.

Street/Project Name, Location, Description: The general scope and location of each project is provided.

Estimated Project Cost: Totals include the anticipated costs, as appropriate, for planning, design, right-of-way, and construction for each project. All costs and revenues are in 2015 dollars and may be subject to change as project scopes are further defined.

Estimated Time Frame: Estimated project time periods are shown when available. The early period includes projects anticipated for fiscal years 2016-2025, the middle period includes projects anticipated for fiscal years 2026-2035, and late period includes projects expected to be developed between fiscal years 2036-2045. Projects with a timeframe of "All" are programs or activities that are ongoing throughout this planning timeframe. Actual implementation time periods may vary based on changing priorities and do not require a plan amendment.

Sponsor: Each project identifies the agency that is expected to be responsible for its implementation. "Multiple" indicates there is more than one sponsor responsible for the implementation.

2045 RMAP In-Plan Project List

Projects Listed Alphabetically by Name

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
Projects highlighted in blue are committed through the RTA plan, and/or the current TIP **Projects in gray at bottom are ADOT freeway projects with subproject detail**						
40.02	1st Ave	Orange Grove Rd to Ina Rd	Widen to 4-lane roadway, bike lanes & sidewalks	Pima County	$ 11,000	Early
684.03	1st Ave #1	Grant Rd to River Rd	Widen to 6-lane roadway, bike lanes, sidewalks & bus pullouts	Tucson	$ 74,398	Early
180.98	22nd St #1	I-10 to Tucson Blvd / Barraza-Aviation Pkwy	Widen to 6-lane divided roadway, bridge over railroad & bike lanes	Tucson	$ 133,805	Early
327.98	22nd St #2	Camino Seco to Houghton Rd	Widen to 4-lane roadway, bike lanes, sidewalks & bus pullouts	Tucson	$ 17,300	Early
300.98	40th St Extension	Between 4th and 6th Ave	New roadway, curbs, sidewalk, landscape & street lights	South Tucson	$ 1,000	Early
429.03	Aerospace Parkway	Nogales Hwy to Sonoran Corridor	Widen to 4-lane roadway, bike lanes and sidewalks	Pima County	$ 31,590	Late
230.98	Air Monitoring & Data Collection	Regionwide	Expand Air Quality Monitoring	PAG/Pima County	$ 8,715	All
299.03	Air Quality Model and Inventory Upgrades	Regionwide	Develop new air quality model with emissions inventory	PAG	$ 2,500	All
137.98	Air Quality Planning	Regionwide	Regional Air Quality Planning, inventory and monitor pollutants	PAG	$ 7,500	All
541.08	Alternative Energy and Fuel Vehicle Infrastructure	Regionwide	Improve alternative energy and fuel infrastructure	Multiple	$ 10,250	All
65.00	Alternative Modes Program	Regionwide	Education and outreach to promote alternative modes	PAG	$ 3,500	All
188.08	Alvernon Way Corridor Project	Hughes Access Road to Ft. Lowell Rd	Improve Corridor - Widen to 4 and 6-lanes including street lights, sidewalks, storm drains, and bus pullouts.	Tucson	$ 73,280	Late

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
365.98	Arterial Street Lighting	Arterial streets regionwide	Construct roadway lighting	Multiple	$ 20,000	All
234.08	Arterial Traffic Management System	Regionwide	Improve the operation of traffic signal systems and traffic flow	Multiple	$ 100,000	All
196.00	Avra Valley Rd #2	Clayton Rd. to I-10	Widen to 4-lane roadway, re-align, multi-purpose lanes & sidewalks	Marana	$ 62,700	Late
193.08	Bicycle Boulevards	Regionwide	Install bicycle boulevards, see bike plan for more information	Multiple	$ 35,000	All
556.08	Bicycle Lanes Connectivity	Regionwide	Fill gaps in the bike lane system, including protected bike lanes, see bike plan for more information	Multiple	$ 73,000	All
196.08	Bicycle Parking and other amenities	Regionwide	Install racks, corrals, lockers, etc.	Multiple	$ 5,000	All
668.03	Bicycle Signage and Stenciling	Regionwide	Way-finding, wrong-way & stenciling along bikeways	Multiple	$ 1,540	All
353.03	Bikeways Continuity and Maintenance	Regionwide	Improve bike infrastructure and maintenance	Multiple	$ 9,750	All
198.08	Bicycle and Pedestrian Encouragement and Safety Outreach Programs	Regionwide	Develop and distribute materials on bicycle and pedestrian safety	Multiple	$ 6,000	All
237.08	Bond Debt Service	Regionwide	Repayment of regional bond debts	Multiple	$ 626,239	All
195.98	Broadway Blvd #1	Euclid to Country Club Rd	Widen to 6-lane roadway, bus pullouts, bike lanes & sidewalks	Tucson	$ 71,207	Early
337.98	Broadway Blvd #2	Camino Seco to Houghton Rd	Widen to 4-lane roadway, bike lanes & sidewalks	Tucson	$ 22,750	Early
110.03	Bus Pullouts	Fixed-route system	Construct transit pullouts at select bus stops	Multiple	$ 30,000	All

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
202.98	Bridge Program	Regionwide	Construction of New or Replacement Bridges	Multiple	$ 26,716	All
516.08	Bus Rapid Transit - 6th Ave / Nogales	Downtown to TIA	BRT Downtown to TIA (see 2009 HCT plan for details)	Tucson Transit	$ 98,750	Middle
441.03	Bus Rapid Transit - Broadway Blvd	Downtown to Houghton Rd	BRT along Broadway (see HCT plan for details)	Tucson Transit	$ 116,150	Middle
525.08	Bus Rapid Transit - Campbell Ave South / Kino Pkwy	Speedway Blvd to TIA	BRT along Campbell to TIA (see HCT plan for details)	Tucson Transit	$ 62,140	Late
523.08	Bus Rapid Transit - Grant Rd	Oracle Rd to Tanque Verde Rd	BRT along Grant Rd ((see HCT plan for details)	Tucson Transit	$ 65,585	Late
521.08	Bus Rapid Transit - Oracle Rd	Downtown to Tangerine Rd	BRT along Oracle Rd (see HCT plan for details)	Tucson Transit	$ 115,600	Late
585.08	Bus Shelters	Regionwide	Add new and refurbish existing bus shelters	Tucson Transit	$ 2,850	All
317.03	Camino de Oeste (South)	Calle Torim to Valencia	Widen to 4-lane roadway	Pascua Yaqui	$ 8,500	Middle
340.98	Camino Seco	Speedway Blvd to Wrightstown Rd	Widen to 4-lane divided roadway, bike lanes, sidewalks & drainage	Tucson	$ 3,600	Middle
101.08	Camino Verde	Valencia Rd to Ajo Way	Widen to 3-lane roadway, bike lanes and sidewalks	Pima County	$ 12,500	Late
702.03	Campbell Ave North	River Rd to Skyline Dr	Add shoulders and intersection widening	Pima County	$ 3,375	Middle
27.00	Campbell Ave South	Quail Crossing Blvd to Sahuarita Rd	Extend 2-lane roadway, bike lanes, sidewalks & drainage	Sahuarita	$ 18,000	Middle
102.08	Catalina Hwy	Houghton Rd to Snyder Rd	Widen to 3-lane roadway, bike lanes	Pima County	$ 10,000	Middle
83.00	Colossal Cave Rd	I-10 to Mary Ann Cleveland Way	Widen to 3-lane roadway, bike lanes	Pima County	$ 10,400	Middle
159.03	Communications Expansion - ITS	Regionwide	Expand communications to improve data collection & distribution	Multiple	$ 8,000	All
355.03	Commuter Incentives for alternative transportation	Regionwide	Incentives aimed at changing the behavior of drive-alone commuters	PAG	$ 5,000	All
13.00	Cortaro Farms Road	Camino de Oeste to Thornydale	Widen to 4-lane roadway, sidewalks and bike lanes	Pima County	$ 18,039	Early

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
175.08	Country Club Rd Corridor	Aviation to 22nd and Speedway to Prince	Widen to 5-lane roadway, sidewalks and bike lanes	Tucson	$ 46,680	Middle
7.14	CNG Fueling System NW	Sun Tran Maintenance Facility Northwest	Install new CNG fueling system to fuel CNG vehicles	Tucson Transit	$ 14,500	All
6.14	CNG Fueling System TOPSC	Sun Tran's South Park/Thomas O Price Service Center	Upgrade existing CNG Fueling system	Tucson Transit	$ 13,000	All
261.98	Downtown Links	Broadway Bl to I-10	Extend Barraza-Aviation Parkway, railroad bridge at 9th Ave/6th St Tucson		$ 85,000	Early
4.12	Downtown Wye: West Leg	Additional rail near downtown Tucson	Additional rail near downtown Tucson	Pima County	$ 12,000	Middle
6.03	Drexel Rd Extension	Midvale Park to Calle Santa Cruz	Extend 2-lane roadway, with bridge over Santa Cruz, bike lanes	Tucson	$ 16,750	Middle
18.00	East Frontage Rd along I-19	S ¼ corner of Sec 26 to Nogales Hwy	Realign and reconstruct roadway	Sahuarita	$ 3,500	Middle
8.14	Eastside Transit Maintenance Facility	Eastside/TBD	Construct a new Sun Tran maintenance facility on the east side of Tucson	Tucson Transit	$ 25,000	Late
23.00	El Toro Rd – Part 1	La Cañada to La Villita	Construct new 2-lane roadway, sidewalks & multi-use lanes	Sahuarita	$ 7,014	Middle
498.08	Emergency & Incident Management System	Regionwide	Programs to address emergency situations and routine incidents	Multiple	$ 30,000	All
633.08	Environmental Mitigation Strategies	Regionwide	Environmental mitigation strategies for transportation projects	Multiple	$ 3,092	All
566.08	Expand Fixed-Route Bus System and improve frequency	Regionwide	Increase service area and frequency as described in the Transit Visioning Workshop Report and Summary	Tucson Transit	$ 200,000	All
558.08	Federal Transit Grant Programs	Regionwide	5310 and 5311 Programs for rural transit and enhanced mobility for seniors and persons with disabilities	PAG	$ 47,040	All
82.08	Flowing Wells Rd	Grant Rd to River Rd	Create a divided cross-section with turning lanes, sidewalks and bike lanes	Tucson	$ 52,500	Middle
499.08	Freeway Management System (all phases)	I-10 and I-19	Cameras, detection, message-boards & traffic control strategies	ADOT	$ 50,000	All
259.98	Grant Rd Corridor Project	Oracle Rd to Swan Rd	Widen to 6-lane roadway, bike lanes, sidewalks & streetscaping	Tucson	162,037	Early

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
208.00	Grier Rd	Luckett / Moore Rd to Tangerine Farms	Widen to 3-lane roadway, bike lanes	Marana	$ 12,800	Late
631.03	Harrison Rd	Irvington Rd to Golf Links Rd	Widen to 4-lane divided roadway, new bridge over Pantano Wash, bike lanes and sidewalks	Tucson	$ 22,619	Early
532.08	High Capacity Transit Enhancements	Regionwide	Enhance transit infrastructure with high-capacity elements	Tucson Transit	$ 10,000	All
12.02	Houghton Road	Camino del Toro to Dawn Rd	Reconstruct 2-lane roadway, bike lanes	Pima County	$ 17,350	Late
490.03	Houghton Parkway #2	Dawn Rd to I-10	Widen to 4-lane divided roadway with sidewalks and bike lanes	Tucson	$ 23,000	Middle
11.02	Houghton Parkway #3	I-10 to Tanque Verde Rd	Widen to 4- and 6- lane parkway, new bridges & greenway, bike lanes and sidewalks	Tucson	$ 160,642	Early
161.00	Ignacio M Baumea Rd (Sheridan Ave / CAP Line Rd)	Los Reales Rd to Calle Torim	Construct 2-lane roadway to PY reservation, bike lanes and sidewalks	Pascua Yaqui	$ 3,000	Early
169.00	Ina Rd #1	Wade Rd to Silverbell Rd	Widen to 3-lane roadway, bike lanes and sidewalks	Pima County	$ 10,800	Middle
235.98	Ina Rd #2	Silverbell Rd to I-10	Widen to 4-lane roadway, includes bridges	Marana	$ 18,000	Middle
68.98	Ina Rd #3	I-10 to Camino de la Tierra	Widen to 6-lane roadway	Marana	$ 13,100	Middle
223.08	Innovative Transit Services	Regionwide	Innovative transit including circulators and other gap services – including RTA circulator	Multiple	$ 106,950	All
544.08	Intermodal Transit Center	6th Ave / Toole Ave	Design and construct new intermodal transit center	Tucson Transit	$ 22,200	Early
30.08	Intersection improvements	Regionwide	Improve intersections throughout the region	Multiple	$ 35,000	All
497.03	Irvington Rd	Ajo Way to Mission Rd	Complete 2-lane roadway, bike lanes and sidewalks	Pima County	$ 4,600	Middle
163.08	Irvington Rd #3	Santa Cruz River to east of I-19	Improve intersections, provide access mgmt, bike lanes & sidewalks	Tucson	$ 9,800	Early
352.98	Irvington Rd #4	Kolb Rd to Houghton Rd	Widen to 4-lane roadway, bike lanes, sidewalks & drainage	Tucson	$ 44,400	Late
230.08	ITS - Intelligent Transportation Systems	Regionwide	ITS improvements	Multiple	$ 18,000	All

