Peoria Avenue Corridor Improvement Study: Jackrabbit Trail Parkway to Dysart Road

Final Report: Appendix

July 2011

MARICOPA COUNTY ARIZONA

MCDOT RightRoads PROGRAM

AECOM

Appendices

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Appendix A

Technical Memorandum No. 1: Existing and Future Corridor Features

Peoria Avenue Corridor Improvement Study: Jackrabbit Trail Parkway to Dysart Road

Technical Memorandum #1: Existing and Future Corridor Conditions

January 2011



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1.0 INTRODUCTION

The Maricopa Association of Governments (MAG) prepared the Interstate 10/Hassayampa Valley Roadway Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the build out of the area west of State Route 303 (SR 303L). This long range regional transportation study identified the need for a roadway network consisting of freeways, parkways, and major arterial roads.

The Hassayampa Framework Study recommended an extension of Peoria Avenue west from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial from the future Jackrabbit Trail Parkway to Sarival Avenue. The study area for this project includes Peoria Avenue from the future Jackrabbit Trail Parkway alignment to Dysart Road (Peoria Avenue Corridor). The study area generally encompasses a 2-mile wide corridor centered on the existing Peoria Avenue. The study area is shown in Figure 1.

This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also develop access management guidelines, determine design standards based upon which jurisdiction anticipates annexing the roadway, and develop an implementation plan. In general, the purpose of this Corridor Improvement Study is to provide the Maricopa County Department of Transportation (MCDOT) and other jurisdictions with a future "footprint" of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

The key objectives of this Corridor Improvement Study are to:

- Define and assess strategic issues within the project study area;
- Develop and evaluate conceptual alternative alignments within the corridor study area;
- Recommend a preferred alignment;
- Develop consensus for the preferred alignment;
- Define the characteristics of the preferred alignment; and
- Develop an implementation plan.

This technical memorandum identifies the existing and future corridor conditions including physical features (utilities, drainage, topography); land use and zoning; transportation network; roadway characteristics; traffic conditions; programmed improvements; and preliminary issues and constraints for the Peoria Avenue Corridor.

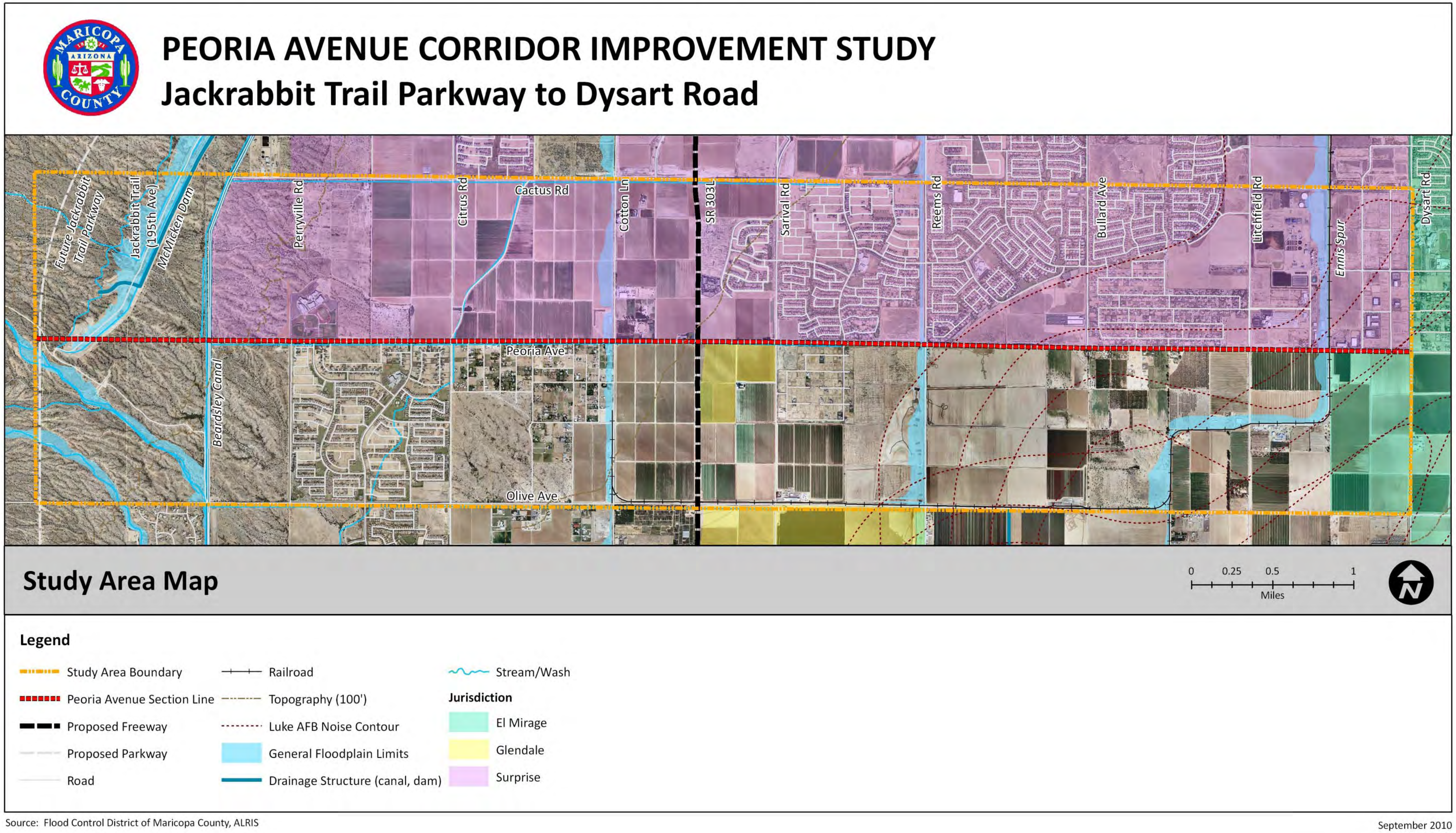


Figure 1 – Vicinity Map

2.0 LAND USE, ZONING, AND OWNERSHIP

Land Ownership and Management

Land ownership is identified in terms of public or private control, whereas land jurisdiction refers to the city, town, county, state, or federal agency or agencies exercising governmental authority over an area. The majority of the land in the study area is privately owned, with only about 20 percent of the westernmost study area publicly owned by the Arizona State Land Department (ASLD) (Figure 2). While much of the private land is parceled out and owned by individual property owners, there are several major private land holdings in the study area, including the Flood Control District of Maricopa County (FCDMC), Maricopa Water District (MWD), and Dysart Unified School District #89, as well as the major master planned community land owners of Property Reserve Arizona LLC and John F. Long and Home Place Development LLC.

Figure 3 depicts the boundaries of all the jurisdictions and their municipal planning areas (MPAs) within the study area. An MPA is defined as the geographic area in which the municipal planning process is carried out. It includes, but is not necessarily limited to, the incorporated territory of the city or town. Three MPAs lie partially within the study area: City of El Mirage, City of Glendale, and City of Surprise. Peoria Avenue serves as the boundary between the Glendale and Surprise MPAs. Maricopa County has planning and zoning authority over the unincorporated areas, including areas inside an MPA but outside the current city limits. The MPAs of El Mirage and Surprise are largely incorporated in the study area, while the areas in the Glendale MPA are mostly unincorporated, with the exception of a parcel abutting SR 303L and a 10-foot strip of land along the south side of Peoria Avenue from Perryville Road to east of Litchfield Road. This annexation is part of the City of Glendale Strip Annex Area which includes approximately 39 square miles of land with Peoria Avenue serving as the northern boundary. Other communities cannot annex property within the strip annex area. Maricopa County Planning and Development Department administers the zoning and subdivision ordinances within the strip annex area. The strip annex area is within the Glendale Municipal Planning Area. The northern edge of the 10-foot wide strip annex is located either 23 or 30 feet south of the Peoria Avenue section line. In some areas, this is within the existing Peoria Avenue right-of-way. While this does not impact the planning for the overall footprint of Peoria Avenue, the municipal control of the corridor is undefined due to the multi-jurisdictional nature of land ownership.

Within unincorporated areas, the county has planning authority over privately owned land. The county works jointly with the ASLD on lands that ASLD owns outside municipal boundaries. Table 1 notes the extent of the study area in each MPA, as well as the remaining land within the county.

Table 1 – Study Area by MPA

MPA/Jurisdiction	Area (acres)	Percent of Study Area
El Mirage	320	3%
Glendale	4,160	38%
Surprise	5,440	50%
Maricopa County	960	9%
Total	**10,880**	**100%**

Source: Flood Control District of Maricopa County.

Existing Land Use

Figure 4 illustrates existing land uses within the study area. The majority of the area is categorized as vacant (i.e., undeveloped) or agricultural. Several single-family residential subdivisions are built or under development, which include three elementary schools, one middle school, and one high school within the communities. Several existing homes, not associated with large master-planned communities, are located adjacent to Peoria Avenue. Small clusters of industrial and commercial development are scattered throughout the area.

The BNSF Railway (BNSF) owns and operates a north-south railroad spur (Ennis Spur) that crosses Peoria Avenue at the half-mile between Litchfield and Dysart Roads. The Ennis Spur connects to a major branch line (Peavine) that links the Phoenix metropolitan area with the Transcon mainline in northern Arizona. The nine-mile long Ennis Spur runs from Ennis, a junction on the Peavine in the Surprise area, west and south through farmland to Fennemore siding, where a fertilizer plant is located. Three other freight customers are currently served by way of the Ennis Spur. The primary commodities carried on the Ennis Spur are natural gas, fertilizer and lumber.

The City of Surprise's 16.3-MGD (millions gallons per day) Surprise South Water Reclamation Plant (SSWRP) occupies the half-section between the Ennis Spur and Litchfield Road. The White Tanks Regional Water Treatment Facility, an Arizona American Water Company (AAW) facility that began operation in April 2009, is a 13.7-MGD water treatment facility located at the intersection of Cactus Road and Perryville Road. The plant treats Colorado River Water from the Central Arizona Project (CAP) Canal that is delivered to the facility via the Beardsley Canal.

Future Land Use

Figure 5 illustrates anticipated future buildout land uses within the study area, based on long-range planning efforts conducted by each jurisdiction. This map shows that the majority of the vacant and agricultural land will be converted to single-family residential housing and mixed-use developments in the future. Commercial and industrial development will expand, but remain scattered throughout the study area. The majority of employment land uses are clustered in the eastern part of the study area, between Litchfield and Dysart Roads. Much of the study area will consist of planned developments (i.e., master-planned communities).

The City of Surprise is working with BNSF and private developers to create a new industrial park along the Ennis Spur. New warehouse districts, distribution centers, and commercial enterprises are expected to double the business demand on the BNSF branch in the future. Additionally, BNSF plans to improve the Ennis Spur with construction of a new wye at Grand Avenue (US 60) and a new rail-oriented business park adjacent to Luke Air Force Base, likely causing rail traffic crossing Peoria Avenue to increase in the future.

Master Planned Communities

With the exception of the southeast portion of the study area, which is affected by the noise contours of Luke Air Force Base, much of the study area is anticipated to lie within master planned communities (Figure 6). About half of the major residential communities located in the study area are built or actively in the development phase. These communities are primarily composed of residences, with some local commercial development. The only major retail town center thus far envisioned is at the north end of Sycamore Farms, between SR 303L and Sarival Avenue, abutting Cactus Road on the south side.

Three commercial/business parks are planned between Litchfield and Dysart Roads; one is in the development phase. Glendale 303, located at the southeast corner of Peoria Avenue and SR 303L, has been annexed by the City of Glendale and is planned as a major commercial center to potentially include auto dealerships and/or large retail businesses. Due to current economic conditions, the rate of growth has slowed, but it is expected to increase in the future-although the timeframe for buildout will likely be extended. Built out, active (e.g., under construction), and future master planned communities in the study area are summarized in Table 2.

Technical Memorandum #1
Existing and Future Corridor Features
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Table 2 – Summary of Study Area Master Planned Communities

Master Planned Community	MPA	Development Status	Acres	Anticipated Dwelling Units	Acreage of Commercial and Industrial Development
Cortessa	Glendale	Active	605	1,732	4
Desert Cove Commercial Park	Surprise	Active	95	0	95
Glendale 303	Glendale	Active	110	0	0
Greer Ranch	Surprise	Active	586	1,664	38
John F Long Industrial Complex	El Mirage	Future	1,470	0	348
Kenly Farms	Surprise	Active	187	256	118
Copper Canyon Ranch	Surprise	Active	416	682	15
Prasada	Surprise	Future	3,355	14,180	850
Rancho Gabriela	Surprise	Active	799	2,329	197
Skyway Business Park	Surprise	Active	145	0	145
Sycamore Farms	Surprise	Active	640	2,131	96
Twelve Oaks Estates	Glendale	Active	133	130	0
Zanjero Pass	Glendale	Future	544	187	0
Zanjero Trails	Surprise	Future	879	3,054	11

Source: City of Surprise, City of Glendale, MAG; 2010.

Potential Traffic Generators and Attractors

During the weekday mornings and afternoons, schools will become significant traffic generators; specifically Shadow Ridge High School, which is the largest school in the study area, located along Peoria Avenue on the west side of the study area. Dysart High School and the Dysart Unified School District #89 Administration Center are both located just outside the study area, between Peoria Avenue and Cactus Road, east of Dysart Road. On weekends, churches could become large traffic generators. Two large “megachurches” exist (Parkway Christian Church, attendance of approximately 2,000) or are planned (Calvary Chapel) on Peoria Avenue, both between Reems Road and Bullard Avenue.

SR 303L, currently a major arterial, is planned to be upgraded to a freeway, with construction beginning in 2011. This corridor is expected to generate adjacent commercial and office/employment land uses, which will become major traffic generators during peak commuting times. The freeway itself will also become a generator because of its nature as a high-capacity transportation facility, providing the ability to move faster and more efficiently around the region.

Because of the proximity to Luke Air Force Base, the area south of Peoria Avenue and east of Reems Road is not compatible with residential development. Therefore, this area may see commercial and industrial land uses – becoming a regional employment center and generating peak hour commuting traffic. Currently, the area is planned to be mixed-use. Additionally, the three commercial/industrial planned developments between Litchfield and Dysart Roads may also be generators of peak hour commuter traffic. Lastly, the land west of the Beardsley Canal, belonging to the ASLD, has the potential to see intense development in the future, although no plans are currently active.

While not located within the study area, the White Tank Mountain Regional Park, accessed via Olive Avenue just west of the study area, is a popular recreational destination.

Prasada, a master planned community, is composed of several "villages", of which a residential village is located within the study area. Between Cactus Road and Greenway Road, two other villages span SR 303L, which have a heavy commercial component. To the west of SR 303L, a major auto mall is planned between Cactus Road and Waddell Road. To the east, a regional mall and lifestyle center, as well as a mixed-use urban village are planned. North of Waddell Road and west of SR 303L is a planned major regional medical campus; to the east of SR 303L is a planned regional employment/office campus. All of these concentrated commercial and employment land uses can generate and attract traffic all day long.

Potential traffic generators and attractors are illustrated on Figure 7.

Growth Areas

The City of Surprise 2030 General Plan illustrates two major growth areas in the Peoria Avenue Corridor study area. A regional center (defined as an area of intense and high-density development with strong connections to the regional transportation system) spans approximately one mile on each side of the planned SR 303L freeway. Concentrated and mixed-use development is encouraged. Streetscapes in regional centers should support future transit-oriented development and must encourage the use of alternative modes of transportation as the preferred method of travel.

The area between Litchfield and Dysart Roads and Waddell Road and Peoria Avenue is intended as an employment center. Employment centers support a variety of employment types that are expected to contain prime industrial land that support export-oriented activities, such as warehouse distribution, heavy or light manufacturing, research and development uses, and selected business services.

The City of Glendale 2025 General Plan also illustrates two major growth areas within the study area. The first includes the Luke Compatible Growth Area, located along and south of Peoria Avenue, from approximately Reems Road east. Special legislation pertaining to land utilization in the Luke Air Force Base vicinity establishes parameters to restrict residential and business development.

The second growth area is the Loop 303 Growth Area, with a growth cluster located at the future traffic interchange of SR 303L and Peoria Avenue. The General Plan calls for commercial and employment uses within this growth area.

<u>Zoning</u>

Zoning, as defined by each jurisdiction in the study area, is illustrated on Figure 8. Except for pockets of commercial and industrial development, the majority of the area is either zoned for rural (one or less dwelling units per acre) or single-family (approximately two to seven dwelling units per acre) residential development.

As of August 2010, no rezoning requests are being processed by the study area jurisdictions.

<u>Socioeconomic Data</u>

The thirteen socioeconomic analysis zones (SAZ) within the study area constitute approximately 17.5 square miles (less than one-half percent) of the 9,223-square-mile MAG planning area and modeling region. In 2005, the study area had a population of approximately 4,550 persons and an employment base of approximately 1,500 employees. By 2030, these numbers are expected to dramatically increase.

Table 3 presents the socioeconomic data for the existing 2005 and adopted 2030 forecast scenarios, as well as the percent change between the two forecast years.

Table 3 – Socioeconomic Data

Scenario	Population (persons)	Employment (employees)
2005	4,550	1,500
2030	36,330	21,010
Percent Change	698%	1,300%

Source: MAG, 2010.

Population density maps (Figures 9 and 10) show the highest existing density located in the built out/under construction master-planned communities located north of Peoria Avenue between Reems and Litchfield Roads. While that will remain an area of higher density, the greatest densities will be located in the Prasada community, north of Peoria Avenue between Citrus Road and SR 303L. The areas of lowest population density include much of the area affected by the BNSF Ennis Spur and Luke Air Force Base noise contours, and the area surrounding the McMicken Dam.

Employment density maps (Figures 11 and 12) illustrate that the largest number of existing jobs are located north of Peoria Avenue between Reems and Dysart Roads, although the employment density is still quite low, reflecting an average of 1.1 to 4 jobs per acre. Employment growth to 2030 is scattered, with the highest densities of jobs located adjacent to SR 303L and Dysart Road. The areas with the lowest employment densities are the McMicken Dam and the area south of Peoria Avenue between Sarival Road and the Ennis Spur – generally affected by the Luke Air Force Base noise contours.

