
Maricopa County Transportation System Plan

**Adopted
February 7, 2007**

TABLE OF CONTENTS

INTRODUCTION	1
1.1 MISSION AND VISION	4
1.2 OTHER MANAGEMENT GUIDELINES	4
1.3 PUBLIC PARTICIPATION	6
1.3.1 Public Outreach	6
1.3.2 Public Comment	7
1.4 PLANNING CONTEXT	8
1.5 ROADWAY SYSTEMS	8
1.5.1 Primary Roads	8
1.5.2 Secondary Roads	8
1.5.3 Local Roads	9
1.5.4 Proposition 400 Roads	9
1.5.5 Enhanced Arterial Roadways	9
1.6 INVESTMENT POTENTIAL MATRIX	10
EXISTING CONDITIONS	12
2.1 OVERVIEW	12
2.2 POPULATION AND EMPLOYMENT	12
2.3 ROADWAY SYSTEM	22
2.3.1 System Summary	22
2.3.2 Roadway Functional Classification	22
2.3.3 County Island Roadways	26
.....	28
2.3.4 Primary/Secondary/Local Roadway System	29
2.3.5 Intelligent Transportation Systems	29
2.3.6 System Performance	30
2.3.6.1 Level of Service	30
2.3.6.2 Roadway Level of Service Conditions	30
2.3.7 Transit Modes	33
2.3.8 Non-Motorized Modes	33
FUTURE TRAFFIC ANALYSIS	36
3.1 FUTURE TRAFFIC ANALYSIS	36
3.1.1 Introduction	36
3.1.2 Traffic Operational Performance Methodology	36
3.1.3 Summary of Results	37
3.2 TRAFFIC MANAGEMENT	40
NEEDS ASSESSMENT AND OPTIONS FOR SECURING ADDITIONAL REVENUES	47
4.1 INTRODUCTION	47
4.2 NEEDS ASSESSMENT	48
4.2.1 Introduction	48
4.2.2 Projected Revenues	48
4.2.3 Projected Costs	48
4.2.3.1 Capital Improvement Costs for Roadways	48
4.2.3.2 Adjusting Projected Capital Improvement Costs	50
4.2.4 Projected Operations and Maintenance Costs	50
4.2.5 Projected Personnel Costs	51
4.2.6 Total Projected Costs	51
4.2.7 Calculation of Projected Revenue Shortfalls	52
4.3 OPTIONS FOR SECURING ADDITIONAL REVENUES	52

ASSET MANAGEMENT	54
5.1 PURPOSE	54
5.2 EXISTING MCDOT PROGRAMS	54
5.3 BENCHMARK PROGRAM PERFORMANCE MEASURES	56
5.4 MCDOT PERFORMANCE MEASURES	59
5.5 ESTIMATE THE OPTIMAL FUNDING DISTRIBUTION BETWEEN MAINTENANCE, OPERATIONS AND CAPITAL	59
5.6 RECOMMEND A MCDOT PROGRAM FUNDING DISTRIBUTION AND METHODOLOGY	60
TRANSPORTATION POLICIES	62
6.1 IMPACT FEES AND IMPROVEMENT DISTRICTS	62
6.2 NEEDS OF AN AGING POPULATION	63
6.3 ROADSIDE AMENITIES	63
6.4 SCALLOPED STREET IMPROVEMENTS	64
6.5 BRIDGE IMPROVEMENTS	65
6.6 INTERSECTION IMPROVEMENTS	65
6.7 MCDOT ROLE OPTIONS	66
IMPLEMENTATION WORK PROGRAM	67
7.1 PROLOGUE	67
7.2 FUTURE WORK AGENDA	68
7.2.1 Ongoing MCDOT Activities	68
7.2.2 New Activities for MCDOT Consideration	69

LIST OF FIGURES

FIGURE 1-1 STUDY PROCESS2

FIGURE 2-1 STUDY AREA13

FIGURE 2-2 POPULATION BY SAZ 2005.....15

FIGURE 2 – 3 POPULATION BY SAZ 201516

FIGURE 2 – 4 POPULATION BY SAZ 202617

FIGURE 2 – 5 EMPLOYMENT BY SAZ 200519

FIGURE 2 – 6 EMPLOYMENT BY SAZ 201520

FIGURE 2 – 7 EMPLOYMENT BY SAZ 202621

FIGURE 2 – 8 PAVED AND UNPAVED ROADWAYS IN THE COUNTY SYSTEM.....23

FIGURE 2 – 9 ROADWAY FUNCTIONAL CLASSIFICATION25

FIGURE 2 – 10 COUNTY ISLAND ROADWAYS28

FIGURE 2 – 11 PRIMARY, SECONDARY AND LOCAL ROADS31

FIGURE 2 – 12 LEVEL OF SERVICE 200432

FIGURE 2 – 13 EXISTING BIKEWAYS IN MARICOPA COUNTY34

FIGURE 2 – 14 MARICOPA COUNTY REGIONAL TRAILS PLAN35

FIGURE 3 – 1 CAPACITY NEEDS: SUPERVISOR DISTRICT 141

FIGURE 3 – 2 CAPACITY NEEDS: SUPERVISOR DISTRICT 242

FIGURE 3 – 3 CAPACITY NEEDS: SUPERVISOR DISTRICT 343

FIGURE 3 – 4 CAPACITY NEEDS: SUPERVISOR DISTRICT 444

FIGURE 3 – 5 CAPACITY NEEDS: SUPERVISOR DISTRICT 545

FIGURE 5-1 PAVEMENT DISTRESS SCORE DISTRIBUTION57

FIGURE 5-2 TYPICAL PAVEMENT LIFE CURVE.....60

LIST OF TABLES

TABLE 1-1 INVESTMENT POTENTIAL MATRIX	11
TABLE 2-1 PROJECTED POPULATION BY MUNICIPAL PLANNING AREA	14
TABLE 2-2 PROJECTED EMPLOYMENT BY MUNICIPAL PLANNING AREA	18
TABLE 2-3 EXISTING TRANSPORTATION SYSTEM SURFACE TYPE SUMMARY	22
TABLE 2-4 CENTERLINE MILES BY ROADWAY FUNCTIONAL CLASSIFICATION.....	24
TABLE 2-5 ROADWAY FUNCTIONAL CLASSIFICATION CHARACTERISTICS	24
TABLE 2-6 CENTERLINE-MILES BY FACILITY TYPE.....	26
TABLE 2-7 COUNTY ISLAND ROADWAY DESCRIPTIONS	27
TABLE 3-1 RELATIONSHIP BETWEEN V/C RATIO AND LOS	36
TABLE 3-2 TRAFFIC OPERATIONAL PERFORMANCE OF BASE NETWORK	37
TABLE 3-3 ARTERIAL STREET WIDENING NEEDED THROUGH YEAR 2015 TO ACHIEVE LOS C.....	38
TABLE 3-4 ARTERIAL STREET WIDENING NEEDED FROM YEAR 2015 THROUGH YEAR 2026 TO MAINTAIN LOS C....	39
TABLE 3-5 LANE-MILES OF ARTERIAL STREETS NEEDED	40
TABLE 3-6 DESIGNATED ARTERIALS FOR REQUIRING ITS INFRASTRUCTURE BY REGION.....	46
TABLE 4-1 MCDOT REVENUE PROJECTIONS, 2006 – 2026.....	49
TABLE 4-2 ESTIMATED CAPITAL IMPROVEMENT COSTS FOR LOS C, BY PERIOD	50
TABLE 4-3 ADJUSTED ESTIMATE OF CAPITAL CAPACITY COSTS.....	50
TABLE 4-4 COMBINED PROJECTED COSTS, 2006 THROUGH 2026 FOR LOS C	52
TABLE 4-5 ESTIMATED REVENUE SHORTFALL FOR LOS C, 2006 - 2026.....	53
TABLE 5-1 TYPICAL PAVEMENT CONDITION PERFORMANCE RATINGS	58

Chapter 1

INTRODUCTION

The Transportation System Plan (TSP) Update

The TSP is Maricopa County's long-range plan for transportation. This plan was last produced in 1997. The Maricopa County Department of Transportation (MCDOT) has undertaken the process of updating the Transportation System Plan because much has happened in Maricopa County since 1997, including:

- Rapid population growth and development throughout the county; and
- Adoption of the Maricopa Association of Governments (MAG) Regional Transportation Plan (RTP)

This updated TSP establishes an organized approach to the planning, design and construction of Maricopa County's transportation system through 2026.

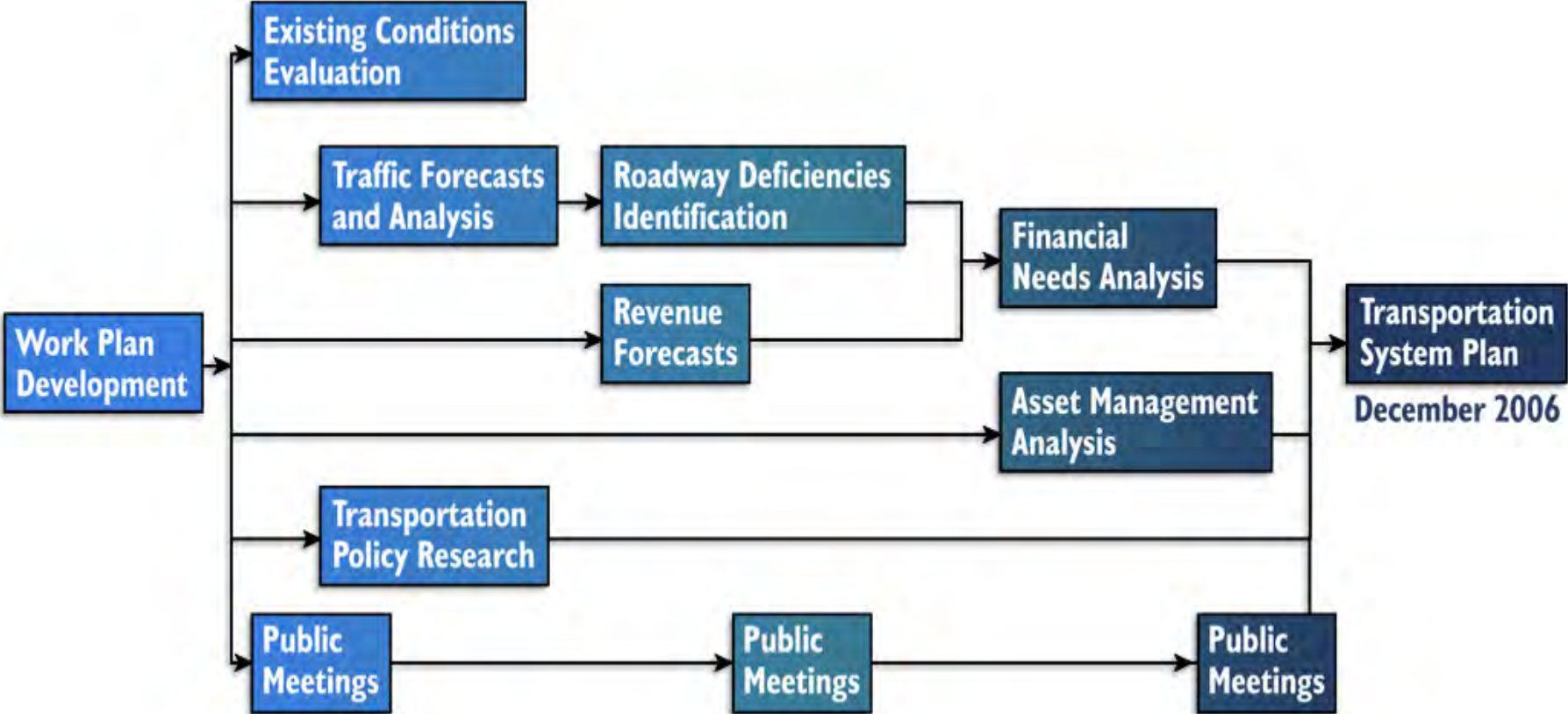
The Transportation System Plan is intended to define the county's role in transportation in the region, foster a seamless transportation system and guide the selection of transportation projects within all unincorporated areas of Maricopa County. In particular, the TSP addresses how to best use limited revenues to maintain and enhance the existing road network, while meeting demand for new facilities in growing areas. Although MCDOT works closely with state and local partners, the TSP does not address state highways or city jurisdiction streets.

This updated TSP serves as a reference for orderly and coordinated development consistent with MCDOT objectives and a clear statement of MCDOT public policy for the Maricopa County Board of Supervisors (BOS), the Transportation Advisory Board (TAB), the Maricopa County Planning and Zoning Commission as well as other agencies, local jurisdictions, the development community and concerned residents. The updated plan also includes an implementation strategy and an action plan covering future TSP updates and issues to be addressed in future plans.

The TSP Update Process

The general process for the development of the TSP Update is depicted in Figure 1-1. The process was initiated in January of 2005. A work plan was developed, policy issues were identified, data was gathered and analysis was conducted throughout 2005. In the fall of 2005, an initial round of public meetings was held in ten locations throughout Maricopa County. At those meetings, citizens, business owners and public officials provided input by commenting on policy issues, identifying transportation problems and concerns, and assisting in refinement of the work plan for the TSP Update. (A more detailed description of the full public involvement process is provided later in this chapter.) Additional direction was provided in the fall of 2005 through individual meetings with local government officials, meetings of the County Advisory Committee (CAC) and work sessions with the Transportation Advisory Board, which served as the steering committee for the TSP Update.

Figure 1-1 Study Process



With a more refined work plan in hand, MCDOT proceeded to follow through with the following early tasks:

- Detailed investigation of policy issues;
- Identification of existing conditions on roadways in unincorporated Maricopa County;
- Forecasting of future population, employment, traffic volumes and other conditions;
- Estimates of future revenues and revenue sources;
- Identification of roadway deficiencies; and
- Preliminary identification of future roadway needs.

After completing these tasks, MCDOT conducted a second round of public meetings at nine locations. In addition, MCDOT held more dialogues with its local government partners (one in the West Valley and one in the East Valley), received further input from the CAC and continued gaining guidance from work sessions with the TAB. This all helped MCDOT to move forward with formation of policy positions and refinement of plan recommendations (in essence, to produce a draft TSP Update). The draft TSP Update was then brought back before the public, local government partners and the CAC for final comment before bringing the document to the TAB for final recommendation to the BOS for ultimate approval late in 2006.

The TSP Update Document

The organization of this TSP Update document reflects the general flow of activities shown in the “Study Process” figure above. Following this introductory chapter, the TSP Update includes chapters on:

- Existing Conditions;
- Future Traffic Analysis;
- Needs Assessment and Options for Securing Additional Revenue;
- Asset Management;
- Transportation Policies; and
- Implementation Work Program.

The final chapter, as listed above, includes major tasks, policy development needs, and other related transportation tasks that need to be done to ensure implementation of the items identified in the TSP Update.

1.1 MISSION AND VISION

To ensure that the MCDOT is aligned with the guidance established in the County Comprehensive Plan, it is important to understand the strategic direction adopted by the Board of Supervisors. The county mission statement is:

To provide regional leadership, fiscal responsibility and necessary public services to its residents so they can enjoy living in healthy and safe communities.

As stewards of public funds, MCDOT strives to ensure all county transportation facilities are well planned, engineered, and constructed. This is done to give taxpayers confidence that funds to provide transportation systems are used wisely. MCDOT has also developed a simple mission statement:

To provide a quality transportation system to travelers in Maricopa County so they can experience a safe, efficient, and cost-effective journey.

The recommendations contained in this document align with these county and MCDOT missions. When implemented, the projects and programs included in the updated TSP will continue to allow residents and visitors to use a wide range of transportation opportunities through the diversification of the transportation network. MCDOT's vision is:

We set a standard of excellence regionally enabling us to consistently deliver on our commitment to provide the right transportation system for Maricopa County at the right time and at the right cost.

What this means in practice is roadway plans and proposals will continue to be evaluated for feasibility by the application of the following three criteria:

- **Is it in the right place?** A roadway proposal should be generally consistent with the use indicated by the land use area in which it lies.
- **Is it at the right time?** Services, particularly roadways, are required for all development. The nature and extent of the services will be indicated by the development area, as well as the demonstrated and timely need based on travel demand or population growth. If services are already in place, planned to be so in the near future, or can be provided by the private sector, then it is the right time to develop.
- **Is it at the right cost?** Do public benefits generated by the proposed transportation improvement exceed the cost for County government to provide services? If the projected benefits exceed the costs, then it is the right cost to county government and the citizens it represents.

1.2 OTHER MANAGEMENT GUIDELINES

To ensure that a safe, efficient and cost effective transportation system is in place, Maricopa County will need to invest in its transportation system in a combination of ways allowed by state statute. In addition to the mission and vision statements established by the Board of Supervisors (BOS) and MCDOT management, further guidance is set forth by the BOS through adoption of

the County Comprehensive Plan. The Comprehensive Plan helps set direction for the county's investment along the following five guidelines:

- Increase safety and mobility along county operated roads.
- Maintain the existing system.
- Serve the needs of existing and future development in unincorporated Maricopa County.
- Serve regional travel.
- Direct future growth to the Urban Service Areas.

These management guidelines are also tied to MCDOT's Strategic Plan through its vision, mission, and goals. As discussed previously, the MCDOT mission reiterates what is outlined in its vision by recommending the department provide a quality transportation system for Maricopa County. The goals identified in the department strategic plan include customer satisfaction, integrity, teamwork, accountability, individual responsibility, regional leadership and professionalism.

The ideas behind the Department's mission, vision and goals provided direction in the development of the management guidelines. For example, maintaining the system is critical to ensure the department's integrity and accountability since investments must be protected through sound maintenance practices. Furthermore, to provide the right system at the right cost and at the right time requires an in-depth understanding of the system and its operation. This is only accomplished by having an accountable team of professionals to provide sound planning guidance.

In 2004, with the aforementioned mission, vision and guidelines firmly in focus, MCDOT sought to redirect its strategic energies by formulating a new set of targeted goals. These new goals additionally sought to affirm MCDOT's fundamental lead role in unincorporated Maricopa County, as well as MCDOT's continuous role as a cooperating partner amongst all MAG member agencies, addressing the realities of the emerging MAG RTP. Thus, the following four goals were included in the 2005 Department Strategic Plan:

- By December 2006 MCDOT will complete a transportation system plan update, including specific policies and strategies that support the implementation of the MAG RTP.
- By December 2006 MCDOT will demonstrate support for the MAG RTP and cooperate with our regional partners by proactively establishing partnership agreements with other local governments on the arterial projects contained in the Plan.
- MCDOT will optimize the existing roadway system by annually deploying 25 safety improvement projects in addition to the Transportation Improvement Program.
- MCDOT will plan for and improve the consistency of our project delivery, thereby improving our capital expenditure rate to 85% and our operations expenditure rate to more than 95%, but less than 98%.

With the release of this TSP Update, the goal of producing the update is accomplished. In addition, MCDOT has demonstrated support for the RTP and is actively cooperating with our local government partners and establishing working agreements. Significant progress has also been made toward meeting our goals related to safety projects and project delivery. Looking forward, MCDOT is again in the process of updating its strategic direction through this TSP Update and related strategic efforts.

1.3 PUBLIC PARTICIPATION

1.3.1 PUBLIC OUTREACH

An extensive, public outreach effort to inform and seek the input of residents, public agencies, and other stakeholders has been a critical component of this update. The goals of the outreach program were the following:

- Inform the public and transportation stakeholders about the TSP update.
- Collect quality input from citizens and stakeholders.
- Build, foster and maintain cooperative regional relationships.
- Increase internal knowledge of other agency/jurisdiction transportation planning.
- Identify opportunities to implement citizen-identified and stakeholder-identified concerns/suggestions.
- Collect information on sub-regional issues.
- Increase opportunities and awareness for project partnerships.
- Minimize, mitigate or avoid potential negative impacts of projects, perceived or actual.
- Enhance positive project impacts.
- Refine and focus project goals and tasks.

The MCDOT Right Roads Program conducted three series of public input meetings throughout unincorporated Maricopa County during key decision points in the update process to gather input from residents, private businesses and property owners, major civic clubs, homeowner's associations and organizations.

Ten public meetings were conducted in Series One during the study "Scoping" phase. Nine additional meetings were conducted during Series Two, the "Alternatives Analysis" phase, and ten public meetings were conducted during Series Three, the final phase, "Findings and Recommendations". The public provided input by identifying both local and regional transportation issues and priorities. Public comment on the development of the work plan for the study was also elicited.

Additional input meetings have been conducted with other identified stakeholder groups that include other local agencies, municipalities, developers and the trucking industry. Input summaries are detailed in separate reports.

1.3.2 PUBLIC COMMENT

During Fall 2005, over 400 people attended Series One “Scoping” public meetings and in Spring 2006, nearly 160 people attended Series Two “Alternatives Analysis” public input meetings. Approximately 170 people attended the final Series Three “Findings and Recommendations” public input meetings conducted during October and November 2006.

Attendees reviewed and discussed the goals and objectives of the TSP Update and informed the MCDOT project team about specific local and sub-regional roadway system issues or concerns. The public commented on preliminary recommendations and reviewed “Update Findings and Recommendations” during Series Three public meetings.

TSP Update information and comment sheets were distributed to all those in attendance. Through written public comment and discussions held with project team members during open house meetings, five prevailing themes regarding transportation priorities emerged, all centering on public safety or quality of life issues.

- Improvements to existing roadways (requests for traffic signal installations, dedicated turn lanes, etc).
- The installation of bike lanes on more roadways.
- Stay ahead of development, respond to development needs quickly and build now for future development.
- Request for expanded public transportation.
- Request for more dust abatement/dirt road paving.

To provide easy access to TSP information and facilitate additional public input on the plan, MCDOT also established a Transportation System Plan web site at <http://www.mcdot.maricopa.gov/tsp/index.htm>. Comments received through the web site are reflected in the documentation summarized above.

It is the intent of MCDOT for our future transportation initiatives to be:

- In accordance with the Board of Supervisors’ mission, vision and strategic priorities;
- Guided by advice from the Transportation Advisory Board;
- Based on sound technical information; and
- Influenced by valuable input received from Maricopa County citizens and other transportation stakeholders in the county.

In developing this TSP update, MCDOT has appreciated the comments provided and has made a sincere effort to appropriately consider and balance the input received.

1.4 PLANNING CONTEXT

Although Maricopa County is responsible for a large number of roads, prior to 1997 there was no mechanism in place to categorize these roads effectively. Most local land use and transportation planning is based on municipal general plans, circulation elements and the MAG RTP. Maricopa County's vast jurisdiction over roads in a variety of circumstances requires MCDOT's planning effort to focus on organizing these roadways.