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
189.98	Kinney Rd	Ajo Way to Tucson Estates Parkway	Widen to 4-lane roadway, bike lanes & sidewalks	Pima County	$ 19,160	Middle
437.03	Kolb Rd	Sabino Canyon Rd to Sunrise Dr	Widen to 3-lane roadway bike lanes, sidewalks & drainage	Pima County	$ 11,000	Early
565.03	Kolb Rd #1	Escalante Rd to I-10	Widen to 6-lane roadway, bike lanes, sidewalks & drainage	Tucson	$ 43,068	Early
5.03	Kolb Rd #2	Speedway Blvd to Tanque Verde Rd	New 4-lane roadway, bridge over Pantano, bike lanes & sidewalks; connection to Sabino Canyon Rd	Tucson	$ 25,693	Early
97.00	La Cholla Blvd #2	Magee Rd to Tangerine Rd	Widen to 4-lane roadway, bridge over Canada del Oro Wash, bike lanes & sidewalks	Multiple	$ 65,600	Early
17.00	La Villita Rd Extension (South)	Sahuarita Rd to Nogales Hwy	Construct 2-lane roadway, bike lanes, sidewalk & drainage	Sahuarita	$ 10,000	Middle
101.98	Lambert Ln	Shannon Rd to La Canada Dr	Widen to 4-lane roadway, bike lanes, multi-use paths & drainage	Oro Valley	$ 37,000	Early
103.98	Linda Vista Safety Improvements	Calle Buena Vista to Oracle Rd	Reconstruct, drainage, pedestrian, bike lanes	Oro Valley	$ 2,500	Middle
564.08	Local funding for non-roadway projects	Regionwide	Jurisdictional discretion for local transit and other alternative modes	Multiple	$ 81,000	All
279.98	Local Jurisdiction Bicycle Infrastructure	Regionwide	Construct Bicycle Infrastructure by the regional jurisdictions	Multiple	$ 9,750	All
434.03	Luckett / Moore Rd	Luckett Rd to Sanders Rd	Construct 4-lane roadway	Marana	$ 20,000	Late
201.00	Luckett/Moore Rd	Marana Rd to Tortolita TI with I-10	Widen to 4-lane roadway, multi-use lanes & sidewalks	Marana	$ 33,000	Late
163.98	Mainsail Blvd	Oracle Rd to Twin Lakes Dr	Construct 2-lane roadway and box culvert, sidewalks & bike lanes	Pima County	$ 3,900	Middle
199.00	Marana Rd	Trico Rd to I-10	Widen to 4-lane roadway; multi-use lanes & sidewalks	Marana	$ 35,000	Middle
90.08	Mark Rd / Joseph Rd	Los Reales Rd to Ajo Wy	Reconstruct 2-lane roadway, bike lanes & sidewalks	Pima County	$ 8,000	Late
102.00	Mary Ann Cleveland Way / Colossal Cave Rd	Tucson city limits to Camino Loma Alta	Widen to 4-lane roadway, bike lanes & sidewalks	Pima County	$ 22,500	Middle
198.00	Moore Rd #1	Sanders Rd to Adonis Rd	Widen to 4-lane divided roadway, bike lanes & sidewalks	Marana	$ 23,800	Late

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
4.14	Moore Rd #2	La Cholla Blvd to La Canada Dr	Redesign and reconstruct roadway	Oro Valley	$ 4,000	Middle
547.08	Naranja Dr #1	Shannon Rd to La Cholla Blvd	Widen to 3-lane roadway, multi-modal facilities	Oro Valley	$ 6,000	Early
107.98	Naranja Dr #2	La Cholla to First Ave	Grade, pave, drain, add curb, gutter, widen to 3 lanes, bike lanes & multi use lanes	Oro Valley	$ 2,200	Middle
324.03	No Drive Days Program	Regionwide	PDEQ Program to promote alternative modes of transportation	Pima County	$ 6,750	All
514.08	Nogales Hwy #1	Old Vail Connection Rd to Los Reales Rd	Widen to 6-lane roadway, sidewalks & bike lanes	Pima County	$ 44,100	Middle
325.03	Nogales Hwy #2 (South)	Calle Valle Verde to Sahuarita Rd	Widen to 4-lane roadway, bike lanes	Sahuarita	$ 25,000	Middle
557.08	Non-Regional Roadways	Regionwide	Jurisdictional Discretion for local roads	Multiple	$ 2,711,011	All
44.08	Northern / Calle Buena	Magee Rd to Linda Vista	Add bike lanes, multi-use paths & transit elements	Oro Valley	$ 4,000	Middle
100.00	Old Spanish Trail	Valencia Rd to Camino Loma Alta	Widen to 4-lane roadway, bike lanes and sidewalks	Pima County	$ 34,600	Late
76.14	Old Vail Connection Road	Alvernon Way to Rita Road	Construct new 2-lane roadway	Pima County	$ 30,000	Early
183.98	Orange Grove Rd #2	Thornydale Rd to Corona Rd	Reconstruct 4-lane roadway, bike lanes & Sidewalks	Pima County	$ 8,000	Middle
17.02	Orange Grove Rd #3	Corona Rd to Oracle Rd	Widen to 4-lane roadway, bike lanes & sidewalks	Pima County	$ 26,800	Middle
1.03	Orange Grove Rd #4	Oracle Rd to Skyline Dr	Widen to 4-lane roadway, bike lanes & sidewalks	Pima County	$ 25,800	Middle
202.08	PAG Bicycle & Pedestrian Program	Regionwide	Coordinate Ped/Bike activities for the region	PAG	$ 1,500	All
222.08	Park & Ride Lots	Regionwide	New Park-n-Ride Lots throughout region	Multiple	$ 20,000	All
108.98	Palisades Rd	First Avenue to 1 mile east	Widen to 3-lanes, shoulders, turn lanes & bike lanes	Oro Valley	$ 4,125	Late
233.00	Paratransit Services Expansion	Regionwide	Expand paratransit service within region	Multiple	$ 200,000	All

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
5.12	Passenger Station Tracks: Downtown Rail Depot	Passenger Station Tracks: Downtown Rail Depot	Construction of passenger rail for loading/ unloading	Pima County	$ 5,000	Middle
232.08	Pavement Preservation and Reconstruction	Regionwide	Maintain and Repair Roadway Pavement	Regional	$ 3,180,000	All
433.98	Pedestrian Mobility Improvements	Regionwide	Improvements includes sidewalks, maintenance, ADA ramps, lighting, landscaping, refuges, etc. (refer to Regional Pedestrian Plan for candidate locations)	Multiple	$ 305,000	All
196.98	Pima County Roadway Safety Program	Various Locations in Pima County	Minor intersection, alignment, drainage & shoulder improvements	Pima County	$ 50,000	All
18.02	Pima Mine Rd #1	I-19 to Nogales Hwy	Widen to 4-lane roadway, bike lanes	Sahuarita	$ 22,000	Middle
174.03	Program - Pave Dirt Roads & Shoulders	Regionwide	Pavement of dirt roads to control particulate matter	Pima County	$ 20,000	All
620.03	Quail Creek Blvd Extension	Old Nogales Hwy to Nogales Hwy	Construct 2-lane divided roadway, includes bridge over Santa Cruz, bike lanes & sidewalks	Sahuarita	$ 15,700	Early
34.00	Railroad Grade Crossing Warning System	Regionwide	Install warning systems at railroad crossing locations	Multiple	$ 6,550	All
228.00	Railroad Grade Separation at Cortaro Farms	Cortaro Farms Rd	Construct grade separated railroad crossing	Marana	$ 16,000	Middle
154.03	Railroad Underpass at Grant Rd	Union Pacific Mainline and Grant Road	Expand railroad underpass east of I-10 to accommodate 6 lanes	Tucson	$ 38,000	Early
583.08	Rancho Sahuarita Blvd	Sahuarita Rd to El Toro Rd	Construct 4-lane roadway, bike lanes, sidewalk & drainage	Sahuarita	$ 7,000	Early
111.98	Rancho Vistoso Blvd	Moore Rd to Tangerine Rd	Reconstruct, mill & overlay	Oro Valley	$ 1,500	Early
384.98	Regional Aerial Mapping	Regionwide	Orthophotos and other mapping work	PAG	$ 8,000	All
407.98	Regional Comprehensive Transit Operations Analysis Study	Regionwide	Conduct a comprehensive operations analysis (COA) study	Tucson Transit	$ 1,800	All

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
392.98	Regional Transit Maintenance Facility and Equipment Upgrades	Regionwide	Miscellaneous facility improvements over 30 years	Tucson Transit	$ 36,000	All
370.98	Regional Traveler Information System	Regionwide	Programs to obtain and disseminate traveler information	Multiple	$ 20,000	All
616.03	Right-of-Way (RW) Preservation	Regionwide	Purchase RW to preserve from development	Multiple	$ 15,000	All
83.14	Safe Routes to School	Regionwide	Improve bike and pedestrian infrastructure near schools	Multiple	$ 20,000	All
349.03	Safety Programming and Funding Process	Regionwide	Dedicated staff to manage safety program	Multiple	$ 2,000	All
350.03	Safety Remediation Programs	Regionwide	Expansion of safety & operations related projects	Multiple	$ 40,000	All
591.03	Sahuarita Rd	Country Club Rd to SR 83	Reconstruct 2-lane roadway with drainage, bike lanes	Pima County	$ 49,500	Middle
25.00	Sahuarita Rd #1	La Cañada Dr to La Villita Rd	Widen to 6-lane roadway	Sahuarita	$ 15,000	Late
98.08	Sandario Rd	Ajo Way to Emigh Rd	Reconstruct 2-lane roadway, bike lanes	Pima County	$ 78,100	Middle
165.00	Shannon Rd	Cortaro Farms Rd to Lambert Ln	Widen to 4-lane roadway, bike lanes & sidewalks	Pima County	$ 30,200	Middle
65.03	Shannon Rd	Lambert Ln to Tangerine Rd	Construct a new 4-lane road, bike lanes, sidewalks & multi-use lanes	Oro Valley	$ 25,000	Late
194.08	Shared Use Paths	Regionwide	Create more shared-use paths, see bike plan for more information	Multiple	$ 85,000	All
165.03	Signalized Pedestrian & Bike Crossings	Regionwide	Construct signalized pedestrian/bike crossings (HAWKS, etc.)	Multiple	$ 25,000	All
257.98	Silverbell Rd	Grant Rd to Ina Rd	Widen to 4-lane divided roadway, bike lanes, sidewalks, & drainage	Tucson	$ 57,045	Early
4.06	Small Business Assistance	Regionwide	Provides help to businesses along major construction corridors	RTA	$ 20,000	All
132.00	Speedway Blvd	I-10 to Euclid Ave	Widen to 6-lane roadway, includes new railroad underpass, bike lanes & sidewalks	Tucson	$ 41,200	Middle

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
42.00	SR 77 #1: Miracle Mile	I-10 to Oracle Rd	Widen to 6-lane roadway	ADOT	$ 19,600	Late
186.00	SR 77 #2: Oracle Rd	Rudasill Rd to Ina Rd	Widen to 8-lane roadway	ADOT	$ 11,250	Late
185.00	SR 77 #3: Oracle Rd	Ina Rd to Magee Rd	Widen to 8-lane roadway	ADOT	$ 2,500	Late
36.14	SR 77 #5: Oracle Rd	Tangerine to Pinal Co. Line	Tangerine to Pinal Co. Line Widen to 6-lane roadway	ADOT	$ 36,500	Early
71.03	SR 86: #5 Sandario to Valencia	MP 156.8 to 159.5	Reconstruct and widen to 40 ft.	ADOT	$ 5,000	Early
177.00	SR 86: #A Sandario Rd to Valencia Rd	MP 156.5 to 160.0	Widen to 4-lane divided roadway	ADOT	$ 38,250	Middle
178.00	SR 86: #B Valencia Rd to Kinney Rd	MP 159.5 to 166.1	Widen to 6-lane divided roadway	ADOT	$ 47,660	Middle
72.03	SR 86: #C Kinney to Mission	MP 166 to 170.5	Widen to 6-lane, divided roadway	ADOT	$ 9,000	Middle
258.98	SR 86: #D Mission Rd to I-19	Mission Rd to I-19	Reconstruct and widen to 6 lanes, bike lanes	ADOT	$ 23,150	Late
439.98	SR 86: #E I-19 to I-10	I-19 to I-10	Widen to 6-lane divided roadway, drainage, bike lanes, & bus pullouts	ADOT	$ 23,725	Late
601.03	Starr Pass Blvd	Shannon Rd to I-10	Widen to 4-lane roadway, bike lanes & sidewalks	Tucson	$ 55,600	Late
379.98	Stone Ave Corridor Gateway Project	University Blvd to Wetmore Rd	Enhance the gateway, alternative mode improvements, bike lanes & sidewalks	Tucson	$ 30,250	Middle
85.14	Streetcar Extension	Campbell Ave, Broadway, or S. 6th St. (exact location TBD)	4-mile extension to the existing Sun Link streetcar	Tucson Transit	$ 170,000	Middle
33.14	Sun Link Modern Streetcar Operations and Maintenance	Downtown Tucson to University Medical Center	Operations and Maintenance for the Sun Link Modern Streetcar	Tucson Transit	$ 126,000	All
715.03	Sunset Rd	Silverbell to I-10 to River Rd	New 3-lane roadway, bridge over Santa Cruz, bike lanes, & sidewalks	Multiple	$ 22,764	Early
393.98	Sun Tran Bus & Support Vehicle Replacements	Regionwide	Replace Sun Tran buses and support vehicles on a regular basis	Tucson Transit	$ 303,672	All
430.98	Sun Tran Existing Operations and Maintenance	Regionwide	Maintain existing Sun Tran levels of service	Tucson Transit	$ 1,790,000	All
688.03	Sun Tran Express Bus Service Expansion	Regionwide	Expand Sun Tran express route services	Tucson Transit	$ 78,420	All

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
254.03	Sun Tran Service Frequency Improvements - RTA Plan	Regionwide	Improve service frequencies on major Sun Tran routes per the RTA	Tucson Transit	$ 112,800	All
416.98	Sun Tran Facility Pavement Replacement	Sun Tran parking lot (5 upgrades over 30 years)	Repave and maintain bus fleet parking area	Tucson Transit	$ 5,200	All
10.14	Sun Tran Maintenance Facility rehab	S. Park Ave	Replace/repair roof for facility	Tucson Transit	$ 600	Early
11.14	Sun Tran Maintenance Facility NW	Prince/I-10	Replace/repair roof for all buildings at facility	Tucson Transit	$ 1,200	Middle
426.98	Sun Van Existing Operations and Maintenance	Regionwide	Maintain existing Sun Van service	Tucson Transit	$ 471,000	All
275.98	Sun Van Vehicle Replacements	Regionwide	Replace existing vans and support vehicles	Tucson Transit	$ 86,607	All
9.14	Sun Van Maintenance Facility rehab	E Ajo Way	Building improvements and upgrades	Tucson Transit	$ 4,320	Early
203.00	Tangerine Connector	Tangerine Rd to Adonis Rd	Construct 4-lane roadway, multi-purpose lanes & sidewalks	Marana	$ 30,000	Late
204.00	Tangerine Rd	I-10 to La Cañada Dr	Widen to 4-lane divided, bike lanes, multi-use lanes, sidewalks, & drainage	Multiple	$ 92,580	Early
367.98	Technology Transfer Program (LTAP)	Regionwide	Ongoing training for regional jurisdictions	Multiple	$ 1,250	All
162.98	Thornydale Rd	Cortaro Farms Rd to Tangerine Rd	Widen to 4-lane roadway, sidewalks & bike lanes	Pima County	$ 33,100	Middle
142.03	Traffic Data Collection Stations	Regionwide	Install traffic data collection stations	Multiple	$ 4,375	All
105.03	Transit - Transit Station - Oro Valley	Oracle Rd and First Ave	Construct a Regional Transit Station	Oro Valley	$ 3,250	Late
109.03	Transit Amenities at bus stop locations	Fixed-route transit system	Electronic signs, route maps, shelters, etc.	Tucson Transit	$ 4,000	All
292.03	Transit Center Upgrades	Ronstadt Center, Laos Center, Tohono Tadai Center, etc	Rehabilitate regional transit centers	Tucson Transit	$ 11,000	All
394.98	Transit Project Development Planning	Regionwide	Transit planning activities	Multiple	$ 4,500	All