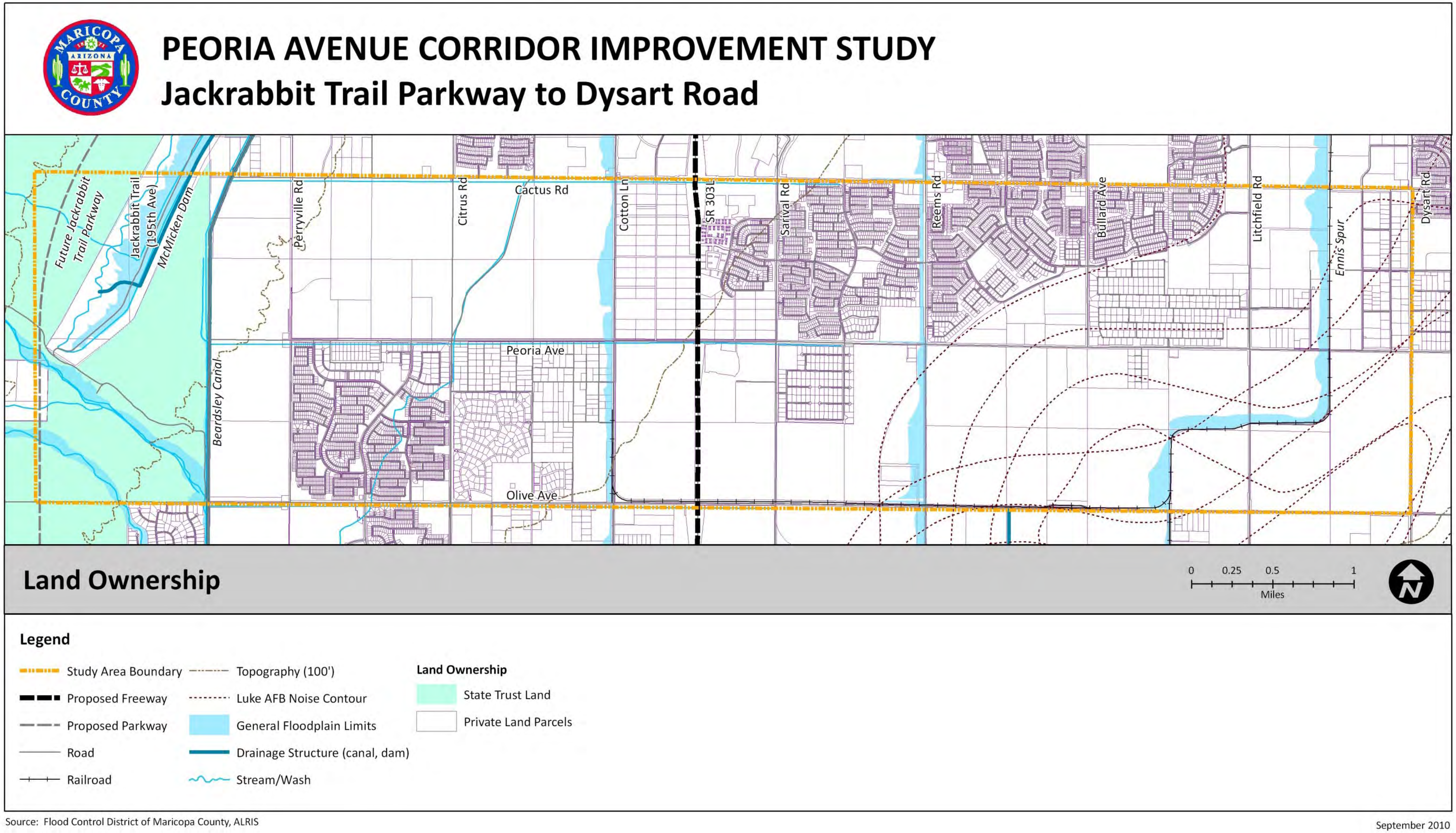


Figure 2 – Land Ownership

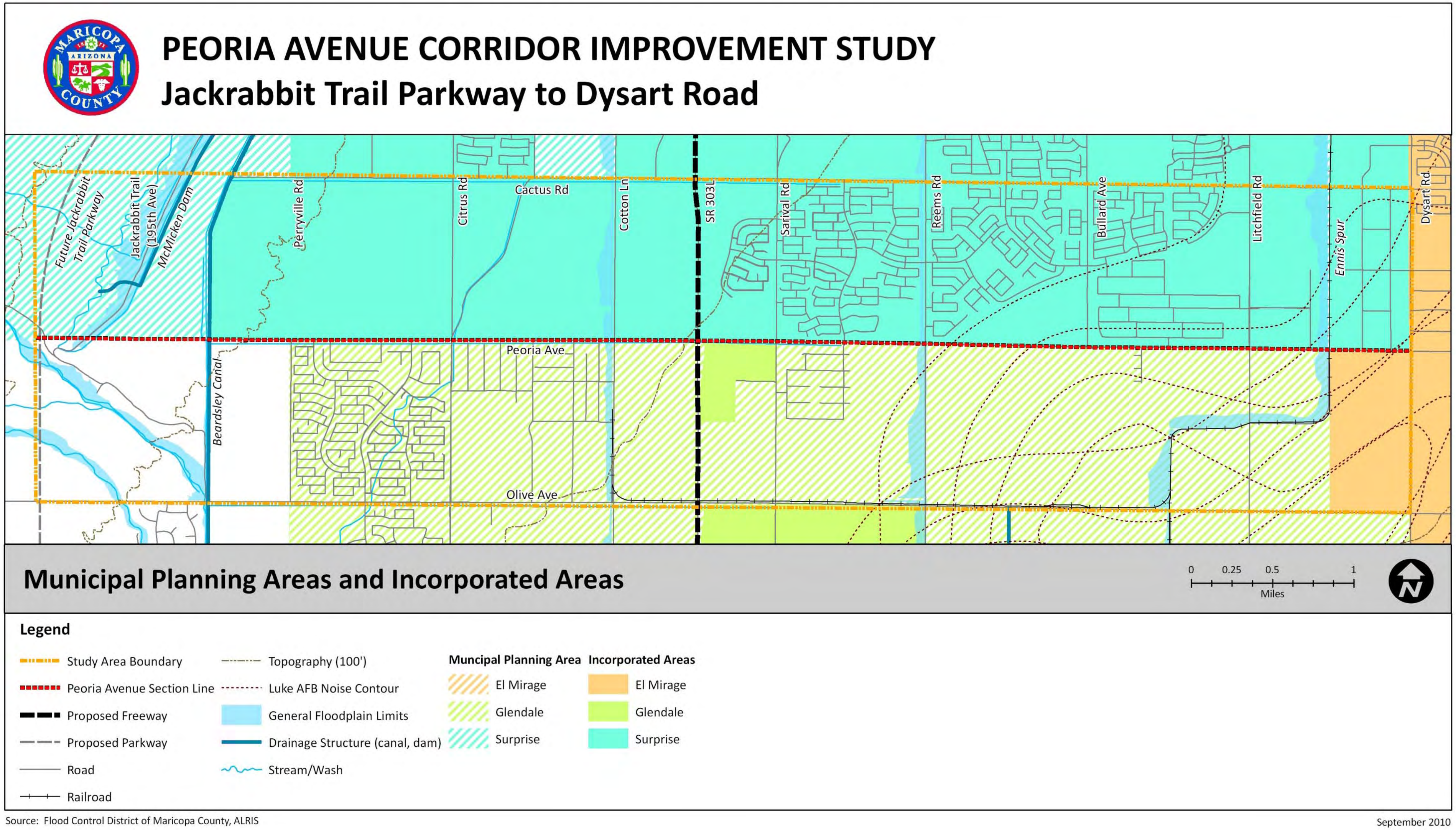
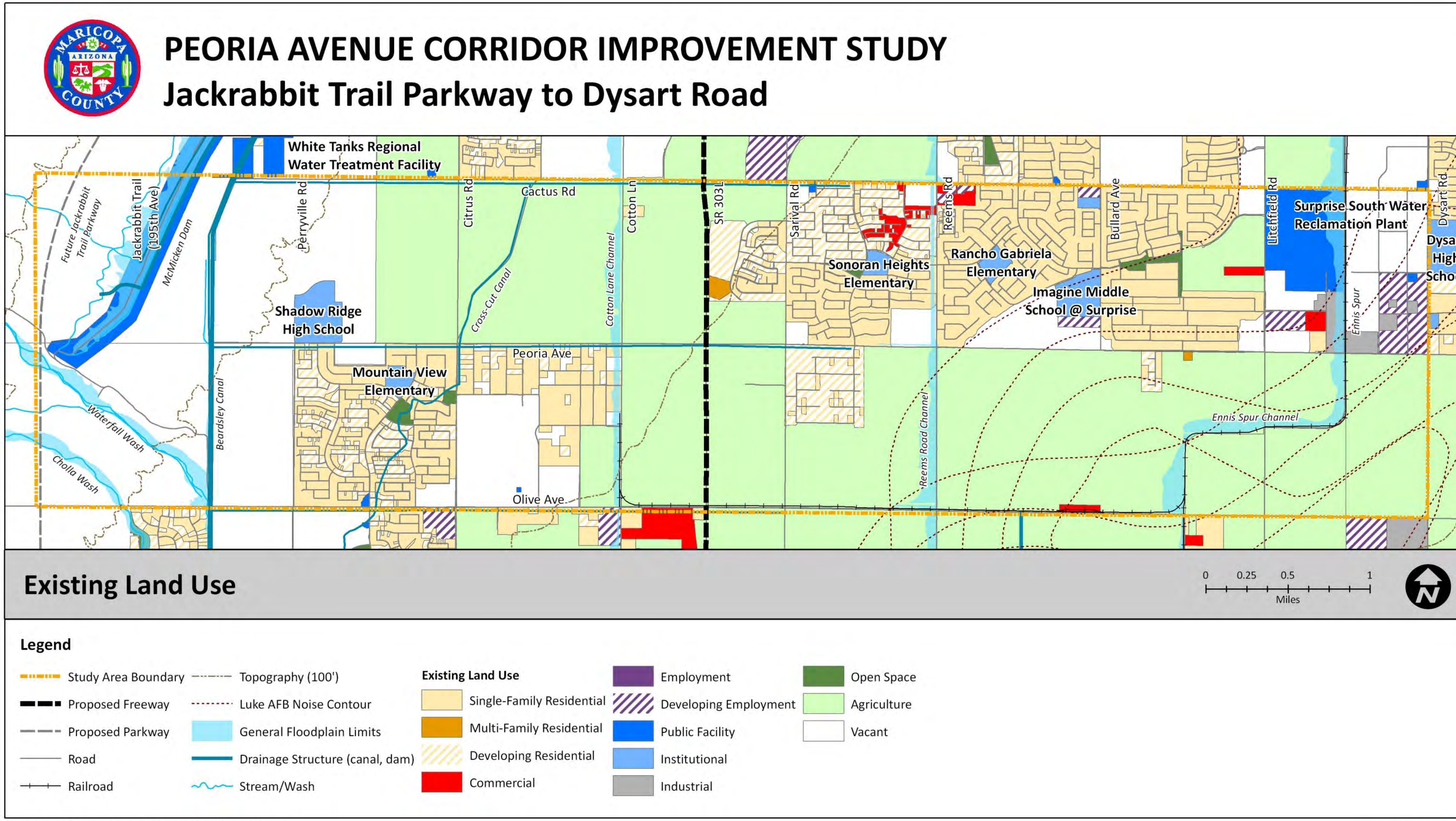


Figure 3 – Municipal Planning Areas and Incorporated Areas



Source: Flood Control District of Maricopa County, ALRIS, MAG

December 2010

Figure 4 – Existing Land Use

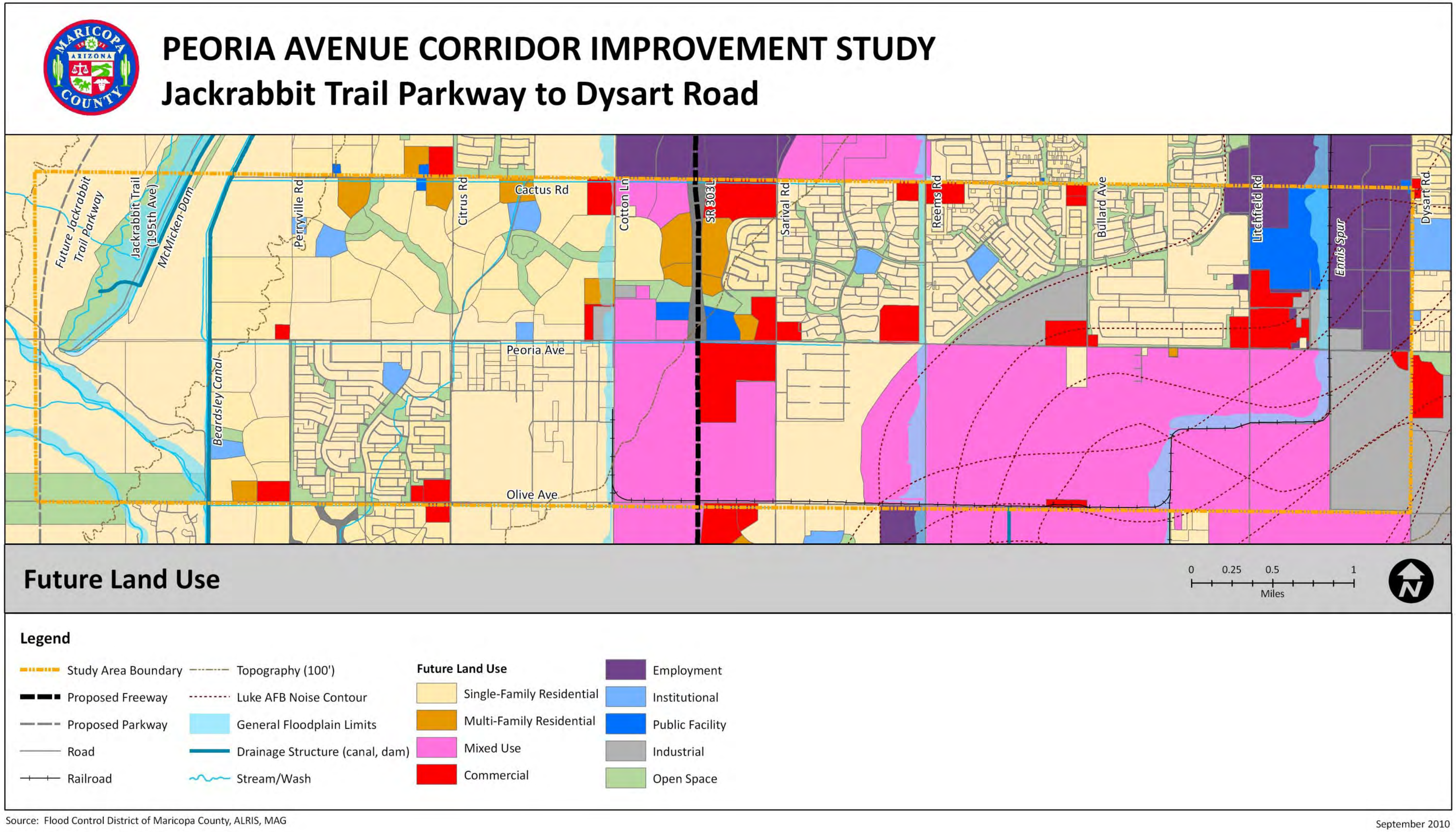


Figure 5 – Future Land Use

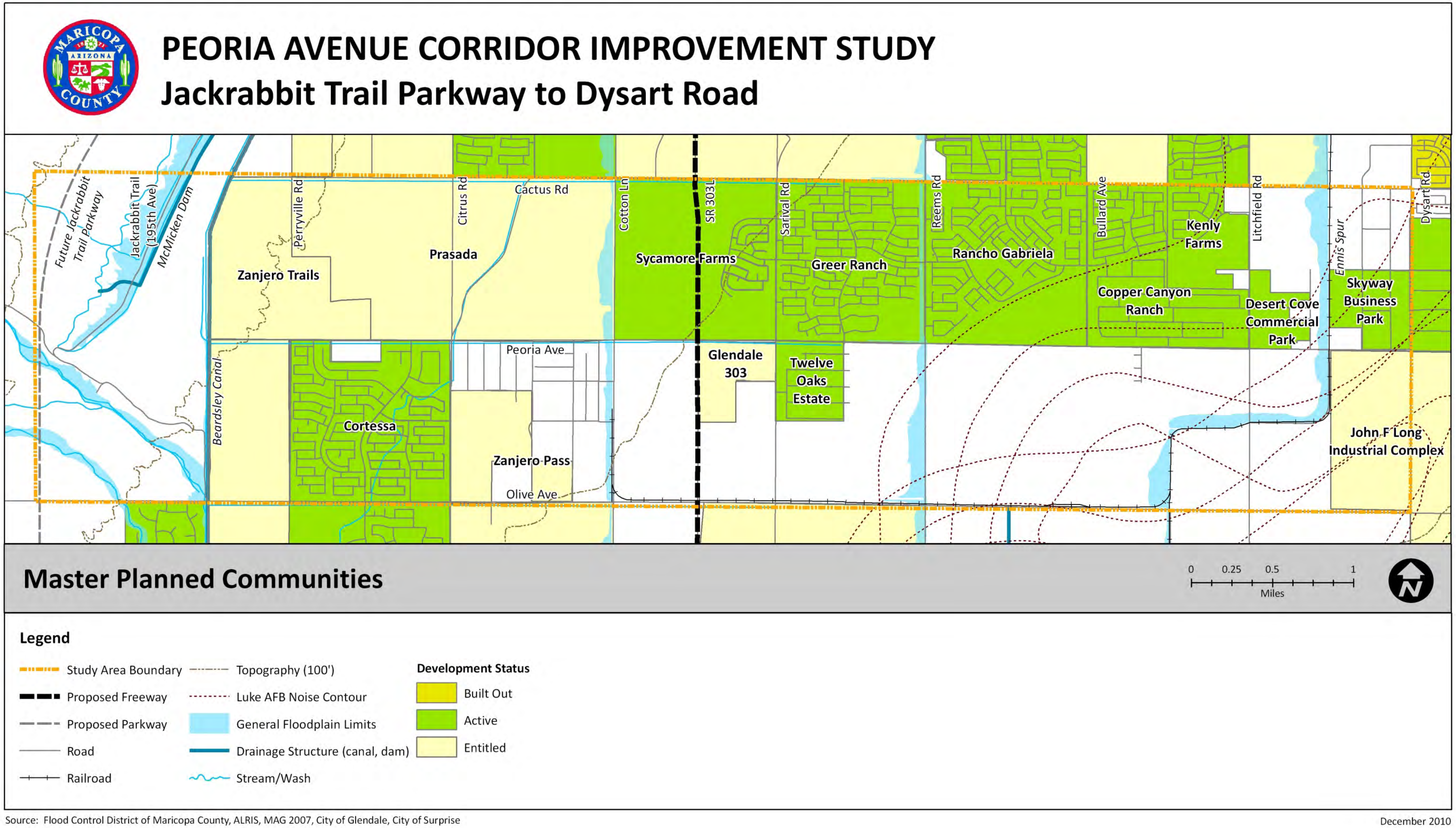


Figure 6 – Master Planned Communities

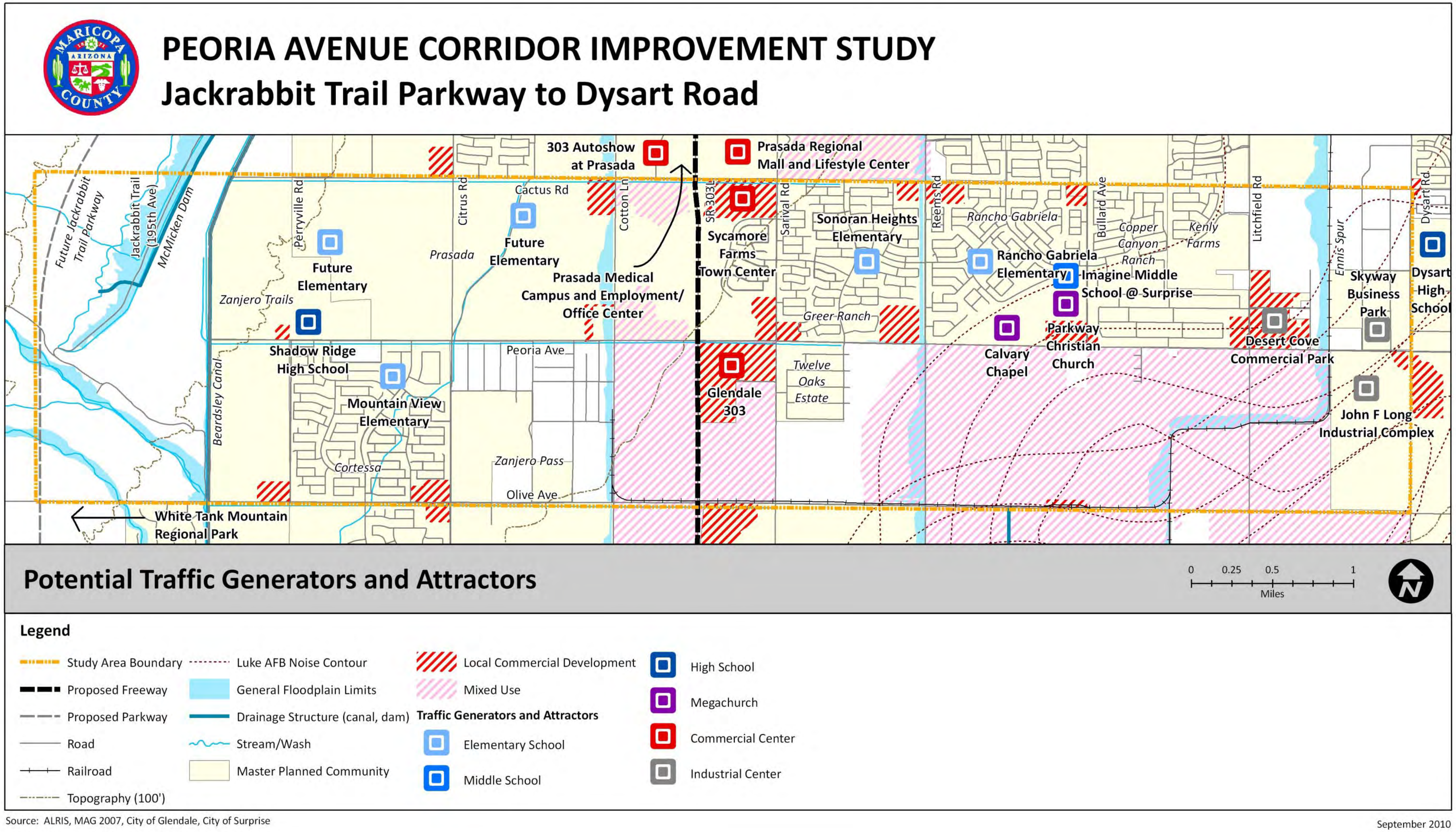
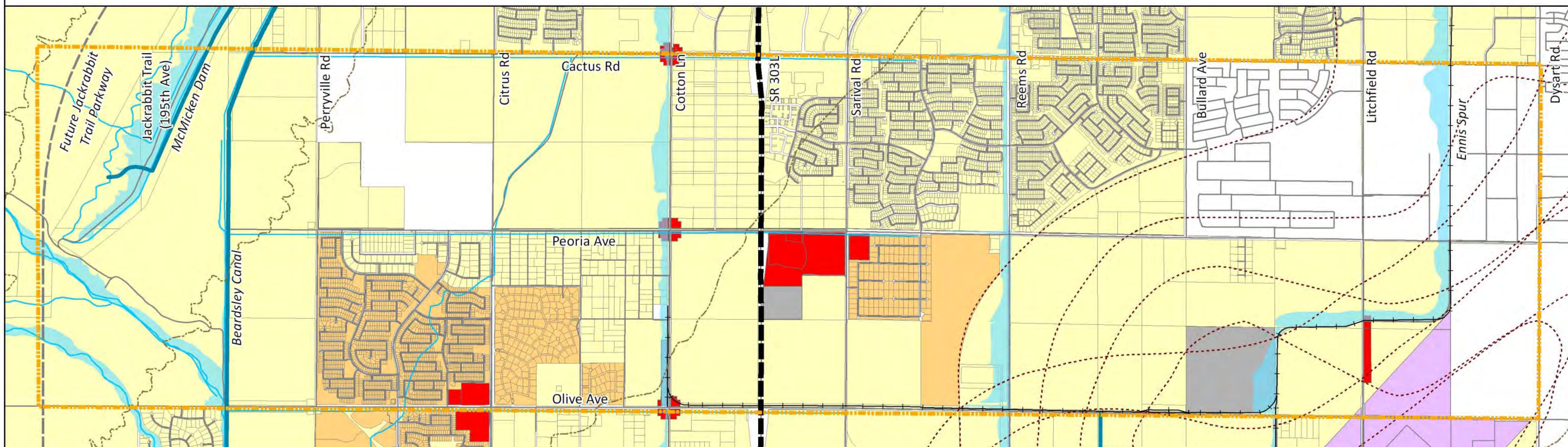


Figure 7 – Potential Traffic Generators and Attractors

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road



Zoning

0 0.25 0.5 1
Miles

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Zoning

- Rural Residential
- Single-Family Residential
- Commercial
- Industrial
- Airport District
- No Zoning Designation