To accomplish this, three roadway categories were established in the original TSP: primary, secondary and local. Primary roads in the system are the most critical to the success of providing regional travel opportunities. They receive a high priority for funding, maintenance and other activities. Secondary roads are broken into several subgroups, and they generally serve sub-regional travel and have a relatively lower funding priority. At the local road level, MCDOT's effort is generally limited to maintenance and not to improve or extend these roads. A more detailed description of primary, secondary and local roads is provided below.

A new category of roadways which MCDOT must consider is arterial street projects that are in the MAG RTP (and are funded as part of Proposition 400). Where MCDOT has a logical role due to jurisdiction over part of or all of the adjoining land along the roadway itself, these projects may receive medium to high priority. Where MCDOT does not have a logical role, financial participation will normally be less. By focusing appropriate attention on this new category of roadways, MCDOT can play the important role of cooperating partner in the implementation of Proposition 400 projects.

Each category of roadway has unique parameters, criteria and implications for evaluation as candidate projects for the Capital Improvement Program (CIP) and for funding. The information provided in the following text is for planning purposes only. The data represent summary analyses and not specific project level information.

1.5 ROADWAY SYSTEMS

1.5.1 PRIMARY ROADS

Primary Roads satisfy the underlying principle of serving regional travel. They are of major importance to the County Roadway system. Primary roads constitute a seamless roadway system crossing jurisdictional boundaries. Some examples of primary roads would include routes to recreation and employment centers, routes connecting to MAG regional freeways or state highways and roads with scenic or recreational significance.

1.5.2 SECONDARY ROADS

Secondary roads are arterial and collector roadways within county jurisdiction not included in the primary system. This also includes programmed or planned roadways along section lines. They primarily serve sub-regional travel.

1.5.3 LOCAL ROADS

These are the remaining roadways that provide residential access and feed into the secondary system. This primary-secondary-local roadway system is further detailed in Chapter 2.

1.5.4 PROPOSITION 400 ROADS

These roadway projects are part of the MAG RTP and are funded in part through Proposition 400, approved by the voters in Maricopa County in November of 2005. These projects are expected to be completed over the next 20 years with funds generated by the half-cent sales tax, federal funds and other state and local revenue available in the region. Arterial road projects included in the RTP require a 30% local match. In many cases, these arterial projects will require Maricopa County and the city and town sponsors to share in the local match requirements.

1.5.5 ENHANCED ARTERIAL ROADWAYS

Enhanced Arterial Roadways include a limited number of important transportation corridors to be identified in Maricopa County that will provide a higher level of service than the typical arterial street. An Enhanced Arterial Roadway must normally meet the following criteria:

1. Connect to a MAG freeway, an Interstate highway, a state highway, or another gateway road.
2. Provide a non-freeway, high capacity corridor.
3. Be at least 8 miles in length unless it directly serves a freeway or state highway.
4. Be classified as a principal arterial or above with a raised median along most of the corridor.
5. Provide 10% capacity enhancement over standard arterial roadway capacity.
6. Facilitate Real-Time Traffic managed corridors.
7. Be compatible with municipal/tribal plans.
8. Be technically, financially and politically feasible.

Enhanced Arterial Roads (EARs) do not have to be fully owned by the county. The jurisdiction that builds, maintains, and/or operates the corridor should be negotiated on a corridor-by-corridor basis. Access management guidelines should also be negotiated on a corridor-by-corridor basis. Ideally, these corridors would meet county arterial standards or some mutually agreed upon standard. Corridor studies should be completed on each roadway if a study does not already exist. When corridors are adopted, those segments that are owned by cities or towns are eligible for up to 50% county participation (plan, design and construction). In order for county TIP dollars to be committed, an EAR will have to compete against all other TIP requests and meet the criteria established for all projects funded by MCDOT.

There are several initial candidate roadways tentatively identified that meet the criteria. They include MC-85, Riggs Road (from Val Vista to Meridian) and Sun Valley Parkway. In the future, other roadways will be considered, as appropriate.

1.6 INVESTMENT POTENTIAL MATRIX

The performance of the transportation system is vital to its users. As a result of the policy investigations and public outreach conducted as part of this TSP update, MCDOT has refined the decision matrix it uses to prioritize transportation investments to implement its mission and vision. This matrix, shown in Table 1-1, links investment priorities to land use concepts while supporting improvements within the Primary System, Proposition 400 and Enhanced Arterial Roadways.

The Investment Potential Matrix includes six different land use designations that correspond to the Maricopa County Comprehensive Plan. The land use element accommodates growth in unincorporated Maricopa County by identifying goals, objectives and policies that translate into land use designations. These will influence the pattern and timing of land development in the county, while recognizing environmental constraints and the desires of residents to have different types of living and working conditions. Uniform application of these goals, objectives and policies should result in balanced and harmonious communities where a high quality of life can be maintained.

Given the vast area under the jurisdiction of Maricopa County, these six main land use designations embody general land use development concepts. Underlying some of these areas are detailed land use plans that recommend more specific land uses, either through a municipal general plan or by a county area land use plan.

The six land use designations are:

- Incorporated Areas are those areas are under the jurisdiction of the cities, towns and Indian communities.
- General Plan Development Areas (GPDA) are unincorporated areas intended to be annexed into a city or town in the future and are included in an adopted municipal General Plan.
- Urban Service Areas may be designated within a GPDA. Within an urban service area, development will be permitted at urban densities in areas where urban services can be provided. The urban service area is not delineated on the land use map; rather it is defined by the ability of a jurisdiction, improvement district or private entity to provide infrastructure and appropriate urban services to a specific site or project.
- Established Communities/Existing Development Master Plans are unincorporated areas in the County that have an established pattern of development. These areas are characterized by existing patterns of development, guided and/or regulated by land use plans, community plans, development master plans or traditional zoning ordinances.

- Rural Development Areas are those areas generally outside the present and future GPDA's of the cities and towns. Residential development will be allowed at a very low density, generally not to exceed one house per five acres.
- Future Development Master Plans (DMPs) have long been a preferred type of residential development within Maricopa County. These communities have the potential to provide mixed land use opportunities, a wide range of housing choices, open space and recreational opportunities, and an appropriate multi-modal transportation system connected to schools, parks, and retail and employment centers. Future DMPs can be developed in any location in the unincorporated county. Appropriate development guidelines would vary depending on the land use area as defined in the Comprehensive Plan.

The Investment Potential Matrix provides guidance on how to invest county funds. It does not guarantee funding for any specific project in the four system categories. When considering investment potential:

- MCDOT will participate in “(H)igh” priority projects for planning, design and construction. Under this scenario, the availability of partnering opportunities is an advantage, but is not always a requirement.
- MCDOT will also fully participate in “(M)edium” priority projects, but partners are required.
- Finally, MCDOT will only participate in the planning and design of “(L)ow” priority projects, and partners are required.
- MCDOT will not (N) participate in secondary or local road projects in incorporated areas, and will require project developers (DR) to assume primary responsibility for road projects within DMPs.

Table 1-1 Investment Potential Matrix

<i>Land Development Area</i>	<i>Enhanced Arterial Corridors*</i>	<i>Primary/ Prop. 400</i>	<i>Secondary</i>	<i>Local</i>
<i>Urban Service Area</i>	<i>H</i>	<i>H</i>	<i>M to H***</i>	<i>L</i>
<i>Rural Development Area</i>	<i>H</i>	<i>H</i>	<i>L</i>	<i>L</i>
<i>Established Areas/Existing DMP</i>	<i>H</i>	<i>H</i>	<i>L</i>	<i>L</i>
<i>General Plan Development Area</i>	<i>M</i>	<i>M</i>	<i>L</i>	<i>L</i>
<i>Incorporated Area</i>	<i>M</i>	<i>L to M**</i>	<i>N</i>	<i>N</i>
<i>New Development Master Plan</i>	<i>DR</i>	<i>DR</i>	<i>DR</i>	<i>DR</i>

* Will follow guidelines established for Enhanced Arterial Roadway program.

** Will vary based on percentage of adjoining land under county jurisdiction.

*** Will vary based on continuity of corridor and percentage of adjoining land under county jurisdiction

Chapter 2

EXISTING CONDITIONS

2.1 OVERVIEW

The purpose of this chapter on existing conditions is to create a transportation database of existing conditions for the MCDOT. The existing conditions report establishes the framework for the remainder of the TSP Update. The report identifies current population and employment data and 2015 and 2026 planning horizon projections. It describes the MCDOT transportation system, including roadway functional classification, facility type, pavement condition, and Level of Service. The report identifies facilities supporting non-motorized modes such as bike paths and trails. The report also discusses county island roadways and the broad MCDOT roadway categories used to prioritize transportation improvements.

The MCDOT transportation system is linked to the systems of other transportation agencies, including the Arizona Department of Transportation (ADOT) and the cities and towns within the County. The TSP Update primarily focuses on identifying deficiencies and recommending improvements on MCDOT facilities. The existing conditions report presents the system in its regional context. Figure 2-1 shows the Maricopa County study area and state highways.

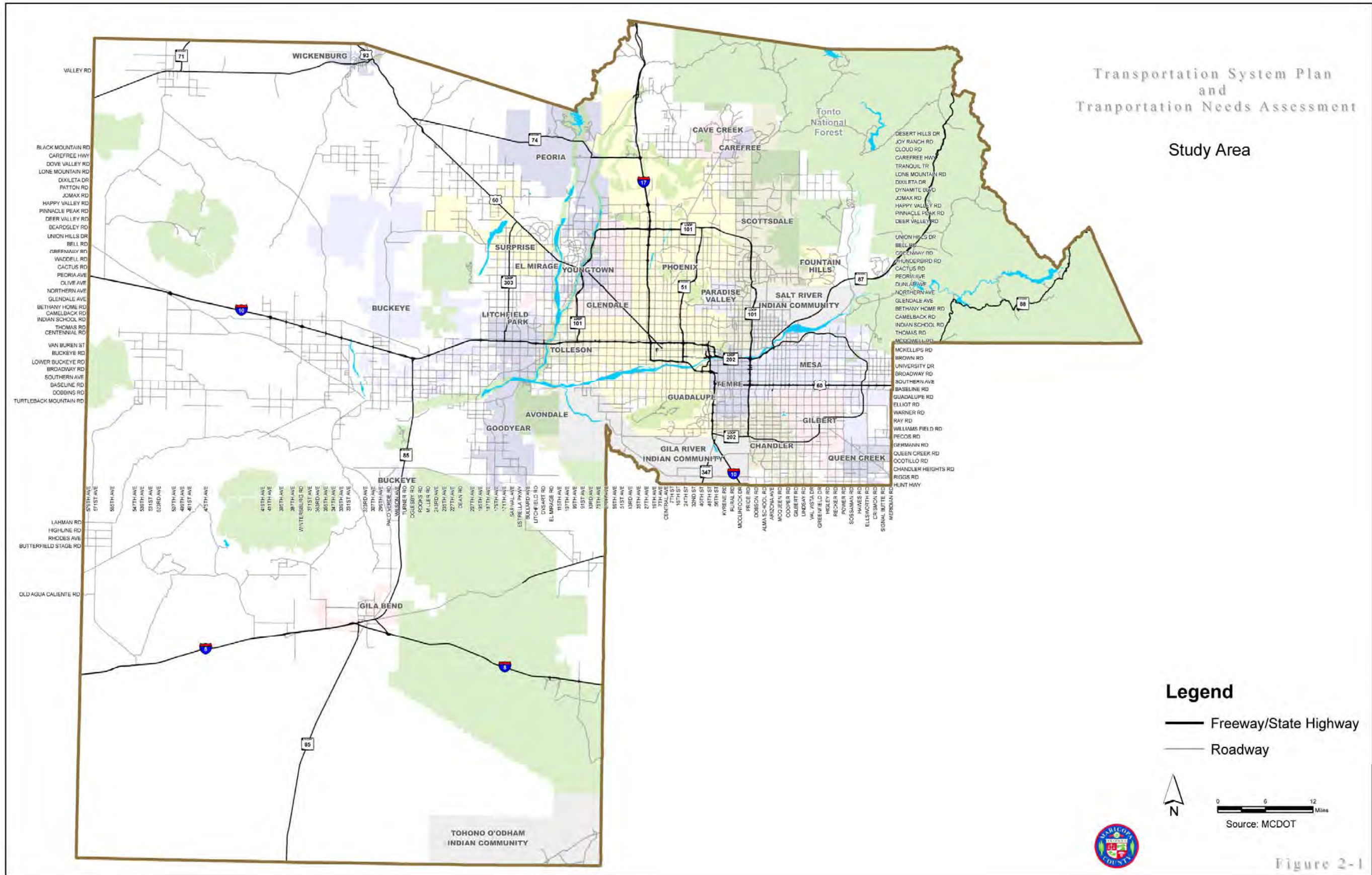
2.2 POPULATION AND EMPLOYMENT

Covering 9,226 square miles, the Maricopa County land area is greater than that of seven states. Maricopa County has also become one of the most populous counties in the United States. Since the completion of the original plan in 1997, the county has added over a million residents. The current county population of 3.6 million is expected to grow to 6.1 million by the year 2026. With population growth comes the need for increased and improved transportation opportunities.

The communities in the outer regions of the Phoenix metro area, including Buckeye, Goodyear, Gila Bend, Queen Creek and Surprise, are projected to have the highest growth rate in Maricopa County. In absolute numbers, however, Phoenix is expected to have the greatest growth, at over 660,000. Table 2-1 lists 2015 and 2026 population projections and percent growth from year 2005 by Municipal Planning Area and unincorporated portion of the county. Figures 2-2 through 2-4 show population by Socioeconomic Analysis Zone (SAZ) for 2005, 2015 and 2026.

Adopted MAG projections show employment growth following a pattern similar to population. Table 2-2 lists 2005 actual employment and 2015 and 2026 employment projections by Municipal Planning Area and for the unincorporated portion of the county. Figures 2-5 through 2-7 show employment by Socioeconomic Analysis Zone for 2005, 2015 and 2026.

Figure 2-1 Study Area



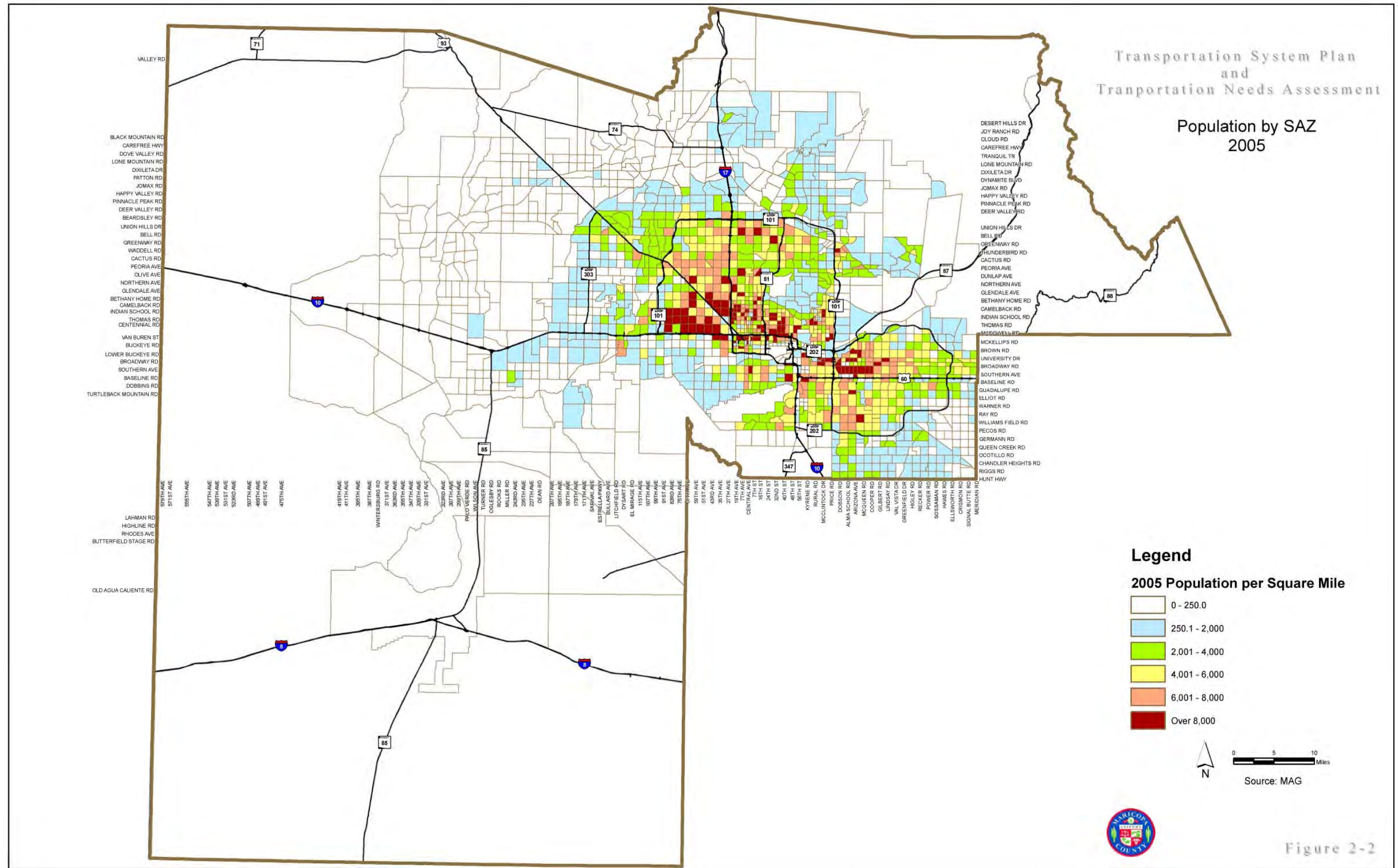
E:\GISDATA\Projects\AZ\MCDOT\TransSysPlan\map_docs\arcmap\new_base_060805\county.mxd

Table 2-1 Projected Population by Municipal Planning Area

Municipal Planning Area	2005	2015		2026	
		Total	% Growth from 2005	Total	% Growth from 2005
Avondale	59,980	102,297	71%	161,395	169%
Buckeye	37,610	105,992	182%	380,569	912%
Carefree	3,505	4,434	26%	4,895	40%
Cave Creek	4,483	5,437	21%	12,897	188%
Chandler	222,672	273,299	23%	288,590	30%
County Areas	89,087	101,406	14%	138,010	55%
El Mirage	19,205	30,535	59%	33,075	72%
Fountain Hills	22,623	27,555	22%	30,742	36%
Gila Bend	2,545	4,414	73%	17,823	600%
Gila River Indian Community	2,944	3,694	25%	5,219	77%
Gilbert	160,993	241,573	50%	290,481	80%
Glendale	260,350	299,237	15%	312,182	20%
Goodyear	41,296	111,231	169%	330,411	700%
Guadalupe	5,228	5,359	3%	5,620	8%
Litchfield Park	5,440	10,367	91%	14,210	161%
Mesa	489,861	577,856	18%	647,760	32%
Paradise Valley	14,626	15,446	6%	15,883	9%
Peoria	137,471	183,700	34%	253,395	84%
Phoenix	1,525,390	1,861,382	22%	2,187,506	43%
Queen Creek	13,156	38,562	193%	88,130	570%
Salt River Pima Maricopa Indian Community	6,915	7,440	8%	7,527	9%
Scottsdale	228,692	270,189	18%	292,706	28%
Surprise	76,466	164,257	115%	395,474	417%
Tempe	167,610	182,769	9%	196,697	17%
Tolleson	5,572	6,189	11%	6,257	12%
Wickenburg	7,574	8,844	17%	15,960	111%
Youngtown	4,214	5,806	38%	6,557	56%
TOTAL	3,615,501	4,649,265	29%	6,139,971	70%

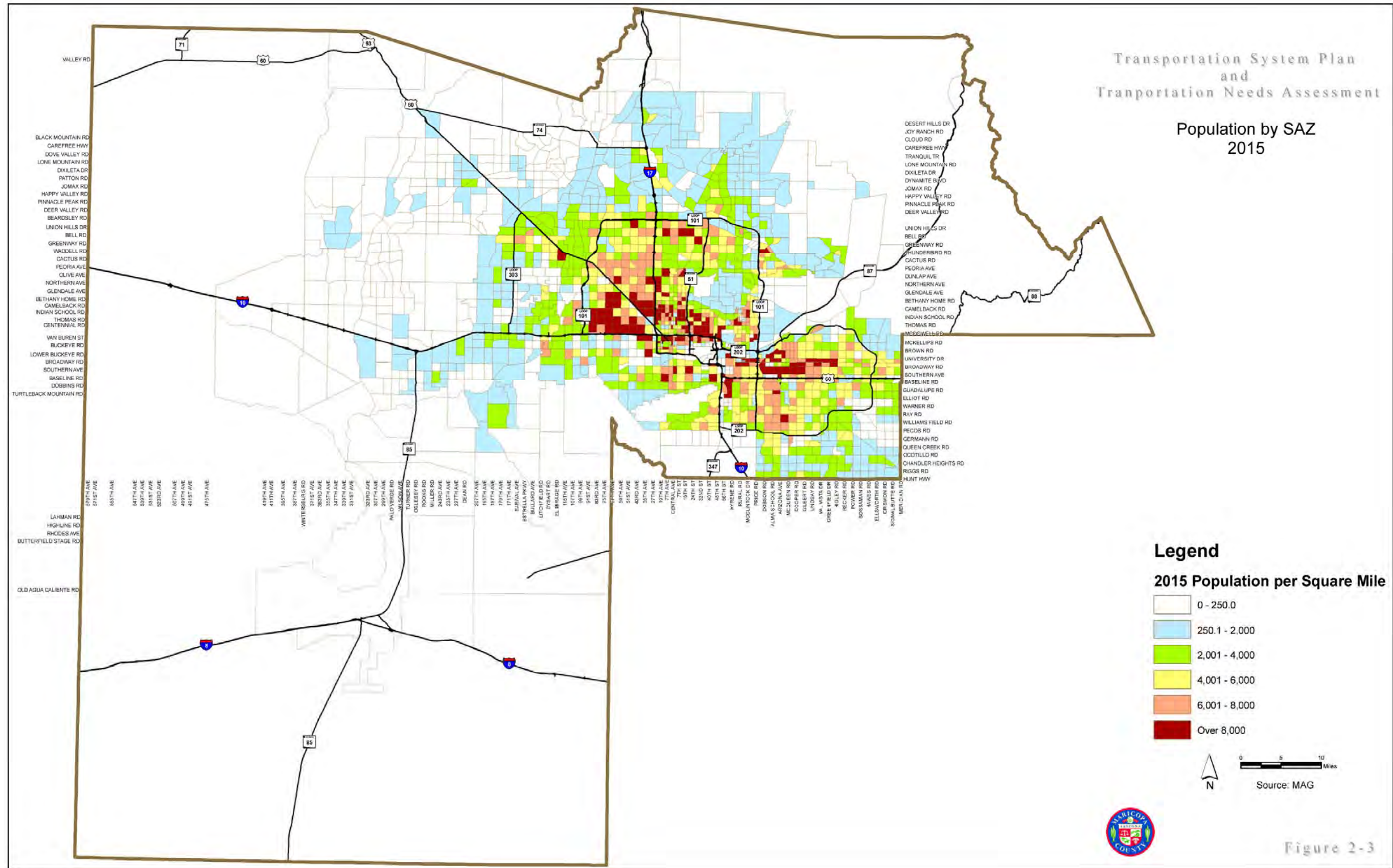
Source: Maricopa Association of Governments, 2003.