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
90.00	Transit - Minor Enhancements	Regionwide	1% FTA requirement for Transit Enhancement program	Tucson Transit	$ 2,650	All
72.00	Transportation Art by Youth	Regionwide	A program that employs youth to create art for transportation facilities	PAG	$ 6,000	All
139.98	Transportation Planning Program	Regionwide	Regional transportation planning, includes RTP and TIP planning	PAG	$ 62,488	All
659.03	Transportation Studies	Regionwide	Studies to improve our transportation network	Multiple	$ 20,000	All
136.98	Travel Demand Management Program	Regionwide	Includes rideshare, TRP, vanpool & congestion management	PAG	$ 24,000	All
56.14	Tucson Regional Bike Share Program	Regionwide	Implement bike share system	Tucson	$ 11,875	All
130.00	Tucson Traffic Operations Center	City of Tucson	Regular maintenance upgrades to the City of Tucson Traffic Operations Center	Tucson	$ 6,000	All
69.98	Twin Peaks Rd #1	SWC Sct 19, T12S, R12E for 1/2 Mile East	Reconstruct, Drain, Pave Two Lanes & Shoulders	Marana	$ 300	Late
122.08	UA Travel Demand Management	In and around UA	UA parking options and transportation alternatives	University of Arizona	$ 4,000	All
100.08	University of Arizona Car Sharing Program	Car Rental locations on the UA Campus	Affordable hourly car rentals on campus	University of Arizona	$ 200	All
99.08	University of Arizona Disabled Cart Service	In and around UA	Demand Response Paratransit Service provided to UA students & staff	University of Arizona	$ 392	All
690.03	University of Arizona Transit System	In and around UA	Maintain & Upgrade Cat Tran Shuttle Services	University of Arizona	$ 1,528	All
195.08	Urban Loop Path System	Regionwide	Divided urban path loop, see bike plan for more details	Multiple	$ 12,000	All
103.00	Valencia Rd #2	Ajo Way to Mark Rd	Widen to 4-lane roadway, bike lanes & sidewalks	Pima County	$ 38,157	Early
156.98	Valencia Rd #3	Camino Verde to Mission Rd	Widen to 6-lane roadway, bike lanes and sidewalks	Pima County	$ 45,420	Early
685.03	Valencia Rd #4	I-19 to Alvernon Way	Access management & safety improvements	Tucson	$ 9,800	Early

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
152.08	Valencia Rd #5	Wilmot to Kolb Rd	Widen to 6-lane roadway, bike lanes & sidewalks	Tucson	$ 10,150	Early
153.08	Valencia Rd #6	Kolb Rd to Houghton Rd	Widen to 6-lane roadway, bike lanes & sidewalks	Tucson	$ 34,882	Early
84.00	Valencia Rd #7	Houghton Rd to Old Spanish Trail	Constuct 2-lane roadway, includes bridge over Pantano and bike lanes	Pima County	$ 12,876	Early
611.03	Valencia Rd #8	Houghton Rd to Old Spanish Trail	Widen to 4-lane roadway includes bike lanes and sidewalks	Pima County	$ 19,000	Late
3.06	Wildlife Linkages	Regionwide	Construct wildlife linkages to help protect wildlife	Multiple	$ 40,000	All
167.08	Wilmot Rd #1 South	Sahuarita Rd to 6 mi north	New 2-lane roadway, includes bike lanes	Pima County	$ 10,290	Early
581.08	Wilmot Rd #3 South	Pima Mine Rd to I-10	Widen to 4-lane divided roadway, turn lanes, bike lanes & drainage	Pima County/Tucson	$ 92,800	Late
3.12	Wilmot Siding Rail Extension	Additional rail siding near Wilmot Rd	Additional rail siding near Wilmot Rd	Pima County	$ 19,000	Early

2045 RMAP Freeway Projects

I-10 East						
488.08	I-10 East Corridor	I-19 to east county line	Improve I-10 east of 1-19	ADOT	$ 637,893	
	I-10 East A: Kino Traffic Interchange	Kino and I-10	Kino TI (incl. mainline 6 lane widening)	ADOT	$ 79,000	Early
	I-10 East B: Country Club TI	Country Club and I-10	Country Club TI (incl. mainline 6 lane widening)	ADOT	$ 80,675	Early
	I-10 East: Park Ave TI	Park Ave and I-10	Park Ave TI (incl. mainline 6 lane widening)	ADOT	$ 44,000	Early
	I-10 East F: Kolb TI	Kolb and I-10	Kolb TI	ADOT	$ 50,000	Late
	I-10 East H: Houghton TI	Houghton and I-10	Houghton TI	ADOT	$ 40,250	Early
	I-10 East Phase 1a: I-19 to Kino	I-19 to Kino	Widen I-10 to 8 lanes from I-19 to Kino	ADOT	$ 66,000	Middle

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
	I-10 East Phase 2: Kolb Rd to Houghton Rd – 6 lanes	Kolb to Houghton	Widen I-10 from Kolb to Houghton to 6 lanes	ADOT	$ 95,000	Middle
	I-10 East Phase 3: Alvernon to Kolb	Alvernon to Kolb	Widen I-10 from Alvernon to Kolb to 8 lanes	ADOT	$ 179,968	Middle/Late
	I-10 East: Corridor Study	I-19 to SR-83	Complete I-10 East Corridor Study	ADOT	$ 3,000	Early
			I-10 West			
489.08	I-10 West Corridor	I-19 to north county line	Improve I-10 west of I-19 (mainline widening of 8-lanes from Ruthrauff to Ina)	ADOT	$ 335,065	
	I-10 West: B - Ruthrauff TI	Ruthrauff and I-10	Reconstruct traffic interchange – mainline widening to 8 lanes	ADOT	$ 104,947	Early
	I-10 West: C - Orange Grove Rd TI	Orange Grove and I-10	Rebuild Traffic Interchange - mainline widening to 8 lanes	ADOT	$ 34,800	Middle
	I-10 West: D - Ina TI & RR Grade Separation @ Ina	Ina and I-10	Reconstruct roadway and add grade separation - mainline widening to 8 lanes	ADOT	$ 85,318	Early
	I-10 West: Sunset Rd TI & RR Grade Separation	Sunset and I-10	Construct Traffic Interchange and RR Grade separation- mainline widening to 8 lanes	ADOT	$ 110,000	Middle
			I-19			
236.08	I-19 Corridor	County Line to I-10	Improve I-19	ADOT	$ 312,535	
	I-19: Mainline Widening #3: San Xavier to Ajo (4 to 6)	San Xavier to Ajo	Widen mainline to 6 lanes	ADOT	120,000	Middle
	I-19: TI #5 @ Irvington Rd	Irvington and I-19	Reconstruct Traffic Interchange	ADOT	$ 69,800	Early
	I-19: TI #6 @ Ajo Way	Ajo and I-19	Reconstruct Traffic Interchange	ADOT	$ 90,085	Early
	I-19: TI #1 @ Sahuarita Rd	I-19 and Sahuarita Rd	Reconstruct Traffic Interchange	ADOT	$ 32,650	Middle
5.14	SR 410 Sonoran Corridor	I-19 to I-10 in the vicinity of Rita Rd	New 4-lane freeway	ADOT	$ 600,000	Middle/Late

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)	Estimated Time Frame
			SR-210			
189.08	SR 210: Barraza-Aviation Parkway Extension	Palo Verde Rd to I-10	Construct new corridor	ADOT	$ 378,602	Middle/Late
	SR 210: Extension	Barraza Parkway to I-10	Extend Barraza Parkway to I-10	ADOT	$ 309,000	Late
	SR 210: Extension	Alvernon TI / GSI	Construct new TI / GSI	ADOT	(cost included in parent project)	Late
	SR 210: Extension I-10 East: Barraza/ Valencia TI / GSI	Barraza/Valencia	Construct new TI / GSI	ADOT	(cost included in parent project)	Late
	SR 210: Right-of-Way Acquisition	Barraza Parkway to I-10	Advanced right-of-way funding for future connection with I-10	ADOT	$ 19,600	Early
	SR 210: Traffic Interchange (Golf Links)	SR 210 and Golf Links	Reconfigure Traffic Interchange	ADOT	$ 50,000	Late

APPENDIX 4

2045 RMAP Reserve Project List

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APPENDIX 4: Reserve Project List

The 2045 Regional Mobility and Accessibility Plan's Reserve Project List, found in Appendix 4, includes projects identified as future transportation needs for which funding has not been identified over the RMAP's 30-year plan horizon. These projects are not technically part of the 2045 RMAP and, therefore, were not included in the analysis of transportation performance (i.e. travel modeling), fiscal constraint, air quality, or effects on protected populations (i.e. Title VI) and the environment.

If priorities change and funding can be identified, a reserve project may be added to the plan through an appropriate amendment process. Refer to Appendix 3 of the 2045 RMAP for projects expected to be funded by 2045.

Projects on the reserve list are sorted alphabetically by project name. Other information presented includes:

RMAP ID#: Each project has an ID number that is used to identify and track the project. Numbers after the decimal point indicate the year the project was originally added to PAG's regional project database.

Street/Project Name, Location, Description: The general scope and location of each project is provided.

Estimated Project Cost: Totals include the anticipated costs, as appropriate, for planning, design, right-of-way, and construction for each project. All costs and revenues are in 2015 dollars and may be subject to change as project scopes are further defined.

Sponsor: Each project identifies the agency that is expected to be responsible for its implementation. "Multiple" indicates there is more than one sponsor responsible for the implementation.

2045 RMAP Reserve Project List

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
332.98	5th St/6th St	I-10 to Wilmot	Improvements include road diet, bike lanes & sidewalks	Tucson	$10,000
572.08	Adonis Rd #1	Lambert Ln to Tangerine Rd	Construct 4-lane roadway	Marana	$35,000
571.08	Adonis Rd #2	Tangerine Rd to San Lucas	Construct 4-lane roadway	Marana	$40,000
421.03	Adonis Rd #3	San Lucas to Pinal County Line	Construct 4-lane roadway	Marana	$32,000
65.14	Alvernon Way Regional Arterial (south)	Pima Mine Rd to Sahuarita Rd	Construct new 4-lane regional arterial roadway on Alvernon between Pima Mine and Sahuarita	Multiple	$17,700
138.08	Avra Valley Rd #1	Town Limits to Clayton Rd	Avra Valley Road - widen 3 lane	Pima County	$7,000
59.14	Avra Valley Rd Regional Arterial	I-10 to N Trico Road	Upgrade Avra Valley Road to a Regional Arterial	Multiple	$6,000
425.03	Benson Highway	Kino to Irvington	Widen to 6-lane roadway	Tucson	$11,600
95.08	Bopp Rd	San Joaquin Rd to Kinney Rd	Widen to 4-lane roadway	Pima County	$22,000
519.08	Bus Rapid Transit - Speedway Blvd	UA to Houghton Rd	Bus Rapid Transit along Speedway	Tucson Transit	$102,000
569.08	Bus Rapid Transit - Vail	Downtown to Vail	Bus Rapid Transit to serve Vail area	Tucson Transit	$40,000
160.00	Camino de Oeste	Irvington Rd to Ajo Way	Reconstruct to 3-lane roadway	Pima County	$4,000
104.08	Camino del Sol	Ocotillo Wash to Continental Rd	Widen to 4-lane roadway	Pima County	$12,000
95.00	Camino Loma Alta	Colossal Cave Rd to Old Spanish Trail	Widen to 4-lane roadway	Pima County	$28,000
505.08	Camino Seco Rd	Irvington Rd to Golf Links Rd	Upgrade to 3-lane roadway	Tucson	$27,000
75.14	Campbell Ave Regional Arterial	SR-210 to Valencia Road	Upgrade Campbell Avenue to a regional arterial	Multiple	$10,200
231.08	Clark Farms Blvd Corridor	Sanders Rd to Tangerine Rd	Make Clark Farms Blvd a 3-lane roadway from Sanders Rd to Tangerine Rd	Marana	$15,000
14.14	Clayton Rd	Dove Mountain Blvd to Thornydale	New 2-lane Roadway	Pima County	$2,000

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
216.00	Collector A - North of Cochie Canyon / Project #22	Pinal Co. Line to 4.6 miles SE	Construct 4-lane divided roadway, multi-purpose lanes & sidewalks	Marana	$23,400
530.08	Commuter Rail - Marana to Downtown	Downtown Tucson to Marana Town Center	Commuter Rail to Marana	Multiple	$382,000
568.08	Commuter Rail Study - Green Valley	Downtown Tucson to Green Valley	Study feasibility and implementation of commuter rail	PAG	$5,000
567.08	Commuter Rail Study – Vail	Downtown Tucson to Vail	Study feasibility and implementation of commuter rail	PAG	$5,000
531.08	Commuter Rail to Green Valley	Green Valley to Downtown Tucson	Commuter Rail to Green Valley	Multiple	$460,000
704.03	Continental Rd	I-19 to Old Nogales Hwy	Widen to 4-lane roadway	Pima County	$16,500
74.03	Craycroft Rd #2	Golf Links Rd to 22nd St	Widen to 6-lane roadway	Tucson	$17,000
3.14	Egleston Rd	Calle Concordia to Linda Vista	New Roadway	Oro Valley	$4,000
31.14	El Toro Rd #2	La Villita to Wilmot Rd	Construct 4-lane divided roadway, includes bridge over Santa Cruz	Sahuarita	$58,000
57.14	El Toro Rd Regional Arterial	I-19 to Wilmot	6-lane Regional Arterial Upgrade of El Toro Road	Multiple	$43,000
73.14	Golf Links Regional Arterial	Alvernon Way to Houghton Road	Upgrade Golf Links to a regional arterial	Multiple	$15,000
63.14	Grant Road/Houghton Rd Regional Arterial	Grant and I-10 to Houghton and Sahuarita	Upgrade Grant and Houghton Roads to Regional Arterials	Multiple	$32,600
69.14	Grant Road/Kolb Road/ Wilmot Rd Regional Arterial	I-10 to Sahuarita Rd	Upgrade corridor to regional arterial	Multiple	$30,000
84.08	Greasewood Rd	Ironwood Hill Dr to Starr Pass Blvd	Widen to 4-lane divided roadway, bike lanes & sidewalks	Tucson	$51,500
432.03	Hardin Rd	I-10 to Trico	Widen to 3-lane roadway	Marana	$5,500
80.08	Houghton Area Master Plan	HAMP Planning Boundaries	Construct arterial street roadways within HAMP area	Tucson	$264,000
22.03	Houghton Rd #4	Tanque Verde Rd to Catalina Hwy	Widen to 3-lane roadway	Pima County	$23,300
62.14	Ina Road/Craycroft Rd Regional Arterial	Ina and Silverbell to Grant and Craycroft	Upgrade the corridor to a regional arterial	Multiple	$33,700
210.00	Kirby Hughes Rd	Luckett Rd to I-10 Frontage Rd	Widen to 4-lane roadway	Marana	$9,000