Source: Flood Control District of Maricopa County, ALRIS, MAG

October 2010

Figure 8 – Zoning

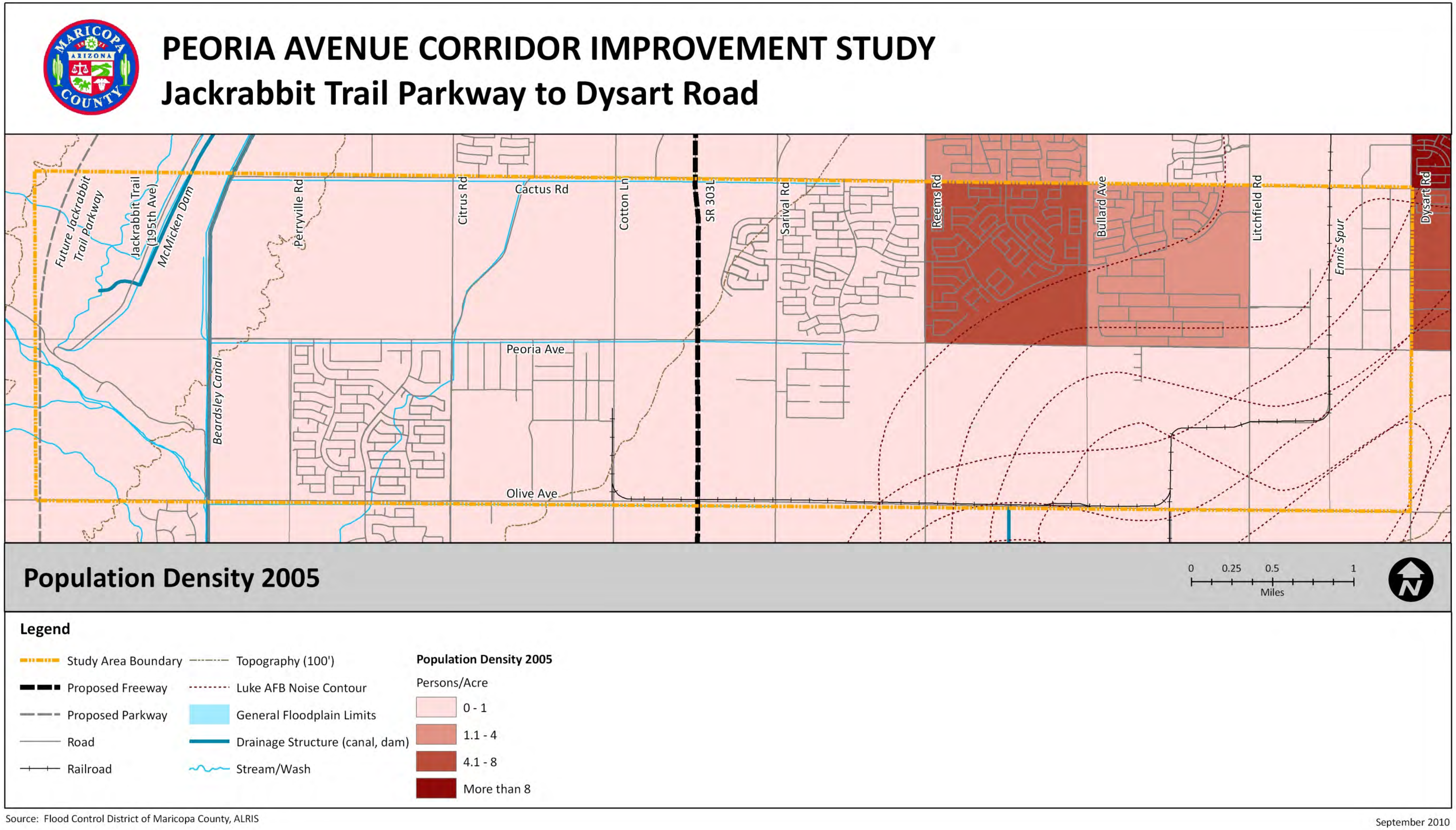


Figure 9 – Population Density 2005

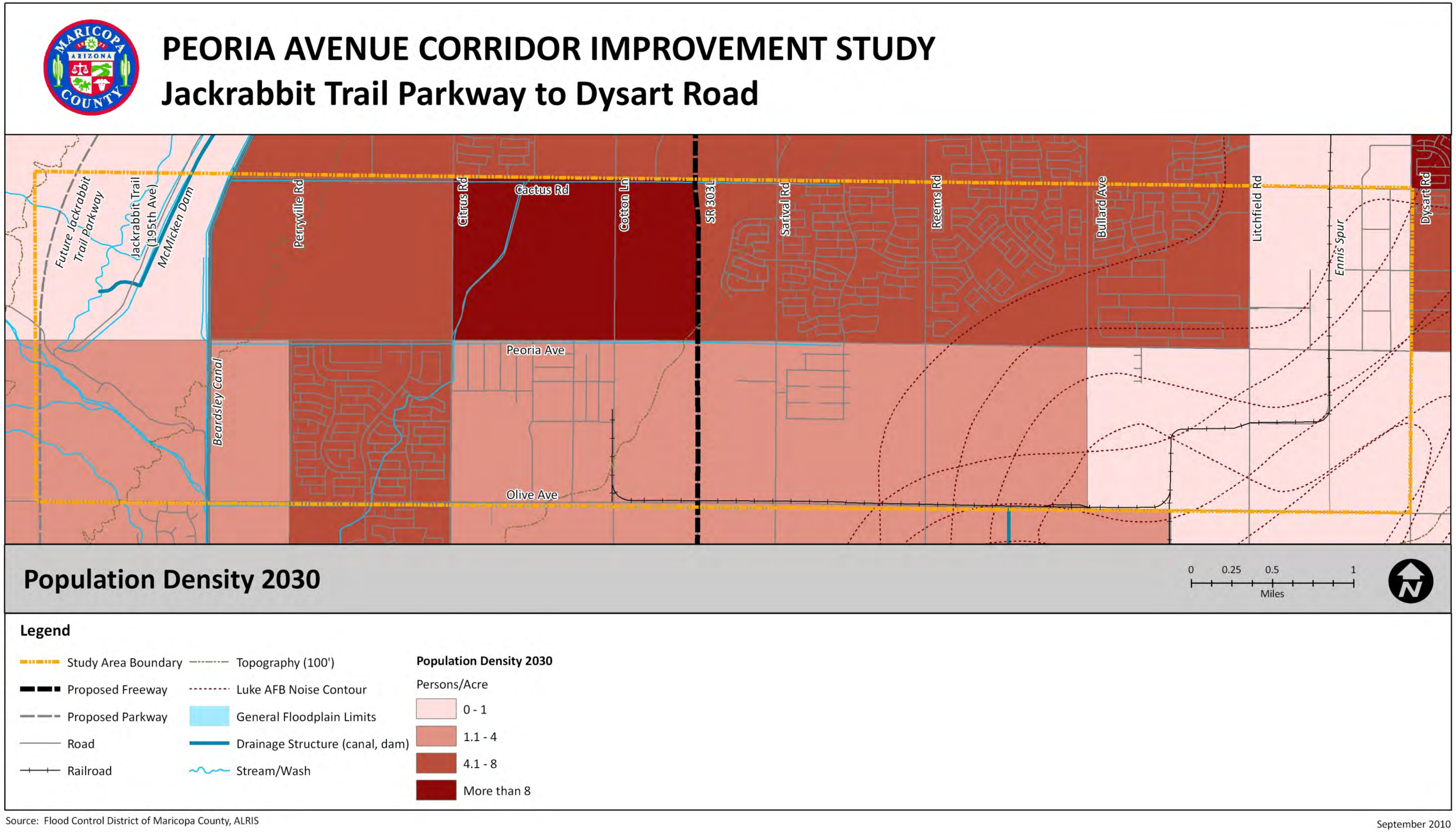
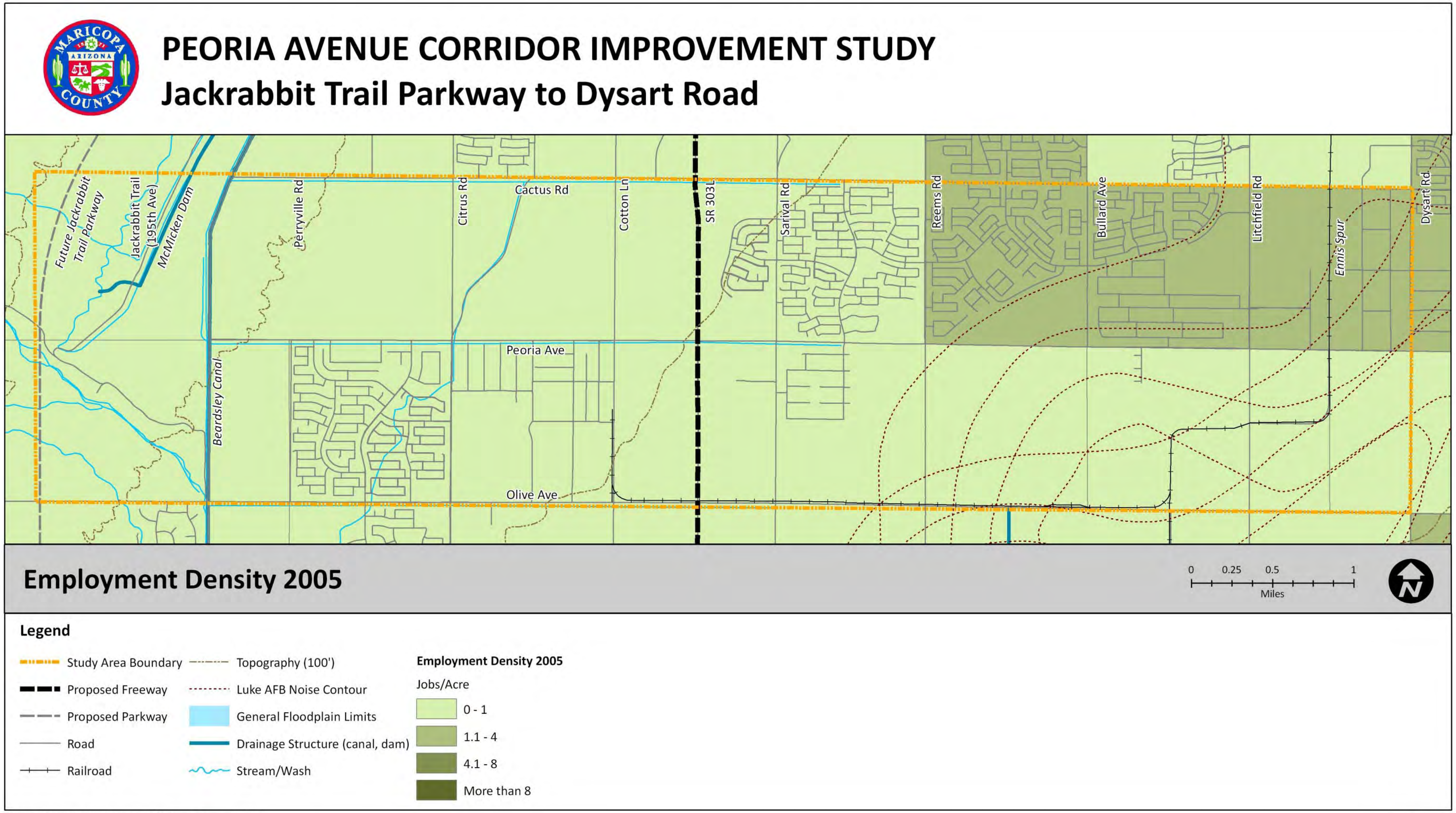


Figure 10 – Population Density 2030



Source: Flood Control District of Maricopa County, ALRIS

September 2010

Figure 11 – Employment Density 2005

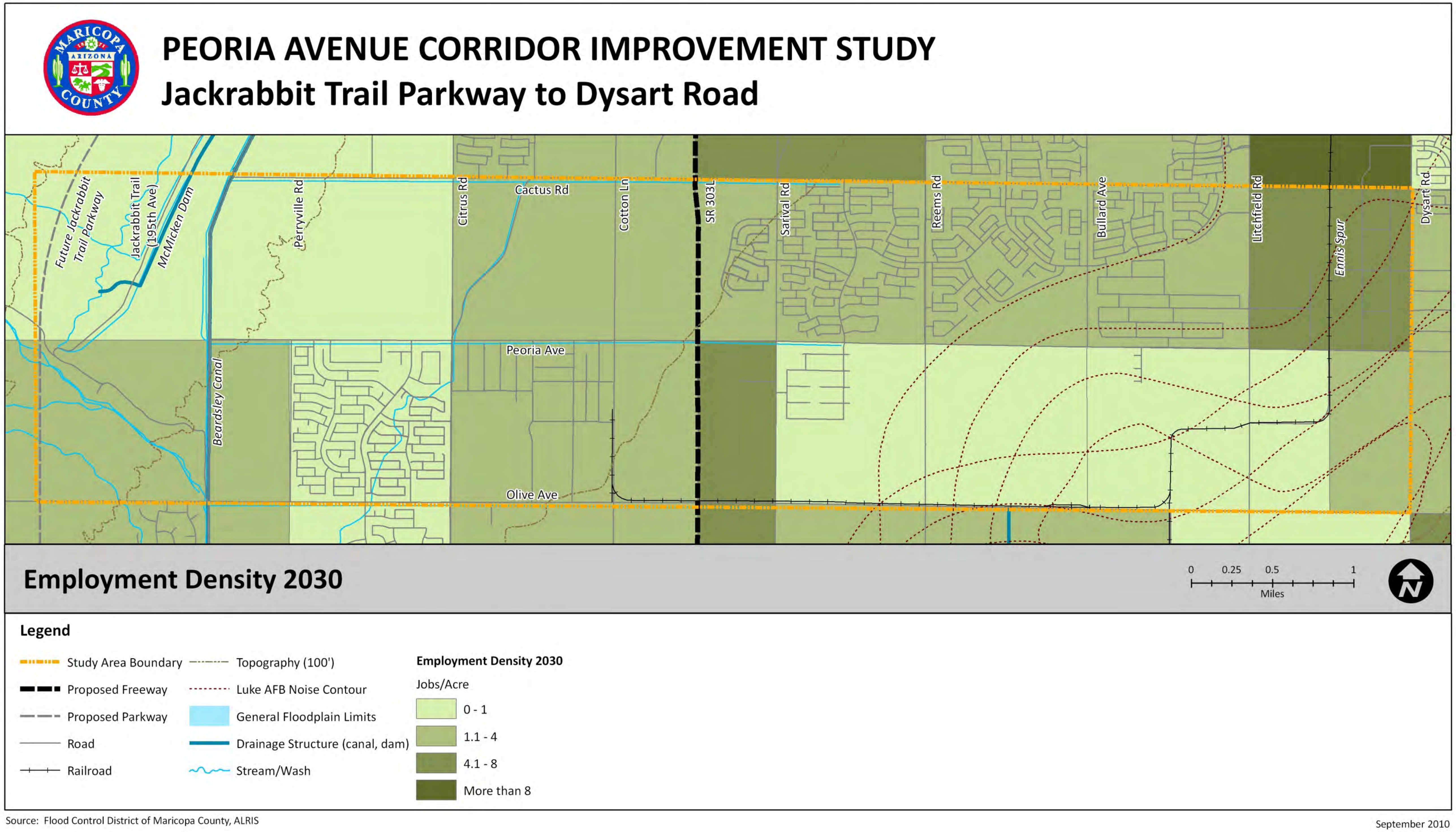


Figure 12 – Employment Density 2030

3.0 PHYSICAL FEATURES

Topography

This section describes the existing physical and natural environment of the Peoria Avenue Corridor study area relative to topographical features, including slopes, land subsidence and fissures. Generally speaking, the study area is relatively flat, with an elevation range of 1,094 to 1,402 feet above mean sea level.

Slope Analysis

Figure 13 shows the slope analysis for the Peoria Avenue Corridor study area. Slope analysis aids in understanding the topography of a region and helps to delineate compatible and incompatible slopes for urban development. It is combined with surface geology and soil data to determine the most appropriate sites for land uses and transportation corridors. The slope of a line segment is the ratio of the change in elevation (rise) to the horizontal distance between endpoints (run). The larger the rise per unit of run, the steeper the slope.

The slopes for the study area have been divided into four ranges. Areas with slopes less than 5 percent are considered "flat," while slopes of 5 to 10 percent are "gradual." Slopes of 10 to 20 percent are "moderate," while slopes of 20 percent or more are "steep." The lighter shades on the map represent flatter terrain, while darker shades denote steeper slopes. Almost the entire study area falls under the "flat" category, with the exception of a small area at the westernmost end, between Waterfall and Cholla Washes, south of the Peoria Avenue section line. These steeper slopes begin the ascent of the White Tank Mountains directly to the west. Therefore, the majority of the study area is deemed suitable for transportation corridor development.

Land Subsidence and Fissures

Figure 14 shows land subsidence for the Peoria Avenue Corridor study area. Land subsidence has been identified in several Arizona locations. This phenomenon occurs when water is removed from underground reservoirs and the weight of the overlying material compresses, causing the land to settle. Once compressed, alluvial deposits take up less space than before and the ground surface sinks. The amount of subsidence varies by location. Portions of the study area have seen land subsidence between five and 15 feet, some of the highest levels in Arizona.

Land subsidence creates another potential problem: earth fissures. These are cracks in the ground surface that occur because of uneven or differentiated land subsidence. Depending on circumstances, fissures can form gullies as much as 50 feet wide and 10 to 15 feet deep. Once fissures start to form, they tend to increase in number and length, spreading at uneven speeds and directions for several miles.

The effects of land subsidence and earth fissuring can be significant, because they may cause significant damage to infrastructure, increase flooding potential, worsen groundwater pollution, and accelerate soil erosion. Continued urban development on lands that require groundwater pumping ensures a future land subsidence problem.

The Arizona Geological Survey is currently conducting a mapping exercise to locate and define fissure locations throughout Arizona. Nine "study areas" have been defined in Maricopa County as areas of earth fissure development. The Luke Air Force Base study area, ranging from approximately Indian School to Waddell Roads, and Jackrabbit Trail to El Mirage Road, contains a series of earth fissures. A fissure crosses Peoria Avenue just west of Sarival Avenue. Additionally, a series of unconfirmed (not confirmed by recent surface investigations, but previously reported) and discontinuous (confirmed portions of fissures, likely representing an incipient surface expression of an earth fissure) are documented approximately along the Peoria Avenue section line, west of the Beardsley Canal.

Drainage Features

Figure 15 depicts major drainage features for the Peoria Avenue study area. Three major drainage structures/features are located within the study area: the McMicken Dam, the Beardsley Canal, and the Reems Road Channel and Basin. The McMicken Dam is almost eleven miles long, following an alignment offset from the Beardsley Canal, beginning at Peoria Avenue west of Perryville Road and extending north and east to Happy Valley Road west of Bullard Avenue. The dam is operated and maintained by the FCDMC. The dam detains storm runoff and meters outflows through a channel located at the east end of the structure. The Peoria Avenue section line intersects the detention basin located immediately south of the dam.

The Beardsley Canal is located approximately a half mile west of Perryville Road and is owned by the MWD. A series of irrigation canals/ditches is also owned by the MWD in the study area. These east-west canals connect with the Beardsley Canal on the west end, extending to approximately one-half mile east of Sarival Road, located south of Peoria Avenue and south of Cactus Road. Parallel, but privately owned, irrigation canals also exist in segments along the south side of Peoria Avenue. Additionally, MWD manages the Cross-Cut Canal and Pipeline, which crosses Peoria Avenue underground, along Citrus Avenue. Any crossings of MWD facilities will require close coordination with MWD.

The Reems Road Channel and Basin is a regional flood control facility to intercept and convey the 100-year stormwater event. The ultimate facility includes a channel flowing south along Reems Road from Bell Road to the Reems Basin, an off-line detention basin is located a quarter-mile south of Peoria Avenue. The purpose of the channel is to protect Reems Road and the land to the east, including the City of Surprise wastewater treatment plant and various utilities. In the summer of 2009, FCDMC completed the construction of the segment of the project south of Peoria Avenue.

While no rivers are located within the study area, several streams and washes traverse the area, generally located in the westernmost portion, draining from the White Tank Mountains. Federal Emergency Management Agency (FEMA) maps show most of the study area to be within the 100-year to 500-year floodplain. Concentrations of land are located within the 100-year floodplain, including drainage areas west of McMicken Dam, major washes, and channel west of Cotton Lane, Reems Road, and the Ennis Spur. The 100-year floodplains listed adjacent to major roadways serve as permanent drainage channels, with the land owned and controlled by the FCDMC, and therefore preserved against future development. As uncontrolled or natural drainage features, both Waterfall and Cholla Washes include floodway areas.

The Arizona Department of Water Resources (ADWR) regulates and permits ground water wells in Arizona. There are a number of wells within the study area, including several located adjacent to Peoria Avenue, whose locations will need to be considered with respect to potential roadway improvements.

Improvement Projects

The FCDMC is implementing and planning improvements to many drainage features to reduce area flooding and drainage problems as new development expands west. Two FCDMC Area Drainage Master Plans (ADMPs) or Area Drainage Master Plan Updates (ADMPUs) cover the study area. The studies estimate flood potential for a watershed, map watercourses, identify existing and potential drainage problems, and develop preliminary solutions and standards for floodplain and stormwater management. A discussion of their major findings follows.

Loop 303 Corridor/White Tanks ADMPU: The study included the analysis of approximately 220 square miles of watershed from the McMicken Dam south to the Gila River and from the White Tank Mountains east to the Agua Fria River, including the entire study area. Three development alternatives recommended in the ADMPU fall within this project's study area: the SR 303L channel and basins, the Reems Road Channel and Basin and the BNSF Railway Channel and Basin. The Beardsley Canal is classified as a facility under development.

Wittman ADMP: The Wittman ADMP study area is approximately 310 square miles and is located within the City of Surprise and unincorporated Maricopa County. The area including and west of the McMicken Dam is in this study area. Recommended improvements in the Peoria Avenue study area include removal of the floodplains west of the McMicken Dam and development of a parallel scenic/wildlife/multi-use corridor west of the dam.