Figure 2-2 Population by SAZ 2005



E:\GISDATA\Projects\MCDOT\TransSysPlan\map_docs\srcmap\new_base_090605\traffic_count\traffic_count_county.mxd

Figure 2 – 3 Population by SAZ 2015



E:\GISDATA\Projects\MCDOT\TransSysPlan\map_06\starom\m\w_base_090605\traffic_count\traffic_count_county.mxd

Figure 2 – 4 Population by SAZ 2026

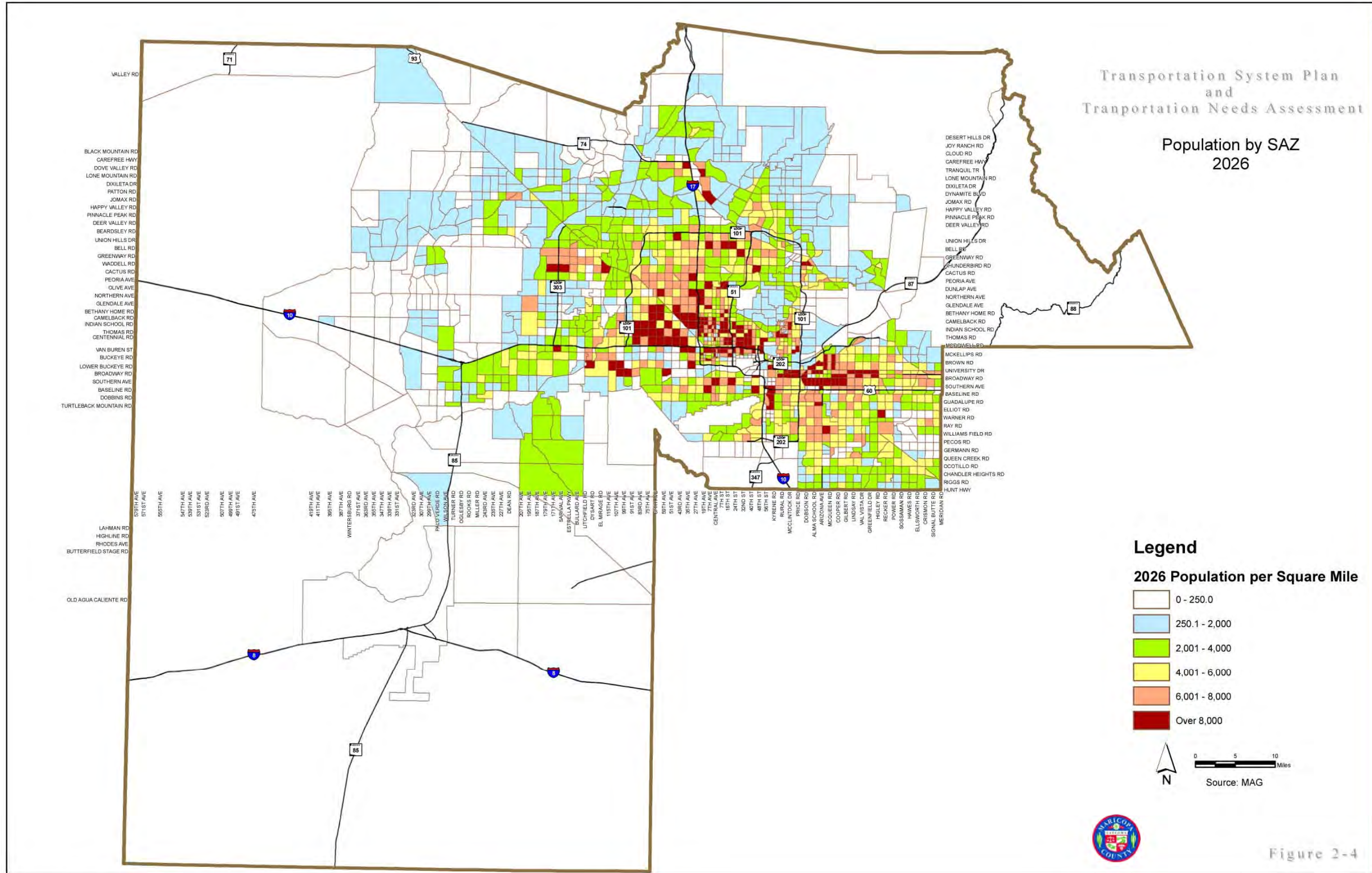
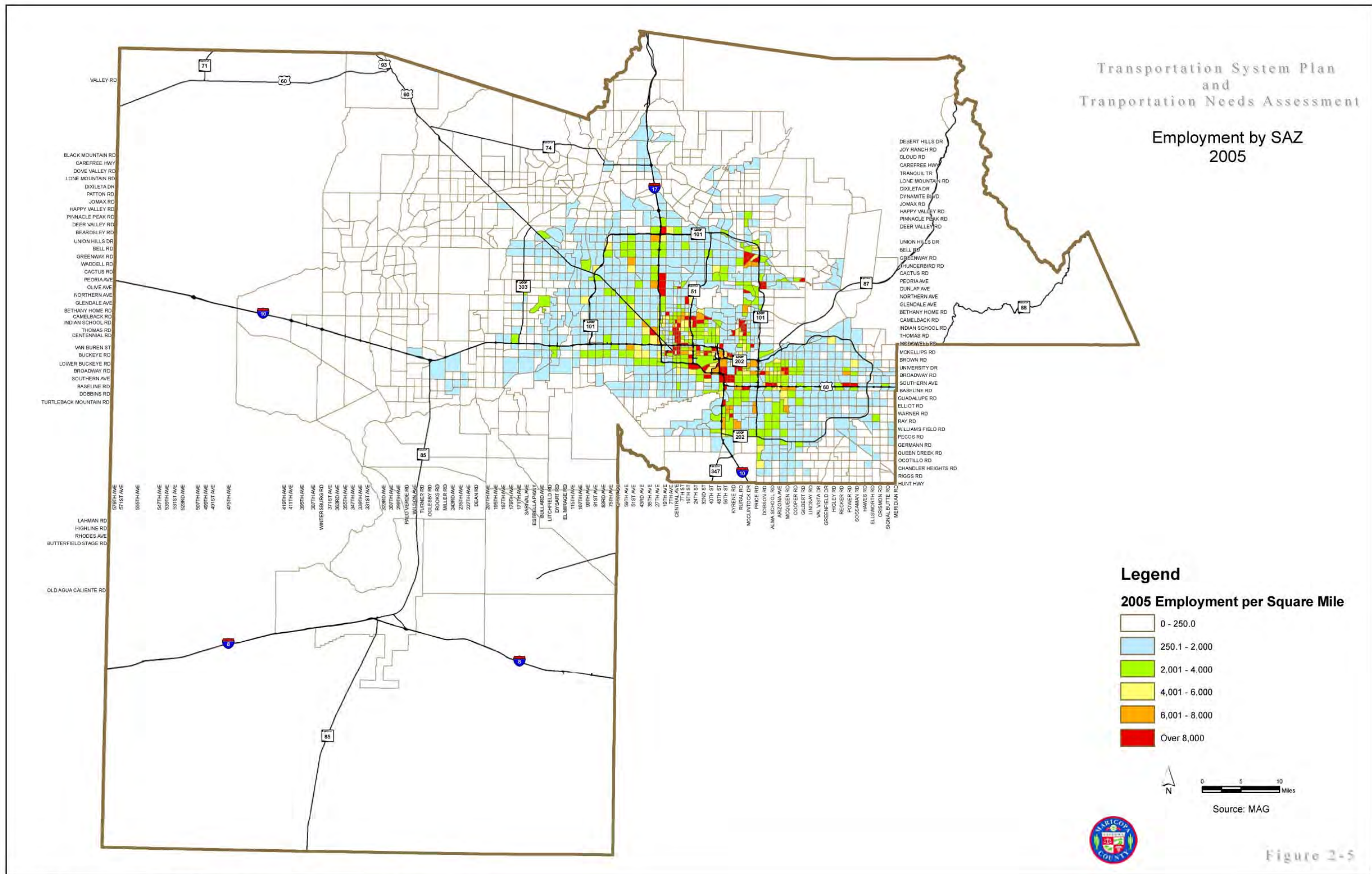


Table 2-2 Projected Employment by Municipal Planning Area

Municipal Planning Area	2005	2015		2026	
		Total	% Growth from 2005	Total	% Growth from 2005
Avondale	15,473	36,372	135%	59,448	284%
Buckeye	16,644	45,175	171%	194,394	1068%
Carefree	2,148	2,984	39%	3,150	47%
Cave Creek	1,352	2,019	49%	3,664	171%
Chandler	102,952	150,507	46%	184,528	79%
County Areas	32,637	35,255	8%	54,487	67%
El Mirage	3,213	6,855	113%	23,560	633%
Fountain Hills	5,986	8,325	39%	8,634	44%
Gila Bend	1,540	2,328	51%	11,651	657%
Gila River Indian Community	4,263	5,763	35%	8,701	104%
Gilbert	52,643	85,685	63%	118,175	124%
Glendale	107,532	144,433	34%	190,225	77%
Goodyear	22,385	48,819	118%	105,826	373%
Guadalupe	1,112	1,640	48%	1,786	61%
Litchfield Park	2,395	4,117	72%	4,263	78%
Mesa	206,282	267,247	30%	318,115	54%
Paradise Valley	5,478	5,733	5%	5,907	8%
Peoria	39,833	69,348	74%	141,492	255%
Phoenix	820,550	996,618	21%	1,264,062	54%
Queen Creek	4,012	13,079	226%	36,802	817%
Salt River Pima Maricopa Indian Community	7,522	8,414	12%	19,598	161%
Scottsdale	166,692	193,577	16%	214,841	29%
Surprise	18,544	39,521	113%	118,383	538%
Tempe	176,880	209,417	18%	241,099	36%
Tolleson	14,412	18,162	26%	30,904	114%
Wickenburg	4,486	5,454	22%	11,626	159%
Youngtown	1,461	1,661	14%	1,679	15%
TOTAL	1,838,418	2,408,500	31%	3,377,000	84%

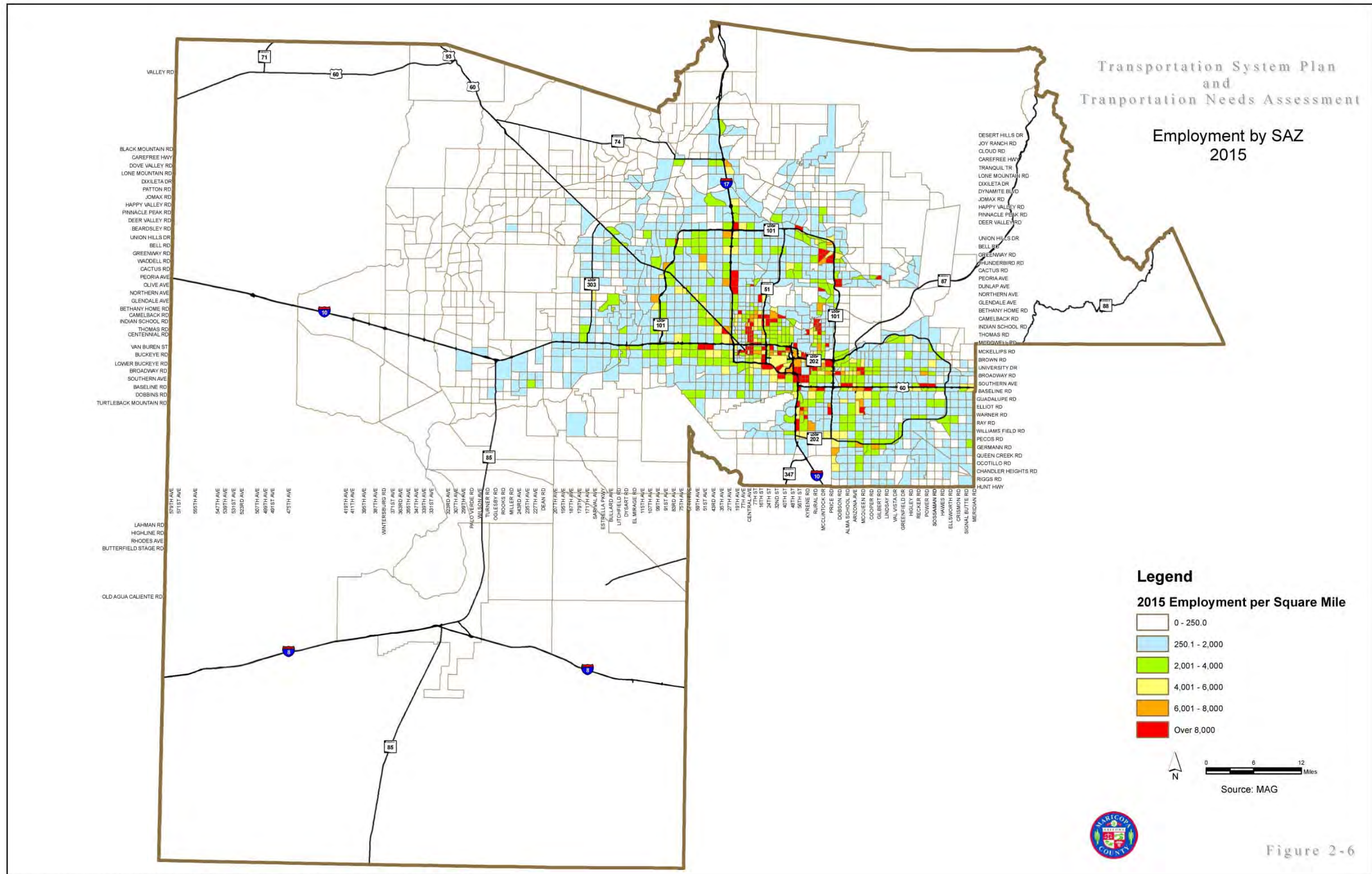
Source: Maricopa Association of Governments, 2003.

Figure 2 – 5 Employment by SAZ 2005



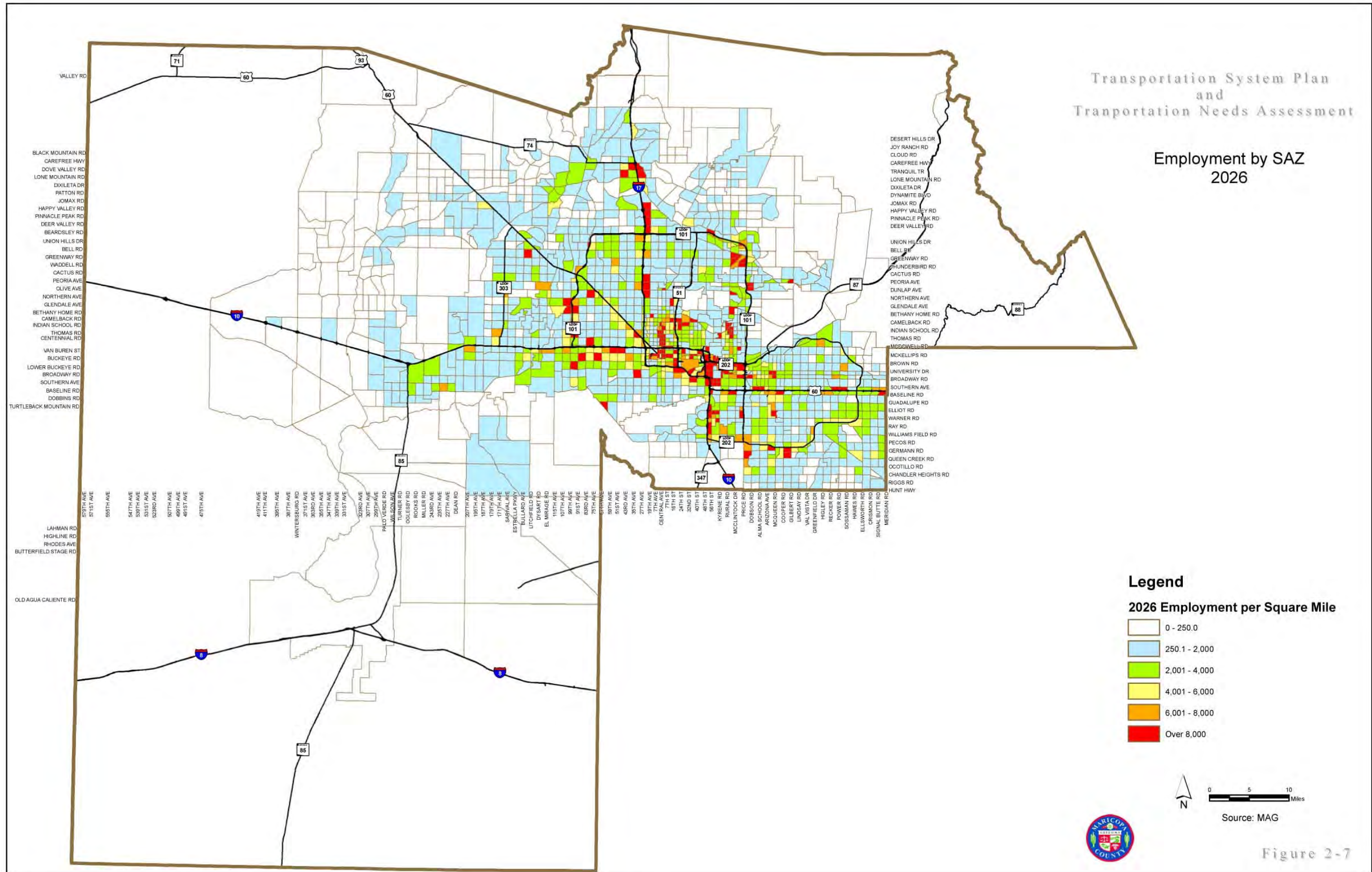
E:\GISDATA\Projects\AZ\MCDOT\TransSysPlan\map_docs\arcmap\update090905\socio\lemp2005\countyE05.mxd

Figure 2 – 6 Employment by SAZ 2015



E:\GISDATA\Projects\VAZ\MCDOT\TransSysPlan\map_docs\arcm\update090905\socio\emp2015\countyE15.mxd

Figure 2 – 7 Employment by SAZ 2026



E:\GISDATA\Projects\MCD\OT\TransSysPlan\map_docs\larcmap\new_base_030605\traffic_count\traffic_count_county.mxd

2.3 ROADWAY SYSTEM

The MCDOT roadway facilities are diverse. They vary from unpaved two-lane roads in remote portions of the county to six-lane principal arterials that provide intercity travel in the Phoenix metropolitan area. This section provides descriptive information about the characteristics of the MCDOT roadway system.

2.3.1 SYSTEM SUMMARY

Table 2-3 summarizes the major components of the existing transportation system. Part of the dynamics of growth in Maricopa County is that cities and towns continue to annex unincorporated portions of the county. These ongoing annexations have resulted in a net decrease in system miles under MCDOT jurisdiction, from 2,829 miles in 1997 to 2,628 miles in 2005.

Table 2-3 summarizes 2005 MCDOT system by surface type. Figure 2-8 shows the location of the paved roads and unpaved roads in the County system.

Table 2-3 Existing Transportation System Surface Type Summary

Surface Type	Centerline-Miles	Lane-Miles
Paved Road	2,069	4,503
Unpaved Road	559	1,109
Total Roadway	2,628	5,612

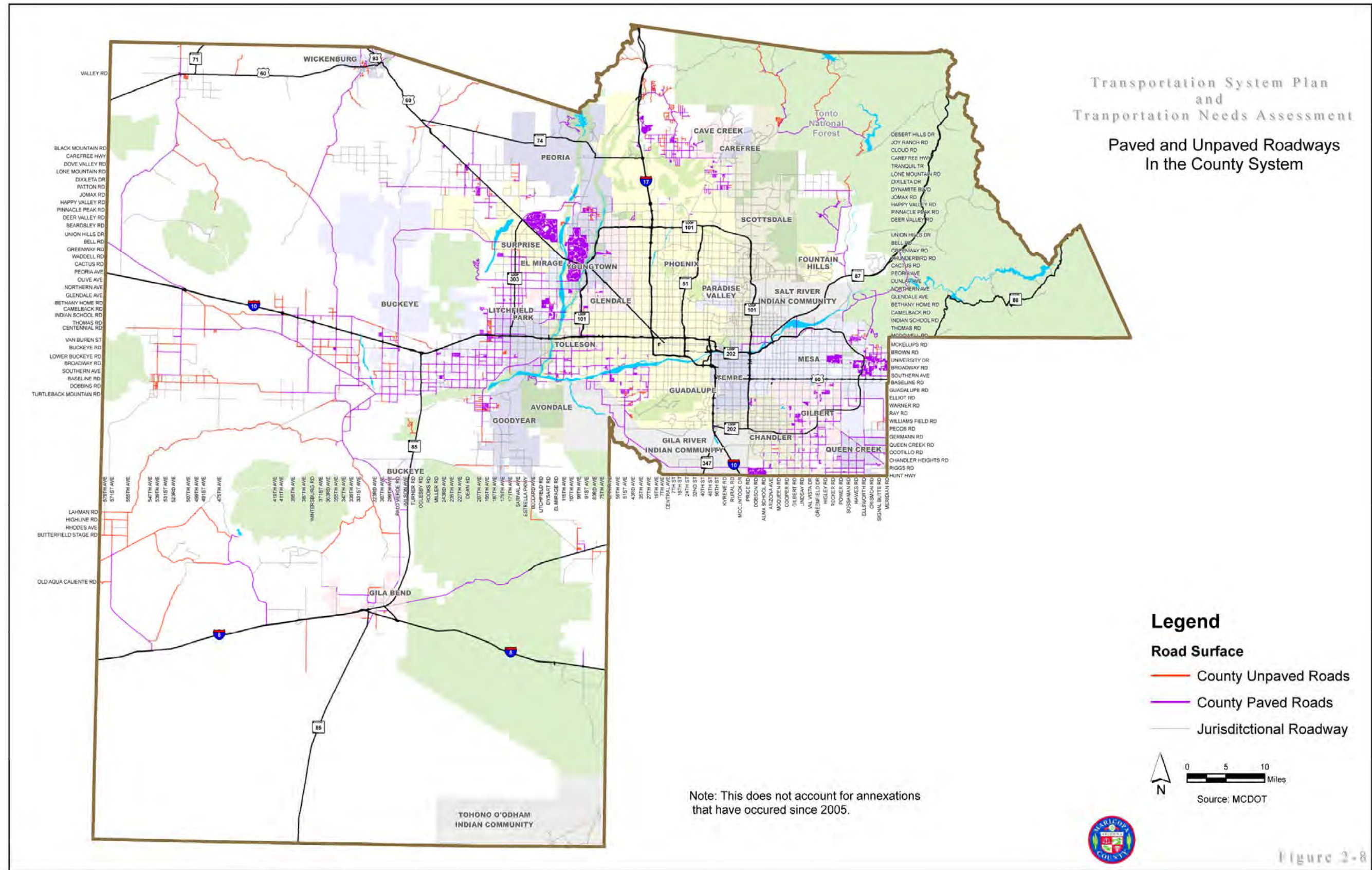
Source: Maricopa County Roadway Inventory System, 2005

2.3.2 ROADWAY FUNCTIONAL CLASSIFICATION

MCDOT roadways are also classified by their role in the transportation system. This classification system includes arterial, collector, and local roadways. This functional classification system is further divided into major and minor facilities.