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
528.08	Kolb / Orange Grove Parkway	La Cholla Blvd to Houghton Rd	Upgrade to parkway level of service	Multiple	$470,000
321.03	La Cañada Dr (South)	Camino Sueno de Sahuarita to North of El Toro Rd	Widen to 4-lane roadway	Sahuarita	$12,100
83.08	La Cholla Blvd (South)	Ajo Way to Starr Pass	Widen to 4-lane divided roadway, bike lane, sidewalks & drainage	Tucson	$34,200
66.14	La Cholla Rd Regional Arterial	Tangerine Rd to Ruthrauff Rd	Upgrade La Cholla Road to a regional arterial	Multiple	$24,000
98.00	Lambert Ln #1	I-10 to 1st Ave	Construct 6-lane roadway, includes wildlife crossing	Marana	$28,700
7.03	Lambert Ln #2	Twin Peaks Rd to Thornydale	Widen to 6-lane roadway, includes wildlife crossing	Marana	$43,800
26.03	Light Rail Transit - Starr Pass	Starr Pass to PCC & Downtown via St. Mary's	Construct new light rail system	Tucson Transit	$247,000
515.08	Light Rail Transit (LRT) - Broadway Blvd	Broadway Blvd from Downtown to Houghton	LRT on Broadway Blvd, see High Capacity Transit plan for details	Tucson Transit	$620,000
526.08	Light Rail Transit (LRT) - Campbell Ave South / Kino Pkwy	Tucson International Airport to Speedway Blvd	LRT along Campbell, see High Capacity Transit plan for details	Tucson Transit	$540,000
524.08	Light Rail Transit (LRT) - Grant Rd	Oracle Rd to Tanque Verde Rd	LRT along Grant Rd, see High Capacity Transit plan for details	Tucson Transit	$485,000
522.08	Light Rail Transit (LRT) - Oracle Rd	Downtown Tucson to Tangerine Rd	LRT along Oracle Rd, see High Capacity Transit plan for details	Tucson Transit	$1,000,000
520.08	Light Rail Transit (LRT) - Speedway Blvd	University of Arizona to Houghton Rd	LRT along Speedway Blvd, see High Capacity Transit plan for details	Tucson Transit	$635,000
16.00	Linda Vista Blvd #1	Twin Peaks Road to eastern town limits	Widen to 4-lane divided roadway, curbs & sidewalk	Marana	$9,000
86.14	Linda Vista Blvd #2	Marana town limits to Thornydale Rd	Widen to 4-lane roadway	Pima County	$10,000
179.08	Los Reales Corridor Project	Ajo Way to Nogales Highway	Improve Corridor	Multiple	$152,300
33.02	Los Reales Rd	I-19 to Old Nogales Highway	Extend and widen to 4-lane roadway	Tucson	$56,000
417.03	Main Street Extension (Marana)	Grier to Marana Rd	Construct 3-lane roadway	Marana	$5,000
692.03	Mission Rd	Valencia Rd to Drexel Rd	Widen to 4-lane roadway	Pima County	$12,200
46.03	Modern Streetcar - Pima College West	Pima College West to Rio Nuevo via Congress St	Construct new streetcar line	Tucson Transit	$90,000

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
23.14	MOE and Complete Streets	Marana	Measures of effectiveness and complete streets initiatives	Marana	$3,500
74.14	Nogales Highway/Duval Mine Rd Regional Arterial	Valencia Road to I-19	Upgrade of Nogales Highway to regional arterial	Multiple	$11,000
427.03	Nogales Hwy #3	Pima Mine Rd to Old Vail Connection Rd	Widen to 4-lane roadway	Pima County	$50,200
32.14	Nogales Hwy #4	Sahuarita Rd to Pima Mine Rd	Widen to 4-lane divided roadway	Sahuarita	$34,000
26.00	Old Nogales Hwy Corridor	Continental Rd to Nogales Hwy	Widen to 4-lane roadway, includes bridge over Santa Cruz	Sahuarita	$49,000
415.03	Orange Grove Rd #1	I-10 to Thornydale Rd	Widen to 8-lane roadway	Marana	$25,000
70.14	Pima Mine Rd Regional Arterial	Alvernon Way to I-10	Upgrade Pima Mine Road to a regional arterial	Multiple	$9,000
15.14	Pinal Air Park Connector	Luckett/Moore to Pinal Air Park	New 2 lane Roadway	Marana	$1,000
511.08	Prince Rd #1	Country Club Rd to River Rd	Build new 4-lane connecting roadway	Tucson	$10,000
127.00	Prince Rd #2	Campbell Ave to Country Club Rd	Widen to 4-lane roadway	Tucson	$17,100
47.00	Regional Component of Tucson/Nogales Passenger Rail	Southern border of Pima County to Downtown Tucson	Construct rail transit system toward Nogales	ADOT	$600,000
46.00	Regional Component of Tucson/Phoenix Passenger Rail	Tucson International Airport to northern Marana boundary	Construct passenger rail transit system toward Phoenix	ADOT	$700,000
529.08	River / Alvernon / Swan Parkway	Thornydale Rd to Sahuarita Rd	Upgrade to parkway level of service and extend to south	Multiple	$690,000
28.08	Roadway Development - Arroyo Grande	Arroyo Grande Planning Area	Plan, design and construct new roadways to support Arroyo Grande	Oro Valley	$75,000
67.14	Ruthrauff Rd Regional Arterial	Silverbell to SR 77	Upgrade Ruthrauff to a regional arterial	Multiple	$11,500
71.14	Sahuarita Rd Regional Arterial	I-19 to SR 83	Upgrade Sahuarita Rd to a regional arterial	Multiple	$20,000
206.00	Sandario Rd #1	Twin Peaks Rd to Avra Valley Rd	Widen to 3-lane roadway	Marana	$10,000

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
214.00	Sandario Rd #2	Moore Rd to Grier Rd	Widen to 3-lane roadway	Marana	$6,400
20.14	Sandario Rd #3	Grier to Marana Rd	Widen to 3-lane Roadway	Marana	$3,500
200.00	Sanders Rd Corridor Project	Twin Peaks Rd to Marana Rd	Widen to 4-lane roadway	Marana	$36,000
219.00	Silverbell Rd	Sanders Rd to west town limits	Widen to 4-lane roadway	Marana	$12,650
68.14	Silverbell Road Regional Arterial	Ina Road to Grant Road	Upgrade Silverbell Road to a Regional Arterial	Multiple	$2,500
4.03	Snyder Rd	Kolb Rd to Catalina Hwy	Construct new 2-lane roadway, includes bridge	Pima County	$23,000
562.08	SR 77: Oracle Rd Parkway Project	Miracle Mile to County Line	Construct grade-separated intersections along corridor	ADOT	$115,000
58.14	Tangerine Rd/Sandario Rd Regional Arterial	SR 77 to Sandario Road	Upgrade Tangerine Road to a regional arterial and extend southwest to Sandario	Multiple	$58,000
635.08	Transit Operations and Maintenance Expansion	Regionwide	Expand transit operations and maintenance	Tucson Transit	$700,000
25.08	Transit Services - Oro Valley/Arroyo Grande	Arroyo Grande Planning Area	Transit Circulator/Paratransit Expansion into Arroyo Grande	Oro Valley	$12,000
426.03	Tucson Blvd	Valencia Rd to Irvington Rd	Widen to 6-lane roadway	Tucson	$35,200
195.00	Twin Peaks Rd #2	Sanders Rd to Sidewinder Ln	Widen to 4-lane roadway	Marana	$23,200
72.14	Valencia Rd Regional Arterial	SR 86 to Old Spanish Trail	Upgrade Valencia road to a regional arterial	Multiple	$32,000
184.03	Wade Rd	Los Reales Rd to Ajo Wy	Construct new 4-lane roadway	Pima County	$20,400
215.00	Wentz Rd	Grier Rd to Hardin Rd	Widen to 3-lane roadway	Pima County	$10,000

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
2045 RMAP Reserve Freeway Projects					
I-10 West					
5.98	I-10 West Phase 2: Prince Rd to Marana Rd	Prince Rd to Marana Rd	Widen to 10-lanes	ADOT	$600,000
661.03	I-10 West Phase 3: Marana TI to N. County Line	Marana Traffic Interchange to N. County Line	Widen to 10-lanes	ADOT	$50,000
413.03	I-10 West: #E - Avra Valley / Lambert Traffic Interchange	I-10 and Avra Valley Rd	Reconstruct Traffic Interchange	ADOT	$34,500
420.03	I-10 West: #G - Tangerine Rd TI	I-10 and Tangerine Rd	Reconstruct Traffic Interchange with railroad grade separation	ADOT	$70,000
37.00	I-10 West: #H - Moore Rd TI	I-10 and Moore Rd	Construct Traffic Interchange	ADOT	$34,500
409.03	I-10 West: #I - Marana Rd TI	I-10 and Trico-Marana Rd	Construct Traffic Interchange	ADOT	$34,500
602.03	I-10 West: #J - Pinal Air Park TI	I-10 and Pinal Air Park Rd	Reconstruct Traffic Interchange	ADOT	$15,000
1.06	I-10 West: #K - Tortolita Blvd TI	1.3 mi SE of Pinal Airpark TI	Construct Traffic Interchange south of County Line	ADOT	$65,000
I-10 East					
55.14	I-10 East Phase 3: Alvernon to Kolb	Alvernon to Kolb	Widen to 10-lanes	ADOT	$60,000
585.03	I-10 East Phase 2: Kolb Rd to Houghton Rd	Kolb Rd to Houghton Rd	Widen to 8-lanes	ADOT	$60,000
612.03	I-10 East #C: Valencia TI	I-10 and Valencia Rd	Construct Traffic Interchange	ADOT	$100,000
606.03	I-10 East #D: Craycroft TI	I-10 and Craycroft Rd	Reconstruct Traffic Interchange	ADOT	$50,000
613.03	I-10 East #E: Wilmot TI	I-10 and Wilmot Rd	Reconstruct Traffic Interchange	ADOT	$40,000
604.03	I-10 East #G: Rita Rd TI	I-10 and Rita Rd	Reconstruct Traffic Interchange	ADOT	$50,000

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
			I-19		
39.02	I-19: Mainline Widening #1	Continental Rd to El Toro Rd	Widen to 6-lanes	ADOT	$24,000
406.03	I-19: Mainline Widening #2	El Toro Rd to Valencia Rd	Widen to 6-lanes	ADOT	$56,000
22.00	I-19: TI #2 at Pima Mine Rd	I-19 and Pima Mine Rd	Reconstruct Traffic Interchange	ADOT	$50,000
34.02	I-19: TI #3 at San Xavier Rd	I-19 and San Xavier Rd	Reconstruct Traffic Interchange	ADOT	$30,000
13.02	I-19: TI #4 at Drexel Rd	I-19 and Drexel Rd	Construct Traffic Interchange & bridge over Santa Cruz	ADOT	$20,000
84.14	I-19: TI #7 at El Toro Road	I-19 and El Toro Road	Construct interstate traffic interchange at El Toro Road	ADOT	$45,000
497.08	Sandario Loop Bypass Project	I-10 to I-19 to the west of Tucson	Limited access bypass west of Tucson	ADOT	$2,400,000

APPENDIX 5

2045 RMAP Aviation Project List

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APPENDIX 5: Aviation Project List

As part of the 2045 Regional Mobility and Accessibility Plan planning process, PAG worked with regional airport operators in order to include aviation improvements in the plan. Aviation projects were not considered as part of the financial analysis conducted for the 2045 RMAP since airports have their own mix of federal, state and local revenue sources.

For more information about planned aviation improvements, please refer to the long-range plans and programs of the region's individual airports.

Projects on the aviation list are sorted by agency/jurisdiction, then airport facility, and within each airport, alphabetically by project name. Other information presented includes:

RMAP ID#: Each project has an ID number that is used to identify and track the project. Numbers after the decimal point indicate the year the project was originally added to PAG's regional project database.

Project Name, Location, Description: The general scope and location of each project is provided.

Estimated Project Cost: Total cost includes the anticipated costs, as appropriate, for planning, design, right-of-way, and construction for each project. All costs and revenues are in 2015 dollars and may be subject to change as project scopes are further defined.

Sponsor: Each project lists the agency that is expected to be responsible for its implementation.

2045 RMAP Aviation Project List

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
Tucson International Airport					
52.08	Air Freight Infrastructure & Utilities	Tucson International Airport	Expansion of air freight facility	TAA	$2,600
4.00	Airfield Safety Enhancement Program	Tucson International Airport	Construct Center Taxiway, Relocate Parallel Runway	TAA	$180,000
55.08	Country Club Rd	Country Club Rd	Extend roadway south of Los Reales Rd	TAA	$3,000
32.08	CUTE System	Tucson International Airport	Common use technology equipment in terminal	TAA	$1,600
112.08	GA Infrastructure	Tucson International Airport	Provide infrastructure for future general aviation development	TAA	$3,700
54.08	Ground Cargo Infrastructure	Tucson International Airport	Ground Cargo Infrastructure	TAA	$4,300
88.14	Land Acquisition	Tucson International Airport	Acquire Property for future expansion	TAA	$3,000
89.14	Main Terminal Apron Reconstruction Phase 4	Tucson International Airport	Reconstruction of PCC pavements	TAA	$7,400
150.03	Multimodal Infrastructure	Tucson International Airport	Extend infrastructure into TIA for freight and passengers	TAA	$700
46.08	Pavement Preservation	Tucson International Airport	Pavement preservation for existing public roads, parking lots	TAA	$40,000
50.08	Pavement Preservation	Tucson International Airport	Pavement preservation of existing runways & taxiways	TAA	$25,000
29.08	RAC Service Center Infrastructure	Tucson International Airport	Infrastructure to support rental car service areas and wash racks	TAA	$5,000
110.08	Security Upgrades - Phase II	Tucson International Airport	Expand security monitoring capabilities	TAA	$5,000
36.08	Taxiway G	Tucson International Airport	Multi Phases Extension of Taxiway G	TAA	$5,000
53.14	TIA Airside Service Road Reconstruction	Tucson International Airport	Reconstruct Service Road	TAA	$500
50.14	TIA Commercial Roadway Reconst/Realign	Tucson International Airport	Reconstruct Commercial Roadway	TAA	$10,000
51.14	TIA Security Master Plan Update	Tucson International Airport	Update Security Master Plan	TAA	$150