McMicken Dam Fissure Zone Remediation Project: Because a series of fissures and conditions sufficient for fissure development were found adjacent to the south end of the dam, this study was conducted to consider alternative alignments or modifications to the dam to negate potential future damage. The recommended action included removing the southern segment of the dam and replacing it with a realigned soil-cement dam segment and basin located outside the area with a high risk of fissures. This project has recently been completed by FCDMC.

Additionally, a series of channels and basins are in varying stages of development throughout the corridor, including those public channels and basins cited above in the Loop 303 Corridor/White Tanks ADMPU, as well as a series of private channels and basins, such as at Shadow Ridge High School and within the master planned communities of Greer Ranch, Twelve Oaks Estates, and Copper Canyon Ranch (Mountain Gate).

Utilities

There are numerous utilities within the study area (Figure 16). A portion of the study area, the properties between the Beardsley Canal and Reems Road, is within the MWD Conservation District Number One service area boundaries. MWD is primarily an irrigation water conservation district providing water services to its customers. The District's irrigation conveyance and delivery channels and pipelines span the entire length of its service areas along Peoria Avenue. Many MWD wells and private irrigation wells (active and inactive) are also sited along Peoria Avenue. Under a contract with Arizona Public Service (APS), MWD also delivers power and energy through APS's distribution facilities to water wells belonging to the District and its customers.

Numerous overhead power distribution lines run in an east-west direction parallel to Peoria Avenue, along both sides of the roadway, as well as in a north-south direction along the cross streets: Cotton Lane, Sarival Avenue, Dysart Road, and the Ennis Spur. Aboveground power lines along Peoria Avenue are fragmented, a result of gradual burying of overhead distribution lines in front of new housing developments over the years. The future APS West Valley-North 230kV power transmission line, scheduled to be placed in service in 2015 in a corridor west of SR 303L, follows SR 303L from Olive Avenue to Cactus Road through the study area, where it will then turn west to parallel Cactus Road to the north. Power substation sites are planned on the adjacent major arterials to Peoria Avenue (Olive Avenue and Cactus Road).

City utilities along Peoria Avenue include underground water and sewer lines and appurtenances: a 30-inch reclaimed water line and reclaimed water delivery headers on the south side of Peoria Avenue across from the SSWRP. Other public utilities along Peoria Avenue include Southwest Gas natural gas lines and Qwest overhead and underground telephone lines.

Recreation and Trails

Figure 17 depicts recreational opportunities in the study area. While there are no regional parks within the study area, White Tank Mountain Regional Park sits just to the west, beyond Jackrabbit Trail. The main entrance to the park is located on Olive Avenue, one mile to the south, but attracts visitors from the entire metropolitan area. Several community or "pocket" parks exist in developed communities.

The 1,521 miles of the planned Maricopa County Regional Trail System are organized into priorities to serve as a guide while implementing the trail system plan. The two corridors in the study area, adjacent to and west of both the McMicken Dam and the Beardsley Canal are Priority 1 corridors. The segment west of McMicken Dam exists; the segment connecting to it from the Beardsley Canal has yet to be built. These corridors are part of the Maricopa Trail, connecting the regional parks in the Maricopa County Park System. The study area corridors provide connections to White Tank Mountain Regional Park.

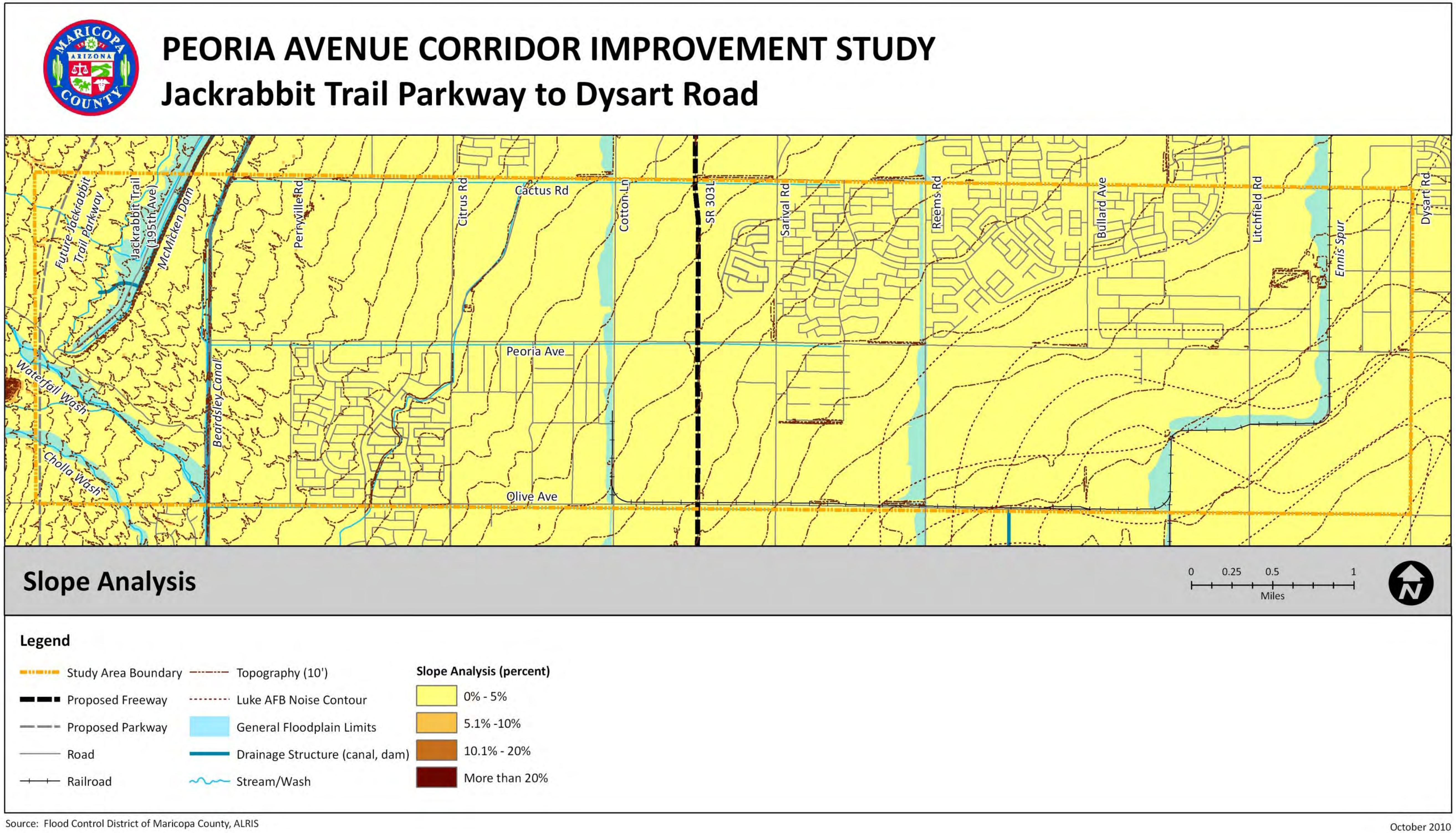
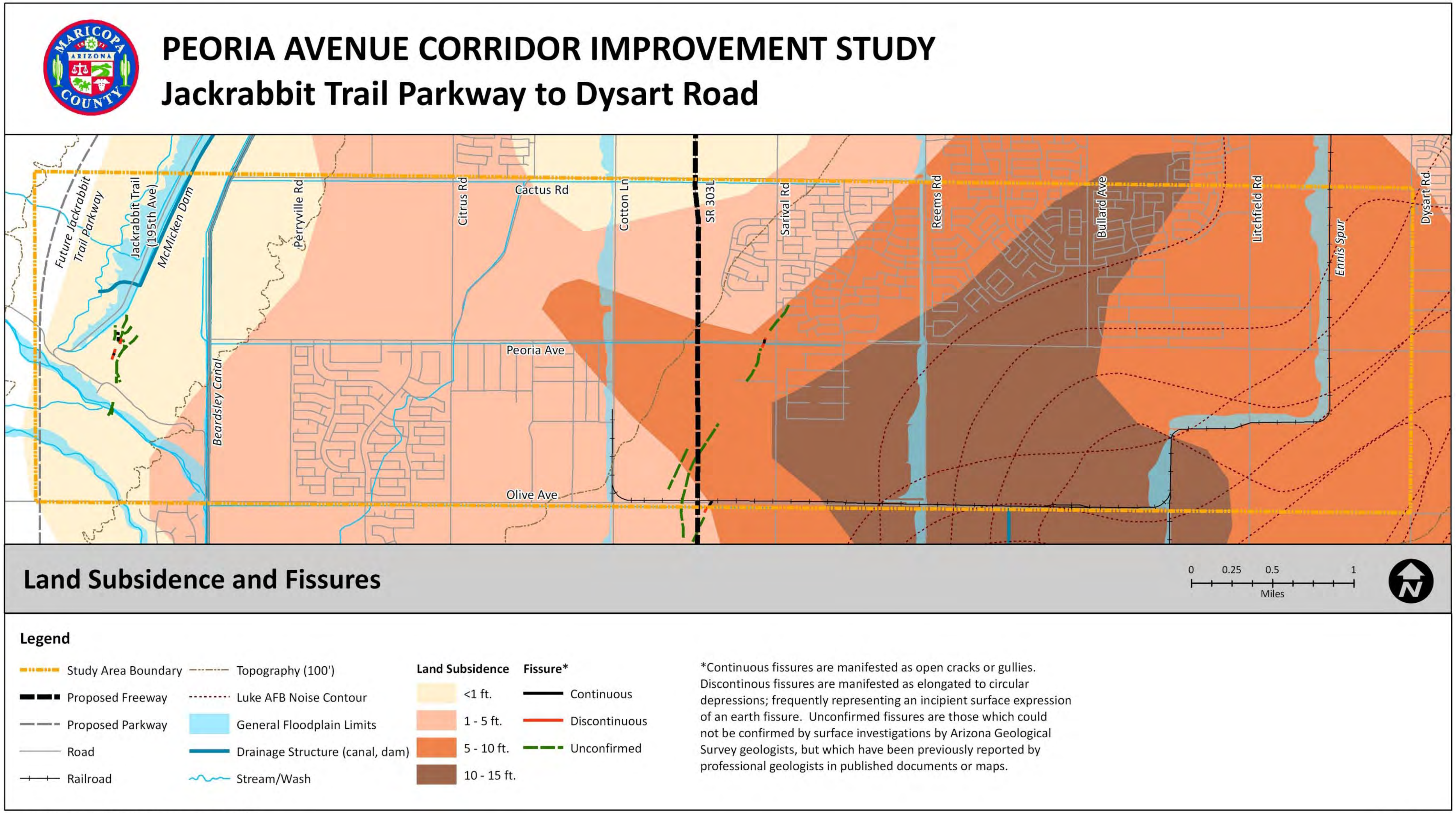


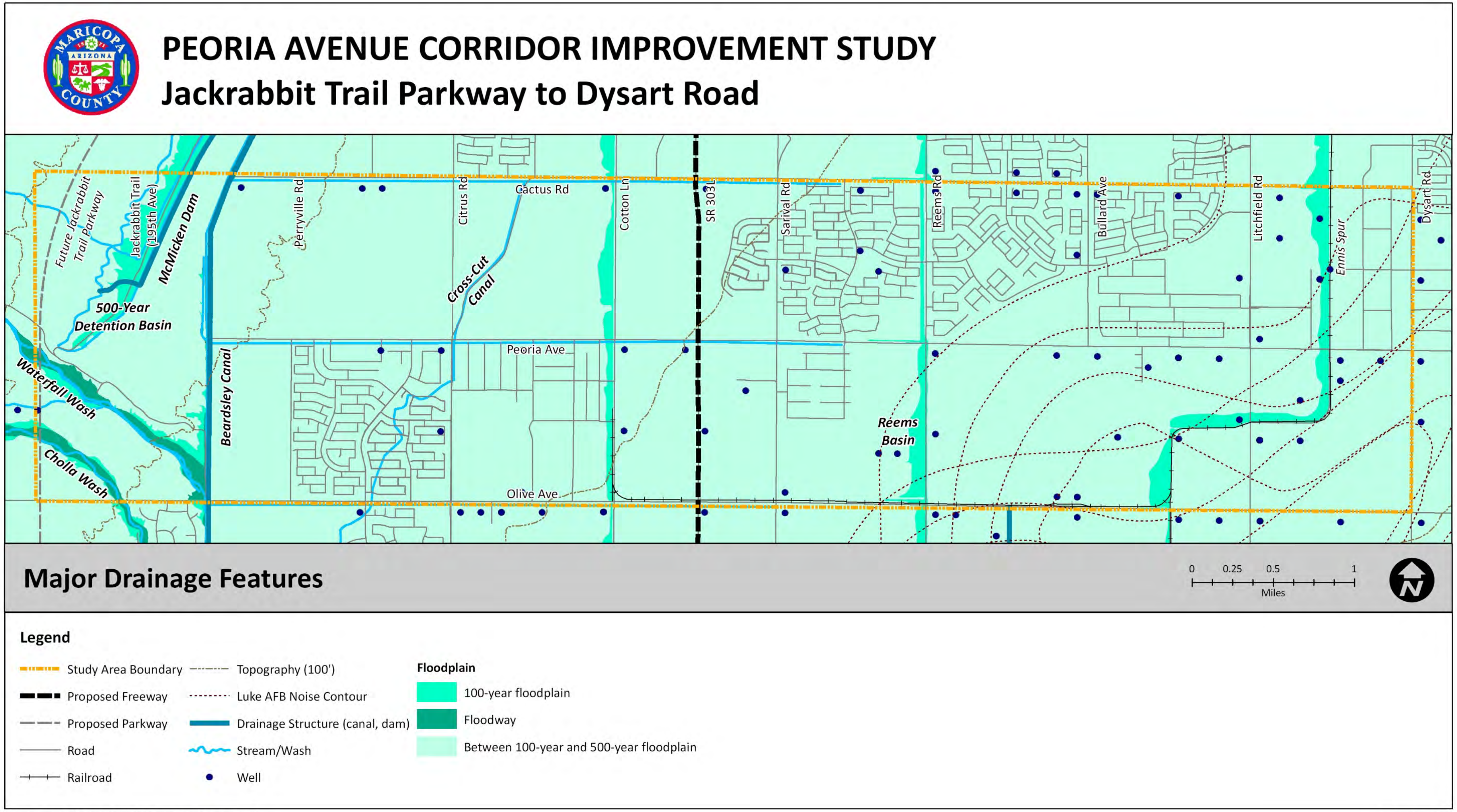
Figure 13 – Slope Analysis



Source: Flood Control District of Maricopa County, ALRIS

September 2010

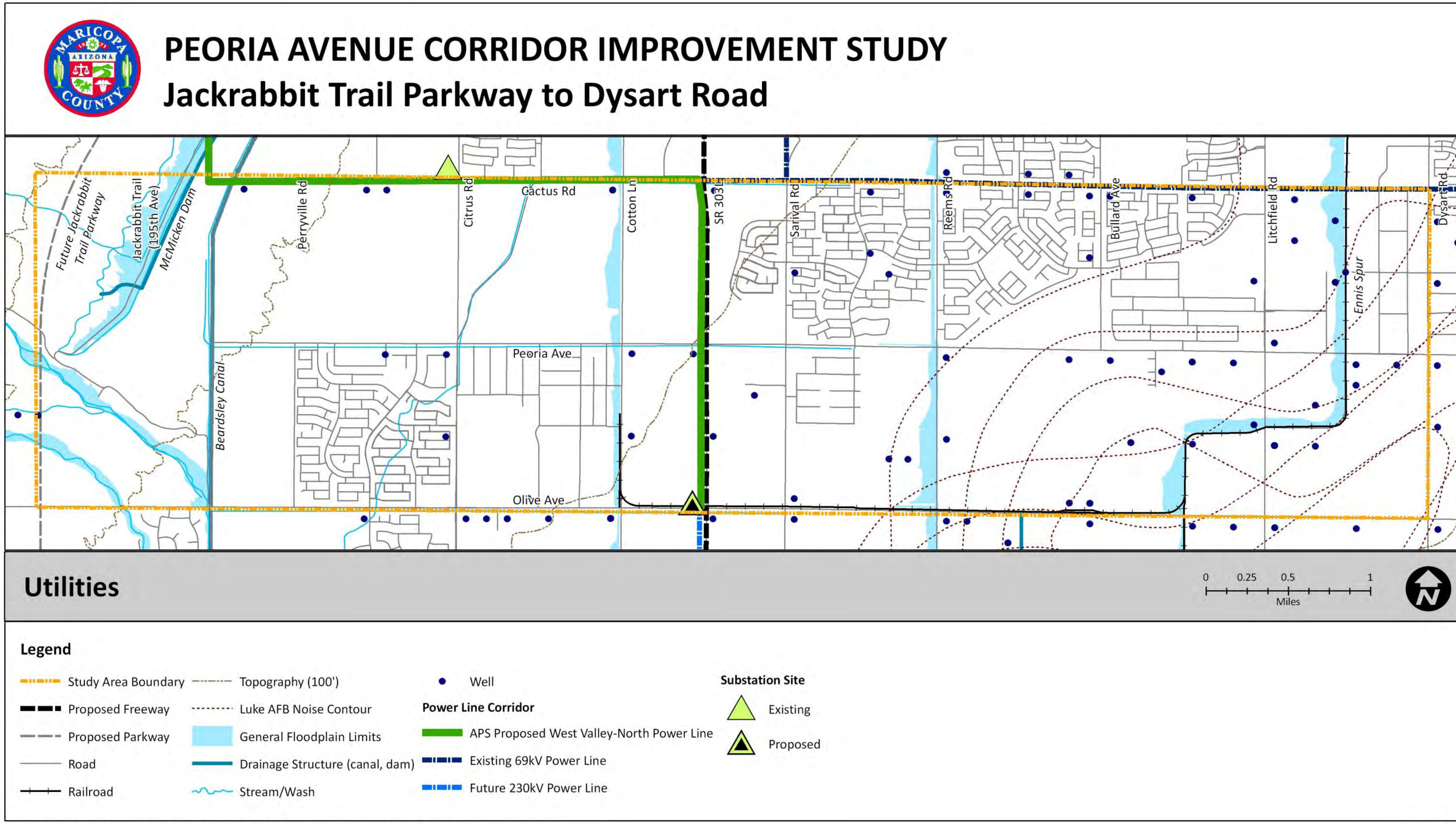
Figure 14 – Land Subsidence and Fissures



Source: Flood Control District of Maricopa County, ALRIS

September 2010

Figure 15 – Major Drainage Features



Source: Flood Control District of Maricopa County, ALRIS, Maricopa Water District, Arizona Public Service, City of Surprise

September 2010

Figure 16 – Utilities

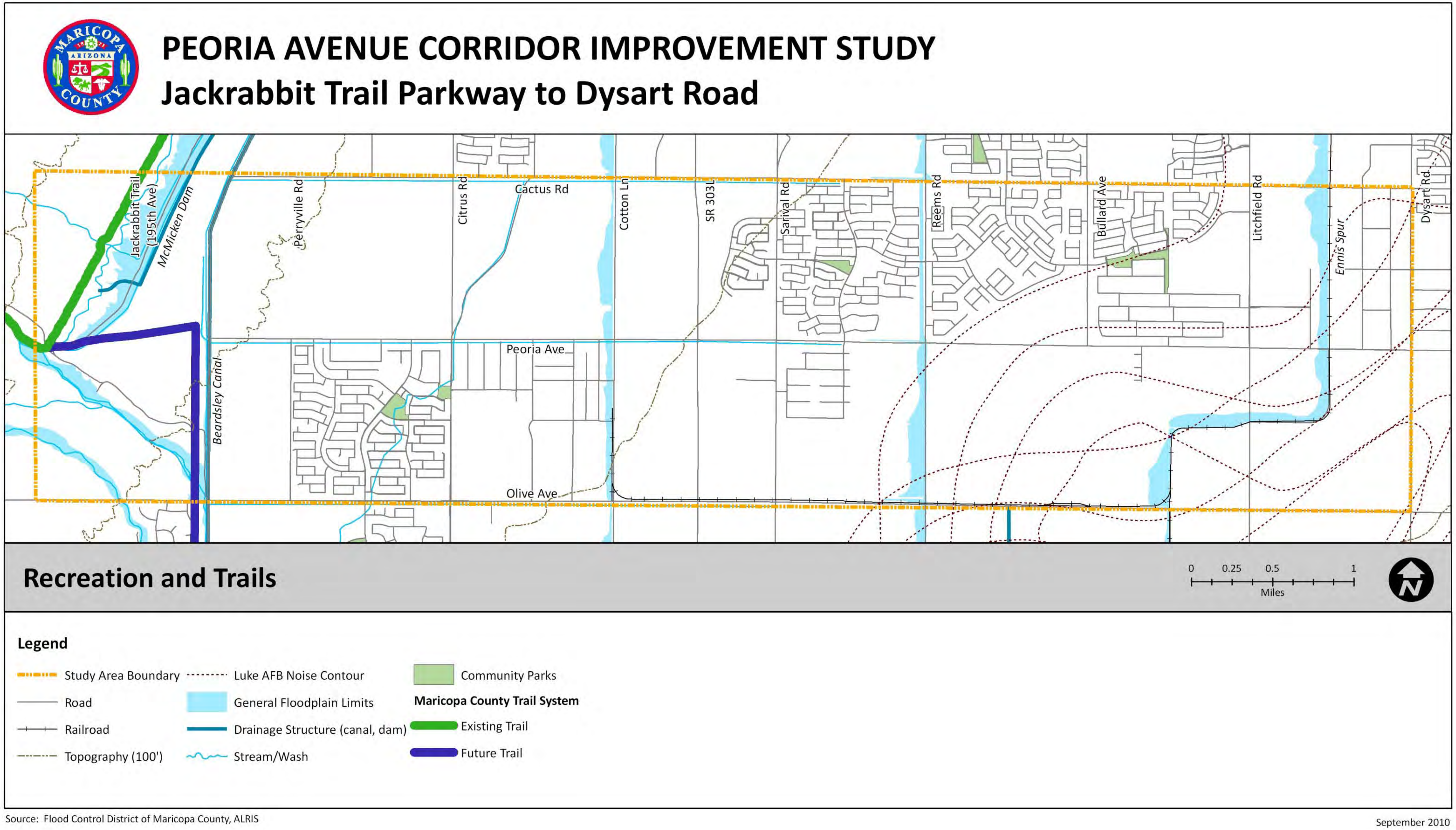


Figure 17 – Recreation and Trails

4.0 TRANSPORTATION NETWORK

Relevant information regarding the existing and future transportation network is detailed in the following sections, including discussions of roadway functional classification, planned network improvements, transit plans, local circulation plans, and programmed transportation improvements.