Table 2-4 provides a summary of MCDOT system mileage by functional classification. Table 2-5 describes the characteristics of each functional classification, Figure 2-9 shows the MCDOT system by functional classification and Table 2-6 shows the centerline-miles of the MCDOT system by facility type.

Figure 2 – 8 Paved and Unpaved Roadways in the County System



E:\GISDATA\Projects\AZ\MCDOT\TransSysPlan\map_tool\arcmap\tpd\ale090905\unpaved_road\county.mxd

Table 2-4 Centerline Miles by Roadway Functional Classification

Description	Miles
Principal Arterial	153
Minor Arterial	488
Major Collector	321
Minor Collector	407
Local Road	1,259
Total	2,628

Source: Maricopa County Roadway Inventory System, 2005

Table 2-5 Roadway Functional Classification Characteristics

Functional Classification	Characteristics
<i>Principal (Major) Arterial</i>	<ul style="list-style-type: none"> • <i>Through movement and major circulation in urban areas.</i> • <i>Substantial regional travel.</i> • <i>Accounts for large portion of total urban travel with minimum mileage.</i> • <i>Movement between urban areas with populations generally greater than 25,000.</i>
<i>Minor Arterial</i>	<ul style="list-style-type: none"> • <i>Major circulation movements with emphasis on development access.</i> • <i>Traffic movements do not penetrate residential areas.</i> • <i>Movement between areas with population less than 25,000.</i>
<i>Major Collector</i>	<ul style="list-style-type: none"> • <i>Provides both circulation and access.</i> • <i>Direct frontage development with industrial, commercial, and neighborhood access.</i> • <i>Service, movement between traffic generators, larger cities, and routes of higher classification.</i>
<i>Minor Collector</i>	<ul style="list-style-type: none"> • <i>Same as major collector, with increased emphasis on residential access.</i>
<i>Local Road (Residential)</i>	<ul style="list-style-type: none"> • <i>Relatively shorter travel distances compared to collectors or higher systems.</i> • <i>Traffic movements between adjacent lands and collectors or other roads of higher classification.</i>

Source: Federal Highway Administration (FHWA) Functional Classification Guidelines, 1989.

Figure 2 – 9 Roadway Functional Classification

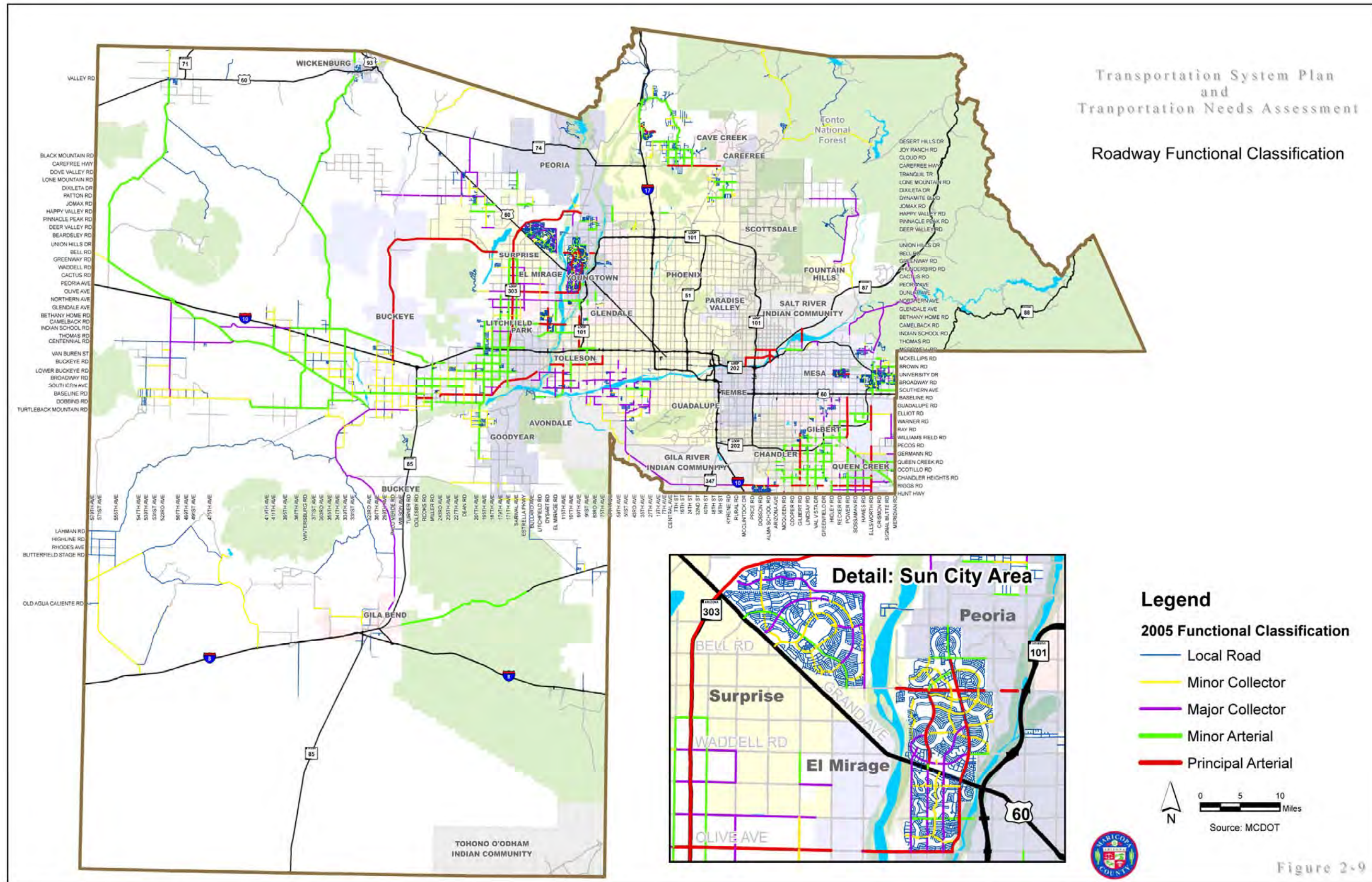


Figure 2-9

Table 2-6 Centerline-Miles by Facility Type

Facility Type	Miles
<i>Urban Principal Arterial</i>	58
<i>Urban Minor Arterial</i>	126
<i>Urban Major Collector</i>	98
<i>Urban Minor Collector</i>	74
<i>Urban Local</i>	671
Total Urban	1,027
<i>Rural Principal Arterial</i>	95
<i>Rural Minor Arterial</i>	362
<i>Rural Collector</i>	556
<i>Rural Local</i>	588
Total Rural	1,601
Total	2,628

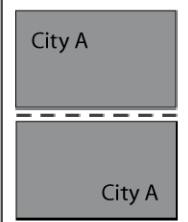
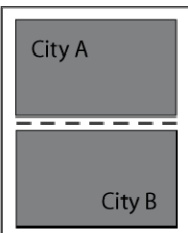
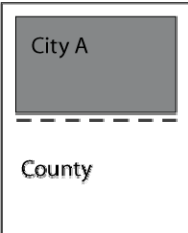
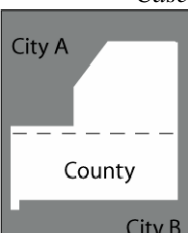
Source: Maricopa County Roadway Inventory System, April 2005

2.3.3 COUNTY ISLAND ROADWAYS

Annexation often occurs in growing regions of the county. Sometimes, when an annexation is being considered by a city or town, property owners wish to remain unincorporated within the county or a municipality elects not to include certain properties in the annexation. The unannexed properties that remain in the unincorporated county after surrounding areas are annexed by a municipality are called "county islands". A county island roadway is a MCDOT roadway segment that serves a county island area and is surrounded by one or more municipalities. These segments also exist because Arizona state statute allows incorporated cities to annex land without annexing the transportation facilities that serve it.

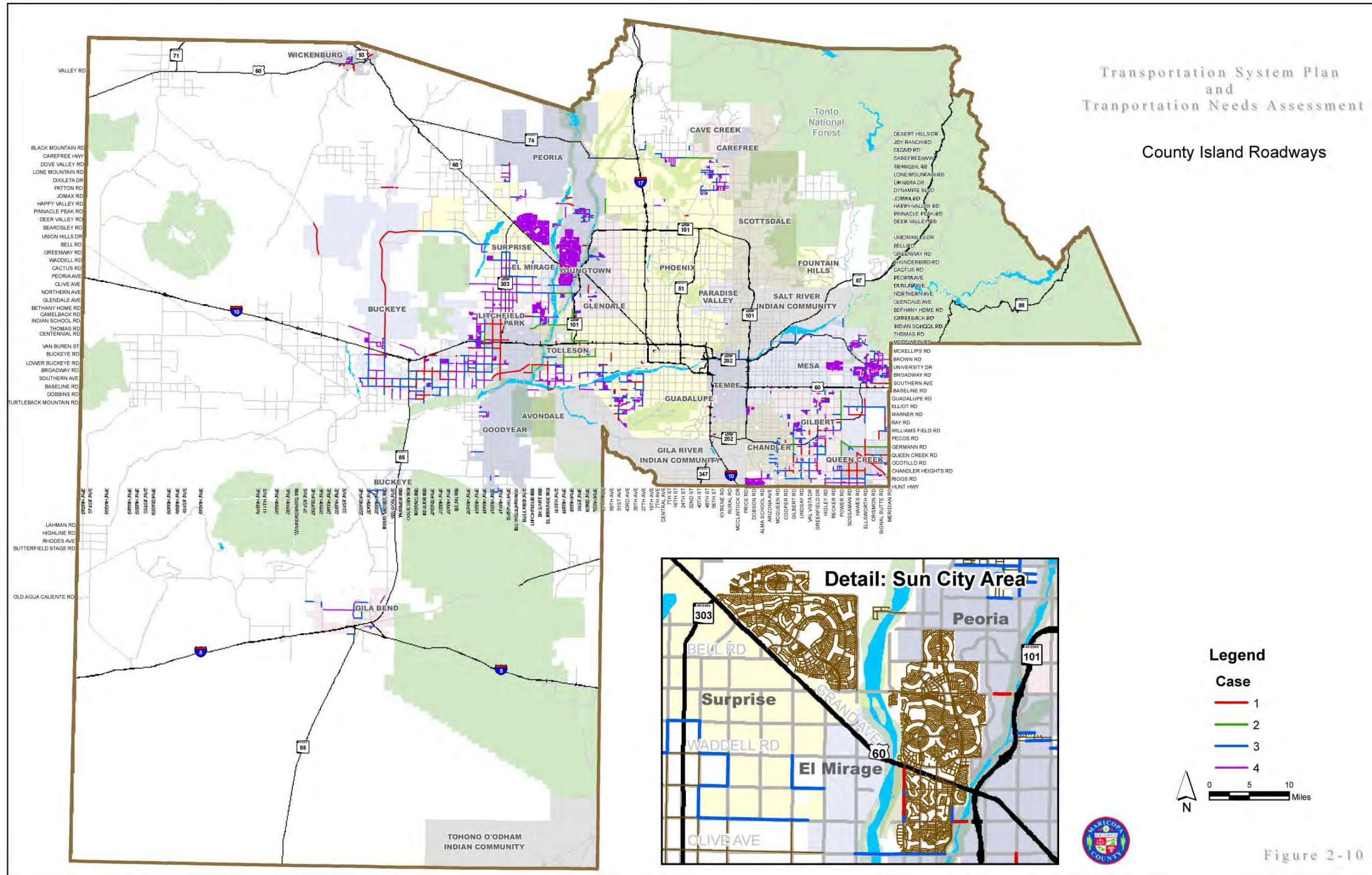
Maricopa County has the responsibility for maintaining these "island" roadways. The responsibility for funding expansion of these roads (adding lanes, for example) when development occurs in these areas is more complicated and may be shared by the county and the municipality in which the development occurs. County island roadways fall into four distinct cases, illustrated in Table 2-7. MCDOT has 1,474 centerline-miles of county island roads, 56 percent of its total system. This is a 34% increase from 966 centerline-miles in 1996. Figure 2-10 identifies the Maricopa County island roadways by case. One-third of the county island roadways are located in the communities of Sun City (225 miles), Sun City West (175 miles), Dreamland Villa (30 miles), Sun Lakes (46 miles), and Anthem (23 miles).

Table 2-7 County Island Roadway Descriptions

Case Number	Description
<p style="text-align: center;"><i>Case 1</i></p> 	<p style="text-align: center;"><i>Only the roadway is unincorporated and it is bounded on both sides by one municipality. 138 Miles</i></p>
<p style="text-align: center;"><i>Case 2</i></p> 	<p style="text-align: center;"><i>Only the roadway is unincorporated and it is bounded by different municipalities on each side. 41 Miles</i></p>
<p style="text-align: center;"><i>Case 3</i></p> 	<p style="text-align: center;"><i>The roadway is unincorporated and is bounded by a municipality on one side. The other side is unincorporated lands. 274 Miles</i></p>
<p style="text-align: center;"><i>Case 4</i></p> 	<p style="text-align: center;"><i>The roadway and adjacent lands are unincorporated but the unincorporated lands are totally bounded by one or more municipalities. 1,021 Miles</i></p>
<p style="text-align: center;">TOTAL</p>	<p style="text-align: center;">1,474 Miles</p>

Source: Maricopa County Department of Transportation, 2005

Figure 2 – 10 County Island Roadways



E:\GISDATA\Projects\AZMCDOT\TransSysPlan\map_docs\arcmap\update090905\county_island_rdw\county.mxd

2.3.4 PRIMARY/SECONDARY/LOCAL ROADWAY SYSTEM

The MCDOT has established three broad roadway categories to better organize and prioritize its long range planning efforts: primary, secondary and local. Primary roads form the backbone of the MCDOT system and receive the highest priority for funding, maintenance and other activities. Secondary roads are lower priority corridors where MCDOT participation would be more limited. MCDOTs only effort on local roads may be to maintain the road or to provide technical assistance for planning and design. (A description of these roadway categories is provided in Chapter 1). Figure 2-11 shows the MCDOT primary, secondary and local roadway system.

2.3.5 INTELLIGENT TRANSPORTATION SYSTEMS

Several Intelligent Transportation Systems (ITS) deployments exist on various corridors within local authorities encompassing the county boundaries. These facilities include coordinated signals, Close Circuit Television (CCTV) cameras, Dynamic Message Signs (DMS) and detection technologies to enable the agencies to provide real-time traffic management, incident response and traveler information services. The operators at the traffic management centers use the ITS tools to monitor traffic conditions and if required they dynamically change signal timings to relieve congestion; post messages on the DMS to alert motorists to roadway conditions, including crashes and closures; and dispatch incident response teams. The real-time services enabled through ITS help in reducing delays and enhancing safety. MCDOT is deploying ITS infrastructure on congested County corridors such as Bell Road.

MCDOT also serves as a program leader for the AZTech Regional Transportation Partnership. Through regional collaboration this partnership aims at integrating and improving regional traffic management. Individual cities and towns deploy, operate and maintain their ITS systems and equipment, and MCDOT helps to integrate these efforts to facilitate better regional traffic management and coordination. The regional AZTech activities that are coordinated through MCDOT Traffic Management Division include:

- Institutional collaboration and public-private partnerships
- Center-Center Communications infrastructure development
- Inter-agency operations
- Regional traveler information support
- Incident Management through Regional Emergency Action Coordinating Team (REACT)

2.3.6 SYSTEM PERFORMANCE

2.3.6.1 Level of Service

Roadway network performance is generally measured by its ability to process travel demand while maintaining acceptable Levels of Service. The Highway Capacity Manual (HCM 2000) prepared by the Transportation Research Board (TRB) Committee on Highway Capacity and Quality of Service outlines six Levels of Service (LOS) ranging from A to F:

LOS A – Best, free flow operations (on uninterrupted flow facilities) and very low delay (on interrupted flow facilities). Freedom to select desired speeds and to maneuver within traffic is extremely high.

LOS B – Flow is stable, but presence of other users is noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within traffic.

LOS C – Flow is stable, but the operation of users is becoming affected by the presence of other users. Maneuvering within traffic requires substantial vigilance on the part of the user.

LOS D – High density but stable flow. Speed and freedom to maneuver are severely restricted. The driver is experiencing a generally poor level of comfort and convenience.

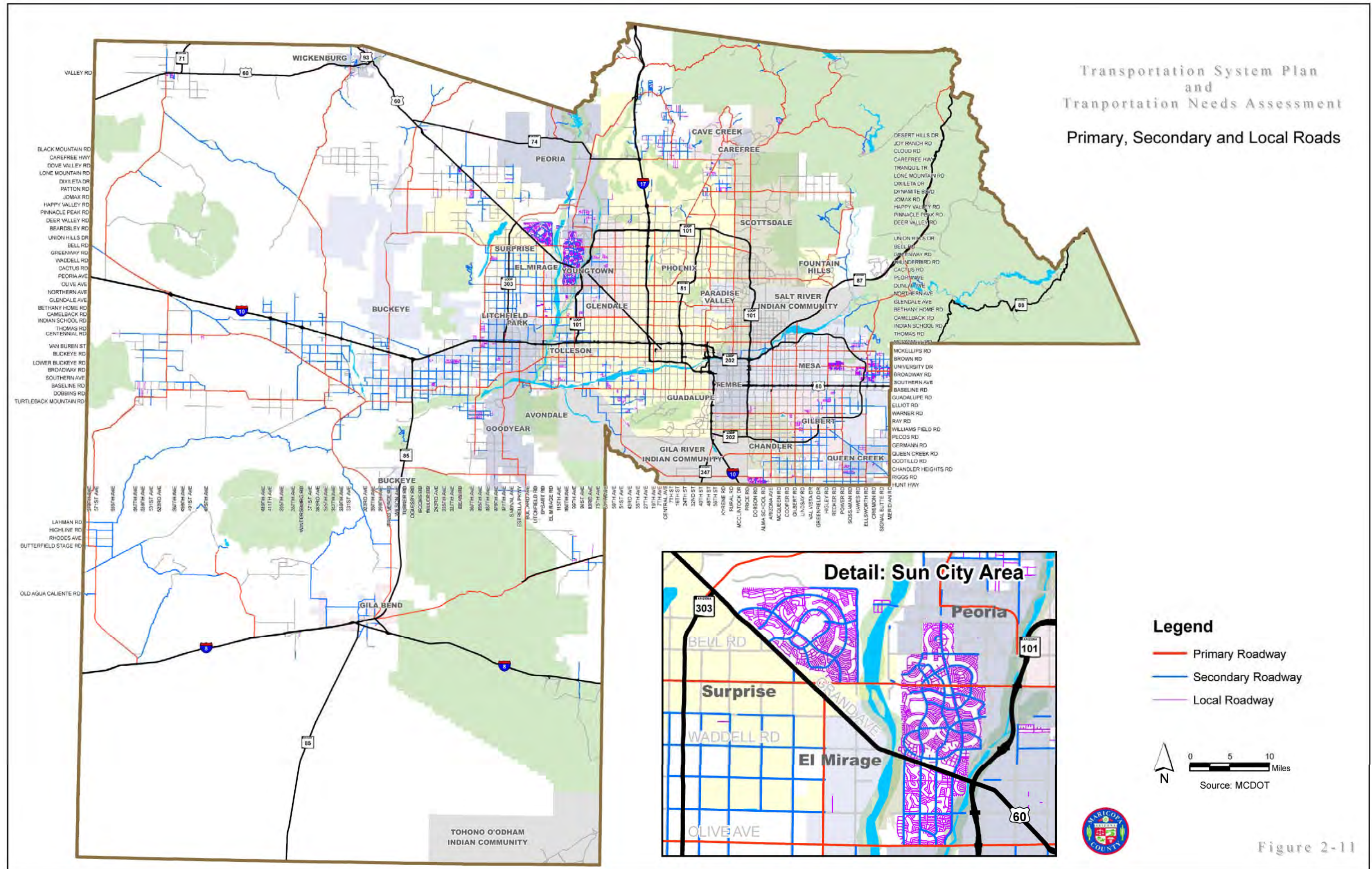
LOS E – Flow is at or near capacity. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within traffic is extremely difficult. Comfort and convenience levels are extremely poor.

LOS F – Worse, facility has failed, or a breakdown has occurred.