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
Ryan Airfield					
70.08	Airfield Drainage Projects	Ryan Airfield	Numerous drainage systems projects	TAA	$8,000
41.08	Construct Apron (40,800 sq. yd.)	Ryan Airfield	Construct apron to facilitate aeronautical development	TAA	$4,000
61.08	Construct Helipad & Helicopter Parking Area	Ryan Airfield	Construct helipad and helicopter parking area	TAA	$1,000
63.08	Construct High-Speed Exit Taxiway 6R	Ryan Airfield	Build high-speed exit taxiway 6R	TAA	$1,200
67.08	Expand Apron & Construct Remaining FBO Apron	Ryan Airfield	Expand apron 48,500 sq.yds and const. remaining 40% of FBO apron	TAA	$5,300
43.08	Extend 6R and Taxiway B - 2,000 ft.	Ryan Airfield	To accommodate larger aircraft	TAA	$10,000
8.00	Extend Runway 6R-24L	Ryan Airfield	Extend runway to 6,300 ft.	TAA	$22,000
108.08	Land Acquisition	Ryan Airfield	Purchase land for runway approach protection	TAA	$800
69.08	Pavement Preservation	Ryan Airfield	Pavement preservation of existing airport pavements	TAA	$10,000
12.00	Runway 15-33 Extension and TWD	Ryan Airfield	Extend crosswind runway to 4,800'	TAA	$2,500
60.08	Runway, Taxiway & Apron Reconstruction	Ryan Airfield	Reconstruction of runway, taxiway & apron	TAA	$3,000
49.14	Ryan Airfield Access Roadway and Parking 220 LOCAL C Lot	Ryan Airfield	Rehabilitate Access Roadway and Parking Lot	TAA	$200
48.14	Ryan Airfield Airside Auto Road	Ryan Airfield	Construct Airside Auto Road	TAA	$200
43.14	Ryan Airfield Construct Drainage Dike and Channel	Ryan Airfield	Ryan Airfield Construct Drainage Dike and Channel	TAA	$2,400
47.14	Ryan Airfield Drainage Dike and Channel	Ryan Airfield	Construct Drainage Dike and Channel	TAA	$2,400
42.14	Ryan Airfield Master Plan Update	Ryan Airfield	Ryan Airfield Master Plan Update	TAA	$400
68.08	Security Equipment - CCTV	Ryan Airfield	Install security equipment on airport	TAA	$2,400

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
Marana Regional Airport					
73.08	Air Traffic Control Tower	Marana Regional Airport	Air Traffic Control Tower Design and Construction	Marana	$14,000
133.08	Airport Land Acquisition 155 Acres	Marana Regional Airport	Airport Land Acquisition 155 Acres	Marana	$5,100
71.08	Airport Land Acquisition 250 Acres	Marana Regional Airport	Airport Land Acquisition 250 Acres	Marana	$6,200
72.08	Airport Terminal	Marana Regional Airport	Construct Airport Terminal	Marana	$7,300
78.08	Apron Reconstruct	Marana Regional Airport	Reconstruct ramp area for AZ State Aerial Fire Aircraft	Marana	$1,800
593.08	Apron Rehabilitation	Marana Regional Airport	Rehabilitate Apron	Marana	$ 1,800
594.08	Avra Valley Road Realignment	Marana Regional Airport	Design and Environmental Assessment	Marana	$1,500
127.08	Construct Auto Parking for Terminal	Marana Regional Airport	Auto parking for terminal	Marana	$1,200
135.08	Construct Runway 12R/30L	Marana Regional Airport	Construct Runway 12R/30L	Marana	$5,000
114.08	Construct Taxiway H	Marana Regional Airport	Construct Taxiway H	Marana	$3,000
74.08	Construct Taxiway K	Marana Regional Airport	Construct Taxiway K. 50 feet x 1,500 feet.	Marana	$1,400
134.08	Construct Taxiways	Marana Regional Airport	Construct Taxiways	Marana	$2,500
595.08	Design Airport Terminal Building	Marana Regional Airport	Design airport terminal building	Marana	$700
139.08	Design and Construct Runway 3-21 Shift	Marana Regional Airport	Extend Runway 3-21 and Taxiway B 500' to the northeast for displacement in 2005	Marana	$4,000
129.08	Design Runway 12R/30L	Marana Regional Airport	Design Runway 12R/30L 4700x75	Marana	$8,500
126.08	Environmental Assessment	Marana Regional Airport	Environmental Assessment for new Rdwy and other airport projects	Marana	$200
75.08	Extend Tiedown Apron (Fire)	Marana Regional Airport	Extend Tiedown Apron (Fire) by 400 x 400 feet	Marana	$12,000
130.08	Fire Protection	Marana Regional Airport	9,000 LF of Fire Protection Line - Install fire protection lines for airport safety	Marana	$3,000
125.08	Fire Protection	Marana Regional Airport	Fire Protection Water Lines on 244 acres	Marana	$1,500
137.08	Fire Protection	Marana Regional Airport	Install 9,000 LF of 16" Fire Protection Line on SE side of airport for public safety.	Marana	$1,400

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
143.08	Fire Protection Lines Phase IV	Marana Regional Airport	Fire Protection Lines Phase IV	Marana	$4,000
77.08	Fire Protection Water Line	Marana Regional Airport	Fire Protection Water Line (To complete loop and Taxiway K)	Marana	$2,500
18.14	Fire Station	Marana Regional Airport	Fire Station at Marana Regional Airport	Marana	$3,000
17.14	Hanger Development	Marana Regional Airport	Hanger Development	Marana	$3,800
596.08	Land Acquisition	Marana Regional Airport	Land Acquisition for the Avra Valley Road Alignment	Marana	$4,500
115.08	Land Acquisition	Marana Regional Airport	Land Acquisition 244 Acres	Marana	$6,100
132.08	Land Acquisition	Marana Regional Airport	Land Acquisition 548 Acres	Marana	$13,700
38.14	Marana Airport Tie Down, Helicopter & Terminal Apron	Marana Regional Airport	Rehab Apron Transient (446,314 sf), Tiedown (166,579 sf)	Marana	$2,900
131.08	Master Plan Update	Marana Regional Airport	Master Plan Update	Marana	$375
128.08	Part 150 Noise Study	Marana Regional Airport	Part 150 Noise Study	Marana	$300
124.08	Reconstruct Runway 3-21	Marana Regional Airport	Reconstruct Runway 3-21	Marana	$1,800
141.08	Rehabilitate Taxiway C	Marana Regional Airport	Rehabilitate Taxiway C	Marana	$900
123.08	Rehabilitate Twy A, Twy B, Twy E	Marana Regional Airport	Rehabilitate Taxiways	Marana	$1,900
76.08	Security Fence	Marana Regional Airport	Construct Security Fence	Marana	$1,500
140.08	Security Fencing	Marana Regional Airport	Install security fence to protect the airside of the airport	Marana	$1,500
136.08	Taxiway Construction	Marana Regional Airport	Construct 6 (50x400) High speed exits off RWY 12L/30R for improved runway efficiency	Marana	$1,900

RMAP ID#	Name	Location	Description	Sponsor Jurisdiction	Estimated Project Cost (000s)
Eric Marcus Municipal Airport					
631.08	Construct Taxiway Turnaround	Eric Marcus Municipal Airport	Construct taxiway turnaround at Eric Marcus Municipal Airport	Pima County	$350
632.08	Facility & Pavement Maintenance	Eric Marcus Municipal Airport	Facility & Pavement Maintenance at Eric Marcus Municipal Airport	Pima County	$300
630.08	Update Airfield Signage	Eric Marcus Municipal Airport	Update Airfield Signage at Ajo Airport at Eric Marcus Municipal Airport	Pima County	$40
629.08	Upgrade Security Fencing	Eric Marcus Municipal Airport	Upgrade Security Fencing at Eric Marcus Municipal Airport	Pima County	$900
Reserve Aviation Projects					
1.00	Concourse Expansion	Tucson International Airport	Add Additional Gates	TAA	$40,000
7.00	Far Parallel Runway	Tucson International Airport	Add new runway	TAA	$150,000
531.03	Fuel Storage Facility	Tucson International Airport	Construct a fuel storage facility	TAA	$18,000
87.14	Solar Canopy Projects	Tucson International Airport	Additional Solar Installation throughout campus	TAA	$40,000
25.08	Upgrade Paving on Economy Overflow Lot	Tucson International Airport	Convert existing millings lot to asphalt	TAA	$3,500

APPENDIX 6

Title VI and Environmental Justice

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APPENDIX 6: Title VI and Environmental Justice

A Title VI and Environmental Justice analysis was performed to determine the impact of 2045 Regional Mobility and Accessibility Plan improvements on protected populations. The Federal Highway Administration and the Federal Transit Administration are committed to ensuring that Title VI of the 1964 Civil Rights Act is carried out for federally funded programs. Within this context, PAG recognizes the importance of transportation to all residents in the region and works toward the fair distribution of benefits and burdens of transportation improvements.

PAG's Title VI and Environmental Justice analysis assesses the relative distribution of costs and benefits of transportation projects upon various segments of the community. The analysis starts by identifying traffic analysis zones (TAZs) in which federally protected classes of population reside in greater concentrations than the total regional percentage of that population group. PAG then uses sophisticated travel modeling and GIS mapping software packages to determine the average travel times for all populations compared to those of protected classes residing in concentrated TAZs. Additionally, maps are created to review whether transportation improvements are fairly distributed throughout the region. Travel time refers to how long it takes the average person to travel by auto on a home-based vehicle trip (a trip that starts or ends at home).

PAG also performs a Title VI analysis on projects included in its five-year Transportation Improvement Program (TIP) while the jurisdictions conduct project-specific assessments during project development. Each jurisdiction or project sponsor is responsible for Environmental Justice and Title VI compliance as part of the planning and construction of its individual projects. This includes "just" compensation and relocation assistance for properties that qualify due to the impacts of the individual projects.

The analysis shows that, when compared to a baseline travel time of all residents in the urban portion of the county (labeled as "all"), the protected populations are expected to experience comparable travel time benefits.

Across all three land use scenarios used in this plan, the average travel time improvement "with the RMAP projects" compared to "without" was 0.9 to 1 minutes for everyone in the region during peak period travel and 0.3 to 0.4 minutes during off-peak travel. Protected classes would be expected to experience an improvement "with the RMAP projects" compared to "without" in travel time between 0.5 and 1.1 minutes during peak period and between 0.2 and 0.4 minutes for off-peak travel.

Title VI and Environmental Justice

Title VI of the 1964 Civil Rights Act (42 U.S.C. 2000d-1 and related regulations) states 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."

A 1994 Presidential Executive Order directed every federal agency to make environmental justice part of its mission by identifying and addressing the effects of all programs, policies, and activities on "minority populations and low-income populations."

Table 1 Title VI/Environment Justice Analysis - Modeling Results for Concentrations of Protected Population - Scenario 2: Mixed Urban/ Suburban Growth (official RMAP scenario)

Group	Travel Period	Average Travel Time 2015 (minutes/vehicle)	Average Travel Time 2045 No Build (minutes/ vehicle)	Average Travel Time 2045 with projects (minutes/vehicle)	Comparison with and without RMAP projects
All	**Peak**	**14.4**	**16.2**	**15.2**	**-0.9**
	Off-Peak	**12.4**	**13.2**	**12.8**	**-0.3**
Black or African American	Peak	12.6	14.8	13.9	-0.9
	Off-Peak	10.6	11.7	11.4	-0.3
Asian	Peak	12.5	14.6	13.7	-0.9
	Off-Peak	10.5	11.7	11.4	-0.4
Persons with Disabilities	Peak	13.6	15.3	14.5	-0.8
	Off-Peak	11.5	12.2	12.0	-0.2
65 Years and Over	Peak	13.0	14.7	13.9	-0.8
	Off-Peak	11.1	12.0	11.7	-0.3
Hispanic or Latino	Peak	14.0	15.6	14.9	-0.7
	Off-Peak	11.9	12.8	12.5	-0.3
Low Income	Peak	12.2	13.5	12.9	-0.6
	Off-Peak	10.4	10.9	10.8	-0.2
American Indian	Peak	13.0	14.6	13.9	-0.6
	Off-Peak	11.1	11.9	11.7	-0.2

Table 2 Title VI/Environment Justice Analysis - Modeling Results for Concentrations of Protected Population - Scenario 1: Mostly Suburban Growth

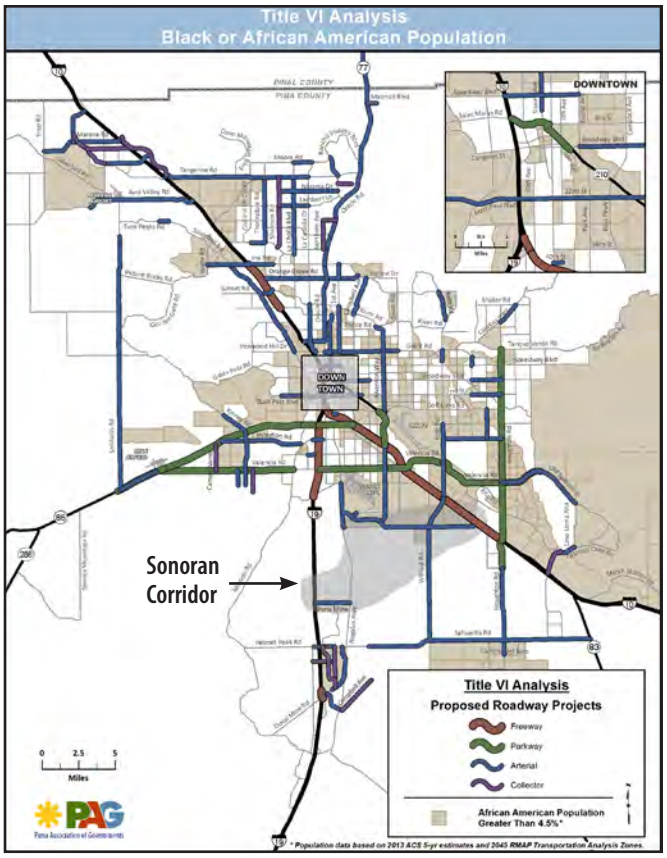
Group	Travel Period	Average Travel Time 2015 (minutes/vehicle)	Average Travel Time 2045 No Build (minutes/ vehicle)	Average Travel Time 2045 with projects (minutes/vehicle)	Comparison with and without RMAP projects
All	**Peak**	**14.4**	**17.2**	**16.2**	**-1.0**
	Off-Peak	**12.4**	**14.1**	**13.7**	**-0.4**
Black or African American	Peak	12.6	15.5	14.7	-0.8
	Off-Peak	10.6	12.5	12.2	-0.4
Asian	Peak	12.5	15.2	14.3	-0.9
	Off-Peak	10.5	12.3	11.9	-0.4
Persons with Disabilities	Peak	13.6	15.8	15.0	-0.7
	Off-Peak	11.5	12.8	12.4	-0.3
65 Years and Over	Peak	13.0	15.7	14.8	-0.9
	Off-Peak	11.1	12.9	12.5	-0.4
Hispanic or Latino	Peak	14.0	16.5	15.7	-0.8
	Off-Peak	11.9	13.6	13.1	-0.4
Low Income	Peak	12.2	14.1	13.6	-0.5
	Off-Peak	10.4	11.6	11.4	-0.2
American Indian	Peak	13.0	14.9	14.3	-0.6
	Off-Peak	11.1	12.3	12.1	-0.2