Existing Transportation Network

Figure 18 illustrates the existing transportation network in the study area. At the time of this report, Peoria Avenue is a two-lane roadway, with varying degrees of improvements. Peoria Avenue extends west as far as Perryville Road as a paved road, with the exception of one mile between Citrus Road and Cotton Lane that is unpaved. Between Perryville Road and the Beardsley Canal, an unpaved and narrow maintenance/access road exists. In the wider context of the study area, Jackrabbit Trail Parkway does not yet exist; Olive Avenue is the only crossing of the Beardsley Canal, providing access to the west; and SR 303L remains a major arterial road with no freeway improvements completed. Local roadways are intermittently developed, depending on the degree of built residential and industrial land uses. The BNSF Ennis Spur crosses Peoria Avenue at an at-grade railroad crossing, protected by lights and gates.

Based on its current function in the existing network, MCDOT functionally classifies the existing Peoria Avenue roadway as a major collector in the Maricopa County Transportation System Plan, February 2007. A major collector provides short-distance (less than three miles) traffic movement, collects and distributes traffic between local and arterial streets, and provides direct access to abutting land.

Future Transportation Network

For the planned future network, functional classification is the process by which roads are grouped into classes or systems according to the kind of service they will provide in the future. Roadways functionally classified as high-speed, high-capacity facilities tend to maximize mobility and minimize direct land access. The hierarchy of functional classification typically includes freeways, expressways, parkways, major and minor arterials, collectors, and local streets.

Maricopa County and MAG similarly classify Peoria Avenue as an (urban) principal arterial in the future network. However, Peoria Avenue actually falls within multiple jurisdictions in the study area. Each jurisdiction has assigned its own future functional classification to the portion of Peoria Avenue within its boundaries. The overlapping classifications are even more complex where Peoria Avenue forms the boundary between jurisdictions.

For the planned future network, Peoria Avenue has been classified by the local jurisdictions as listed below:

- MCDOT – Urban Principal Arterial
- MAG – Major Arterial
- City of El Mirage – Minor Arterial
- City of Glendale – Major Arterial
- City of Surprise – Major Arterial

The future MCDOT functional classification of Peoria Avenue in the study area is as an urban principal arterial, as stated in the Maricopa County Major Streets and Routes Plan, adopted in 2001 and revised in 2004 (Figure 19). The corridor currently exists from Dysart to Perryville Roads, and is classified as "future" from Perryville Road to Jackrabbit Trail. A principal arterial is defined as a street that provides for long-distance traffic movement within Maricopa County or between Maricopa County and urban areas. Access to abutting land is restricted and controlled through frontage roads and raised medians, as well as by the spacing and location of driveways and intersections. Opposing traffic flows may be separated by a raised median.

MCDOT also classifies all other one-mile grid roadways in the study area as principal arterials, except Perryville Road south of Cactus Road, which is defined as a minor arterial, and SR 303L, defined as a future freeway.

The Maricopa Association of Governments (MAG) I-10/Hassayampa Valley Transportation Framework Study identifies Peoria Avenue as a major arterial, as illustrated in the functional classification network map in Figure 20. This is supported in the 2010 MAG Regional Transportation Plan (RTP), which defines Peoria Avenue as a four-lane arterial from Dysart to Reems Road, and as a six-lane arterial from Reems Road to Jackrabbit Trail in 2030 (Figure 21).

The City of Surprise incorporated area within the study area extends north from Peoria Avenue, between the Beardsley Canal and Dysart Road. Surprise classifies Peoria Avenue as a major arterial in the current General Plan, illustrated in Figure 22.

Incorporated El Mirage includes the areas both north and south of Peoria Avenue east of Dysart Road (and therefore out of the study area), but also the area south of Peoria Avenue between the Ennis Spur and Dysart Road. El Mirage classifies Peoria Avenue as a minor arterial (based upon City of Peoria standard details). El Mirage does not have a functional classification map at the current time.

The City of Glendale maintains planning jurisdiction over the south side of Peoria Avenue from the Ennis Spur to Perryville Road as part of its MPA. One-half mile between SR 303L and Sarival Road is incorporated, fronting Peoria Avenue to the south. Recent General Plan amendments have upgraded Peoria Avenue to a major arterial roadway (Figure 23).

Planned Network Improvements

Much of the surrounding roadway system to the project area does not exist or is planned to be expanded or adjusted from its current configuration. SR 303L, Jackrabbit Trail Parkway, and Northern Avenue Parkway are other planned roadway facilities in the surrounding network that are considered regional routes.

SR 303L Corridor: SR 303L is located roughly in the center of the study area. It intersects Peoria Avenue between Cotton Lane and Sarival Road. It has been studied, classified, reclassified, restudied, and ultimately confirmed as a major link in the regional and state highway system. SR 303L is currently being improved from an interim two-lane roadway into a "Rural Major Freeway," as classified by MAG. SR 303L is an important link in the regional freeway system because it will alleviate the bottlenecks on the Grand Avenue arterial (US 60/US 93) and provide a new transportation corridor for the West Valley.

The ultimate improved SR 303L will be a fully access-controlled, grade-separated urban freeway with a rolling profile that will be elevated or depressed at the arterial crossroads and near ground level at all other locations. The ultimate freeway will include four general purpose lanes with high-occupancy vehicle (HOV) lanes and auxiliary lanes between service interchanges. Thirteen service interchanges for arterial crossroads and two system interchanges at Northern Parkway and US 60 are also planned for this freeway.

Peoria Avenue is one of the thirteen service interchanges planned for the build out of the SR 303L corridor. This interchange is under design as a full diamond interchange. The Stage III ADOT design plans have been obtained for this interchange and will be considered throughout the study.

Jackrabbit Trail Parkway: Jackrabbit Trail Parkway has undergone several planning and corridor-level studies in the last few years. In the 2007 MAG I-10/Hassayampa Valley Transportation Framework Study, Jackrabbit Trail was established as an Arizona Parkway, a new category of roadway classification in Arizona. The framework study also changed the alignment of the corridor – specifically within the Peoria Avenue study area, offsetting it a half mile west of the section line – to miss major topographical and drainage features.

Jackrabbit Trail Parkway will follow the new Design Guideline Recommendations for the Arizona Parkway (MCDOT, August 2008), which includes an intermediate-capacity, six- to eight-lane divided highway with partial access control and no direct left turns permitted at major intersections. Compared with a conventional arterial, an Arizona Parkway can provide additional travel capacity without full grade separations at major intersections. It can provide the benefit of increasing intersection capacity while maintaining direct driveway access to each quadrant of the intersection. The junction of Peoria Avenue with Jackrabbit Trail Parkway will need to consider the design standards in the Arizona Parkway Intersection/Interchange Operational Analysis and Design Concepts Study (MCDOT, August 2009).

In 2008, MCDOT completed the Jackrabbit Trail Access Control and Corridor Improvement Study, which further refined the corridor and established a preferred alignment, supported by preliminary engineering considerations that provide operational and design details regarding its classification as an Arizona Parkway. Because Peoria Avenue will intersect Jackrabbit Trail Parkway, this study can provide guidance for future roadway improvements in the study corridor.

Northern Avenue Parkway: While located outside the study area, Northern Avenue through the Phoenix metropolitan area has been under study for several years, with a view to upgrading it to a "super street." With a fourteen–mile gap in the freeway system between I-10 and SR 101L, Northern Avenue has been envisioned as another east-west connection across the metropolitan area, offering more access control and capacity than a major arterial, but less speed than a freeway.

In the MAG I-10/Hassayampa Valley Transportation Framework Study, this facility is defined as an Arizona Parkway, positioned approximately one-half mile between the Northern and Olive Avenue section lines throughout the study corridor.

Scenic Corridors

Maricopa County has designated a series of corridors as scenic for a number of reasons, including their prominent views or vistas, native landscaping, or unique characteristics that attract residents in search of a distinct quality of life. MCDOT has developed design guidelines (e.g., landscape, habitat, character, height, lighting, signage, fencing) to direct and enhance planning of these corridors as development occurs, with the intent of highlighting, promoting, and preserving the scenic and environmental characteristics of the community, while minimizing the impacts of rapid urban growth . Two scenic corridors exist in the study area:

- The Olive Avenue Scenic Corridor has been designated because it provides access to the White Tank Mountain Regional Park, a major recreational destination in Maricopa County.
- The McMicken Dam Scenic Corridor has been designated for its recreational role and potential as a segment of the Maricopa County Regional Trail System.

As alternatives are developed for Peoria Avenue, coordination should occur with these studies, if the alternative alignments intersect these corridors in any way.

Public Transit

Figure 24 expands upon the future roadway network planned for the study area and includes other transportation modes planned or proposed by the jurisdictions. They include two future transit services, currently funded through the MAG RTP: bus rapid transit (BRT) along the future SR 303L, and local bus service along Dysart Road. Unfunded but proposed future service includes local bus service along Cotton Lane, Sarival Road, Litchfield Road, and Peoria

Avenue through the study area, and on Reems Road and Bullard Avenue north of Peoria Avenue. Consideration should be given to future bus stops and pullouts for these services.

Circulation Plans

As discussed earlier, the study area includes several existing and proposed master planned communities. Each of these communities has its own planned internal circulation system. Most of the communities plan curving and circuitous local roadways that loop back on each other, often with cul-de-sacs and limited connectivity in and out.

Programmed Transportation Improvements

MCDOT's Transportation Improvement Program (TIP) for Fiscal Years (FY) 2011-2015 does not include any transportation improvements for Peoria Avenue within the study area boundaries. In the larger project area, Olive Avenue is slated for intersection improvements in FY 2011 at Reems Road and Cotton Lane, to install traffic signals, make safety improvements, reduce congestion, and increase traffic flow. Along Olive Avenue between Litchfield Road and SR 101L, intelligent transportation system (ITS) elements will be constructed through FY 2013.

MAG maintains two major documents that identify projects: the RTP, which identifies transportation projects for a twenty-year horizon; and the TIP, which summarizes projects programmed during the next five years. The MAG RTP was updated in July 2010. With the exception of SR 303L, defined as a five- to six-lane freeway to be constructed between FY 2011 and 2015, the RTP defines the major roads within the study area as arterials, varying between four and six lanes by 2030. No roads, however, are designated for specific improvements within the study area. BRT along SR 303L is planned for implementation in "Phase 5" of the RTP (FY 2026-2031); no other transit service is specified. ("Phase 5" is in quotation marks because the half-cent sales tax that funds the RTP expires in 2026, so no funding is actually available beyond that date.)

The MAG TIP for FY 2011-2015, approved in July 2010, outlines recently completed, deferred, and deleted projects from the previous year's TIP. A number of projects have recently been deleted because of revenue and funding shortfalls. The only listing pertaining to Peoria Avenue is the recently completed Peoria Avenue (Cotton Lane to Litchfield Road) and Litchfield Road (Peoria Avenue to Greenway Road) design and construction of fiber optic cable interconnection of existing and future ITS facilities.

Table 4 lists programmed projects included in the MAG FY 2011-2015 TIP. The list draws from the individual city and town TIPs, including capital projects currently programmed in the City of Surprise Capital Improvement Plan FY 2010-2014, City of El Mirage FY 2009-2019 Capital Improvement Plan, and City of Glendale FY 2010-2019 Capital Improvement Plan.

Table 4 – Programmed Roadway Improvements: MAG TIP

Agency	FY	Location	Description	Funding Source*	Funding Total
ADOT	2011	SR 303L: Glendale Avenue - Peoria Avenue	Right-of-way acquisition	STP-AZ	$85,900,000
ADOT	2011	SR 303L: Peoria Avenue - Waddell Road	Landscape design	RARF	$200,000
ADOT	2011	SR 303L: Peoria Avenue - Waddell Road	Construction	NHS	$60,000,000
ADOT	2012	SR 303L: Glendale Avenue to Peoria Avenue	Landscape design	RARF	$300,000
ADOT	2012	SR 303L: Peoria Avenue - Waddell Road	Landscape construction	RARF	$2,400,000
ADOT	2013	SR 303L: Glendale Avenue to Peoria Avenue	Landscape construction	RARF	$3,500,000
El Mirage	2011	Dysart Ranchettes area: Varney Road, Peoria Avenue, Dysart Road, El Mirage	Paving dirt roads	CMAQ	$3,000,000
Maricopa County	2012	Olive Avenue: Litchfield Road to SR 101L	Construct and install new conduit and fiber optic cable to connect existing and planned ITS field devices	CMAQ	$1,265,000
Surprise	2011	Litchfield Road: Desert Cove and Cactus Road	Construct new 2 northbound and 2 southbound lanes	Local	$2,472,000
Surprise	2011	Peoria Avenue: Perryville Road and east 1/4 mile	Construct new 2 westbound lanes with curb, gutter, sidewalk, raised median, and 1 turn lane	Private	$500,000
Surprise	2011	Perryville Road: Peoria Ave and Cactus Road	Construct new 2 lane arterial road	Private	$1,000,000
Surprise	2011	Reems Road: Cactus Road and Peoria Avenue	Reconstructed 2 lane arterial road adding 1 southbound and 1 northbound lane with curb, gutter, median, and sidewalk	Local	$2,600,000
Surprise	2011	Peoria Avenue: Cotton Lane to Litchfield Road	Design and installation/construction of fiber optics.	Local	$800,000
Surprise	2011	SR 303L: Peoria Avenue to Bell Road	JPA with ADOT to install fiber optic conduit	Local	$190,000
Surprise	2012	SR 303L: Peoria Avenue to Bell Road	Design fiber optic line and ITS devices to interconnect arterial/freeway traffic signals	Local	$120,000
Surprise	2013	SR 303L: Peoria Avenue to Bell Road	Construction of fiber optic line and ITS devices	CMAQ	$753,500

*Funding source abbreviations: STP-AZ – Surface Transportation Program-Arizona, RARF – Regional Area Road Fund, NHS – National Highway System, CMAQ – Congestion Mitigation and Air Quality.

Sources: MAG FY 2011-2015 TIP, City of Surprise Capital Improvement Plan FY 2010-2014, City of El Mirage FY 2009-2019 Capital Improvement Plan, and City of Glendale FY 2010-2019 Capital Improvement Plan.

As can be noted from the table, the City of Glendale Capital Improvement Plan contains no capital improvements in the study area during the FY 2010-2019 period.

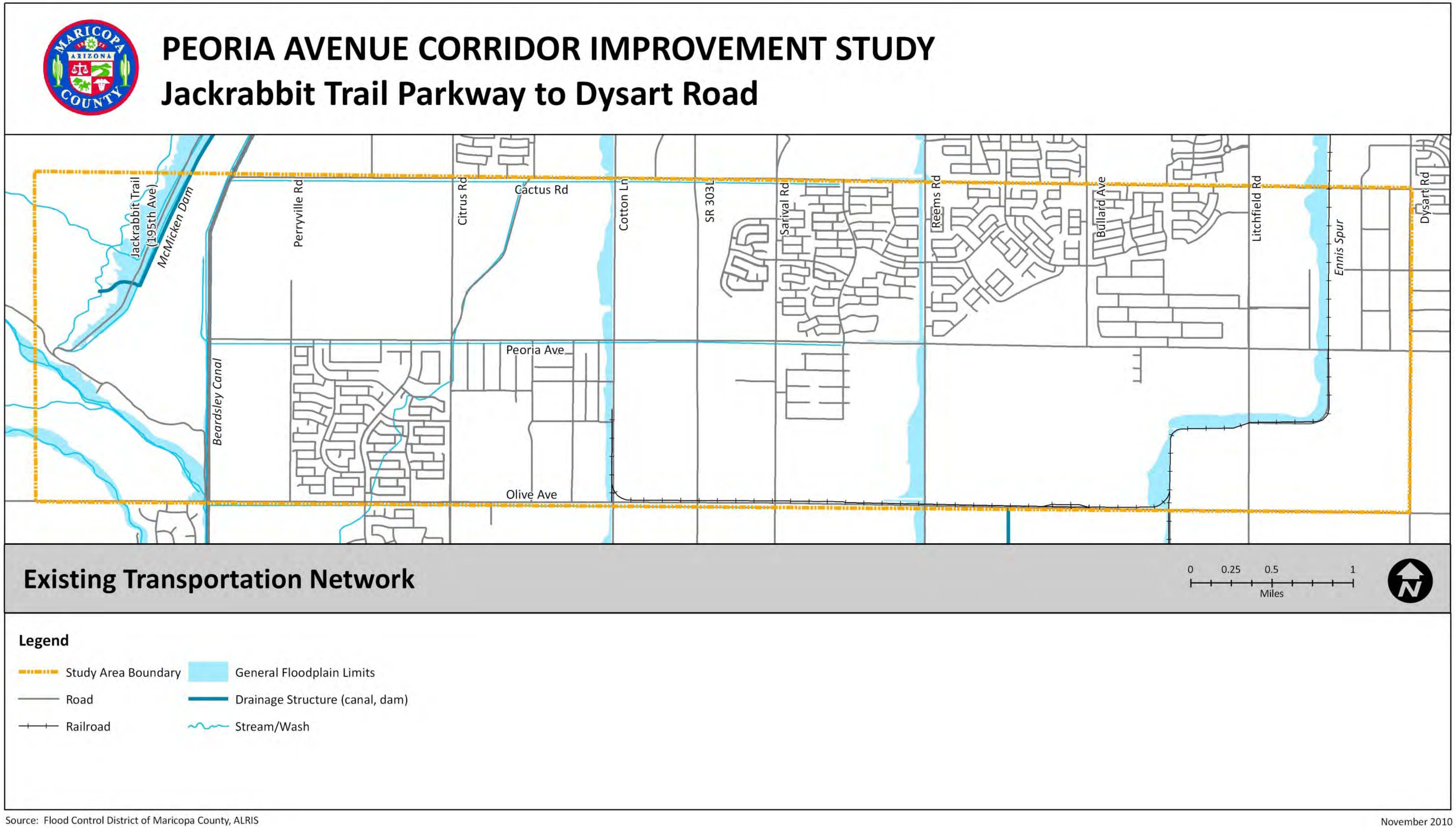
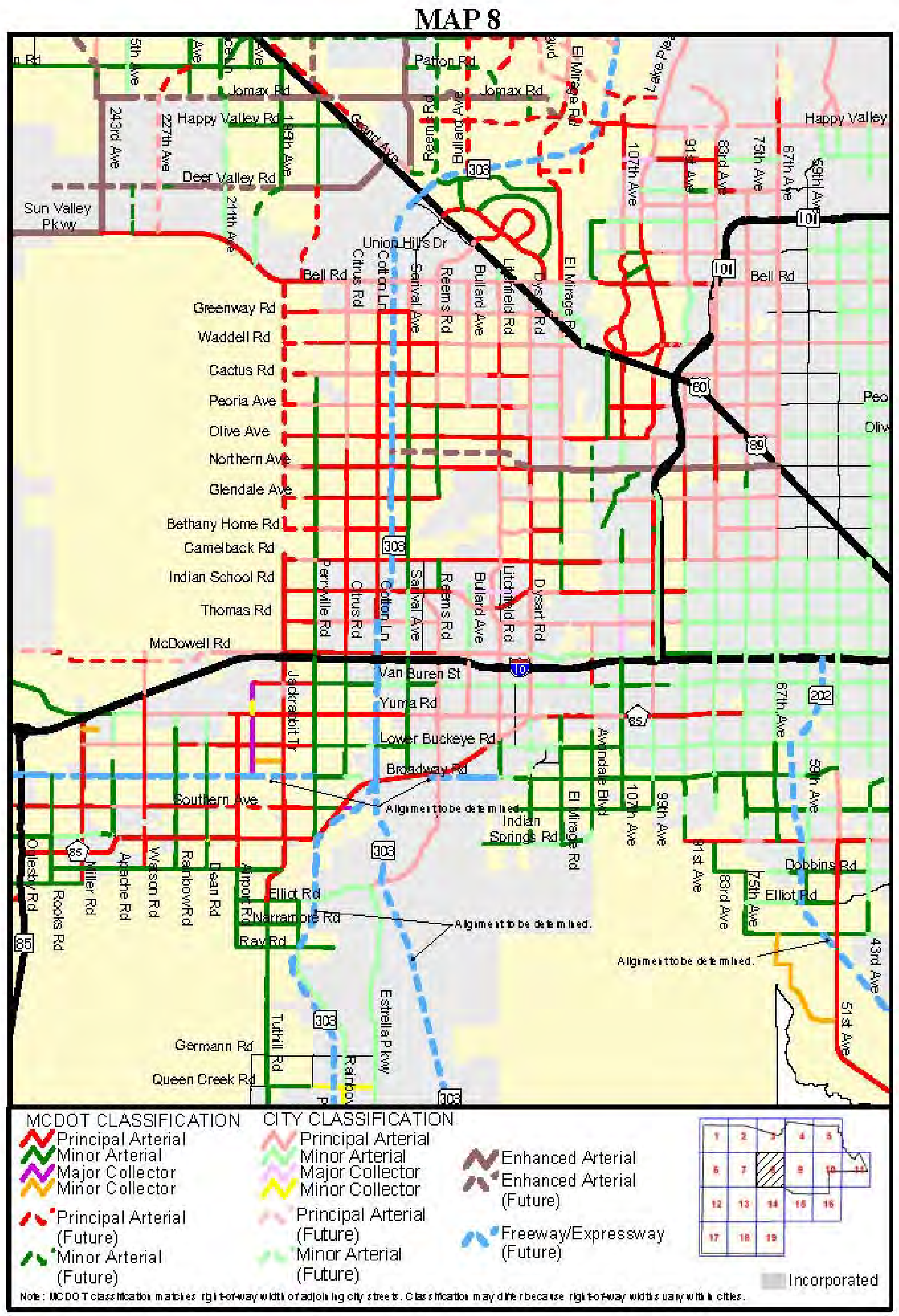