2.3.6.2 Roadway Level of Service Conditions

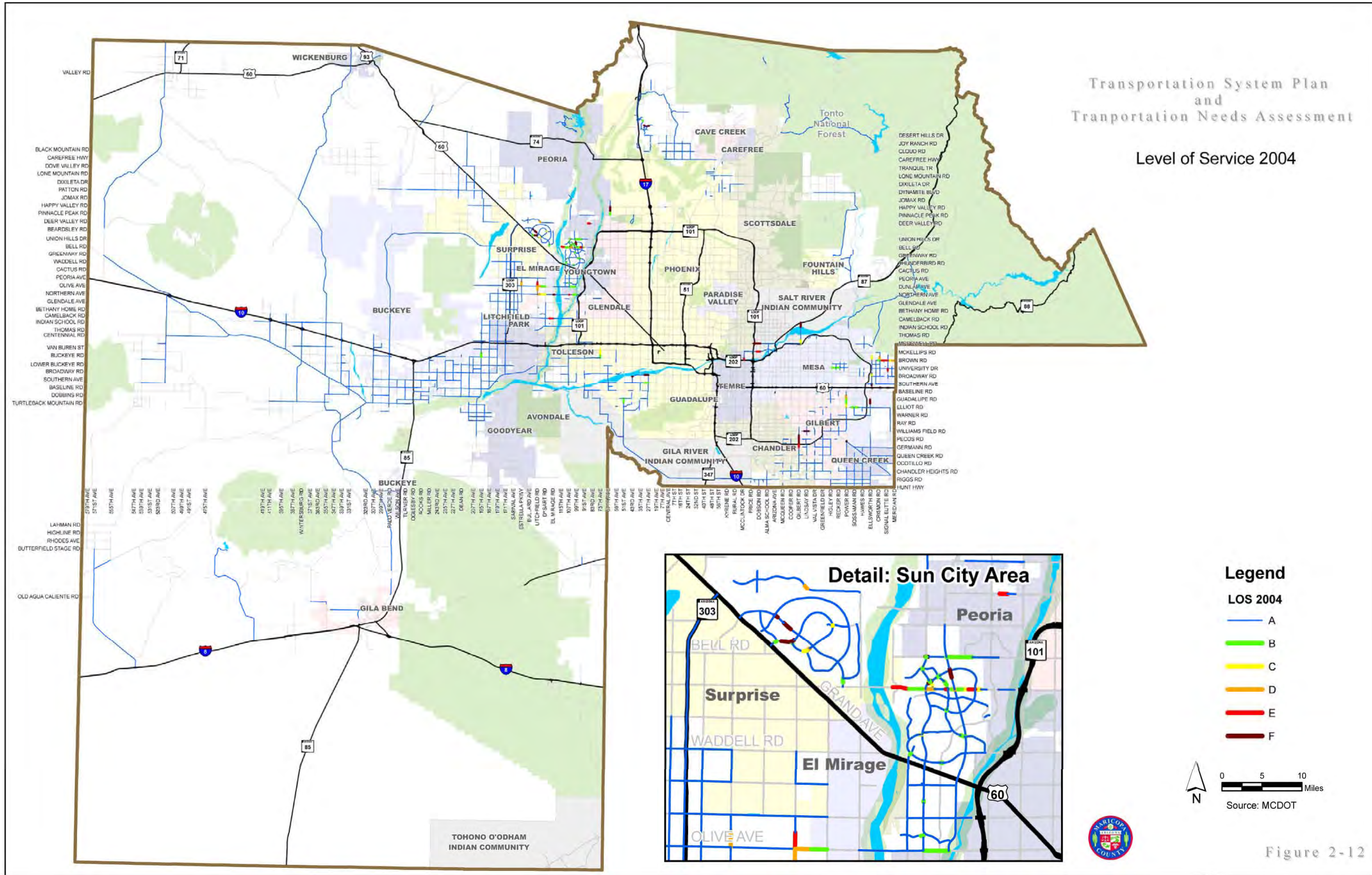
Actual traffic counts were used to establish Level of Service on MCDOT roadways. Roadway Levels of Service based on 2004 count data are depicted in Figure 2-12. The MCDOT Level of Service standard for its facilities is C. Over 97% of the MCDOT roadways operated at LOS A in 2004. As reported in the next chapter, this will not be the case in the future.

Figure 2 – 11 Primary, Secondary and Local Roads



E:\GISDATA\Projects\VAZ\MCDOT\TransSysPlan\map_docs\larcmap\update090905\primary_secondary_local\p_s_l_county.mxd

Figure 2 – 12 Level of Service 2004



E:\GISDATA\Projects\AZ\MCDOT\TransSysPlan\map_docs\lrcmap\update090905\LOS\LOS_county.mxd

2.3.7 TRANSIT MODES

Many municipalities within Maricopa County provide transit alternatives. Service varies from local and express buses operating on a fixed route with a defined schedule to dial-a-ride service for those disabled or with no access to transportation. The majority of fixed route service in the Phoenix metro area is provided by the City of Phoenix. Tempe, Scottsdale, Glendale, Chandler, Peoria, and Mesa also provide significant transit service to their communities.

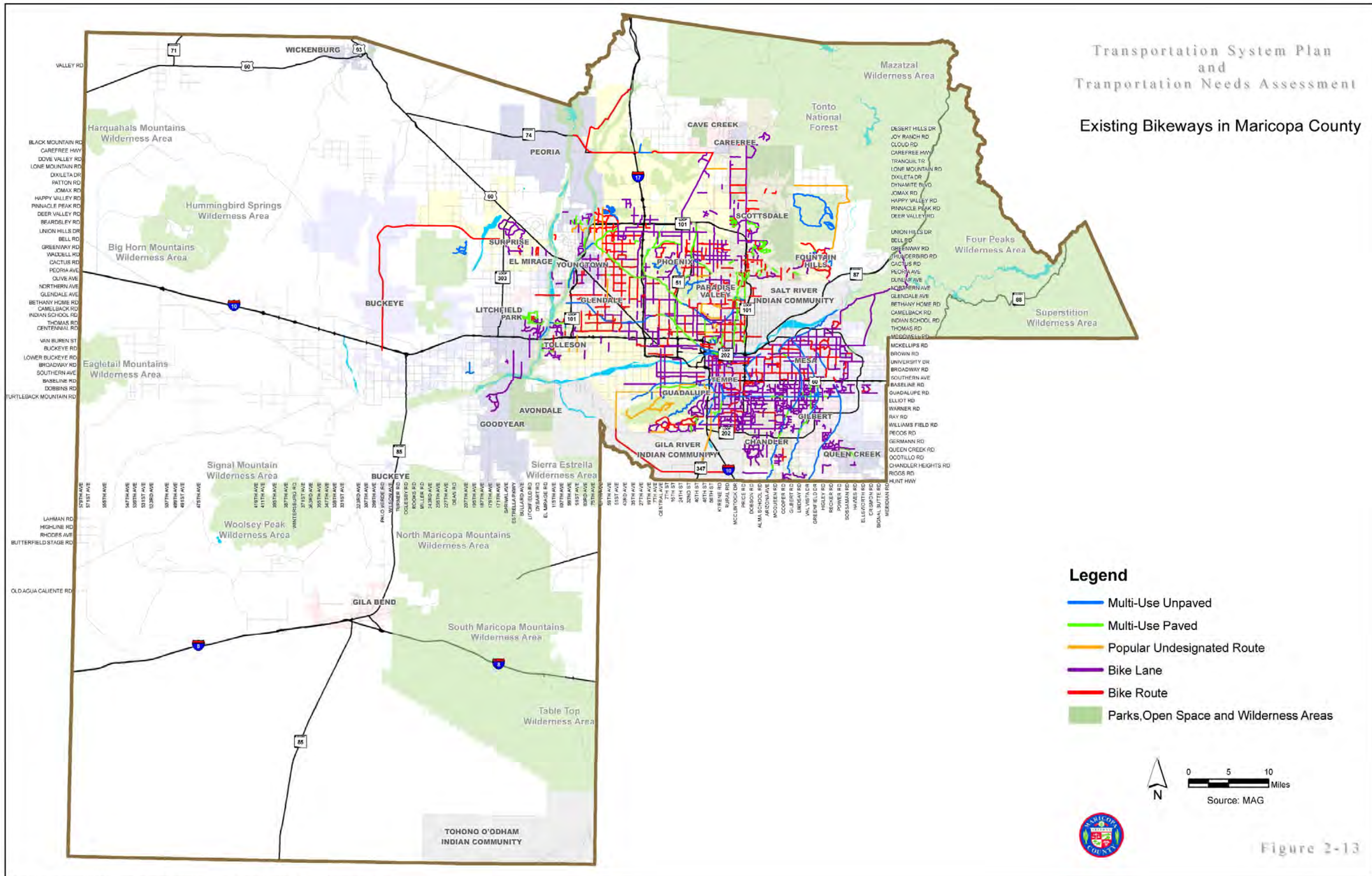
Outside of the Phoenix metropolitan area, in rural unincorporated areas of the county, demand-responsive dial-a-ride service is the only transit option. The Maricopa County Special Transportation Services Department provides demand-responsive service for social service and medical trips to the entire unincorporated county.

2.3.8 NON-MOTORIZED MODES

Maricopa County has extensive facilities to support non-motorized transport, including on-road bike lanes, bike paths, and multi-use trails for horseback riders and hikers. Figure 2-13 shows the existing MAG Regional Bikeway Plan. This plan includes seamless integration of county and municipal facilities. As well, many paved county roadway facilities incorporate a paved shoulder that also serves as a bike lane or route.

Figure 2-14 shows the Maricopa County Trail Plan. This Plan will provide extensive access throughout the Phoenix metropolitan area using a combination of municipal and county trails. One important note for long range transportation planning is that county policy requires that both new roads and roadway widening projects accommodate trail crossings.

Figure 2 – 13 Existing Bikeways in Maricopa County



E:\GISDATA\Projects\MCDOT\TransSysPlan\map_docs\arcmap\new_base_090605\bike_lanes\bike_lanes_county.mxd

Figure 2 – 14 Maricopa County Regional Trails Plan

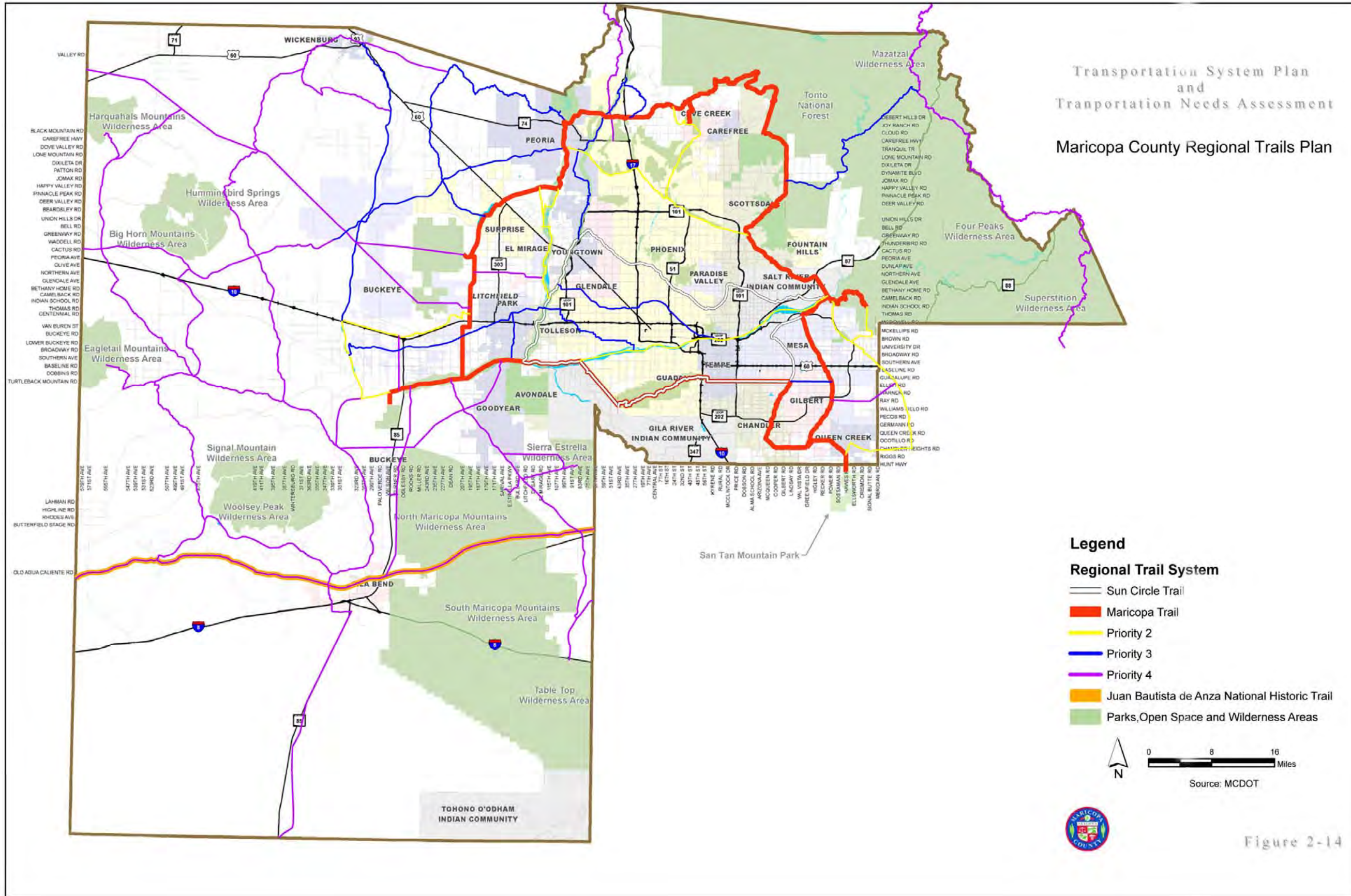


Figure 2-14

Chapter 3

FUTURE TRAFFIC ANALYSIS

3.1 FUTURE TRAFFIC ANALYSIS

3.1.1 INTRODUCTION

The purpose of this chapter is to present the analysis of future traffic conditions on roads that are currently owned and maintained by the MCDOT. To accomplish this task, future travel demands on MCDOT roadways were forecast and compared with the roadway capacities to evaluate their future traffic operational performance. Two future horizon years, 2015 and 2026, were evaluated in the study. The purpose of the evaluation was to determine whether the roadway network in each of the horizon years would be able to accommodate the forecast travel demand. Where a roadway capacity deficiency was identified, potential roadway widening improvements are recommended.

3.1.2 TRAFFIC OPERATIONAL PERFORMANCE METHODOLOGY

For each evaluation year (2015 and 2026), an analysis was completed on a base network that has the same roadways that exist or are planned to be completed in the previous evaluation year. For example, the existing 2005 network represents the 2015 base network. The 2026 base network includes all the 2015 improvements.

The volume/capacity (v/c) ratio was used as the measure of effectiveness. The forecast daily traffic volumes for the evaluation year were obtained from the models and evaluated against the capacity of the base roadway network on a segment-by-segment basis. The roadway capacity was obtained by multiplying the per lane capacity (from MAG models) by the number of lanes in the base network. The v/c ratio was computed on each section of the MCDOT roadway network. Table 3-1 shows how the v/c ratios relate to the LOS classification.

Table 3-1 Relationship Between V/C Ratio and LOS

V/C	LOS
0.75 or less	C
0.76 to 0.90	D
0.91 to 1.00	E
1.01 or greater	F

As stated earlier, capacity improvements identified in one evaluation year are incorporated into the base network of the following evaluation year. For example, improvements identified in 2015 are incorporated into the base condition for the 2026 evaluation year.

3.1.3 SUMMARY OF RESULTS

An analysis of the base network has been conducted for each analysis year (2015 and 2026) and an estimate has been made of the number of lanes that would need to be added to that base network in order to achieve and maintain LOS C. For the lane-mile calculations it was assumed:

- New construction would add a 2, 5, or 7-lane roadway;
- Widening of a 2 or 3-lane roadway would be accomplished through total reconstruction; and
- Widening of a 4 or 5-lane roadway would be accomplished through saving the existing lanes and adding the additional lanes.

The estimated miles of roadway that need to be widened to achieve LOS C in 2015 and 2026 are shown in Tables 3-2, 3-3, 3-4, and 3-5. The roadways that would need to be reconstructed or widened are shown, by Supervisor District, in Figures 3-1 through 3-5 at the end of this chapter.

As shown in Table 3-2, 232 centerline-miles of roadway, 36% of the 640 centerline-miles of arterial streets under county jurisdiction, would need to be widened to achieve/maintain LOS C in the Year 2015, and another 266 miles would need to be widened by 2026. In addition, 193 centerline-miles of new arterial streets would need to be constructed to serve growth in unincorporated Maricopa County by the end of calendar year 2015 (Table 3-3), and another 170 centerline-miles would need to be constructed by the end of calendar year 2026 (Table 3-4).

Table 3-2 Traffic Operational Performance of Base Network

Planning Horizon	Miles of Roadway Widening Needed to Achieve LOS C (Centerline-Miles)			Total
	LOS D	LOS E	LOS F	
By 2015	111	40	81	232
By 2026	117	51	98	266

Tables 3-3 and 3-4 summarize the new construction, reconstruction, and widening that would need to occur through the 2015 and 2026 planning horizons, respectively, in order to achieve/maintain LOS C.

For the period from 2005 through 2015:

- New Construction (i.e. arterial streets going from 0 to 2, 5, or 7 lanes): 193 miles resulting in 454 new lane-miles
- Total Reconstruction (i.e. reconstruction of an existing 2- or 3-lane arterial street): 203 miles resulting in a net gain of 680 lane-miles
- Widening of Existing Facility (i.e. adding lanes to an existing 3- or 5-lane arterial street): 29 miles resulting in 81 new lane-miles.

Table 3-3 Arterial Street Widening Needed Through Year 2015 to Achieve LOS C

Widen From-To (lanes)	Centerline-Miles	Constructed Lane-Miles	Replaced Lane-Miles	Additional Lane-Miles
New Construction				
0-2	173	346	0	346
0-5	16	80	0	80
0-7	4	28	0	28
Total New Construction	193	454	0	454
Reconstruction				
2-5	166	830	332	498
2-7	36	252	72	180
3-5	1	5	3	2
Total Reconstruction	203	1087	407	680
Widening of Existing Facility				
4-7	23	69	0	69
5-7	6	12	0	12
Total Widening	29	81	0	81

For the period from 2016 through 2026:

- New Construction (i.e. arterial streets going from 0 to 2, 5, or 7 lanes): 170 miles resulting in 408 new lane-miles
- Total Reconstruction (i.e. reconstruction of an existing 2 or 3-lane arterial street): 207 miles resulting in a net gain of 647 lane-miles
- Widening of Existing Facility (i.e. adding lanes to an existing 4 or 5-lane arterial street): 59 miles resulting in 132 new lane-miles

Table 3-4 Arterial Street Widening Needed from Year 2015 Through Year 2026 to Maintain LOS C

Widen From-To (lanes)	Centerline-Miles	Constructed Lane-Miles	Replaced Lane-Miles	Additional Lane-Miles
New Construction				
0-2	150	300	0	300
0-5	16	80	0	80
0-7	4	28	0	28
Total New Construction	170	408	0	408
Reconstruction				
2-5	194	970	388	582
2-7	13	91	26	65
3-5	0	0	0	0
Total Reconstruction	207	1,061	1,268	647
Widening of Existing Facility				
4-7	14	42	0	42
5-7	45	90	0	90
Total Widening	59	132	0	132

Table 3-5 provides information on how many lane-miles of arterial streets could be under MCDOTs jurisdiction (if funding is available) after the necessary new roadway construction and widening of existing facilities occurs. *This is a “worst-case” calculation that does not include allowance for periodic roadway annexations by municipalities that are a natural result of urban growth.* There are currently 2,460 lane-miles of arterial streets under MCDOTs jurisdiction. Using this as a base for 2015, the 454 lane-miles of new arterial streets, the 1,087 lane-miles of reconstructed arterials, and the 81 miles of widened arterials, minus the 407 lane-miles that are replaced through reconstruction result in a 50% increase in the number of lane-miles under MCDOT jurisdiction. Following the results through to the year 2026, without annexation, lane-miles under county jurisdiction would nearly double.

Chapter 4 presents a discussion of the financial needs to construct the arterial street system outlined in this chapter. The basis of the needs discussion is the fact that MCDOT will have to construct 1,622 (454+1,087+81) lane-miles of arterial streets by the year 2015, and another 1601 (408+1,061+132) lane-miles from 2016 through 2026.

Table 3-5 Lane-Miles of Arterial Streets Needed

Description	2005	2015	2026
Lane-Miles on MCDOT Arterial System	2,460	2,460	3,675
New Arterials	N/A	454	408
Reconstructed/Widening	N/A	1,087	1,061
Replaced	N/A	(407)	(414)
Widening	N/A	81	132
New Total	N/A	3,675	4,862

3.2 TRAFFIC MANAGEMENT

Growing traffic volumes on the County roads will lead to a greater demand for real-time traffic management solutions to reduce (or hold steady) travel times and minimize the impacts of accidents and road closures. MCDOT has recently instituted the Traffic Management Division to meet the current and future needs. ITS infrastructure elements including coordinated signals, dynamic message signs, CCTV cameras, fiber optic communications and traffic detection will be required on the key County corridors as summarized in Table 3.6 for effective traffic management.

MCDOT Traffic Management Center (TMC), built in 1998, provides real-time traffic management services on the MCDOT and regional roads using the ITS technology. MCDOT's Traffic Management Center is responsible for the following tasks: management and surveillance, real-time data analysis, interagency signal coordination, incident detection, public notification, coordination with the REACT program, control of automated flood warning signs, construction information updates, special event management, modernization of the existing signals and support for design and implementation of new ITS infrastructure.

The challenge for TMC operations is the physical space limitation of the center. Expansion of the physical area of the TMC should be considered. Preliminary estimates have indicated that with the expected expansion of services, ultimately the TMC will need approximately 3,000 square feet of space.