Table 3 Title VI/Environment Justice Analysis - Modeling Results for Concentrations of Protected Population - Scenario 3: Mostly Urban Growth

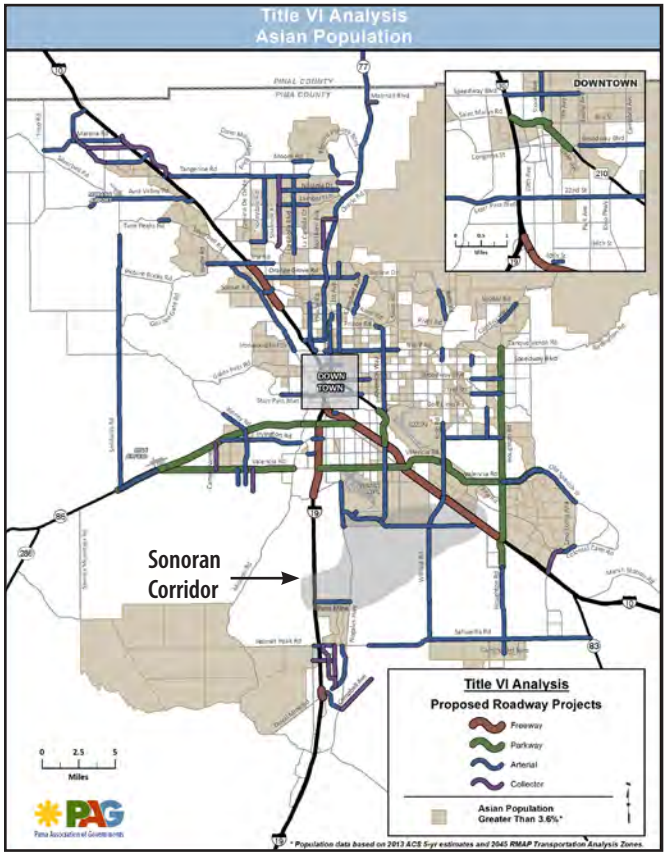
Group	Travel Period	Average Travel Time 2015 (minutes/vehicle)	Average Travel Time 2045 No Build (minutes/ vehicle)	Average Travel Time 2045 with projects (minutes/vehicle)	Comparison with and without RMAP projects
All	**Peak**	**14.4**	**16.7**	**15.7**	**-1.0**
Black or African American	**Off-Peak**	**12.4**	**13.1**	**12.8**	**-0.4**
	Peak	12.6	14.6	13.7	-0.8
Asian	Off-Peak	10.6	11.2	10.9	-0.3
	Peak	12.5	14.7	13.8	-0.9
Persons with Disabilities	Off-Peak	10.5	11.2	10.9	-0.3
	Peak	13.6	15.6	14.8	-0.8
65 Years and Over	Off-Peak	11.5	12.1	11.8	-0.3
	Peak	13.0	15.2	14.1	-1.1
Hispanic or Latino	Off-Peak	11.1	11.7	11.3	-0.4
	Peak	14.0	16.1	15.2	-0.9
Low Income	Off-Peak	11.9	12.6	12.2	-0.3
	Peak	12.2	13.9	13.2	-0.8
American Indian	Off-Peak	12.6	13.4	13.0	-0.4
Black or African American	Peak	13.0	15.0	14.0	-1.0
	Off-Peak	11.1	11.5	11.2	-0.3

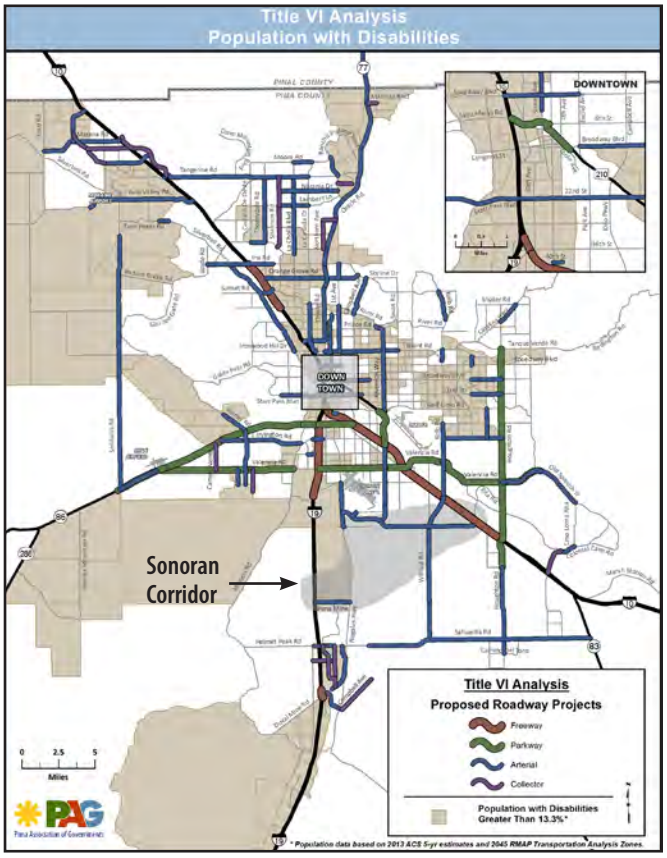
Title VI maps graphically represent the location of the projects in comparison to the location of various concentrations of protected populations. While the mapping of the projects doesn't take into consideration the travel time impact of the projects, this visualization of the proximity of the projects acts as a good "common sense" double check to make sure there is an appropriate distribution of projects across the region in relation to protected populations, and no undue burden falls on any group of residents.

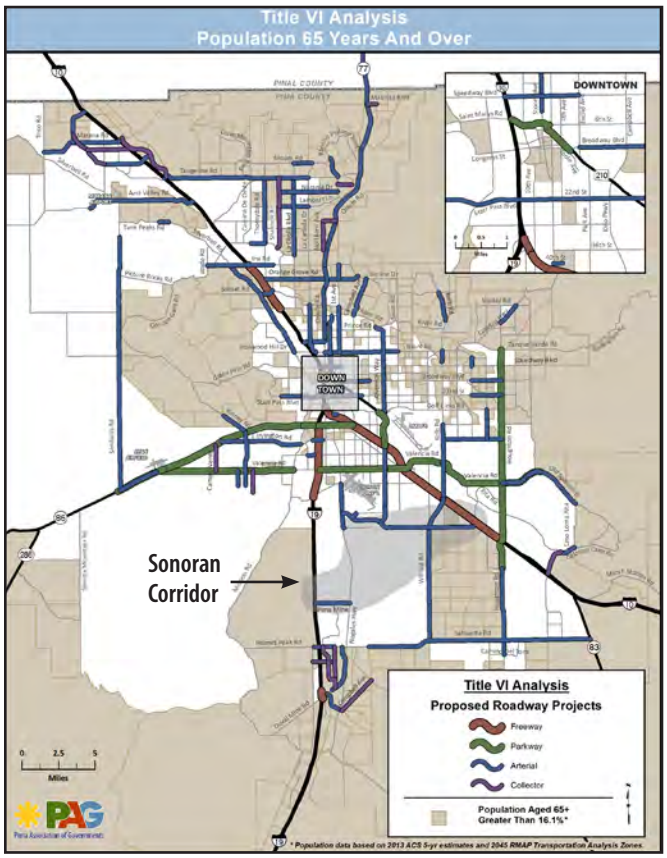
The Title VI Roadway Maps on these two pages represent the location of the 2045 RMAP In-Plan Roadway Projects in comparison to the location of various concentrations of protected populations. These maps visually show there is an appropriate distribution of projects across the region in relation to protected populations.

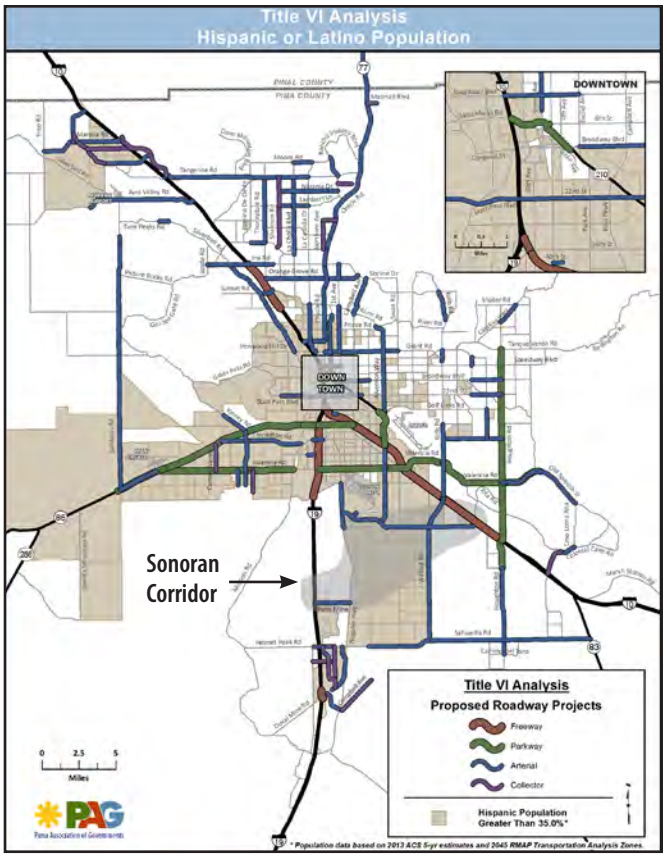


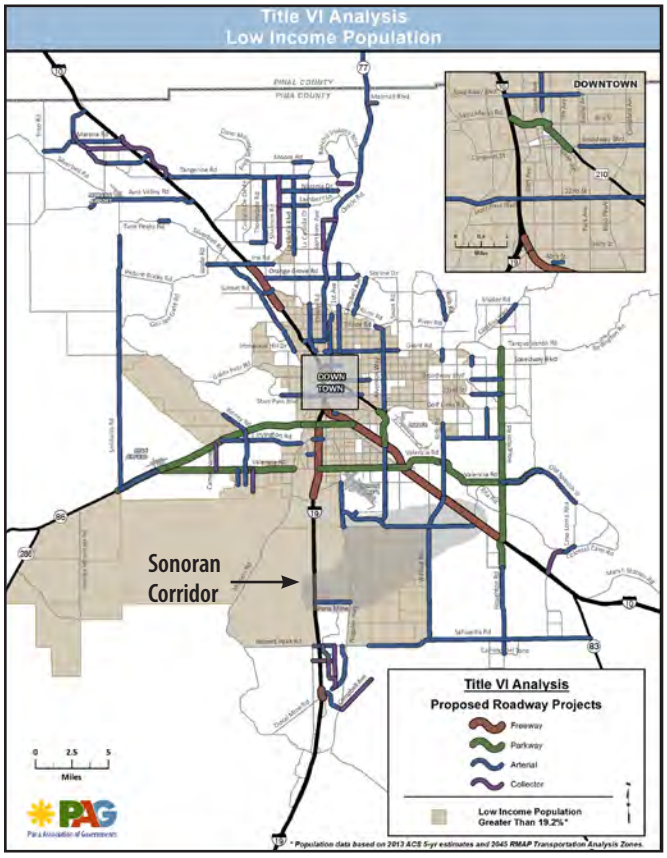
The FAST Act designated SR 410 (Sonoran Corridor) as a High Priority Corridor on the National Highway System. The maps in the document show an illustrative area, which generally encompasses the area south of Valencia RD, east of I-19, and west of I-10.

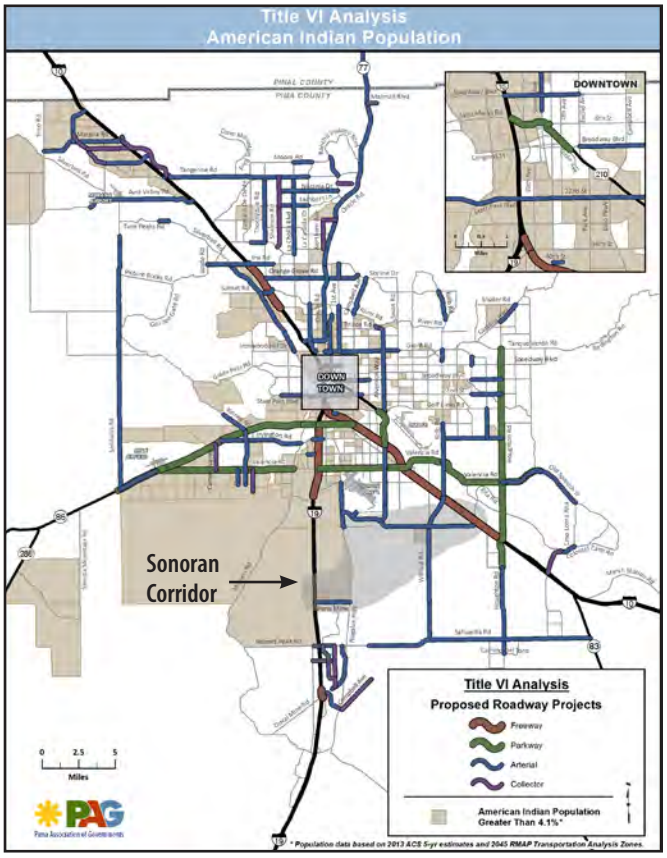




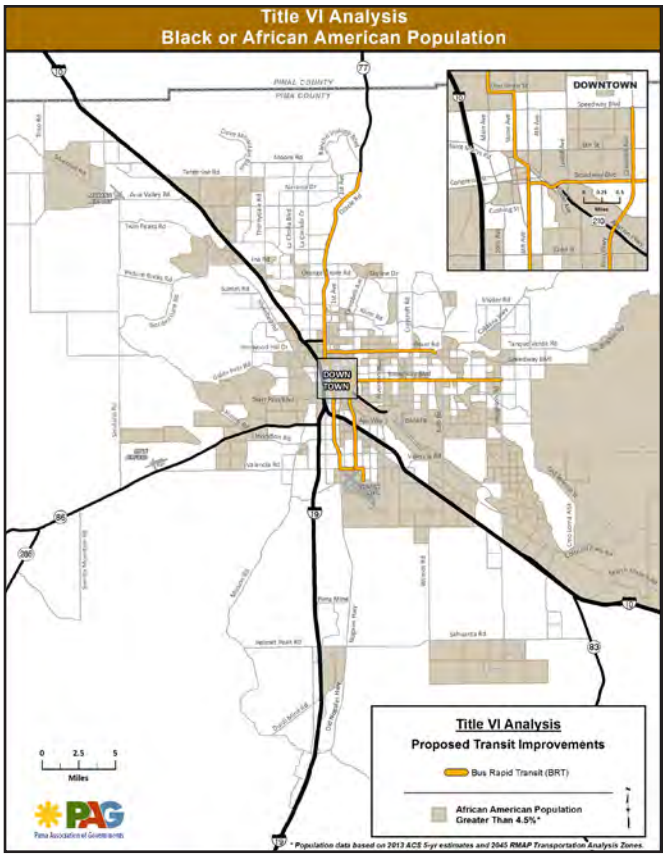

Title VI Analysis
Population 65 Years And Over
DOWNTOWN
Sonoran
Corridor
Title VI Analysis
Proposed Roadway Projects
Freeway
Parkway
Arterial
Collector
Population Aged 65+
Greater Than 16.1%*
Miles
* Population data based on 2013 ACS 5-yr estimates and 2045 RMAP Transportation Analysis Zones.