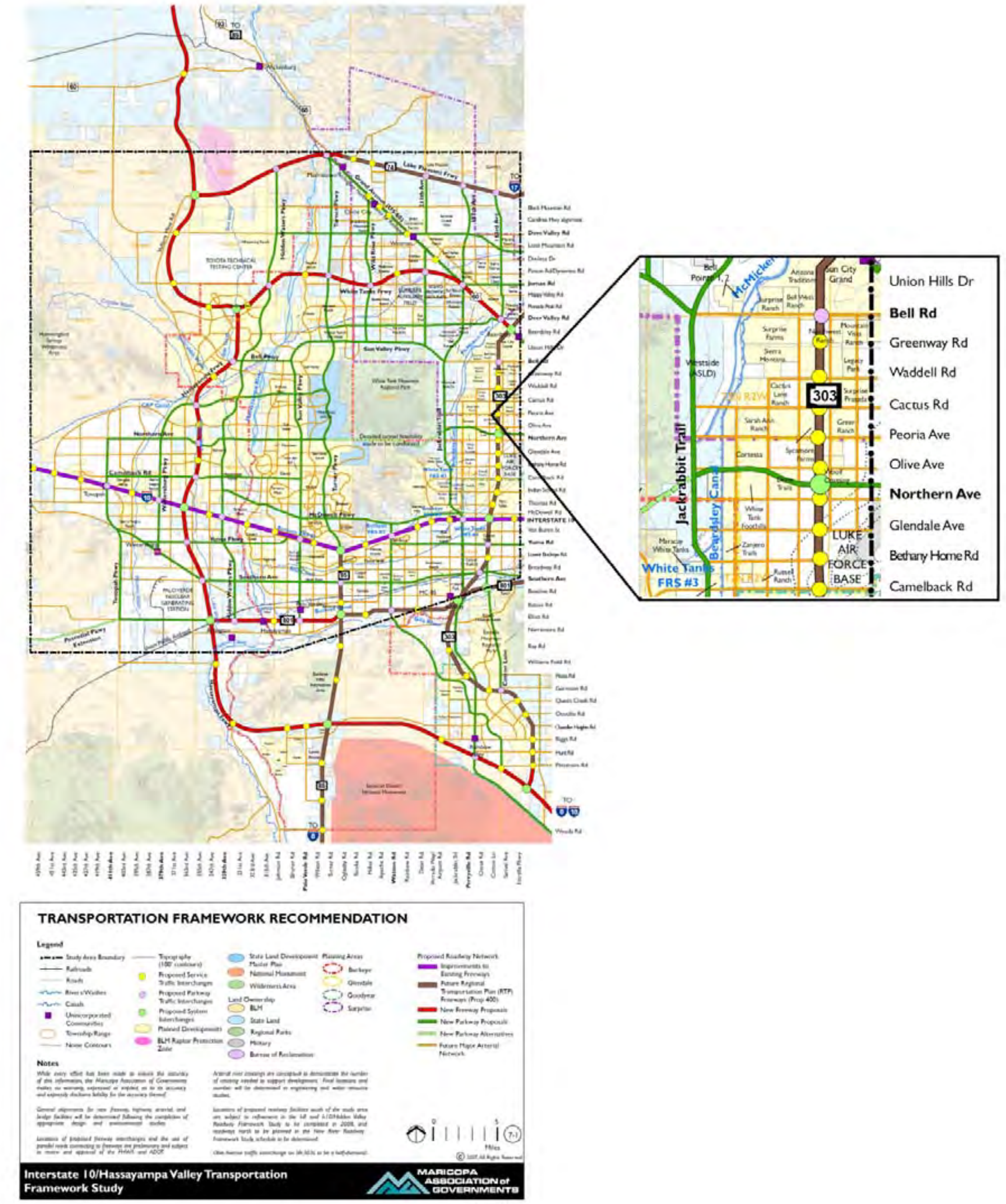
Figure 18 – Existing Transportation Network



Source: Maricopa County Major Streets and Routes Plan, Street Atlas, revised 2004.

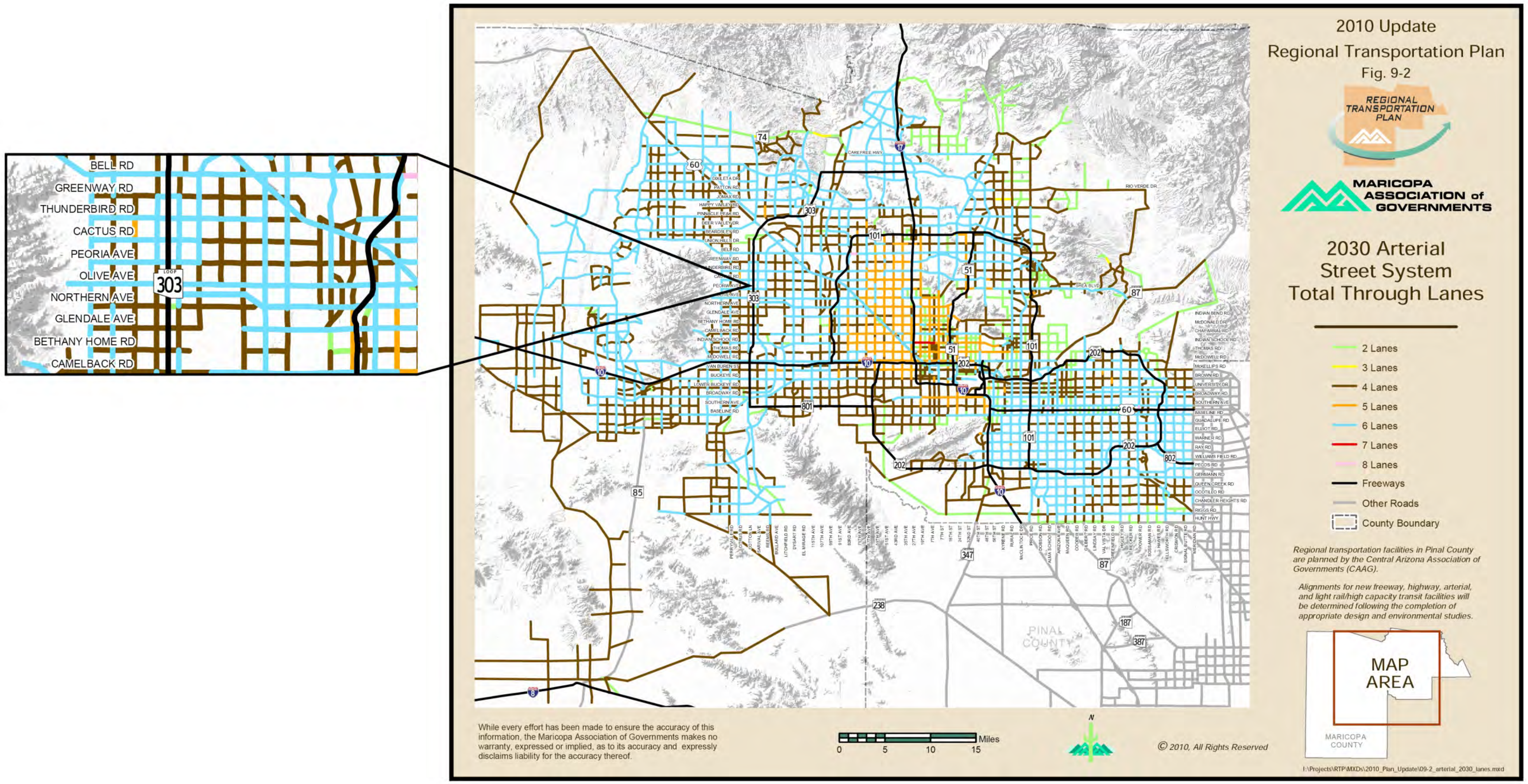
Figure 19 – Maricopa County Major Streets and Routes Plan Functional Classification

Technical Memorandum #1
Existing and Future Corridor Features
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road



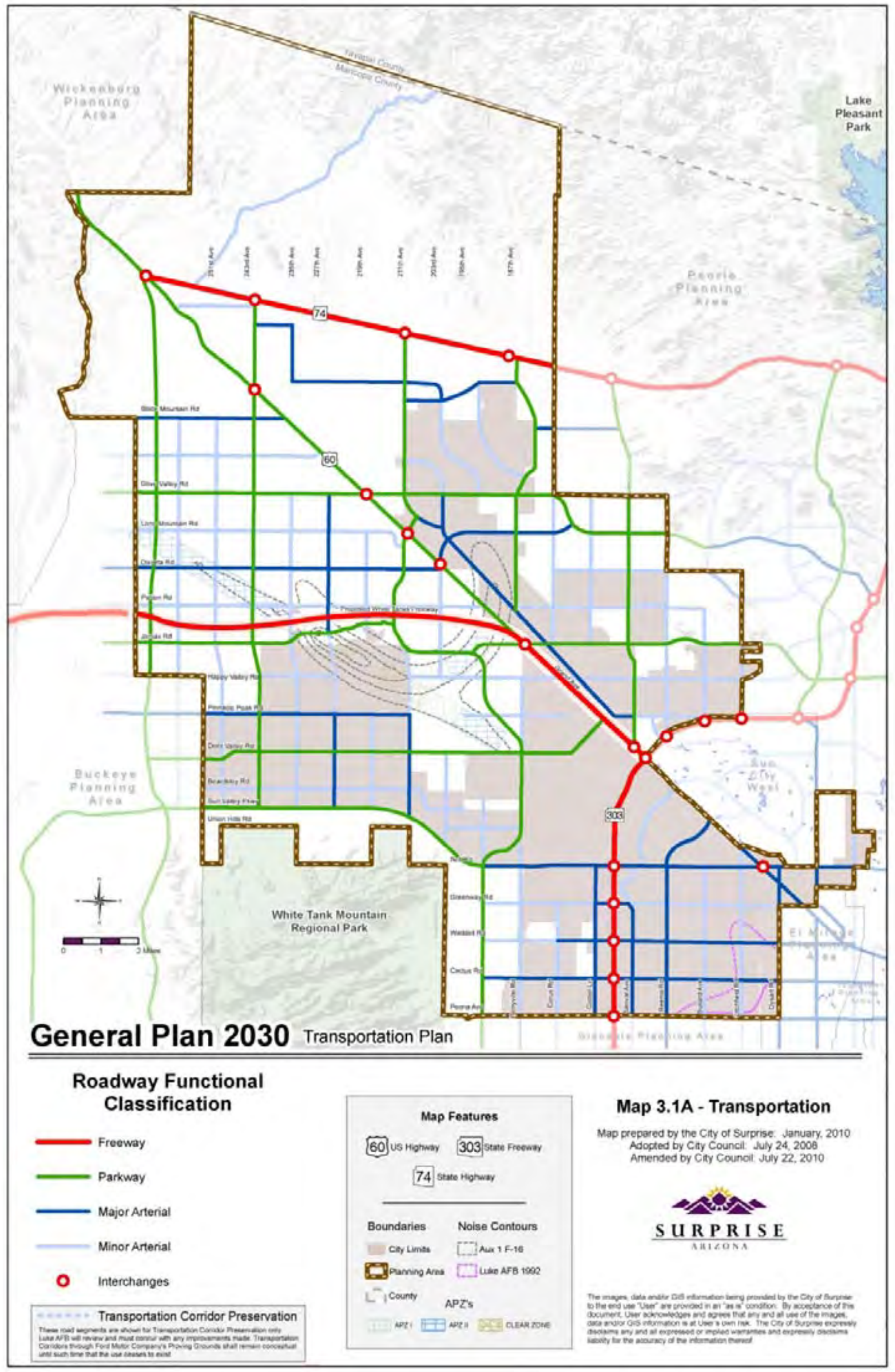
Source: MAG I-10 Hassayampa Valley Transportation Framework Study, 2007.

Figure 20 – MAG I-10/Hassayampa Valley Transportation Framework Study Functional Classification



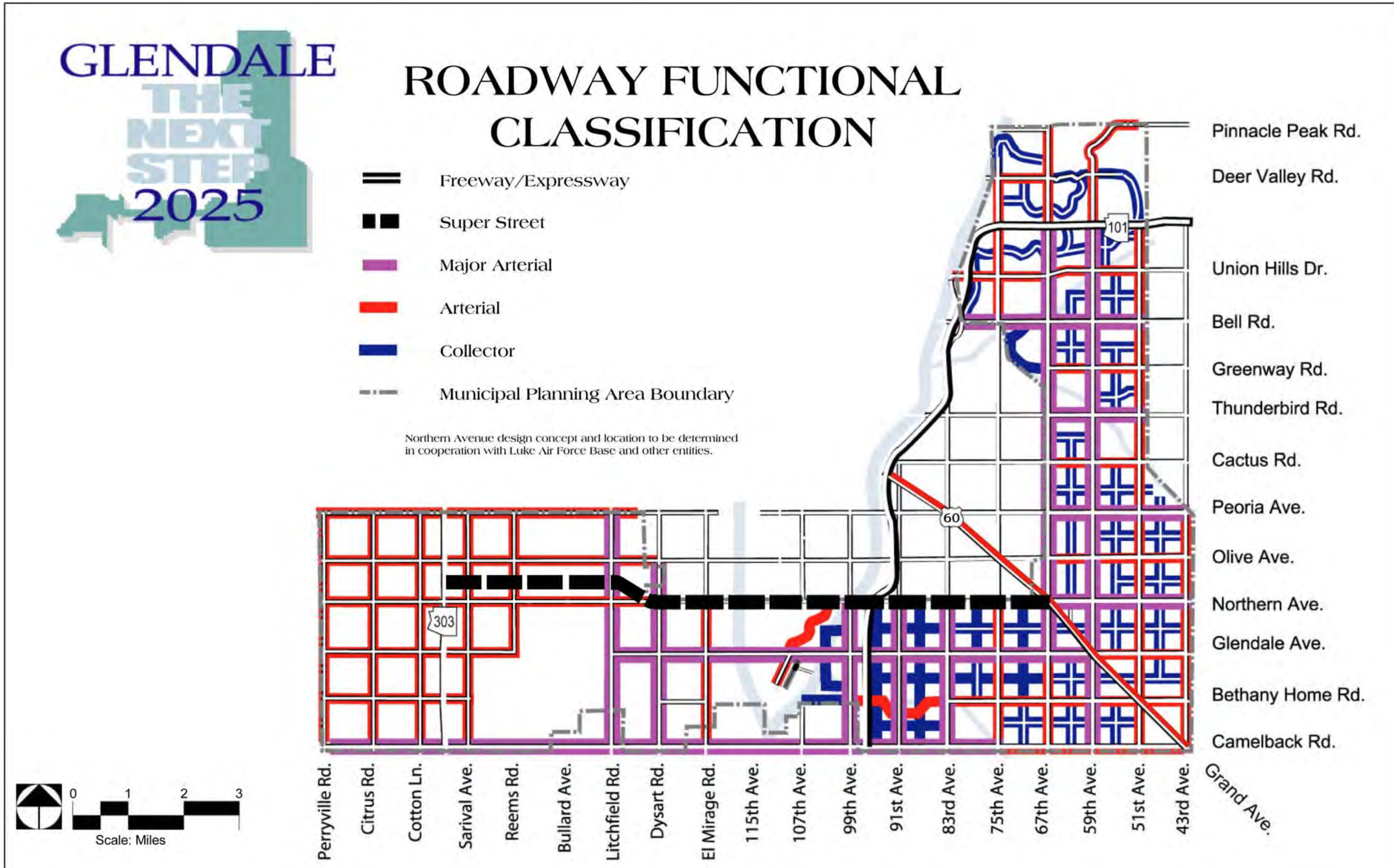
Source: MAG RTP 2010 Update, 2010.

Figure 21 – MAG 2030 Arterial Street System



Source: City of Surprise General Plan 2030, Transportation Plan, 2010.

Figure 22 – City of Surprise Functional Classification Map



Source: City of Glendale General Plan 2025.

Figure 23 – City of Glendale Functional Classification Map

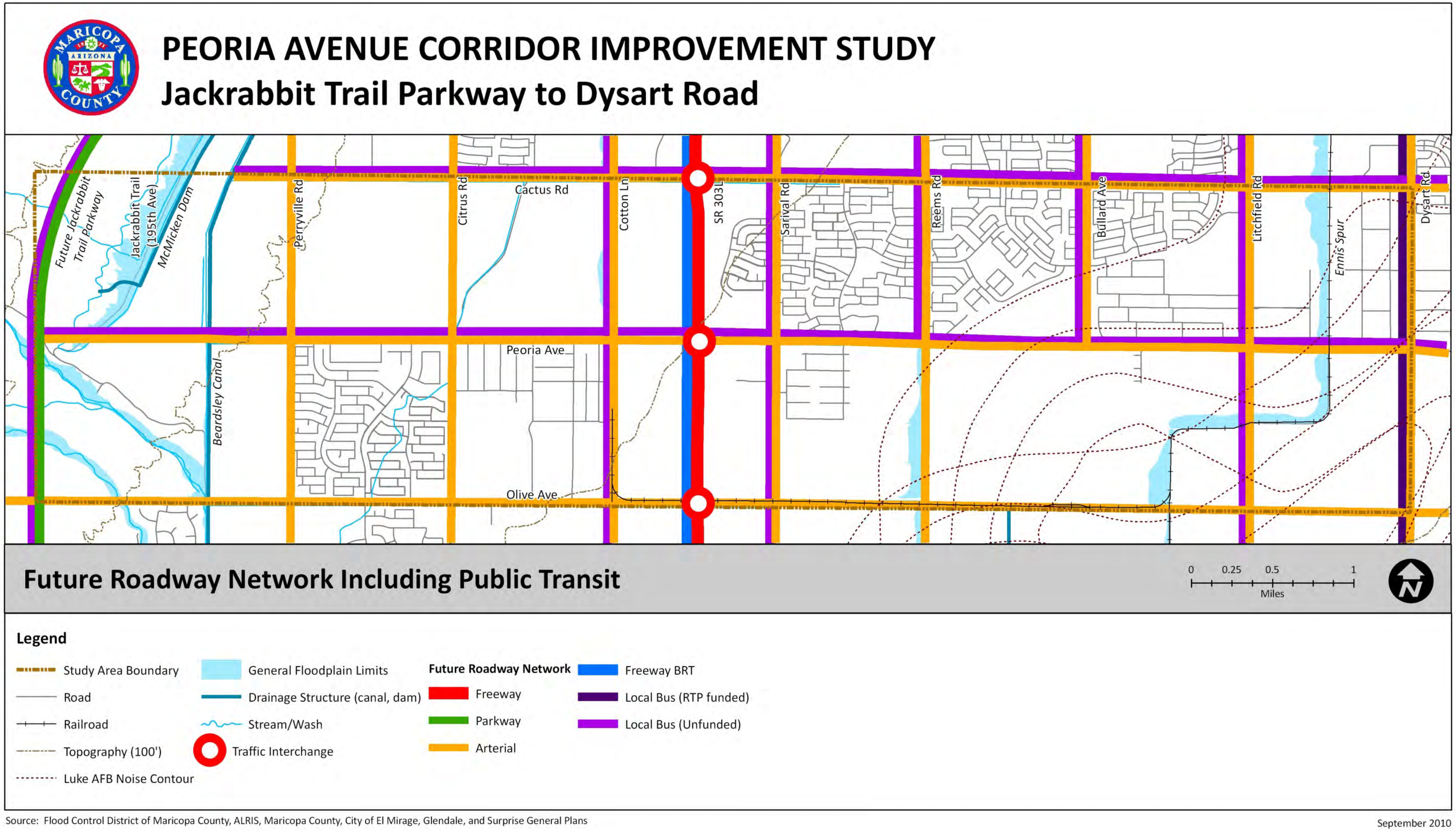


Figure 24 – Future Roadway Network Including Public Transit

5.0 ROADWAY CHARACTERISTICS

The following sections detail relevant information regarding the existing and future characteristics of Peoria Avenue. Currently, Peoria Avenue exists as a two-lane roadway with varying degrees of improvements throughout the study area.

Existing Horizontal/Vertical Alignment

Peoria Avenue is currently an east/west roadway from Perryville Road to Dysart Road, with an unpaved section from Citrus Road to Cotton Lane (one mile). Within these limits, the current roadway alignment generally follows the Peoria Avenue section line, with some variation (Figure 25). The existing roadway is centered on the Peoria Avenue section line in the following areas: between Perryville Road and a half-mile east, between a quarter-mile west of Cotton Lane and a half-mile east of Sarival Road, between Reems Road and Bullard Avenue, and between Litchfield Road and Dysart Road. The existing roadway shifts slightly to the south so that the Peoria Avenue section line is near the north edge of the existing roadway between a half-mile east of Perryville Road and Citrus Road, and between a half-mile east of Sarival Road and Reems Road. Between Bullard Avenue and Litchfield Road, the existing roadway shifts slightly to the north so that the Peoria Avenue section line is near the south edge of the existing roadway. As-built plans are not available for Peoria Avenue, so the horizontal alignment data (curves and angle points) are unknown.