Figure 3 – 1 Capacity Needs: Supervisor District 1

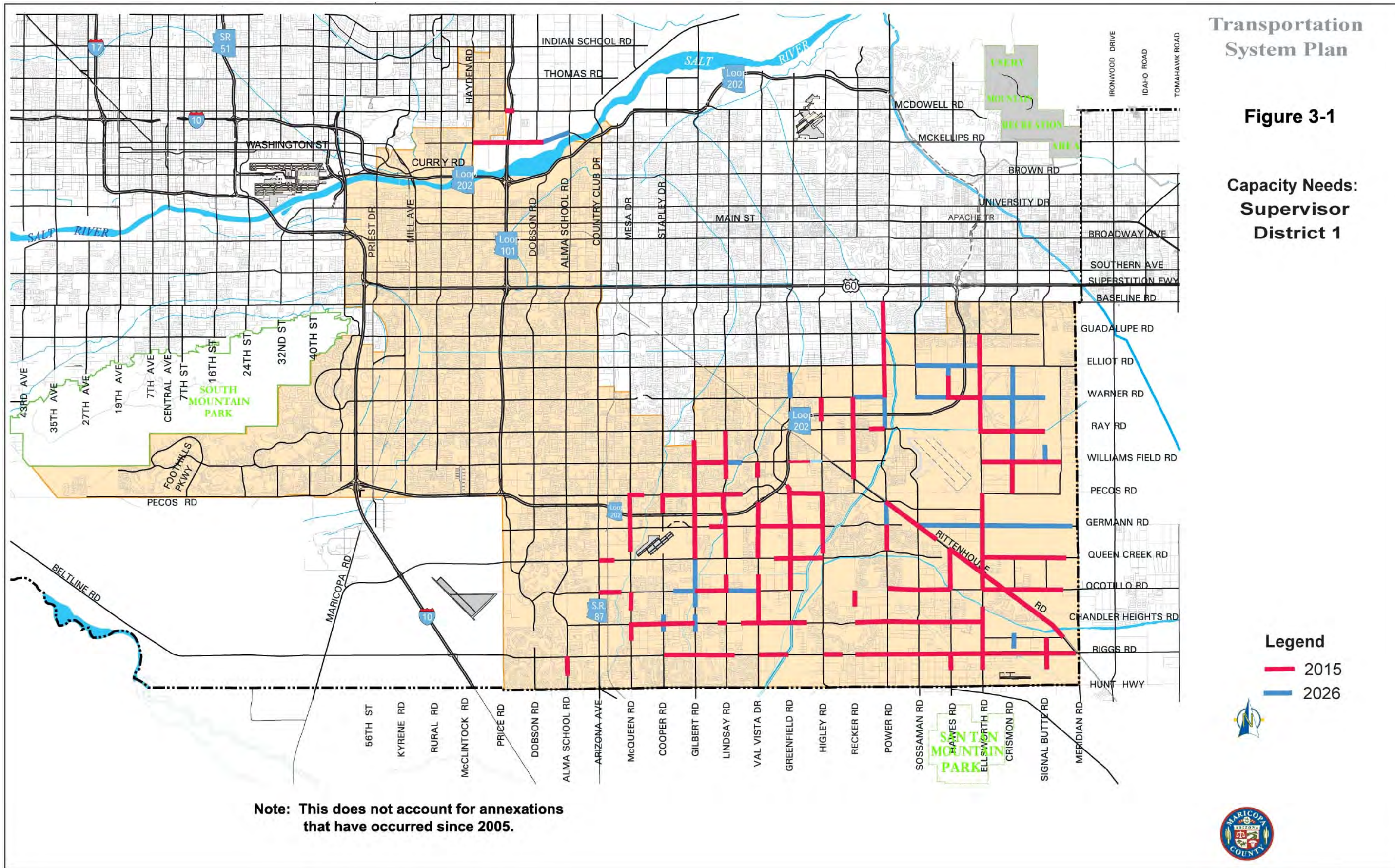


Figure 3 – 2 Capacity Needs: Supervisor District 2

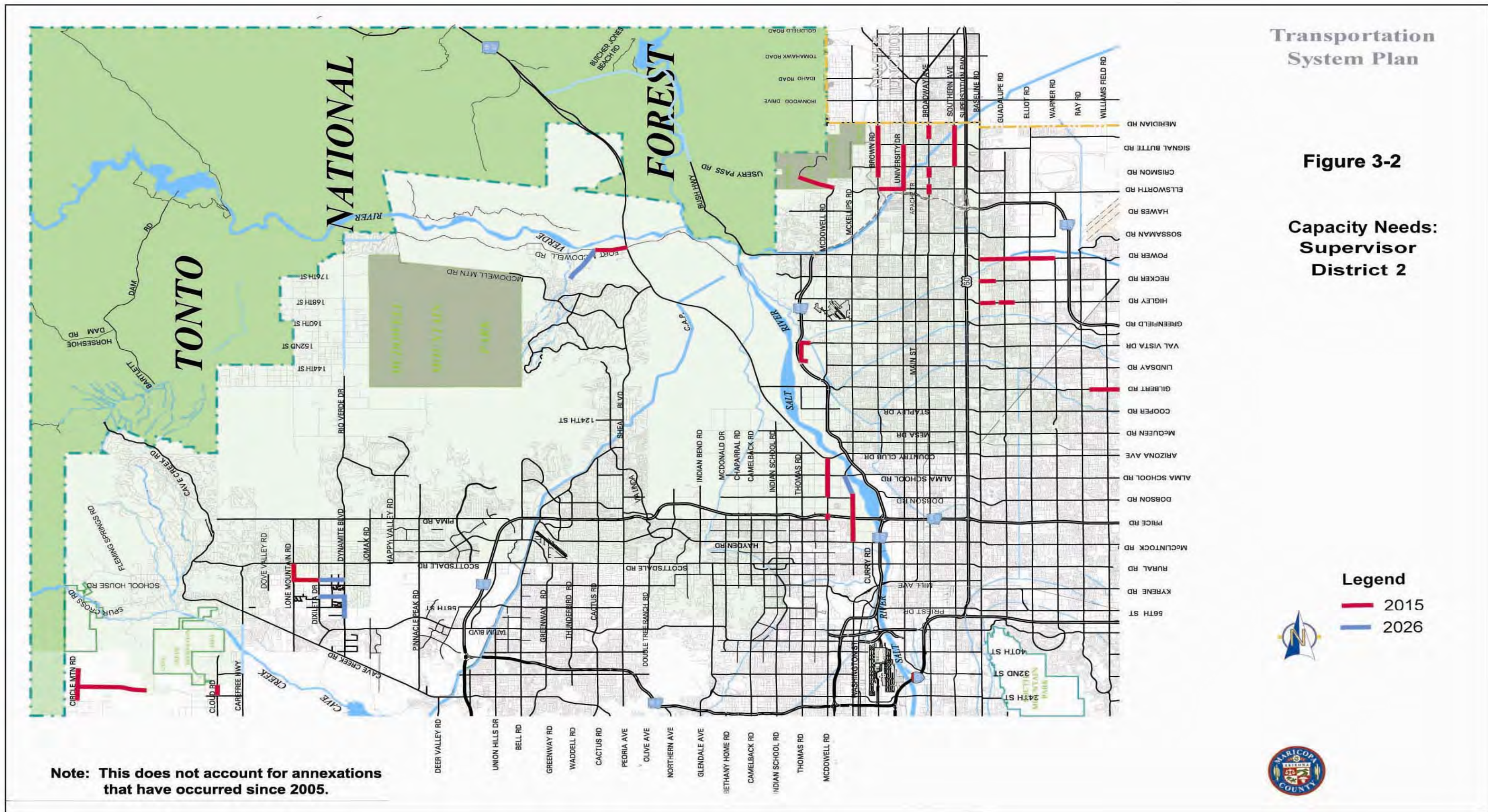


Figure 3 – 3 Capacity Needs: Supervisor District 3

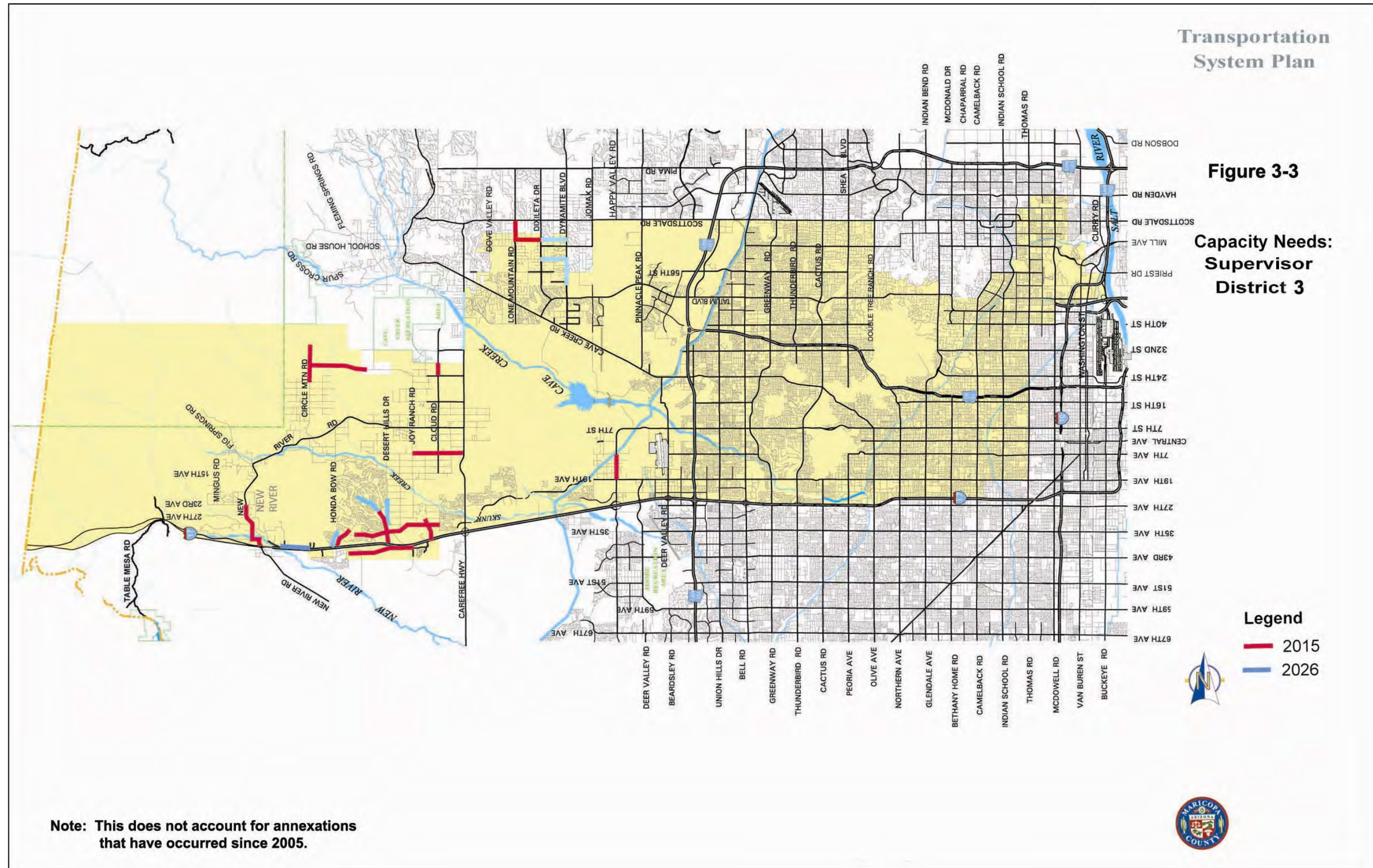


Figure 3 – 4 Capacity Needs: Supervisor District 4

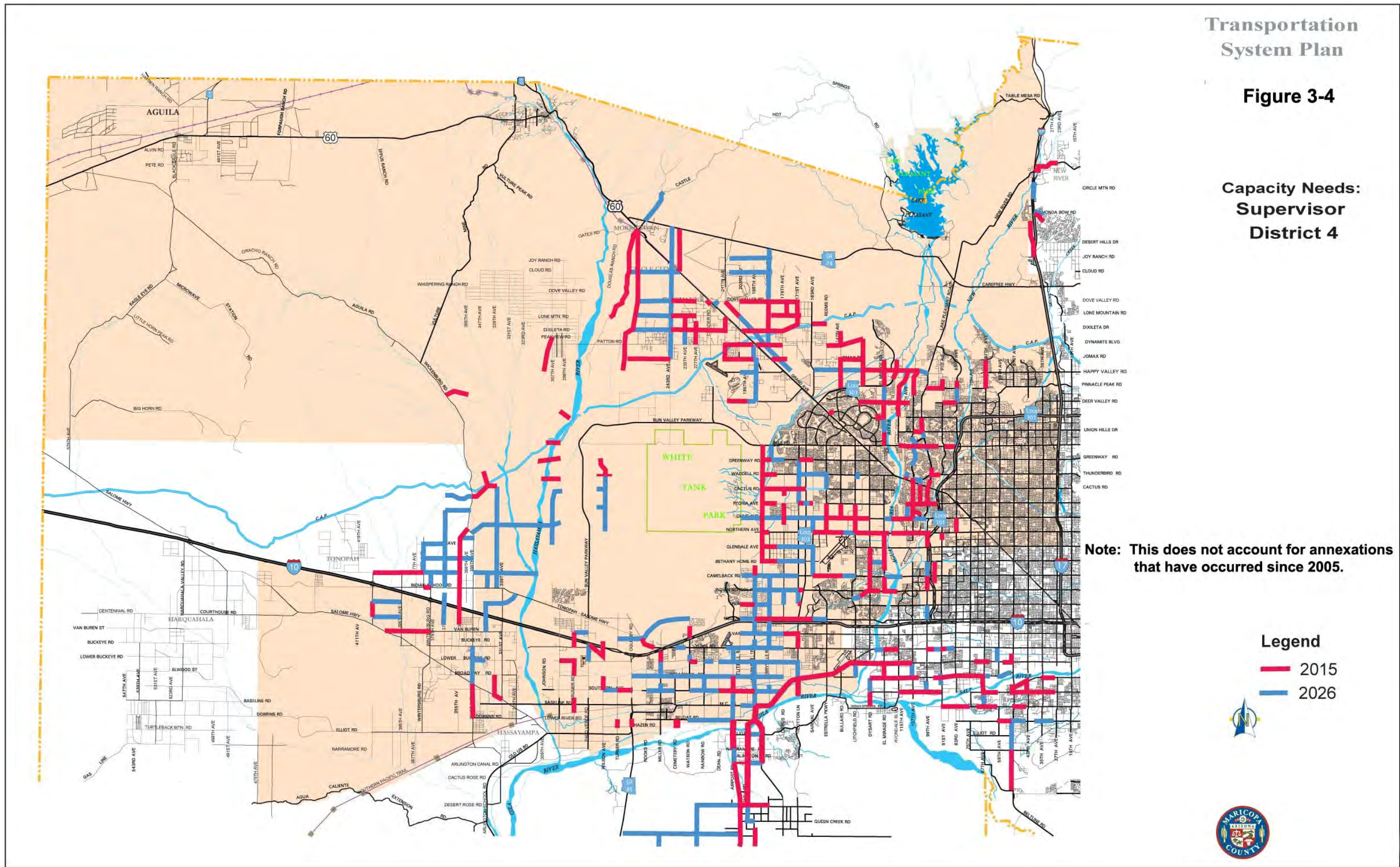


Figure 3 – 5 Capacity Needs: Supervisor District 5

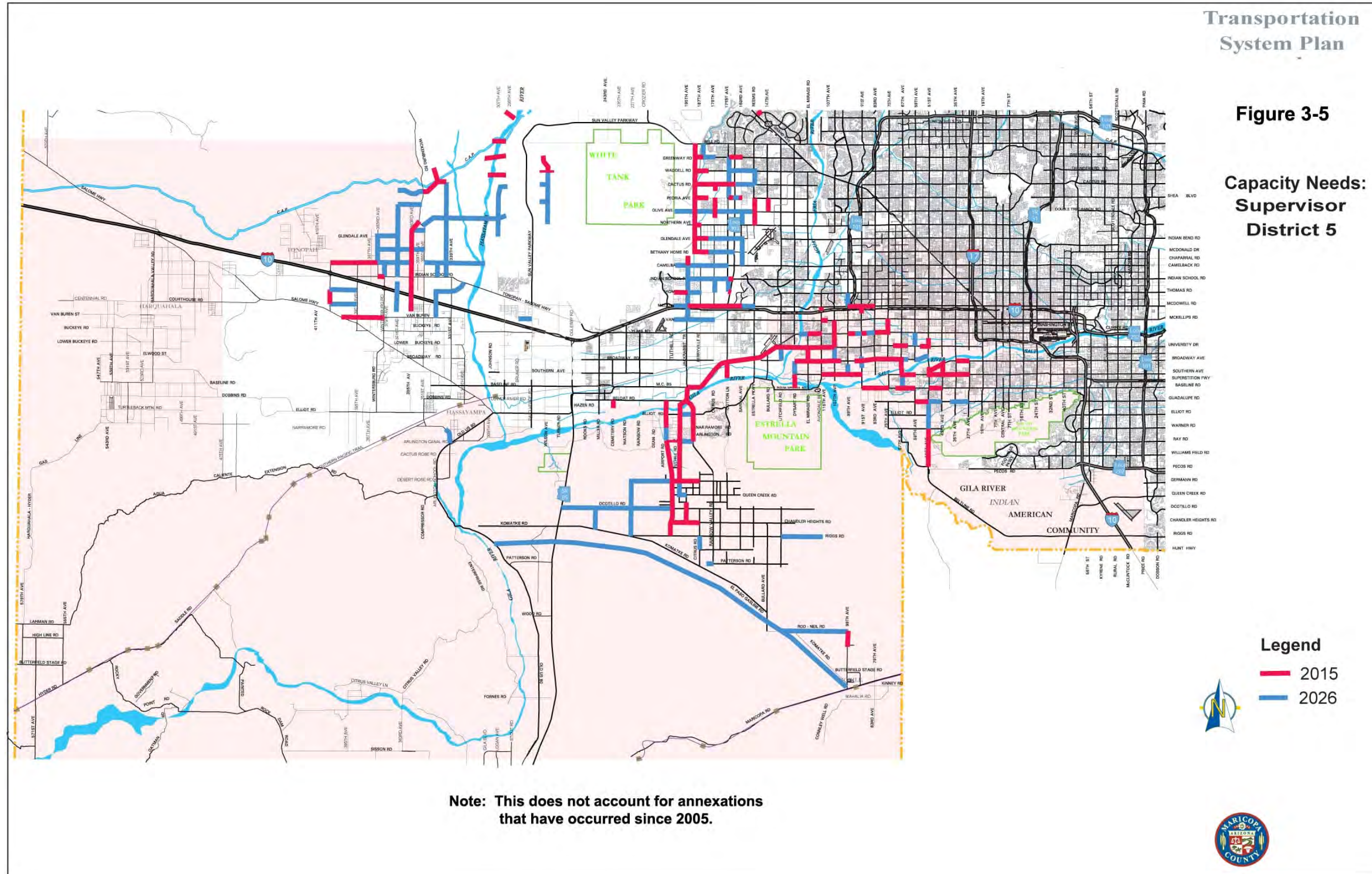


Table 3-6 Designated Arterials for requiring ITS infrastructure by Region

Corridor	Limits	Length	Classification
North Region			
Anthem Way	I-17 to Daisy Mountain Drive	2.5 miles	Principal Arterial
Daisy Mountain Drive	I-17 to Anthem Way	2.5 Miles	Principal Arterial
Carefree Highway	New River Road to 56 th Street	16.0 Miles	Principal Arterial
Gavilan Peak Parkway	Anthem Way to Daisy Mountain Dr.	1.6 Miles	Principal Arterial
East Region			
Bush Highway	Mesa City Limits to Recreational Facilities	5.0 Miles	Minor Arterial (Rural ITS)
Alma School Road	Loop 202 to McKellips Road	1.0 Mile	Principal Arterial
Northwest Region			
Bell Road	Sun Valley Parkway to Grand Avenue	9.0 Miles	Principal Arterial
Sun City West	All Links	20.0 Miles	Collectors
99 th Avenue	Olive Avenue to Beardsley Road	7.0 Miles	Principal Arterial
Litchfield Road	Last Mile Connection	1.0 Mile	Principal Arterial
Southeast Region			
Riggs Road	SR 87 to I-10	5.0 Miles	Principal Arterial
Southwest Region			
Olive Avenue	West Limits to Loop 101	14.0 Miles	Principal Arterial
MC 85	Jack Rabbit Trail to 75 th Avenue	15.0 Miles	Principal Arterial
West Region			
Sun Valley Parkway	I-10 to Loop 303	28.0 Miles	Enhanced Arterial

Chapter 4

NEEDS ASSESSMENT AND OPTIONS FOR SECURING ADDITIONAL REVENUES

4.1 INTRODUCTION

This Needs Assessment is essentially a comparison of projected revenues and projected costs for the period 2006 through 2026. Projected costs in excess of projected revenues result in a revenue shortfall.

Projected costs are heavily dependent on the Level of Service (LOS) Maricopa County intends to provide on its roadway system. This issue is especially a factor with establishing the capital needs and costs through 2026. This summary reports needs and costs relative to achieving LOS C on MCDOT system roadways. (The Technical Supplement to the TSP provides needs and cost information if the goal is LOS D or E.) Projected costs are measured as capital improvement costs, operation and maintenance O&M costs, and personnel costs.

Findings include the following:

- MCDOT faces a revenue shortfall through 2026 of \$2.9 billion to produce a system at LOS C.
- An option for securing additional revenues that is potentially available to the county is a roadway development impact fee program. A county roadway development impact fee could generate revenues of between \$326.3 million under the most constrained assumptions to \$4.4 billion under the least constrained assumptions.
- An expanded improvement district program has a low overall potential for generating new revenues, but any new revenues could be specifically targeted to “niches” in the MCDOT system, especially for rural areas where existing residents and businesses are requesting that the county pave their roads and include them in the county's maintenance system.
- The State Legislature exerts total control over a revenue source with great potential for generating needed new revenues: the statewide gasoline and use fuel taxes. Three options for raising these taxes were reviewed, with projections of additional Highway User Revenue Fund (HURF) revenue for MCDOT ranging from \$335.6 million to \$1.03 billion.

The timing of annexation of currently unincorporated areas within Municipal Planning Areas and the schedule for constructing roadway improvements within these areas will greatly affect MCDOTs forecast of needs and revenue. Every lane-mile of new capacity that goes to construction after annexation would be the responsibility of the annexing jurisdiction, not MCDOT. Additionally, annexation will influence MCDOTs projected O&M costs.

On the revenue side, annexation could reduce the County's share of statewide population, thereby reducing its proportional share of HURF revenues. Furthermore, if the County establishes a development impact fee program, annexation will affect MCDOTs revenues from this new source, depending upon whether annexation occurs before or after the development occurs and the County has collected the fees.

4.2 NEEDS ASSESSMENT

4.2.1 INTRODUCTION

Projected revenues and costs have been examined to determine the extent of the revenue shortfalls facing MCDOT from 2006 through 2026.