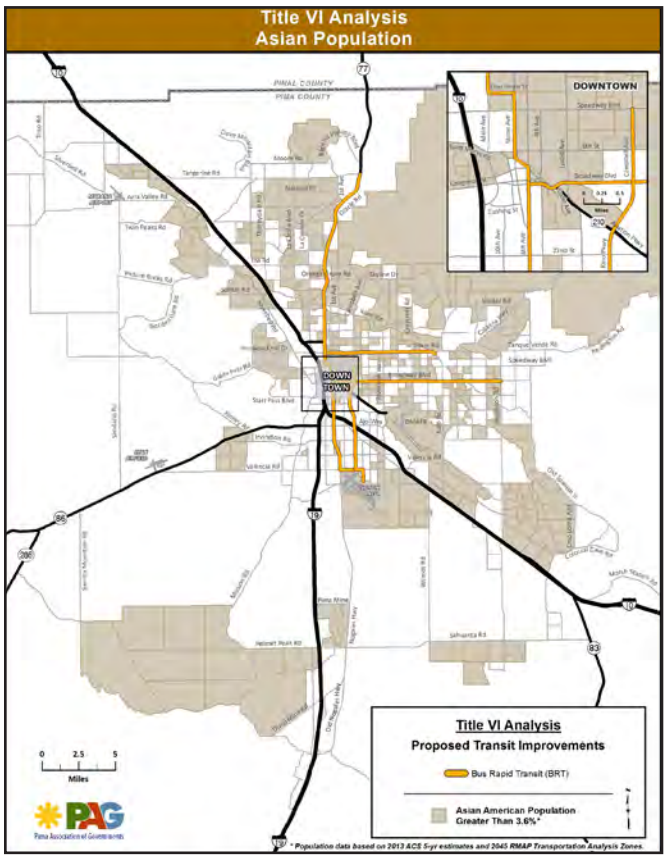

Title VI Analysis
Hispanic or Latino Population
DOWNTOWN
Sonoran
Corridor
Title VI Analysis
Proposed Roadway Projects
Freeway
Parkway
Arterial
Collector
Hispanic Population
Greater Than 35.0%*
Miles
* Population data based on 2013 ACS 5-yr estimates and 2045 RMAP Transportation Analysis Zones.

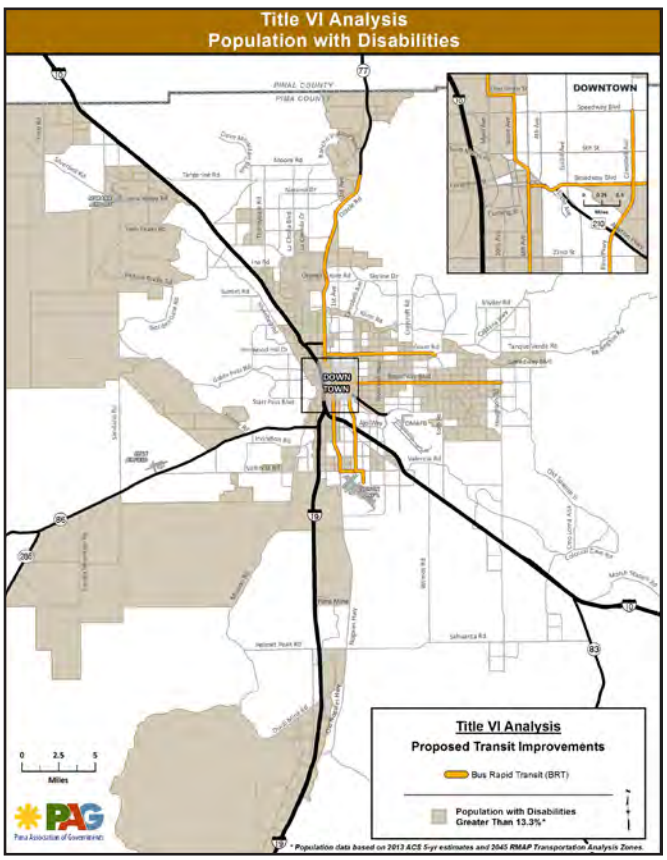

Title VI Analysis
Low Income Population
DOWNTOWN
Sonoran
Corridor
Title VI Analysis
Proposed Roadway Projects
Freeway
Parkway
Arterial
Collector
Low Income Population
Greater Than 19.2%*
Miles
* Population data based on 2013 ACS 5-yr estimates and 2045 RMAP Transportation Analysis Zones.

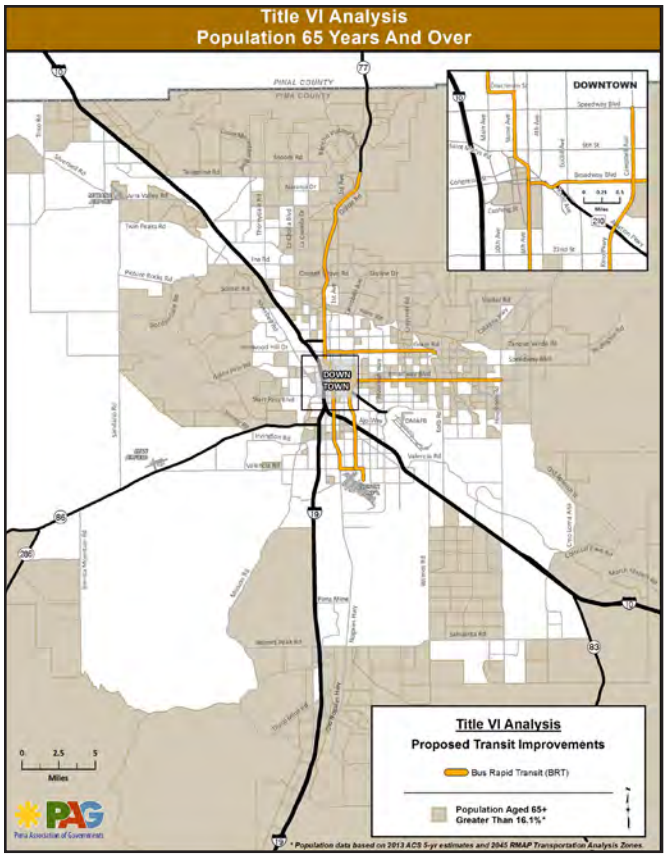

Title VI Analysis
American Indian Population
DOWNTOWN
Sonoran
Corridor
Title VI Analysis
Proposed Roadway Projects
Freeway
Parkway
Arterial
Collector
American Indian Population
Greater Than 4.1%*
Miles
* Population data based on 2013 ACS 5-yr estimates and 2045 RMAP Transportation Analysis Zones.

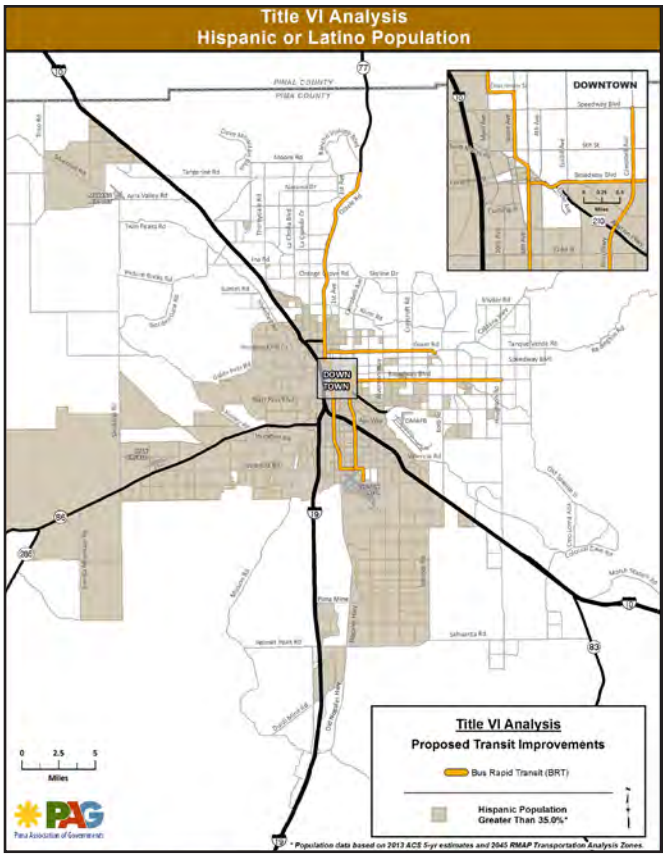
The Title VI Transit Maps on these two pages graphically represent the location of the 2045 RMAP In-Plan Transit Projects in comparison to the location of various concentrations of protected populations. These maps visually show there is an appropriate distribution of projects across the region in relation to protected populations.

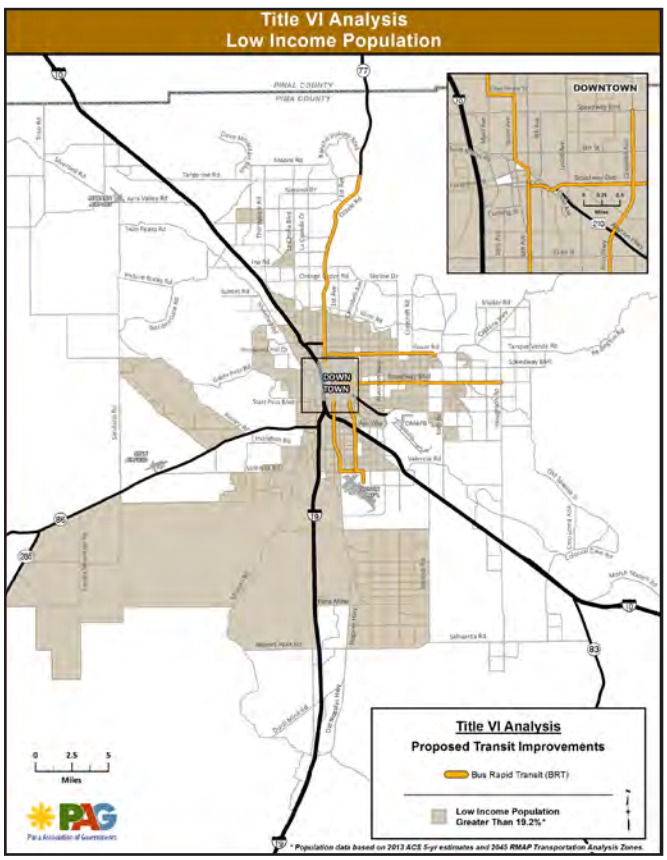


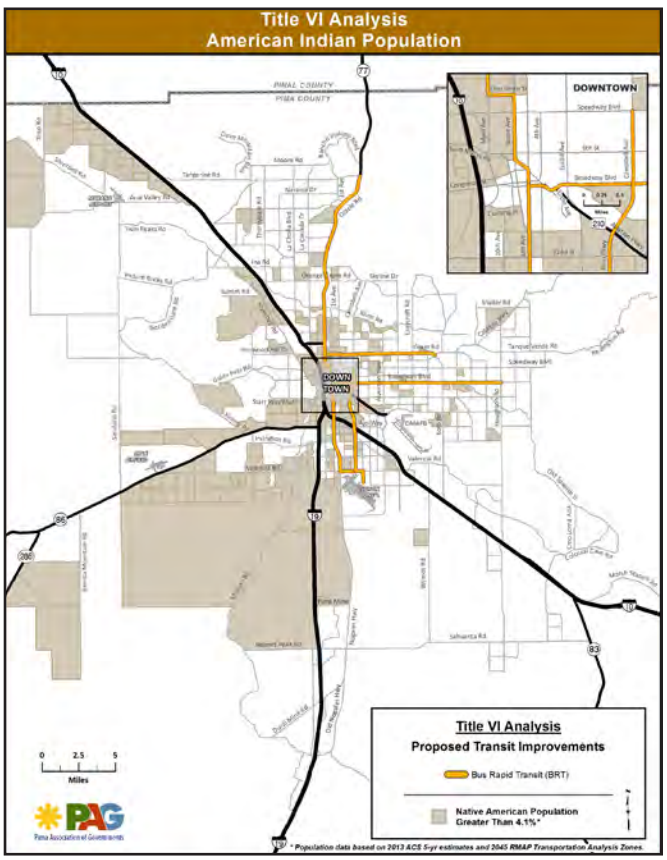





Title VI Analysis
Population 65 Years And Over
DOWNTOWN
Title VI Analysis
Proposed Transit Improvements
Bus Rapid Transit (BRT)
Population Aged 65+
Greater Than 16.1%*
* Population data based on 2013 ACS 5-yr estimates and 2045 RMAP Transportation Analysis Zones.


Title VI Analysis
Hispanic or Latino Population
DOWNTOWN
Title VI Analysis
Proposed Transit Improvements
Bus Rapid Transit (BRT)
Hispanic Population
Greater Than 35.0%*
* Population data based on 2013 ACS 5-yr estimates and 2045 RMAP Transportation Analysis Zones.


Title VI Analysis
Low Income Population
DOWNTOWN
Title VI Analysis
Proposed Transit Improvements
Bus Rapid Transit (BRT)
Low Income Population
Greater Than 19.2%*
* Population data based on 2013 ACS 5-yr estimates and 2045 RMAP Transportation Analysis Zones.


Title VI Analysis
American Indian Population
DOWNTOWN
Title VI Analysis
Proposed Transit Improvements
Bus Rapid Transit (BRT)
Native American Population
Greater Than 4.1%*
* Population data based on 2013 ACS 5-yr estimates and 2045 RMAP Transportation Analysis Zones.

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APPENDIX 7

Illustrative 2045 RMAP Projects

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Federal regulations for long-range transportation plans, such as the 2045 Regional Mobility and Accessibility Plan, allow for the inclusion 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. These projects are discussed in the 2045 RMAP for illustrative purposes only, because funding for their construction is beyond what is available in the 2045 RMAP and other funding sources have not been identified. The illustrative projects highlighted in this appendix are those that are of such a scale that each of them could potentially transform the region's transportation system. There is no requirement to select any project from an illustrative list of projects in a long-range transportation plan at some future date, when funding might become available. In addition, no priorities are stated or implied by inclusion as an illustrative project.