The existing roadway profile of Peoria Avenue does not contain any significant changes in elevation. Based on FCDMC; White Tanks-Agua Fria ADMP, 1989; NGVD29 data, the existing roadway elevations vary from 1,280 feet at Perryville Road to 1,108 feet at Dysart Road, which equates to an approximate slope of 0.50 percent. The flattest section is between Reems Road and Bullard Avenue (approximate 0.2 percent slope) and the steepest section is from Perryville Road to Cotton Lane (approx. 0.70 percent slope). Exact vertical alignment data is unknown, since as-built plans are not available.

Existing Roadway Widths

In general, existing Peoria Avenue from Perryville Road to Dysart Road has been built as a two-lane roadway, with varying degrees of improvements along the route. The existing roadway currently has a speed limit of 45 miles per hour. No designated parking lanes or bicycle lanes exist along the roadway. There is existing sidewalk (primarily detached) at various locations along the route where curb and gutter exist.

Table 5 lists the number of lanes by direction, median type, and approximate roadway width along Peoria Avenue between Perryville Road and Dysart Road.

Technical Memorandum #1
Existing and Future Corridor Features
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Table 5 – Roadway Characteristics

Segment	Number of Lanes EB	Number of Lanes WB	Median Type	Roadway Width
Perryville Road				
to	1	2	Raised	96’
¼ Mile East				
to	1	1	None	96’-27’
½ Mile East				
to	1	1	None	27’-54’
¾ Mile East				
to	1	1	None	36’-52’
Citrus Road				
to	Unpaved	Unpaved	n/a	n/a
¾ Mile East				
to	1	1	None	28’
Cotton Lane				
to	1	1	None	28’
Sarival Road				
to	2	1	TWLTL	50’
½ Mile East				
to	1	1	None	50’-28’
¾ Mile East				
to	1	1	None	28’
Reems Road				
to	1	1	None	28’
Bullard Avenue				
to	1	1	None	50’-32’
¼ Mile East				
to	1	1	None	32’-40’
½ Mile East				
to	1	1	None	40’-33’
¾ Mile East				
to	1	1	None	33’-50’
Litchfield Road				
to	1	1	TWLTL	64’
¼ Mile East				
to	1	1	TWLTL	64’-47’
½ Mile East				
to	1	1	TWLTL	46’
¾ Mile East				
to	1	2	TWLTL	74’-64’
Dysart Road				

Note: All roadway widths vary at intersections. TWLTL median type is a two way left-turn lane.

Source: Maricopa County 2010; Field verification 2010.

Existing Right-of-Way

Existing right-of-way information was obtained from Maricopa County Assessor Maps, recorded plat maps and other surveys, and Maricopa County geographic information systems (GIS) data. The existing right-of-way width along Peoria Avenue varies along the corridor. Figure 26 provides representative right-of-way width information along Peoria Avenue from Perryville Road to Dysart Road. It is important to note that information presented on this map includes formally recorded right-of-way per the Maricopa County Assessor's Office, as of September 2010. This does not reflect right-of-way dedications that may be in process, municipality required developer stipulations that have not been administered, or any other situations not documented with the county.

Pavement Conditions

Peoria Avenue is generally paved with asphalt concrete from Perryville Road to Dysart Road, with the exception of the unpaved segment from Citrus Road to Cotton Lane. MCDOT supplied road summary reports for three specific locations: Cotton Lane to approximately 3,000 feet east, Sarival Avenue to Reems Road, and Reems Road to Bullard Avenue.

Peoria Avenue from Cotton Lane to approximately 3,000 feet east of Cotton Lane was constructed in May 1974 and is currently paved with a two-inch road mix over a native subgrade. This section was last sealed with a chip seal in May 2007. The left and right shoulders consist of native dirt. No curb and gutter are present.

Peoria Avenue from Sarival Avenue to Reems Road was originally constructed in June 1975 and improved in February 2008. It is currently paved with a five-inch road mix over an eight-inch aggregate base course. This section was last sealed with a 3/8-inch chip seal in June 2009. The left shoulders consist of native dirt. Curb and gutter are present on the right edge (south) for most of the segment.

Peoria Avenue from Reems Road to Bullard Avenue was constructed in June 1975 and is currently paved with a one-inch road mix over a native subgrade. This section was last sealed with a 3/8-inch chip seal in June 2009. The left and right shoulders consist of native dirt. No curb and gutter are present.

The Pavement Condition Rating (PCR) is a composite evaluation of nine surface distress categories for extent and severity. The PCRs for Peoria Avenue, obtained from MCDOT in August 2010, are given in Table 6. The PCR for Peoria Avenue ranges from a low of 60 (from Cotton Lane to a point approximately 3,000 feet east, and from Reems Road to Bullard Avenue) to a high of 86 (between Sarival Road and Reems Road). A PCR of 55 to 70 is considered "good," 71 to 84 rates as "very good," and 85 to 100 rates as "excellent." As shown in Table 6, the section of Peoria Avenue between Sarival Road and Reems Road is in excellent condition, while the other two segments are in good condition. Based on historical data (2002-2007), approximately 70 percent of the arterial road segments in Maricopa County have a higher rating

than the two "good" segments on Peoria Avenue. PCR data was not available for the remaining sections of the study corridor.

Also shown in Table 6, the Sufficiency Rating identifies how each arterial roadway segment compares to the MCDOT Roadway Design Manual (RDM) standards for each segment's functional classification. The MCDOT Roadway Management Section maintains information on lane geometry, width, shoulder width, drainage features, vertical sight distance, and horizontal sight distance. This information is then combined so that each road is scored on a scale from 1 to 100, with an excellent rating of 100 representing a road in complete compliance with RDM standards. The Sufficiency Rating of Peoria Avenue ranges from a good rating of 66 between Sarival Road and Reems Road to a very good rating of 71 from Cotton Lane to approximately 3,000 feet east. Based on historical data (2002-2007), approximately 85 percent of the arterial road segments in Maricopa County have a higher rating than all three of these segments on Peoria Avenue. Sufficiency Rating data were not available for the remaining sections of the study area.

Table 6 – Existing Pavement Condition

Segment	Pavement Condition Rating	Sufficiency Rating
Cotton Lane to 2,957' east	60 (Good)	71 (Very Good)
Sarival Road to Reems Road	86 (Excellent)	66 (Good)
Reems Road to Bullard Avenue	60 (Good)	69 (Good)

Source: MCDOT Road Management System – Road Summary Report, August 2010.

Intersection and Lane Geometry

The existing portion of Peoria Avenue within the study area has eight major cross-street intersections from Perryville Road to Dysart Road. The intersection with Litchfield Road is a four-legged signal controlled intersection. The other seven intersections are either two-way stop controlled or all-way stop controlled. The Perryville Road intersection is a "T" intersection, with the existing Peoria Avenue terminating here. The roadway lane geometry and intersection traffic control was taken from aerial mapping provided by Maricopa County and field-verified in August 2010. Table 7 summarizes the configuration of these eight intersections, including the type of intersection, current traffic control, and number of lanes at each approach. Figure 27 shows the lane geometry of each intersection along with an aerial plan view of the intersection.

Table 7 – Existing Intersection Characteristics

Intersection	Type	Traffic Control	Approach Lanes			
			NB	SB	EB	WB
Perryville Road	"T"-intersection	Three-Way STOP	1	1	n/a*	2
Citrus Road	Four-legged	NB/SB STOP	1	1	2	1
Cotton Lane	Four-legged	EB/WB STOP	1	1	1	1
Sarival Road	Four-legged	Four-Way STOP	3	2	2	2
Reems Road	Four-legged	Four-Way STOP	2	3	1	1
Bullard Avenue	"T"-intersection	Three-Way STOP	n/a	2	1	2
Litchfield Road	Four-legged	SIGNAL	2	3	2	3
Dysart Road	Four-legged	Four-Way STOP	3	3	2	3

*n/a applies to approach lanes that do not exist (e.g., three-legged intersection).

Source: Maricopa County 2010; Field verification 2010.

Access Conditions

There are thirty four driveways and fifteen intersections on Peoria Avenue. The names and approximate locations of these driveways and intersections were obtained on a field visit in August 2010. In addition to these defined access points, there is also "undefined" access throughout the corridor at various locations. All of the intersections have full access configurations, but only a few have separate lanes for left and right turns. All of the driveways have full-access, single-lane configurations with shared movements for each approach. The approximate locations of these minor intersections and driveways are shown in Figures 28 and 29. The figures include example photos of the various types of access conditions that are present along the corridor. All intersections and driveways along existing Peoria Avenue have full movement access in all directions (no limited access).

Future Typical Sections

As mentioned in section 4.0, Peoria Avenue has been classified by the local jurisdictions as follows:

- MCDOT – Urban Principal Arterial
- MAG – Major Arterial
- City of El Mirage – Minor Arterial
- City of Glendale – Major Arterial
- City of Surprise – Major Arterial

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A MCDOT principal arterial is six lanes wide, constructed on a minimum right-of-way of 130 feet, including a bicycle lane. Right-of-way for future bus pullouts should be provided on the far side of each intersection of a principal arterial with another principal or minor arterial – which, in the study area, includes every one-mile cross street. Figure 30 illustrates this MCDOT typical cross-section for Peoria Avenue.

A MAG principal arterial is also six lanes wide, constructed on a minimum right-of-way of 140 feet, including a bicycle lane. Figure 31 depicts the MAG typical cross-section for Peoria Avenue.

Surprise classifies Peoria Avenue as a major arterial in the current General Plan, whereas El Mirage classifies Peoria Avenue as a minor arterial (based on City of Peoria standard details). Typical cross-sections for both cities are illustrated in Figures 32 and 33.

The City of Glendale has indicated that amendments to the General Plan have upgraded Peoria Avenue to a major arterial. A typical cross-section for the City of Glendale is shown in Figure 34.

Bicycle lanes are typically part of most arterial cross-sections, but are specifically planned for Perryville Road, Citrus Road, Bullard Avenue, and Litchfield Road – all north of Peoria Avenue – in the Surprise General Plan. Multi-use paths are planned along Peoria Avenue and Jackrabbit Trail Parkway. Surprise has designated SR 303L and Dysart Road as truck routes (Figure 35).

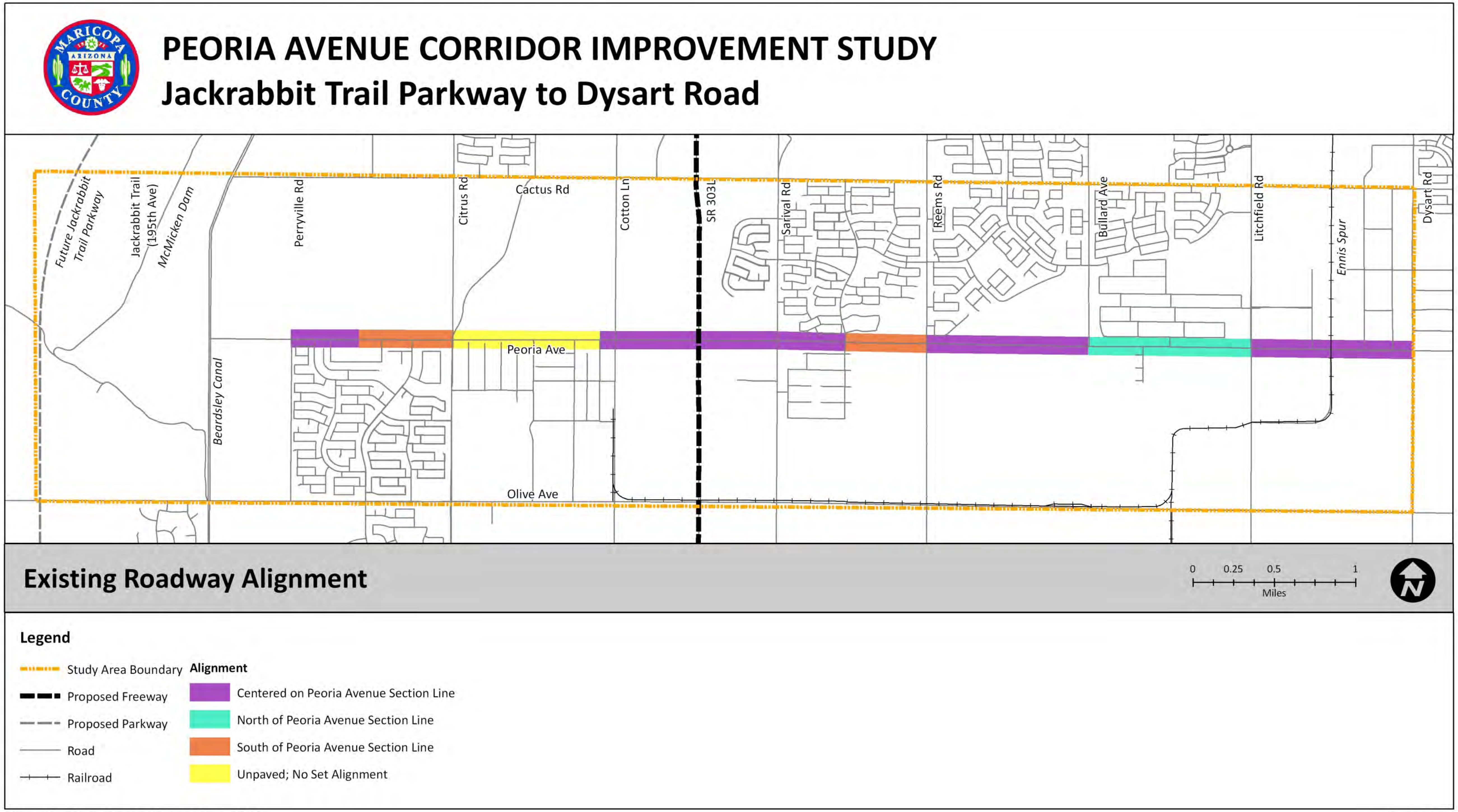
Design Criteria

Table 8 summarizes the functional classification guidelines described for each of the typical sections displayed in the last section.

Table 8 – Adopted Design Guidelines

Element	Design Guidelines			
	MCDOT Principal Arterial	**Surprise Major Arterial**	**El Mirage Minor Arterial**	**Glendale Major Arterial**
Number of Lanes	6	6	4	6
Minimum Right-of-Way	130 feet	136 feet	110 feet	130 feet
Roadway Width	101 feet	101 feet	78 feet	95 feet
Lane Width	12 feet	12 feet	12 feet	11-12 feet
Lane Separation	14 foot Median	24 foot Median	16 foot Median	15 foot Median
Access (min. driveway spacing)	165' for low vol driveways and 330' for high vol driveways	200' for all driveways and 300' for major arterial intersections	150'-260' based on 30 mph to 50 mph design speed	150' min spacing
Design Speed	55 mph	55 mph	n/a	n/a
Bicycle Facilities	5.5 feet	Multi-Use Path	6 feet	5 feet w/11 foot lane

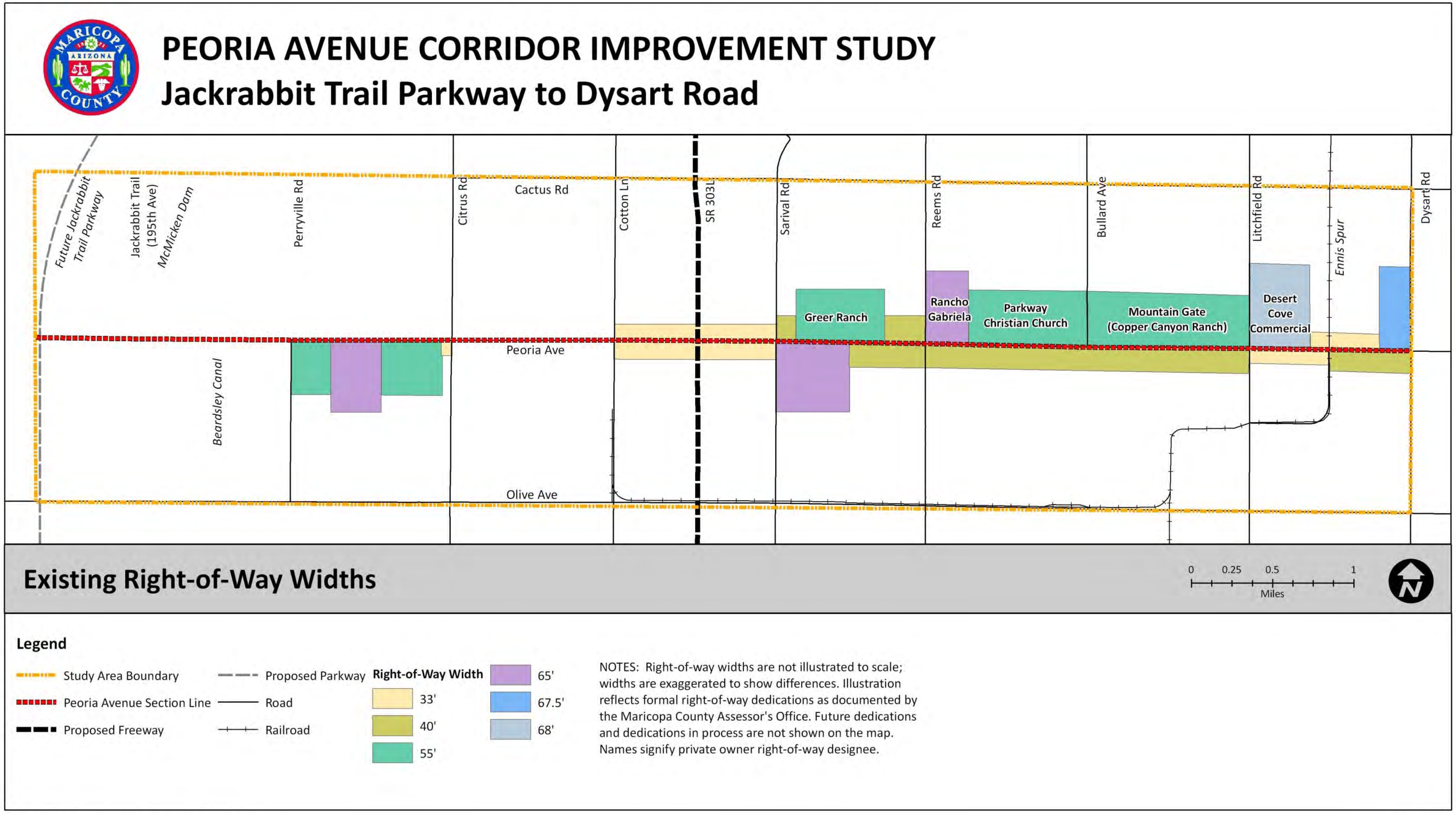
Source: Maricopa County Major Streets and Routes Plan, Policy Document, revised 2004; MCDOT Roadway Design Manual; City of Surprise Transportation Plan, 2009; City of Surprise Engineering Design Standards; City of Peoria Standard Detail, 2007; City of Peoria Infrastructure Design Guidelines; City of Glendale Standard Detail Index, 2002; City of Glendale Design and Construction Standards, 2002.