4.2.2 PROJECTED REVENUES

Table 4-1 provides the revenue estimates for 2006 through 2026. The projection is for \$4.1 billion in revenues, with \$1.5 billion between 2006 and 2015 and \$2.6 billion from 2016 through 2026. State shared revenues, HURF and Vehicle License Tax, are the principal source of revenues, constituting \$3.7 billion (almost 90%) of total revenues. The next largest source of revenues is other IGA revenues, at \$227.4 million. Table 4-1 assumes the statutory formulas for distributing HURF revenues will not change and the county's share of unincorporated population will remain the same.

4.2.3 PROJECTED COSTS

Costs are projected through 2026 in three categories: capital improvement costs, operation and maintenance costs and personnel costs. Capital improvement costs include roadway costs and other capital costs (bridges and other structures, bicycle lanes, etc.). Levels of costs are established based upon needs, not upon available revenues or what MCDOT has spent in the past.

4.2.3.1 Capital Improvement Costs for Roadways

Capital improvement costs for roadways include capacity enhancements to existing roads and new roads.

As developed in Chapter 3, 1,622 lane-miles of construction would be needed to achieve LOS C by 2015 and 1,601 additional lane-miles would be needed to achieve LOS C by the end of 2026. Thus, the total need would be for 3,223 lane-miles of construction through the year 2026. This includes capacity enhancements to existing roads as well as construction of new roads.

Table 4-1 MCDOT Revenue Projections, 2006 – 2026

Revenue Source	2006-2015	2016-2026	Total
State Shared Revenues			
State Shared HURF	1,225,400,000	2,164,400,000	3,389,800,000
State Shared Vehicle License Tax	106,400,000	176,500,000	282,900,000
Subtotal State Shared Revenues	1,331,800,000	2,340,900,000	3,672,700,000
Other IGA Revenues			
IGA Revenues	103,680,000	123,750,000	227,430,000
Maricopa County Controlled Revenues			
Licenses/Permits Revenues	19,800,000	22,000,000	41,800,000
Miscellaneous Revenues	16,345,000	19,800,000	36,145,000
Interest Income Revenues	6,230,000	7,150,000	13,380,000
Gain on Fixed Assets Revenues	3,125,000	3,575,000	6,700,000
Subtotal Maricopa County	45,500,000	52,525,000	98,025,000
Controlled Revenues			
Grant Revenues			
Federal Grant Revenues	40,000,000	44,000,000	84,000,000
Developer Contributions Revenues	8,850,000	9,900,000	18,750,000
Subtotal Grant Revenues	48,850,000	53,900,000	102,750,000
TOTAL REVENUES	1,529,830,000	2,571,075,000	4,100,905,000

Table 4-2 presents projected capital improvement costs for roadways, for 2006 – 2015 and 2016 – 2026, assuming an average cost per lane-mile of \$1,270,000 (including planning, design and construction management). This estimate of cost per lane-mile was provided by MCDOT, based upon their methodology for calculating improvement costs for the Highway Economic Requirements System (HERS) Model, a methodology developed by the Federal Highway Administration to help with estimates of future investment requirements in roadway systems. When MCDOT last compiled data for HERS in early 2006 the average cost/lane-mile was just over \$1.26 million. This estimate has been rounded up to \$1.27 million/lane-mile, to take into account inflation of costs since MCDOT's last input into the HERS Model.

For LOS C, roadway capital improvement costs by 2015 would be \$2.1 billion and for 2016 – 2026 the costs would total \$2.0 billion. Therefore, the total projected capital improvement cost for roadways would be \$4.1 billion (see Table 4-2).

Table 4-2 Estimated Capital Improvement Costs for LOS C, by Period

Period	Cost Categories	Lane-Miles/Costs*
2006-2015	Lane-Miles Needed	1,622
	Capital Costs	2,059,940,000
2016-2026	Lane-Miles Needed	1,601
	Capital Costs	2,033,270,000
Total	Lane-Miles Needed	3,223
	Capital Costs	4,093,210,000

- Assumes cost of \$1.27 million per lane-mile.

4.2.3.2 Adjusting Projected Capital Improvement Costs

The capital improvement costs estimated above are for roadways only. MCDOT, however, will encounter other costs for capacity improvements. The Arizona Association of County Engineers (AACE) “Year 2004 Roadway Needs Study Update,” for example, reports on \$116.9 million in needs for “New Bridges on Existing Roads” in Maricopa County between 2005 and 2014. The 1999 MCDOT Needs Study lists several “capacity enhancement” needs in addition to those on roadways, including bridge capacity enhancements, bike lanes, signalization capacity enhancements, capacity-related safety projects, system wide capital projects, and capital expenditures for AZTech model deployment. Together, these "other" needs accounted for \$382.2 million or 25.2% of the total \$1.52 billion in “capacity enhancement needs” identified in the 1999 study. Based on these sources, relying only on costs of roadway capacity needs will understate actual total capital capacity costs. Table 4-3 presents adjusted estimates of capacity needs, assuming that other (non-roadway) capital needs would add 25% to total costs. For LOS C, the 2015 costs would increase to \$2.6 billion; 2026 costs would rise to \$2.5 billion; and total capital improvement costs would grow to \$5.1 billion.

Table 4-3 Adjusted Estimate of Capital Capacity Costs

Period	Capital Costs*	Adjusted Capital Costs**
2006-2015	2,059,940,000	2,574,925,000
2016-2026	2,033,270,000	2,541,587,500
Total	4,093,210,000	5,116,512,500

* Includes roadway costs only.

** Includes roadway costs plus other capital costs.

4.2.4 PROJECTED OPERATIONS AND MAINTENANCE COSTS

In addition to estimates of the costs of new roads and capacity enhancements on existing roads, the Needs Assessment must include an estimate of O&M costs through 2026.

In its benefit-cost analyses, MCDOT estimates O&M costs at \$12,100 per lane-mile. The average number of lanes for all paved roads is 2.18, which translates into average O&M cost per mile of approximately \$26,400.

This estimate does not include an estimate of what the Arizona Association of County Engineers (AACE) “Year 2004 Roadway Needs Study Update” identified as “operating expenses” for system support efforts that include administrative costs, upkeep and expansion of maintenance yards, education programs, citizen involvement and transportation planning ... and other system wide projects” that represent 10% of O&M costs. Applying the AACE 10% to the estimated annual O&M Costs of \$26,400 would increase estimated annual O&M costs to \$29,040, which has been rounded up to \$30,000/mile of paved road.

There are 1,893 miles of paved road in the MCDOT maintenance system and 719 miles of unpaved roads, for a total existing system of 2,628 miles. It is assumed the inventory of unpaved roads will continue to decline, as MCDOT completes paving programs needed for air quality compliance. It is estimated an average of 10 miles of unpaved roads will be paved each year, increasing the paved road inventory to 1,993 miles. It is further assumed with construction of new roads and the conversion of County roads through annexations, the net MCDOT paved roadway system through 2026 will remain at 1,993, rounded to 2,000 miles of paved roads.

Assuming average annual costs/mile of \$30,000 and a net of 2,000 paved miles in the County maintenance inventory, annual O&M needs would be \$60 million per year, with \$600 million in the period of 2006 through 2015 and \$660 million for 2016 through 2026, for total O&M needs of \$1.26 billion.

4.2.5 PROJECTED PERSONNEL COSTS

The methodologies described above, to estimate capital costs and O&M cost, do not include an accounting of personnel services costs. The County's Fiscal Year 2007 budget includes recommended expenditures of \$29.9 million for personnel services, for a staff of approximately 480 employees. For simplicity, this amount is rounded up to \$30 million per year and an average annual expenditure of that amount is assumed through 2026. That results in projected personnel services costs of \$300 million for the period through 2015 and \$330 million for the period through 2026, for total costs of \$630 million.

4.2.6 TOTAL PROJECTED COSTS

Table 4-4 summarizes total projected costs for a system at LOS C through 2026. Total costs for 2006 – 2015 are \$3.5 billion, costs for 2016 – 2026 are \$3.5 billion, and costs over the entire period are \$7.0 billion.

Table 4-4 Combined Projected Costs, 2006 through 2026 for LOS C

Cost Categories	2006-2015	2016-2026	Total
Capital Improvement Costs	2,574,925,000	2,541,587,500	5,116,512,500
Operations and Maintenance	600,000,000	660,000,000	1,260,000,000
Personnel Services Costs	300,000,000	330,000,000	630,000,000
Total Needs	3,474,925,000	3,531,587,500	7,006,512,500

4.2.7 CALCULATION OF PROJECTED REVENUE SHORTFALLS

Table 4-5 shows projected revenue shortfalls for a system at LOS C. From 2006 through 2015, the revenue shortfall would be the largest, at \$1.9 billion (56% of existing revenues). From 2016 through 2026, the revenue shortfall decreases somewhat but is still substantial at \$960 million (27.2%). For the entire period, the shortfall would be \$2.9 billion (41.5%).

4.3 OPTIONS FOR SECURING ADDITIONAL REVENUES

MCDOT faces a revenue shortfall of \$2.9 billion for a system at LOS C. As is true for transportation departments throughout the country and at all levels of government, MCDOT's transportation revenue picture has not improved, and might have worsened, over the decade since the 1999 study. Facing a future of increases, some probably dramatic, in the Construction Cost Index, revenue constraints will continue to worsen unless MCDOT can take steps to find additional revenues.

The technical supplement to the TSP includes a review of options for increased revenues, such as implementation of a roadway development impact fee program or expanded use of improvements districts. It also demonstrates the capacity for increased revenues, for MCDOT and all other transportation agencies in the state, if the Legislature were to increase the statewide gasoline/use fuel taxes and index both of them to inflation in the future.

Under any scenario regarding new revenues, HURF revenues will continue to be the major source of funding for MCDOT. If gasoline and use fuel taxes remain frozen at the levels set in the early 1990's, the purchasing power of this revenue source will continue to decline, while the costs of new capacity and O&M continue to increase, with the effects of inflation and increase in demand. Raising these taxes would improve the revenue picture for MCDOT, as well as every other jurisdiction in the County.

Either an impact fee program or increased gasoline/use fuel tax could help raise significant new revenues for MCDOT. For example, the lowest estimate for impact fee revenues was \$326.3 million and for gas/use fuel tax increase was \$335.6 million. Combined, these options would generate an additional \$662.0 million in revenues for MCDOT.

Table 4-5 Estimated Revenue Shortfall for LOS C, 2006 - 2026

	2006-2015	2016-2026	Total
Needs			
Operations and Maintenance	600,000,000	660,000,000	1,260,000,000
Capital Improvement Costs	2,574,925,000	2,541,587,500	5,116,512,500
Administrative Costs	300,000,000	330,000,000	630,000,000
Total Needs	3,474,925,000	3,531,587,500	7,006,512,500
Revenues			
State Shared Revenues	1,331,800,000	2,340,900,000	3,672,700,000
Other IGA Revenues	103,680,000	123,750,000	227,430,000
Licenses/Permits Revenues	19,800,000	22,000,000	41,800,000
Miscellaneous Revenues	16,345,000	19,800,000	36,145,000
Interest Income Revenues	6,230,000	7,150,000	13,380,000
Gain on Fixed Assets Revenues	3,125,000	3,575,000	6,700,000
Federal Grant Revenues	40,000,000	44,000,000	84,000,000
Developer Contributions Revenues	8,850,000	9,900,000	18,750,000
Total Revenues	1,529,830,000	2,571,075,000	4,100,905,000
Shortfall (Revenues Less Costs)	-1,945,095,000	-960,512,500	-2,905,607,500
Shortfall (% of Total Needs)	-56.0%	-27.2%	-41.5%

In addition, what the future holds in store for MCDOT, both in terms of revenues (existing and new) and costs will be affected by how quickly annexation proceeds. The department should closely monitor this issue and adjust its projections of revenues and costs accordingly.

Ultimately, elected officials and policy makers have the responsibility to determine if and when it is prudent to pursue additional revenue sources. Whether additional revenues are pursued or not, MCDOT will continue to be well served by following its guiding vision to provide the right transportation system, at the right time, and at the right cost.

Chapter 5

ASSET MANAGEMENT

5.1 PURPOSE

The primary purpose of Asset Management is to improve the allocation of funding by developing long-term budget scenarios that show the implications of alternative investments in maintenance, operations and capital. Maintenance is the preservation or extension of the life of an asset or the correction of a distress that impedes mobility, safety, serviceability or engineering integrity. Operations are a focus on real-time service and operating efficiency that enables a facility to provide the maximum level of service before expansion is necessary. Capital improvement is the addition of physical capacity to an existing facility or creating new capacity constructing a new facility. The task of developing long-term budget scenarios will focus primarily on the maintenance and operations functions. MCDOT has years of experience in long-range planning on the capital side, while having minimal experience with forecasting long-range needs and project programming for maintenance and operations.

There are five tasks necessary to achieve the development of the long-term budget scenario objective:

1. Evaluate existing MCDOT programs, determining the program funding alternatives that can be evaluated by MCDOT using appropriate strategies.
2. Benchmark program performance measures against peer agencies.
3. Develop a list of performance measures for each program.
4. Estimate the optimal distribution of revenues among maintenance, operations and capital.
5. Recommend a MCDOT program funding distribution and methodology.

5.2 EXISTING MCDOT PROGRAMS

The MCDOT Planning Division uses the HERS Model to analyze system condition and performance. The results and analysis may enable decisions to be made regarding maintenance versus capital expenditures utilizing a benefit/cost (B/C) ratio for each project. There are numerous variables that need to be incorporated into the modeling, such as roadway condition information, volume/capacity (V/C) ratio and geometrics. The benefits from various expenditure levels are determined by setting multiple deficiency levels in the HERS Model. In the HERS Model the pavement condition is measured by the International Roughness Index (IRI), a universally recognized international standard. The HERS Model determines the surface improvements needed and selects roads for maintenance by the highest B/C ratio. However,

there is uncertainty as to whether the HERS Model has the ability to be utilized effectively for programming capital versus maintenance, because it is only capable of looking at one maintenance strategy at a time. The HERS Technical Report provides the background information for deterioration curves and equations that are used within HERS. MCDOT adjusted the default curves to better reflect the climate and conditions of the environment in Maricopa County.

MCDOT has established a Pavement Condition Rating (PCR) index that provides individual roadway section and overall system pavement ratings. The evaluation information is contained in the MCDOT Road Management System (RMS). The MCDOT accepted overall rating for arterial roads has been a PCR in the 80 to 90 range. In the late 1990's, the arterial overall rating was going up (90+) because of additional funds being transferred from the capital program. More recently the arterial network has normalized (81+) because the maintenance budget has not been augmented as substantially and new equipment is being used to more accurately measure the road profile. The questions remain: What will happen to the system condition if maintenance continues at the current funding level and what happens if funding is varied?

The primary tool for planning and programming roadway maintenance is the Roadway Management System (RMS). The RMS utilizes roadway inventory data such as: name and cross reference, segment length, functional classification, number of lanes, lane width, surface type, shoulder width and type, maintenance history and traffic volumes. The RMS also maintains the Pavement Condition Rating (PCR) and the detail for each road segment. The surface distress measures include: cracking, rutting, raveling, shoving, patching and excess asphalt. The individual road ratings can then be combined to develop an overall system rating. This process is detailed in the MCDOT Road Management System Procedures. The IRI is determined using a triple (3) laser road profiler.

PCR and IRI are the two measures of the overall system performance that can provide the comparative data necessary to determine the impact of various expenditures on future pavement condition. Monitoring these measures over time will assist in establishing an acceptable standard of performance for the PCR, IRI, and support future budget decisions.

RMS Phase 1 (completed April 2004) is the edit module. The edit module includes: generating rating schedules, updating PCR and IRI ratings and developing maintenance plans. RMS Phase 2 is the business analysis and budget optimization modules, including: system analysis, budget options, custom reporting and multi-year prioritization (to be completed in 2006-2007). The goal of the RMS is to enable the creation of funding scenarios in order to keep the network at an established, acceptable performance level. There is a need to develop a set of pavement degradation curves for the MCDOT pavement network.

Operations must be recognized as having a strategic role in maximizing the roadway system's capacity and be established as a key element of good system management. Transportation operations have always been a logical component of highway management. Lower cost operational improvements that enhance the system performance are routinely evaluated and applied prior to or within transportation improvement Projects. MCDOT uses MUTCD warrants to evaluate congestion and safety issues.

The third program is Capital improvements. MCDOT has years of experience in long-range planning on the capital side with a very sophisticated process for selecting projects. The

Transportation Improvement Program (TIP) programming process takes projects through a rigorous series of steps that includes: review of the initial project request, scoring, prioritization, corridor studies, Candidate Assessment Reports (CAR) and Design Concept Reports (DCR) that enable MCDOT to develop long-range plans for capital construction. The capital program utilizes the annual TIP funding and develops alternative funding sources with developers and agreements with cities and towns in the form of Inter-Governmental Agreements (IGA).

5.3 BENCHMARK PROGRAM PERFORMANCE MEASURES

Specific meetings were held with representatives from several counties and a software consultant to research benchmarking methods. A search of best practices of county, local, state and federal agencies was conducted, including the Federal Highway Administration Long-Term Pavement Performance (LTPP) Program, a twenty-year ongoing project with extensive pavement measures performance data.

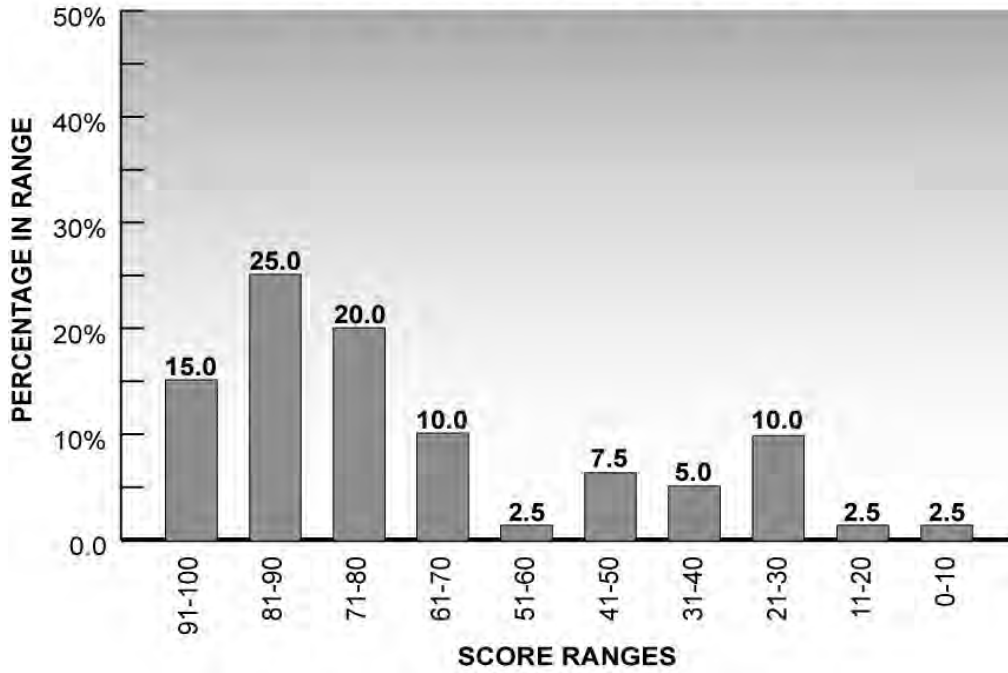
Some counties and cities use proprietary software programs to evaluate system performance based on varying budget levels. Figure 5-1 shows a typical pavement analysis for a single roadway classification. The figure shows both the current condition of the pavement and the pavement condition in fifteen years, assuming no increase in funding. This type of analysis can be done in annual increments with varying funding amounts. The process uses an empirical analysis that may be tempered with staff judgment. The primary focus is on a pavement condition rating of individual roadway segments as well as the entire system.

One of the perceived difficulties of using system performance indexes as a benchmark is the inability to make a direct comparison with other agencies that use different techniques and roadway evaluation parameters. Most agencies have generally accepted the utilization of a pavement condition index (100-point system) and the IRI as good measures for reporting on system performance. There are two primary differences among agencies regarding the use of the pavement condition index. The first difference is what surface distress measures are used to determine the index. This varies among agencies by the number and the type. The second difference is establishing the value to be used as the agency performance standard. An overall system index in the 85 range is generally considered acceptable. The actual target value seems to be one of agency preference, and in some cases this value is part of an agency policy or resolution.

The IRI is a roughness index measured mechanically and scored on a sliding scale from 1 to 500 with 500 representing an extremely rough road. The local agency determines the IRI targets. An IRI for a roadway segment in the 65 to 75 range is considered excellent by most agencies, however, MCDOT has a slightly higher standard for excellent, which is less than 60. Table 5-1 shows the pavement condition ratings for a sample of cities and counties across the country.