I-11 and Intermountain West Corridor

The concept and goal of enhancing north-south connectivity between Mexico, the United States and Canada through the intermountain west was well established decades ago. This was exemplified through the 1995 designation of the CANAMEX Corridor. Nearly two decades later, federal surface transportation legislation enacted in 2012 included designation of Interstate 11, or I-11, between Las Vegas and the vicinity of Phoenix as part of the High Priority Corridors of the National Highway System. Also in 2012, ADOT and the Nevada Department of Transportation (NDOT) initiated a two-year study of the I-11 and Intermountain West Corridor. This effort established a vision and study description, developed a business case, and analyzed broad connectivity segments from the Arizona border with Mexico to the northern border of Nevada. All study materials can be found at www.i11study.com.

Potential benefits of the I-11 and Intermountain West Corridor identified at the outset of the study include:

- Connecting communities, major trade hubs, existing and future domestic and international deepwater ports, and intersecting transcontinental roadways and railroad corridors.
- Enhancing the economic vitality of communities connected and served by the corridor.
- Improving safety and travel time reliability for the movement of people and goods throughout the Intermountain West.
- Providing relief for congested north-south corridors in the Western United States, such as I-5 and I-15.
- Enhancing commercial opportunities by linking trade between Canada, Mexico and the Intermountain West.
- Increasing the global competitiveness of the region. (Sources: ADOT/NDOT)

Although several southern Arizona future connectivity corridors were initially selected for high level screening, the process identified the corridor between Casa Grande and Nogales, by way of eastern Pima County, as the preferred corridor for further evaluation in a subsequent study. Factors for this preference included, but were not limited to, linking major freight and economic centers in Arizona (e.g., Tucson and Nogales) and Mexico (e.g., cities and ports along Mexico Highway 15) as well as helping to address projected congestion around the Tucson metropolitan area.

In 2014, Pima Association of Governments' Regional Council approved a resolution recognizing the economic potential of the I-11 and Intermountain West Corridor and supported further study of this broad, 5- to 50-mile wide corridor. At the conclusion of the initial, two-year ADOT/NDOT study, the Arizona State Transportation Board approved funding for the development of a Tier 1 Environmental Impact Statement, or EIS, for the corridor segments between Wickenburg and Nogales, Ariz. Commencing in 2016 and anticipated to last three

or more years, this next study will attempt to determine the transportation mode, or modes, and refined corridor alignments.

The most recently approved federal surface transportation legislation, the FAST Act, expands the I-11 designation. Within the High Priority Corridors of the National Highway System, the I-11 designation now also includes all three segments of the CANAMEX Corridor in Arizona. Like the CANAMEX Corridor, I-11 generally follows I-19 from Nogales to Tucson, I-10 from Tucson to Phoenix, and U.S. Route 93 in the vicinity of Phoenix to the Nevada border.

Sources: ADOT/NDOT

I-11 and Intermountain West Corridor segments identified at the conclusion of the two-year study

Interstate 10 and Interstate 19 Planned Build-out

The identified capacity needs on the interstate system in Pima County are beyond what can be paid for under the 2045 RMAP's revenue assumptions. The table on page A71 compares capacity improvements included in the financially constrained 2045 RMAP with proposed unconstrained interstate build out. There are major gaps in funding for capacity needs on I-10 north of Ina Rd and east of Alvernon Way. On I-19, there is a funding shortfall for needed capacity south of San Xavier Rd.

Interstate 10 and Interstate 19 Planned Build-out

Project Name	Location	2045 RMAP Description	Ultimate Corridor Build Out Description
I-10 Planned Future Configurations			
I-10 East Phase 1a	I-19 to Kino	Widen to 8 lanes	Widen to 8 lanes
I-10 East Phase 1b	Kino to Alvernon	Widen to 6 lanes	Widen to 6 lanes
I-10 East Phase 3	Alvernon to Kolb	Widen to 8 lanes	Widen to 10 lanes
I-10 East Phase 2	Kolb to Houghton Road	Widen to 6 lanes	Widen to 8 lanes
I-10 West Planned Future Configurations			
I-10 West Phase 2	Prince Rd to Marana Rd	8 lanes from Ruthrauff Rd to Ina Rd. Maintain 6 lanes Ina Rd to Marana Road	Widen to10 lanes
I-10 West Phase 3	Marana Rd to N. County Line	Maintain 6 lanes Marana Road to N County Line	Widen to 10 lanes
I-19 Planned Future Configurations			
I-19 Mainline Widening #1	Continental Rd to El Toro Rd	Maintain 4 lanes	Widen to 6 lanes
I-19 Mainline Widening #2	El Toro Rd to San Xavier Rd	Maintain 4 lanes	Widen to 6 lanes
I-19 Mainline Widening #3	San Xavier to Ajo Rd	Widen to 6 lanes	Widen to 6 lanes

Tucson to Phoenix Intercity Passenger Rail

Arizona Passenger Rail Corridor Study: Tucson to Phoenix

ADOT has recently prepared a Tier 1 Environmental Impact Statement (EIS) for passenger rail service between Tucson and Phoenix. According to ADOT's Draft Arizona Passenger Rail Corridor Study: Tucson to Phoenix:

ADOT has identified a need for an alternative transportation mode to help meet existing and future travel demand in the Pima, Pinal, and Maricopa tri-county area. By 2035, the travel time between Tucson and Phoenix via Interstate 10 (I-10) is projected to take 26 percent longer than the travel time in 2010 and, by 2050, 59 percent longer, even if the highway is widened to 8 lanes. The Arizona Passenger Rail Corridor Study (APRCS), led by the Federal Railroad Administration (FRA), builds on statewide and regional planning efforts and initiatives to investigate alternative approaches to implementing passenger rail service between Tucson and Phoenix, Arizona's two largest cities.

In the Tier 1 draft EIS, ADOT recommends a passenger rail study corridor from the Tucson International Airport to Surprise and Buckeye in the Phoenix metro area for future Tier 2 environmental analyses as shown on page A70. The Tier 1 EIS narrowed down the wide-range of potential study corridors that exist between Phoenix and Tucson for further study. The recommended study corridor provides a general framework to identify, evaluate and compare specific alignment alternatives in future Tier 2 environmental studies.

While still very preliminary, the EIS discusses both an intercity service, with few stops between Tucson and Phoenix, and a commuter service which would stop more frequently to serve local or regional trips. ADOT estimates over 3,300 daily intercity riders and nearly 17,000 commuter travelers, reducing Vehicle Miles Traveled by 566,000 on the corridor every day.

If completed, the Tucson to Phoenix passenger rail corridor would potentially form part of a broader Southwestern U.S. passenger rail network, as outlined in the high-level conceptual Southwest Multi-State Rail Planning Study developed by the FRA.

For more information about the Tucson to Phoenix Passenger Rail Study, visit:

http://www.azdot.gov/planning/CurrentStudies/PassengerRail/overview

The FRA Study can be found here: https://www.fra.dot.gov/eLib/Details/L16012

Phoenix Tucson Passenger Rail Study. Preferred alternative shown. Source: ADOT

APPENDIX 8

Acronym Glossary

CONNECT | MOVE | THRIVE

ACRONYM GLOSSARY

Transportation terms and acronyms can often be confusing. This glossary provides a listing of the most common transportation planning terms and acronyms that are referenced in the plan and project lists.

AASHTO	American Association of State Highway and Transportation Officials
ADA	American with Disabilities Act
ADEQ	Arizona Department of Environmental Quality
ADOA	Arizona Department of Administration
ADOT	Arizona Department of Transportation
ADT	Average Daily Traffic
APRCS	Arizona Passenger Rail Corridor Study
BMP	Border Master Plan
BRT	Bus Rapid Transit
CAG	Central Arizona Governments
CFR	Code of Federal Regulations
CMP	Congestion Management Process
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO LMP	Carbon Monoxide Limited Maintenance Plan
COA	Comprehensive Operational Analysis
E-85	Ethanol
Eller EBR	Eller College of Management Economic and Business Research Center
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EVAC	Economic Vitality Advisory Committee
FAA	Federal Aviation Administration
FAST Act	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
FMS	Freeway Management System
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	Fiscal Year
GA	General Aviation
GHG	Greenhouse Gases
GI	Green Infrastructure
GSI	Grade-Separated Intersection
HAWK Beacon	High-Intensity Activated CrossWalk
HCT	High-Capacity Transit
HPMS	Highway Performance Monitoring System
HSIP	Highway Safety Improvement Program
HURF	Highway User Revenue Funds
IGA	Intergovernmental Agreement
IRI	International Roughness Index
ITS	Intelligent Transportation Systems
JPAC	Joint Planning Advisory Committee
LOS	Level of Service
LTAF	Local Transportation Assistance Fund
MAG	Maricopa Association of Governments
MAP-21	Moving Ahead for Progress in the 21st Century
MOE	Maintenance of Effort
MPO	Metropolitan Planning Organization
MRA	Marana Regional Airport

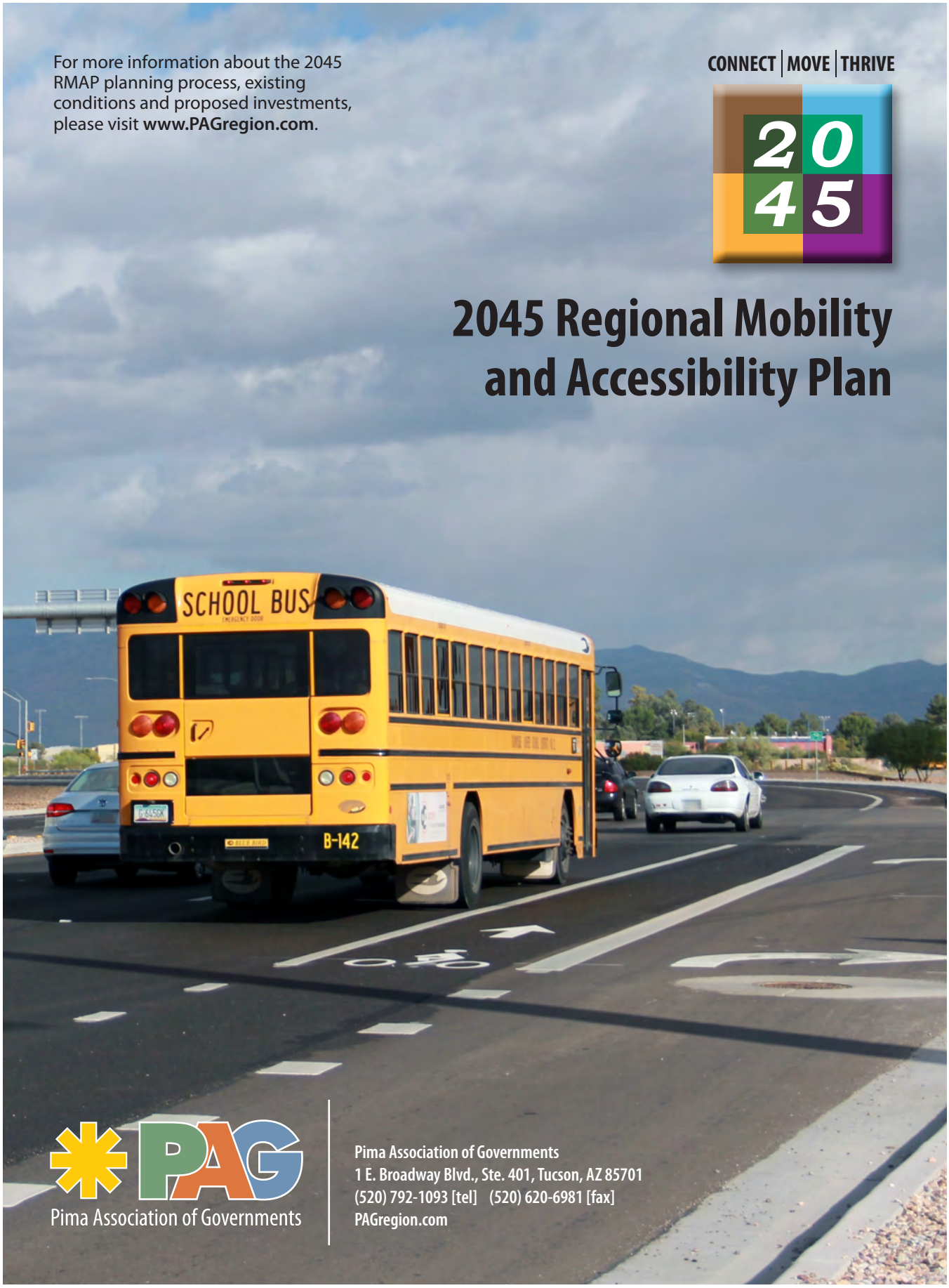
MUTCD	Manual of Uniform Traffic Control Devices
NAAQS	National Ambient Air Quality Standards
NDOT	Nevada Department of Transportation
NHS	National Highway System
NHTS	National Household Travel Survey
NOX	Oxides of Nitrogen
O3	Ozone
PAG	Pima Association of Governments
PDEQ	Pima County Department of Environmental Quality
PM	Particulate Matter
ppm	parts per million
PCS	Primary Commercial Service
PTI	Planning Time Index
RMAP	Regional Mobility and Accessibility Plan
RSA	Roadway Safety Assessment
RSC	Regionally Significant Corridors
RTA	Regional Transportation Authority
RTP	Regional Transportation Plan
SDCP	Sonoran Desert Conservation Plan
SHF	State Highway Fund
SHSP	Strategic Highway Safety Plan
SO2	Sulfur Dioxide
STBGP	Surface Transportation Block Grant
STP	Surface Transportation Program
STSP	Strategic Transportation Safety Plan
TAA	Tucson Airport Authority
TAPA	Tucson Air Planning Area
TCM	Transportation Control Measures
TDM	Travel Demand Management
TI	Traffic Interchange
TIA	Tucson International Airport
TIGER	Transportation Investment Generating Economic Recovery
TIP	Transportation Improvement Program
TOD	Transit-Oriented Development
TMA	Transportation Management Area
TPC	Transportation Planning Committee
TRP	Travel Reduction Program
TTCA	Transportation and Trade Corridor Alliance
TTI	Texas Transportation Institute
TTI	Travel Time Index
UA	University of Arizona
U.S.C.	United States Code
US DOT	U.S. Department of Transportation
UZA	Urbanized Area
VOC	Volume to Capacity Ratio
VHT	Vehicle Hours Traveled
VLT	Vehicle License Tax
VMT	Vehicle Miles Traveled

For more information about the 2045 RMAP planning process, existing conditions and proposed investments, please visit **www.PAGregion.com**.

CONNECT | MOVE | THRIVE

2045

2045 Regional Mobility and Accessibility Plan



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Pima Association of Governments

Pima Association of Governments
1 E. Broadway Blvd., Ste. 401, Tucson, AZ 85701
(520) 792-1093 [tel] (520) 620-6981 [fax]
PAGregion.com