Figure 5-1 Pavement Distress Score Distribution

**PAVEMENT DISTRESS SCORE DISTRIBUTION
Arterial Streets—Current Year**



**PAVEMENT DISTRESS SCORE DISTRIBUTION
Arterial Streets—In 15 Years**

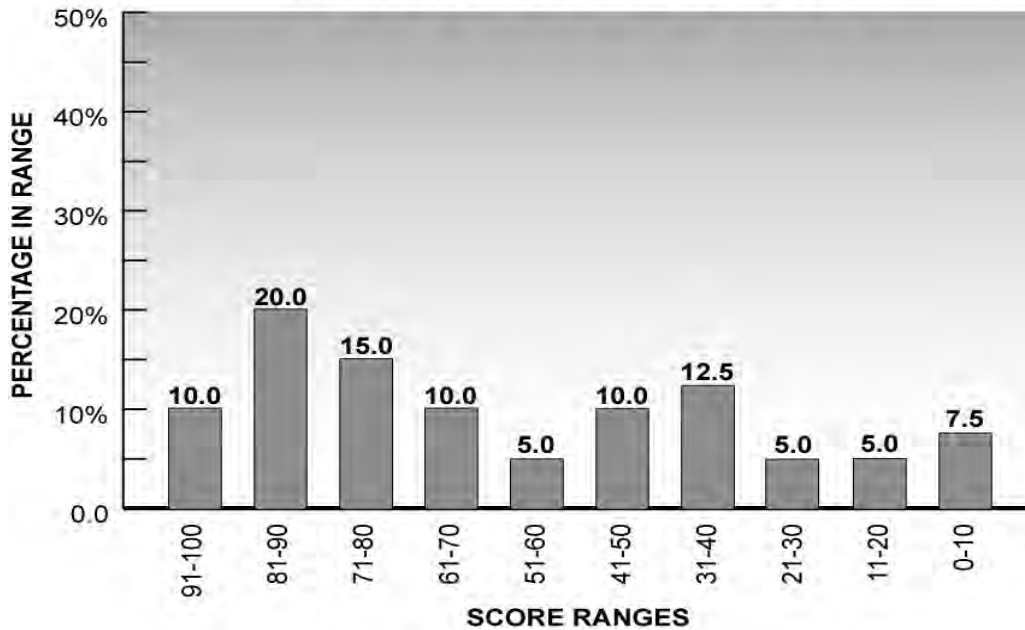


Table 5-1 Typical Pavement Condition Performance Ratings

Agency/Organization	Pavement Rating System	Performance Standard
MCDOT	Pavement Condition Rating (PCR) 0-100 Based on Pavement Surface Distress Evaluation	85
Yuma County	Pavement Condition Rating (PCR) 0-100 Based on Pavement Surface Distress Evaluation	100% of Pavements >75
City of Mesa	Pavement Condition Index (PCI) 0-100 Based on Pavement Surface Distress Evaluation	85 (Arterials)
City of Oxnard, CA	Pavement Condition Index (PCI) 0-100 Based on Pavement Surface Distress Evaluation	>90 (Arterials)
Bay Area, CA (MTC, Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Salano, Sonoma)	Pavement Condition Index (PCI) 0-100 Based on Pavement Surface Distress Evaluation	75-80
City of Lake Oswego, OR	Pavement Condition Index (PCI) 0-100 Based on Pavement Surface Distress Evaluation	>80
City of Stockton, CA	Pavement Condition Index (PCI) 0-100 Based on Pavement Surface Distress Evaluation	>80
Ohio DOT	Pavement Condition Rating (PCR) 0-100 Based on Pavement Surface Distress Evaluation	90% >75
Washington DOT	Pavement Structural Condition (PSC) 0-100 Based on Pavement Surface Distress Evaluation	80
Nebraska DOT	Pavement Condition Rating (PCR) 0-100 Based on Pavement Surface Distress Evaluation	82% >70

Operations have a number of indicators that can be used as performance measures. Local agency preferences are sometimes influenced by the impact of the general public acceptance and policy issues. Level of Service (LOS) is a generally accepted standard and is used by most agencies. However, the acceptable LOS and the application of the LOS to the road system may vary significantly. Therefore, it is important to understand the application of the LOS as well as what the chosen quality of performance means to the driving public. LOS can be applied to a system, area or individual roadway section. Other measures include travel time and V/C ratio. As with the pavement measures, there is variation among agencies as to the application and acceptable level, and it generally comes down to agency preference.

5.4 MCDOT PERFORMANCE MEASURES

An evaluation of the performance measures used by numerous other agencies and the current information, available data and measures used by MCDOT indicate there is significant consistency among agencies regarding performance measures. The differences arise from the individual agencies' application of the performance measure.

MCDOT currently sets pavement condition target values in their Managing for Results (MFR) program and in their Asset Management program. In both cases, the Pavement Condition Rating (PCR) is used as the primary measure. The PCR ranges from 0 to 100 with 100 indicating the pavement is in perfect condition.

The Asset Management/GASB 34 program states that “MCDOT will maintain 85% of all paved roads to a PCR of 70 or above and no more than 5% will be allowed to fall below 55.” The target results are weighted by lane-miles in the Asset Management program. Currently, 86.5% have PCR values above 70, and 0.1% have PCR values below 55. Typically, non-arterial (local) roads are maintained at a lower level than arterial roads since speed limits are much slower on local roads. Approximately 94.8% of MCDOT local roads have PCR values above 70 while 81.6% of non-local roads have PCR values above 70.

Optimally, MCDOT would be able to maintain roads to a PCR level of “excellent” (85 to 100). This would minimize the noise emitted from the tires of vehicles traveling on the roads and would minimize future maintenance needs about 58% of MCDOT pavements have PCR values of 85 and above.

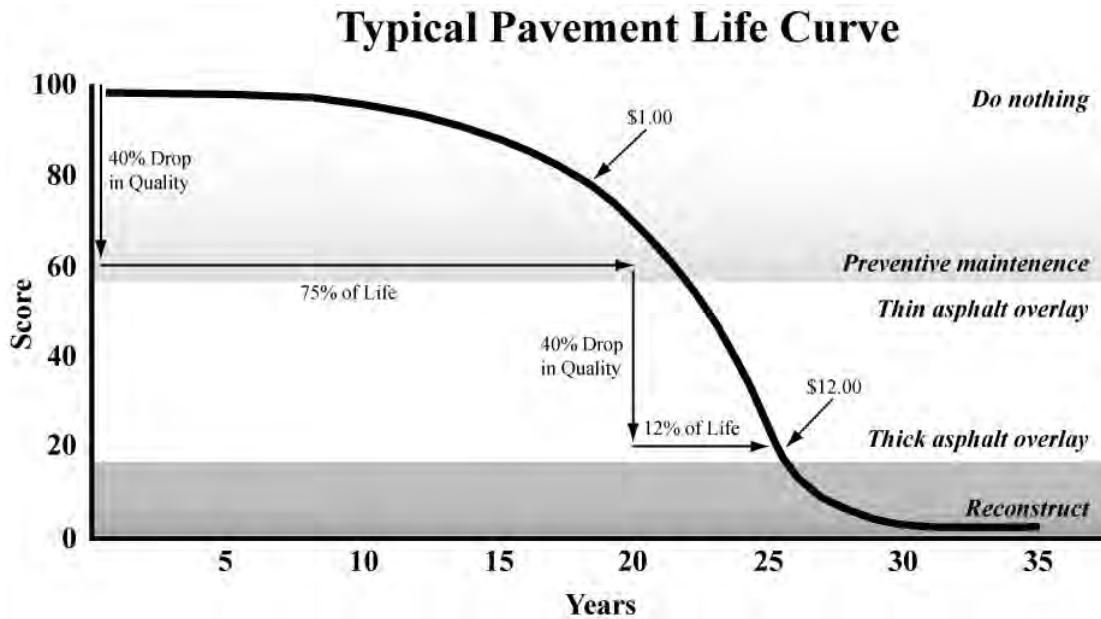
Given the Asset Management/GASB 34 targets and the speed limit considerations, MCDOT should strive to maintain 80% of arterial roads above a PCR value of 70. MCDOT should also strive to maintain 70% of local roads above a PCR of 70.

Asset Management targets are currently the only measures used to indicate the most justifiable levels for MCDOT to set pavement condition target values. MCDOT is in the process of developing Phase 2 of the MCDOT Roadway Management System (RMS). RMS Phase 2 will provide much more detailed information to aid in the current and future management of MCDOT pavements. It should also allow MCDOT to set pavement condition target values based on economic criteria such as life-cycle cost analyses and cost effectiveness of multiple management options. MCDOT will use RMS Phase 2 to set future targets when the application becomes available.

5.5 ESTIMATE THE OPTIMAL FUNDING DISTRIBUTION BETWEEN MAINTENANCE, OPERATIONS AND CAPITAL

Some agencies utilize pavement life curves, such as the one shown in Figure 5-2, to help in making decisions about allocation of funding among maintenance, operations and capital programs or needs.

Figure 5-2 Typical Pavement Life Curve



The current MCDOT budget process is relatively straightforward and is guided by the Office of Management and Budget (OMB). OMB annually provides the budget target for both capital and operations. MCDOT recommends the specific items that go into capital budget. With approximately 95% of the MCDOT budget being state shared revenues, Highway User Revenue Fund (HURF) and Vehicle License Tax (VLT), the funding levels are predictable and show modest growth into the future.

The maintenance program would be well served by having analysis and reports to support the appropriate funding level. The current maintenance budget is based on last year's expenditures and not on how the system is performing or on the predicted future performance. The program funding distribution process should be driven by MCDOT, based on the funding levels provided in the OMB. This process improvement will enable MCDOT staff to make budget adjustments based on actual needs versus arbitrary increases in the annual budget provided by OMB.

5.6 RECOMMEND A MCDOT PROGRAM FUNDING DISTRIBUTION AND METHODOLOGY

An issue that must be recognized is that the development of the maintenance, operations and capital budgets are independent exercises, and the final determination of the respective amounts in those budgets is based on policy and adopted performance standards. The process recognizes that there will always be limited resources. Trade-offs will have to be made in order to financially constrain the budgets.

Agencies have a significant investment in their existing roadway system, which demands that maintaining that investment is a top priority. There are a number of issues that will need to be resolved to determine the appropriate funding for maintenance. First, establish the appropriate performance standard for the pavement condition rating. Secondly, determine the system performance over time based on various funding levels. To achieve this it will be necessary to develop pavement degradation curves.

The operations process should be similar to the one for maintenance. There must first be agreement on the standards and their application. What is the appropriate LOS for the system and how are travel time and V/C used in the operational improvement process? The key is to be able to determine when to make operational improvements versus capacity expansion improvements. Utilization of the HERS Model may prove to be useful in making operational versus capacity expansion improvements.

Chapter 6

TRANSPORTATION POLICIES

The MCDOT Transportation System Plan update includes a long range assessment of roadway infrastructure needs to accommodate increasing travel demand associated with population growth. The magnitude of the transportation needs associated with these growth forecasts raises a variety of issues within MCDOT.

As part of the update, MCDOT has investigated options relative to several important transportation policy issues to better help the agency meet public expectations. These policy issues involved the following subject areas:

- Transportation Impact Fees and Improvement Districts
- Needs of an Aging Population
- Roadside Amenities
- Scalloped Street Improvements
- Major Bridges
- Intersection Improvements
- MCDOT Role in Regional Transportation

Research was conducted and policy papers were prepared on each individual policy issue. In addition, input on each policy issue was received from cities, towns, and the Maricopa County Transportation Advisory Board (TAB). The full text of each policy paper may be found in the Appendix.

6.1 IMPACT FEES AND IMPROVEMENT DISTRICTS

Increased travel demand driven by population growth puts increased pressure on MCDOT to both provide new roads and upgrade existing facilities to accommodate travel demand. In fact, between 2006 and 2026, more than \$7 billion would be required to maintain the MCDOT road system and fund needed capital improvements. Over the same period, \$4.1 billion in revenues are anticipated.

These growth pressures on the MCDOT road system and the revenue shortfall make it important that development pays its fair share of roadway expansion costs. Arizona state statutes allow counties to implement development impact fee ordinances. Impact fees can be assessed for water and sewer infrastructure, parks and public safety facilities in addition to streets. Pima County and Yavapai County are the only two Arizona counties that currently assess development impact fees. As of September 2006, Pinal, Cochise, and Santa Cruz counties are considering impact fees. Within Maricopa County, ten cities impose impact fees for transportation. Maricopa County itself uses a thorough yet informal process of negotiating developer contributions through the development agreement process.

Both transportation impact fees and improvement districts may have merit as a means to assess development for the infrastructure costs of growth. Recognizing that a decision to implement or not implement a formal program lies with the Board of Supervisors, this discussion provides a primer for decision makers to help shape potential new policy as they see fit.

6.2 NEEDS OF AN AGING POPULATION

Elderly residents and visitors within Maricopa County comprise a significant proportion of drivers using MCDOT facilities. One major challenge for these drivers, among others, is the ability to negotiate roadway segments and intersections safely. Current MCDOT roadway design and operations standards have been reviewed relative to guidelines provided by Federal Highway Administration (FHWA). This analysis determined that current MCDOT standards closely match or exceed FHWA recommendations.

Comments solicited from cities and towns indicated that municipalities are implementing measures to facilitate navigation through the roadway system. These measures include larger signs, larger fonts on signs, illuminated signs, advance street signs in medians, and longer crossing times for pedestrians. These measures are applied uniformly through coordination with the MAG Safety Committee.

Specific areas where modifications to MCDOT standards or practice were considered include: intersection median design, sight distance enhancements, and improved pavement markings and signing. MCDOT believes an appropriate approach is to work closely with the MAG Safety Committee on these matters and adopt measures as appropriate in coordination with the MAG cities and towns.

6.3 ROADSIDE AMENITIES

MCDOT often engages in multi-jurisdictional roadway improvement projects. While intergovernmental agreements with municipalities provide funding mechanisms, delays in design and construction sometimes result when MCDOT design standards and the partner city's design standards are different. While MCDOT's historical role has been providing farm-to-market transportation infrastructure, these city-county partnerships put increasing pressure on MCDOT to provide urban roadside amenities.

Current MCDOT standards and practices have been examined related to roadside amenities including roadside landscaping, raised medians, sidewalks, street lighting, and utilities sitting. It is recommended that MCDOT should maintain its focus on following currently adopted guidelines to provide safe and adequate transportation facilities.

6.4 SCALLOPED STREET IMPROVEMENTS

Patterns of development coupled with municipal annexation create 'scalped streets' on many MCDOT arterials. This is a situation where either one side of the street is improved and the other is not or the number of travel lanes along a roadway segment is otherwise inconsistent. Scalped streets are aesthetically undesirable and may sometimes create potential operational and safety challenges. Most occurrences of scalped streets exist around growing communities due to developers building half-street improvements to the roadway centerline along the project frontage. The full arterial cross section should be built as infill occurs. However the timing of developments does not always coincide. As a result, roadways on the periphery of the metropolitan area often evolve with lane imbalances.

Funding for improvements to scalped streets is the primary challenge. Currently, MCDOT prioritizes improvements to scalped streets through its Transportation Improvement Program (TIP) process that many times include intergovernmental agreements.

In addition to continuing to apply appropriate criteria for identifying and prioritizing scalped street improvements, MCDOT has considered the following policy options, among others, during this TSP update effort.

1. MCDOT could support/develop a region-wide policy that requires developers to over pave beyond the roadway centerline to maintain centerline orientation, providing a balanced number of lanes in both directions as an interim operation improvement, thus avoiding scalped street patterns.
2. MCDOT could support/develop a policy that would require the first new development on an unimproved section-line road to improve both sides of the entire roadway segment with costs to be shared by subsequent developers. This policy should include a threshold (i.e., units, trips, or length of frontage) that would trigger implementation of this policy.
3. MCDOT could consider earmarking funds for scalped street improvements.

While it may or may not prove prudent to pursue any of the above options, MCDOT will work with municipalities in the county to develop an appropriate strategy regarding scalped streets. The selected strategy could be applied countywide or tailored to specific working relationships with individual municipalities.

6.5 BRIDGE IMPROVEMENTS

Increased travel demand from rapid population growth is creating a greater demand for new and wider bridges across major stream and river channels on the MCDOT roadway system. Currently five bridges are under development. Three bridges from Proposition 400 are on the MCDOT system. There is also a recently completed bridge needs study for Agua Fria River crossings between Interstate 10 and Bell Road.

Most bridge construction over the past ten years has been funded by developers. Maricopa County is certified to administer the expenditure of federal funds, however few bridges off of the state highway system are built with federal monies. MCDOT could perform an oversight role for bridge design and construction due to its historical knowledge of bridges within the county. Further, some of the growing West Valley communities may not have necessary expertise to provide oversight for bridge design and construction. This may generate a need for MCDOT assistance.

Funding is a challenge because of the significantly high cost of constructing a major bridge. For the foreseeable future, MCDOT will continue to prioritize and schedule bridge projects based on need and will conduct additional studies similar to the Agua Fria River Crossing Study model, as appropriate.

6.6 INTERSECTION IMPROVEMENTS

Intersection widening has been evaluated as an interim measure for providing capacity improvements on existing MCDOT roadways. While there are no formal guidelines or policies governing the implementation of intersection improvements versus general roadway widening, MCDOT recognizes the benefit of increasing capacity at intersections to ease system bottlenecks.

Travel time research conducted as part of this policy analysis indicated that interim intersection improvements could provide a clear travel time savings for a relatively modest capital investment. As a result, MCDOT will specify that its future design concept reports consider interim intersection improvements in the matrix of potential capacity solutions together with general segment widening. MCDOT will also be open to consideration of such projects as candidates for Special Project Fund monies, as determined by the Transportation Advisory Board.

6.7 MCDOT ROLE OPTIONS

As part of this TSP update, MCDOT has carefully considered its fundamental roles and has conducted dialogues with its partner agencies regarding appropriate MCDOT roles for the future. As a result, it appears appropriate that MCDOT roles could include the following:

1. Continue to build, maintain, and operate roads in unincorporated Maricopa County. (This is the county's fundamental statutory role.)
2. Transition rural roads to urban roads by constructing the right road, at the right time, and at the right cost, and then transferring these streets to the cities and towns.
3. At the request of, and in cooperation with, cities and towns, manage large multi-jurisdictional arterial street projects through the DCR, design, construction phases and traffic management.
4. Identify and preserve major street corridors in unincorporated areas of the county to serve regional travel.
5. Continue to identify bridge needs on major waterways, and build partnerships in the design and construction of these bridges.
6. Continue to lead and coordinate the AZTech program to provide Intelligent Transportation System (ITS) for roadways in Maricopa County.
7. Preserve right-of-way for identified high capacity corridors (enhanced arterials roadways, super streets, parkways, and potentially freeways, as deemed appropriate).

Chapter 7

IMPLEMENTATION WORK PROGRAM

7.1 PROLOGUE

Keeping the TSP up to date is critical for Maricopa County due to the continued growth this region will experience. It will be essential that the findings of future area studies, corridor studies and other transportation related studies be incorporated into the findings of this report to keep it current. As these studies are completed in the future, it is expected that the findings will be merged as appropriate. This is especially critical in the area west of the Hassayampa River and the area south of Interstate-10 in the Southwest portion of unincorporated Maricopa County.

Planning is a dynamic process that must adjust to ever changing conditions, such as major changes to the transportation networks or land-use changes. These changes should be monitored and accommodated in a timely fashion. Triggers may include, but should not be limited to, major changes to freeway corridor implementation, the addition of major rail transit corridors or the addition of new large master planned communities. Planning is often preparation, and if significant changes do occur, the guiding principals in this document should not stay static. Rather, they must be dynamic and refined to meet changing needs.

Transportation System Plan Update Process:

Keeping the Transportation System Plan current will be an ongoing effort for Maricopa County. The TSP will be monitored annually to address any major changes in the region that would require significant changes to this planning document. The TSP will also have to address any changes to the County Comprehensive Plan as those come along. Major updates to the TSP will take place every ten years, or sooner if required because of changes to the Comprehensive Plan or other major regional efforts.

Minor updates to the TSP may need to be considered on a regular basis. To ensure that these changes are evaluated and processed in a prompt manner, three types of updates will be considered:

- The first type of update will be the annual certification of the roadway network. This will include changes to the Primary, Secondary and Local Road Networks. This certification will be approved by the TAB during each fiscal year.
- The second type of update will occur through various transportation plans completed by MCDOT or another partner agency. These updates may be considered throughout the year and the findings from a given study will be considered part of the TSP when they have been adopted by the Board of Supervisors.

- The last type of update considered will be those due to special circumstances. These types of changes are considered when major impacts to the County roadway network are encountered. This could include changes to the regional freeway system, new large commercial developments or large residential developments that had not been anticipated. These types of updates can be considered throughout the year and will be brought forth by MCDOT staff.

7.2 FUTURE WORK AGENDA

There are significant work items that the TSP did not address, but have been identified and documented here as areas for further consideration. These items can be grouped in the following categories: future transportation studies, design guidelines, policy considerations, safety considerations, and other.

7.2.1 ONGOING MCDOT ACTIVITIES

- Annually complete the State of the System Report.
- Annually complete the Bridge, Safety and Congestion Management Reports.
- There are still many transportation corridors (both existing and those that will be identified as part of other planning studies) where corridor studies will be required. MCDOT will continue to program to start several new corridor studies each year as the need exists.
- Detailed transit planning in unincorporated communities such as the Sun Cities, Sun Lakes, and Anthem will be required in the future when the regional transit service begins to abut these communities. These studies will need to be completed soon and should include identifying alternative funding mechanisms since Maricopa County does not have the same funding options available as the cities and towns.
- Detailed bicycle plan updates should be investigated every ten years.
- There are still areas of Maricopa County where bridge needs must be further studied. These studies will primarily be focused in the west valley, but there may also be a need to evaluate bridge needs over large flood control structures and a need to look at grade separation strategies over rail lines throughout the County.
- As part of the policy analysis done for the TSP update, the roadway amenities the county should provide as part of roadway construction was evaluated. There were no recommendations made as part of the TSP, but there is ongoing work being conducted by the department on this issue and this area will require further work.

- The transportation needs analysis and funding options report that was completed as part of the TSP update identified a significant funding shortfall for country transportation needs. Both MCDOT and Maricopa County need to continue to investigate other funding alternatives that could be considered to meet the funding shortfall that is anticipated.
- Scalloped streets will continue to occur throughout the Maricopa Country region. MCDOT staff must continue to talk to all of the cities and towns in the region and establish an over-pave policy or some other alternative to help reduce the burden that growth and development cause.
- Assist the Statewide Over-Dimensional Vehicle Task Force in their efforts and follow through on oversize vehicle planning needs as they are identified.
- Continue development of Pavement Degradation Curves that apply to Maricopa County region.
- Continue refinement to the Performance Goals and Objectives established in the TSP.

7.2.2 NEW ACTIVITIES FOR MCDOT CONSIDERATION

- There are a number of transportation studies that will need to be completed in the future. MCDOT will partner with the Maricopa Association of Governments on two area studies in the West Valley: the I-10/Hassayampa Valley Roadway Framework Study and the Hidden Valley Roadway Framework Study. When completed, these studies will provide vital transportation needs analysis that should be incorporated as part of the TSP. Upon the completion of these two studies, MCDOT should immediately update the Major Streets and Routes Plan to account for all the new roadway corridors identified in these two area studies.
- One of the new programs identified as part of the TSP update is the Enhanced Arterial Roadways Program. There will be a need to identify pilot roadways that meet the program criteria and formally adopt those in the future.
- Complete a study to identify existing scallop streets.
- Maricopa County needs to complete a system-wide access management plan.
- MCDOTs current cost share policy will need to be updated to be in alignment with the new investment potential matrix and with what Maricopa County learned through the TSP update process. The policy work is critical and is a high priority for completion.
- Study the Single Vehicle Crash Phenomena to determine are there any programs or geometric changes that could help lower this crash type.
- Start a Safety Audits Program for Maricopa County.
- Investigate ways to increase funding for safety issues.

- Develop a Roundabout Strategy for MCDOT.
- Take lead in advancing the 511 traveler information service to encompass the regional arterial roads in Maricopa County.
- Provide leadership in improving the regional signal coordination to improve traffic flows and reduce delays on major corridors.
- Expand the REACT incident response program valley-wide through collaboration with cities and towns in Maricopa County.