Source: Flood Control District of Maricopa County, ALRIS

October 2010

Figure 25 – Existing Roadway Alignment



Source: Flood Control District of Maricopa County, ALRIS

October 2010

Figure 26 – Existing Right-of-Way Widths

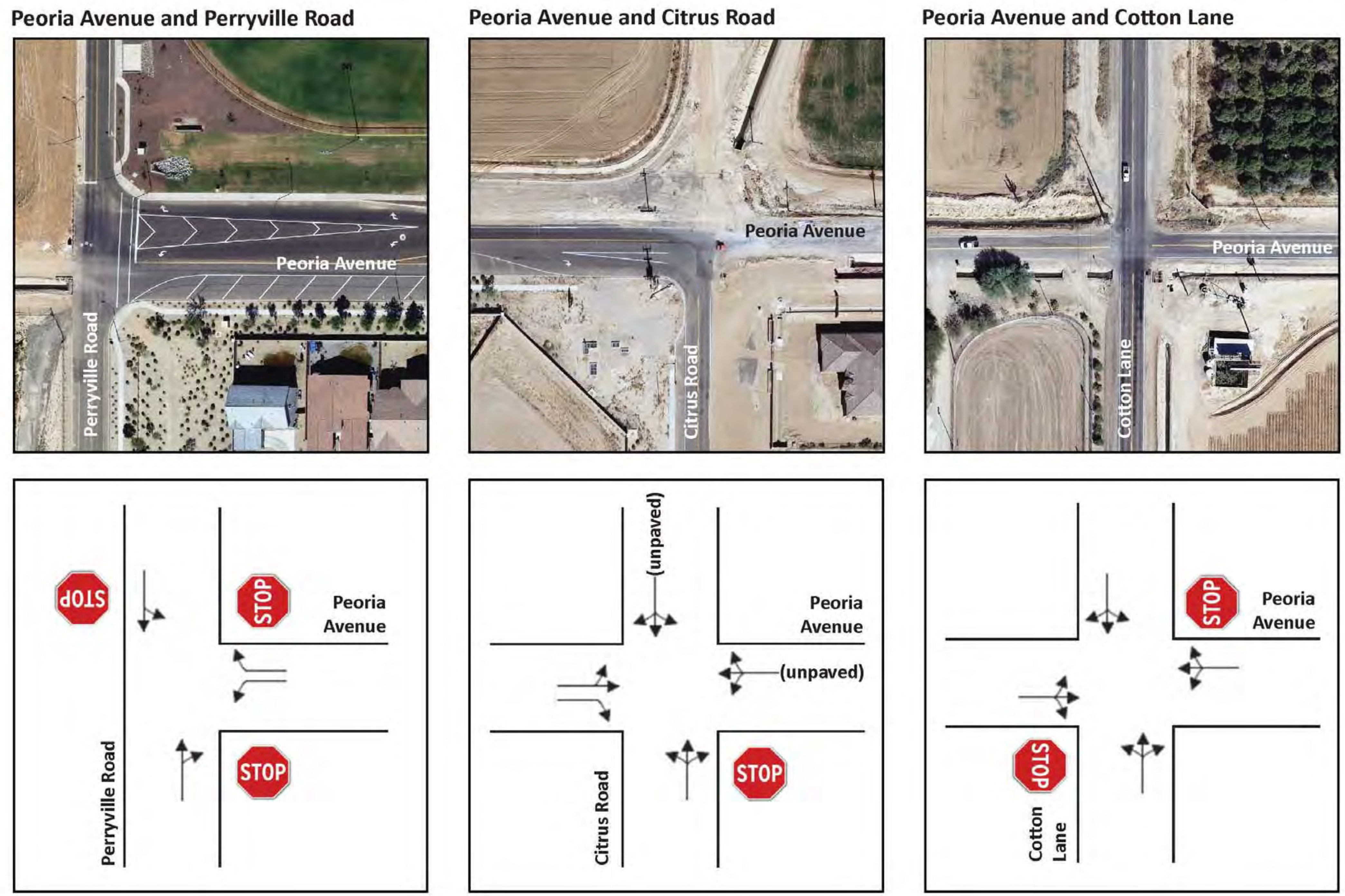


Figure 27 – Existing Intersection Configurations

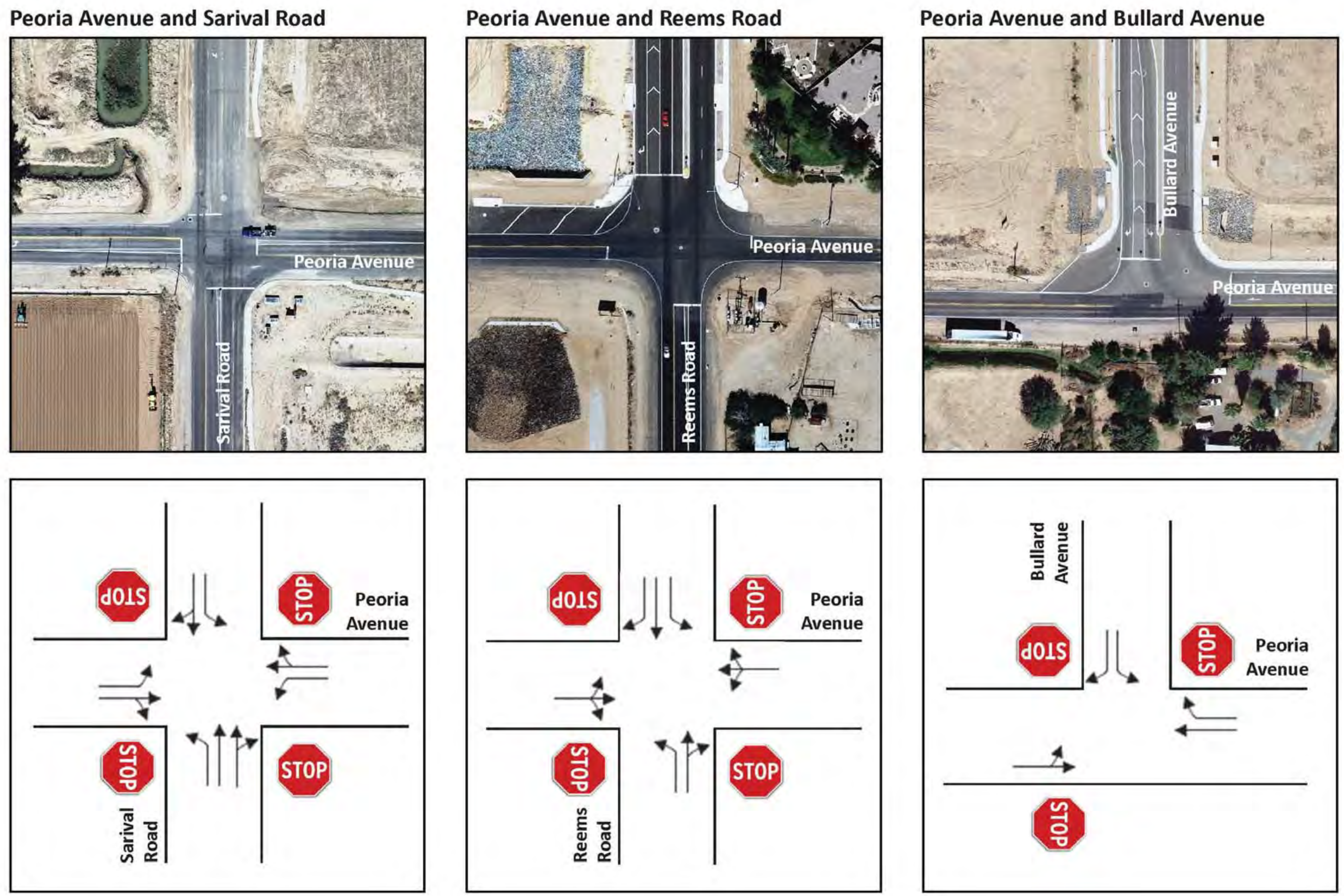


Figure 27 – Continued

Peoria Avenue and Litchfield Road

Peoria Avenue and Dysart Road

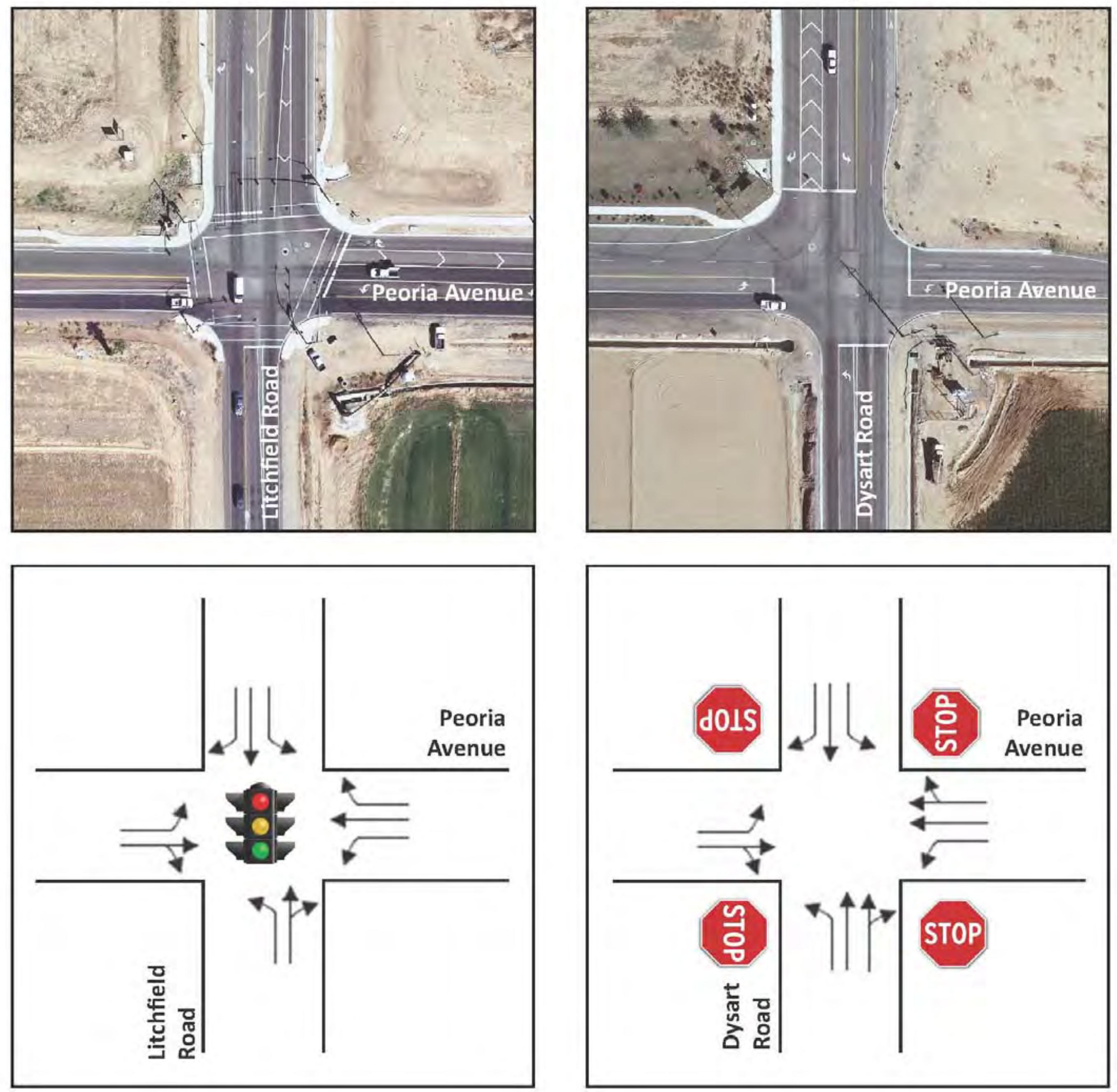
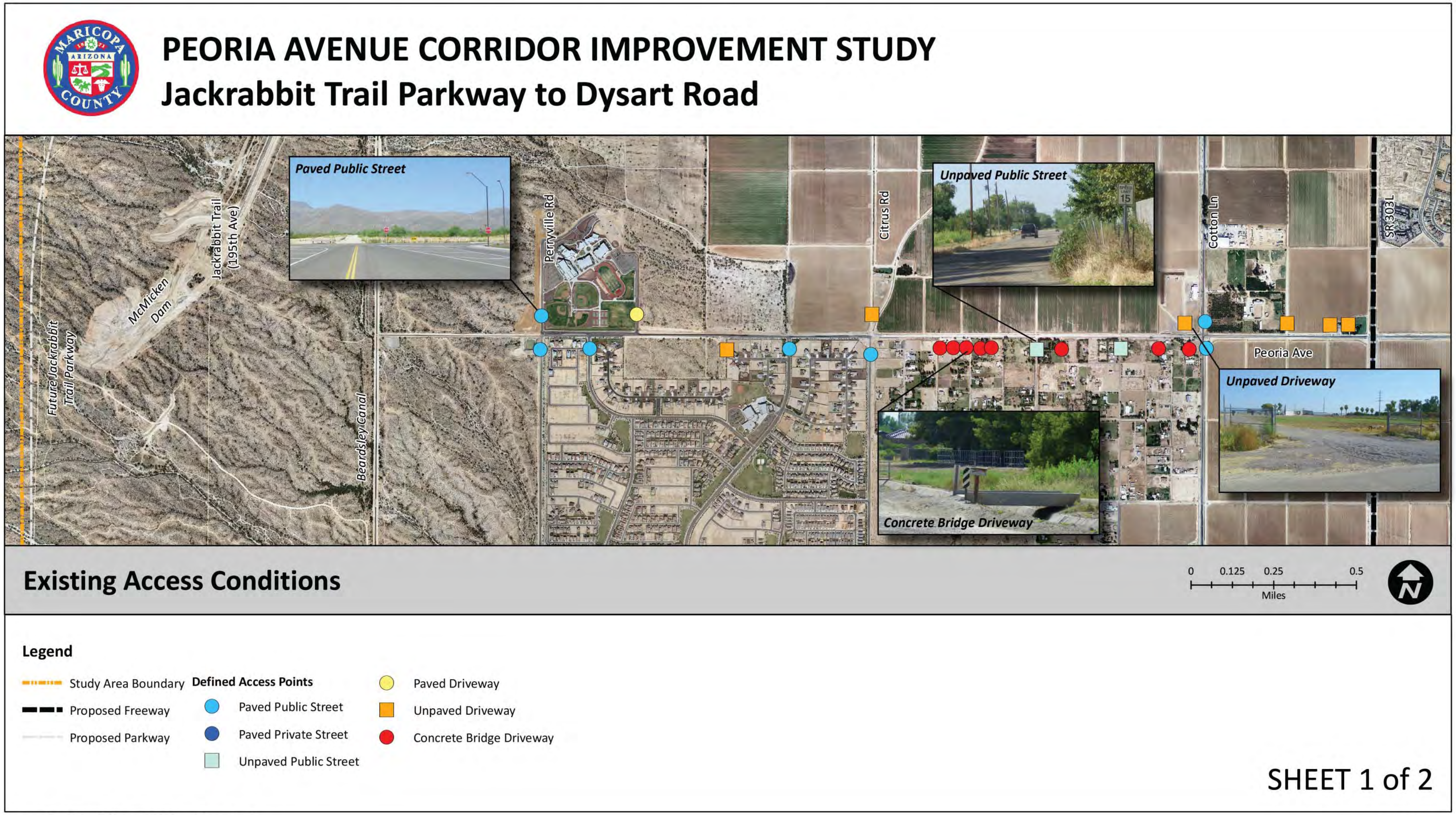


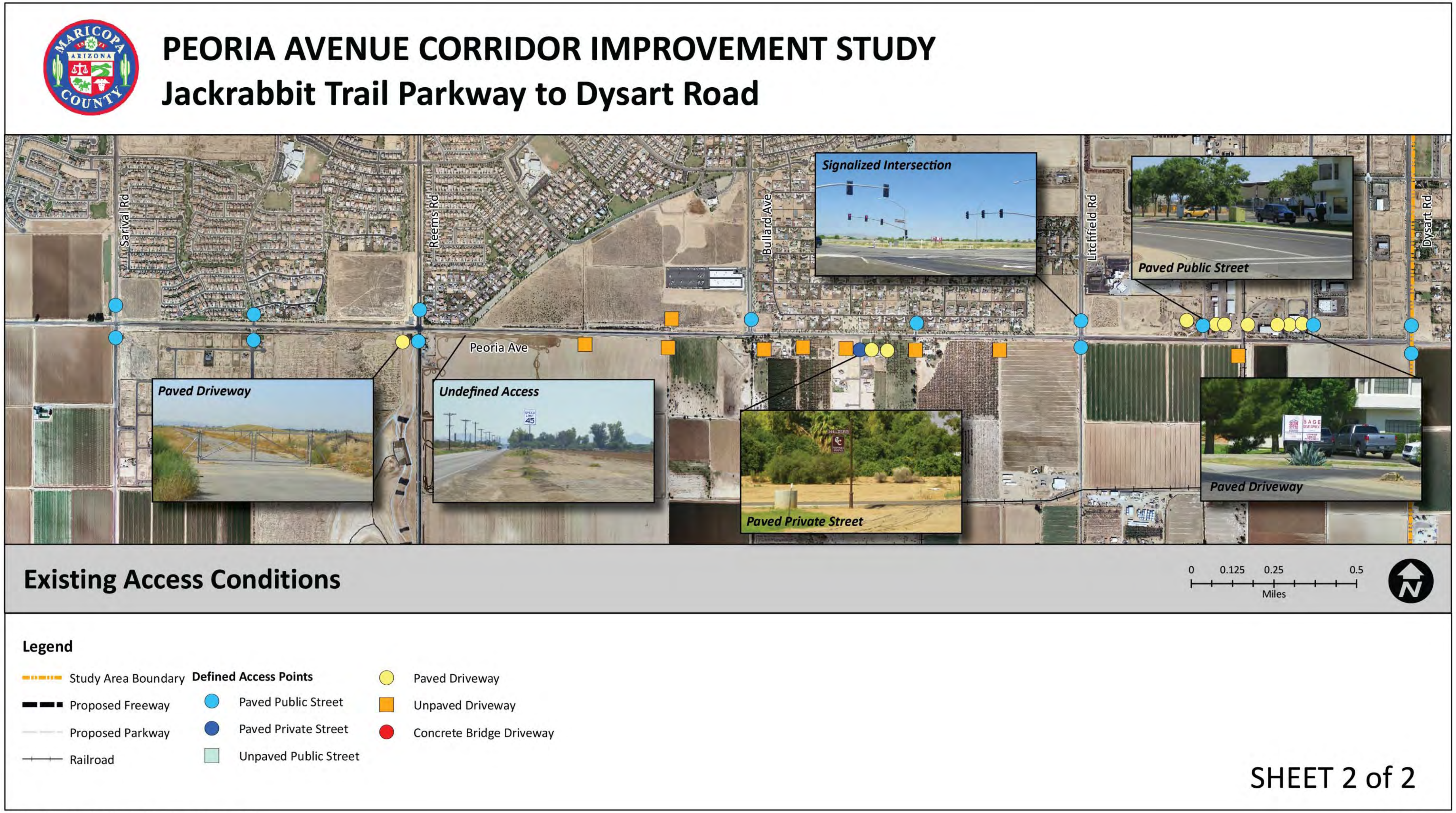
Figure 27 – Continued



Source: Flood Control District of Maricopa County, ALRIS

September 2010

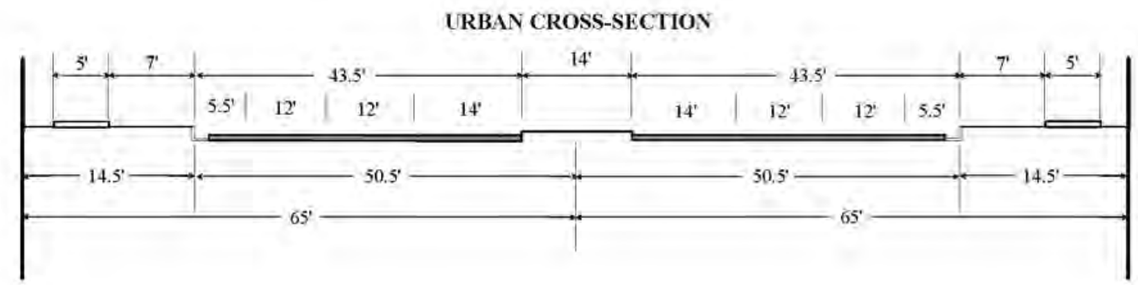
Figure 28 – Existing Access Conditions (Sheet 1)



Source: Flood Control District of Maricopa County, ALRIS

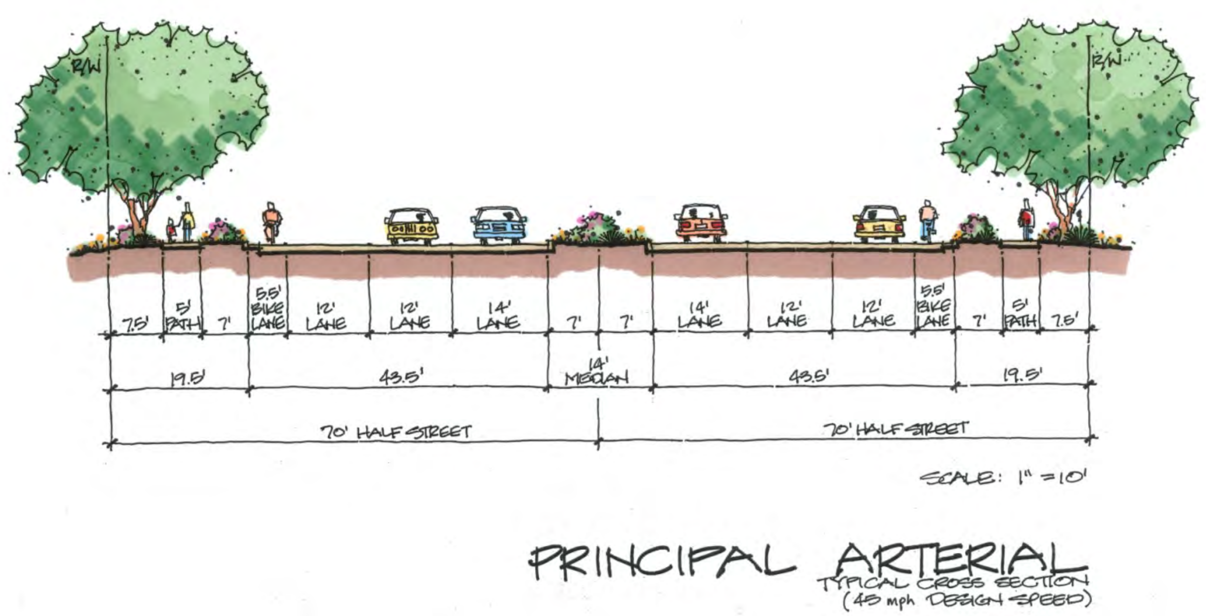
September 2010

Figure 29 – Existing Access Conditions (Sheet 2)



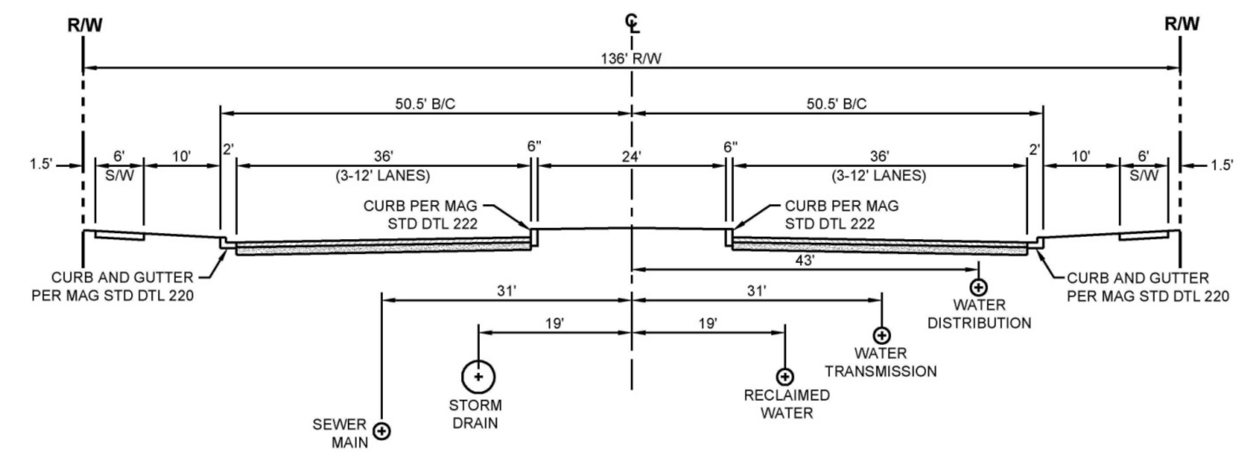
Source: Maricopa County Major Streets and Routes Plan, Policy Document, revised 2004.

Figure 30 – MCDOT Principal Arterial Cross-Section



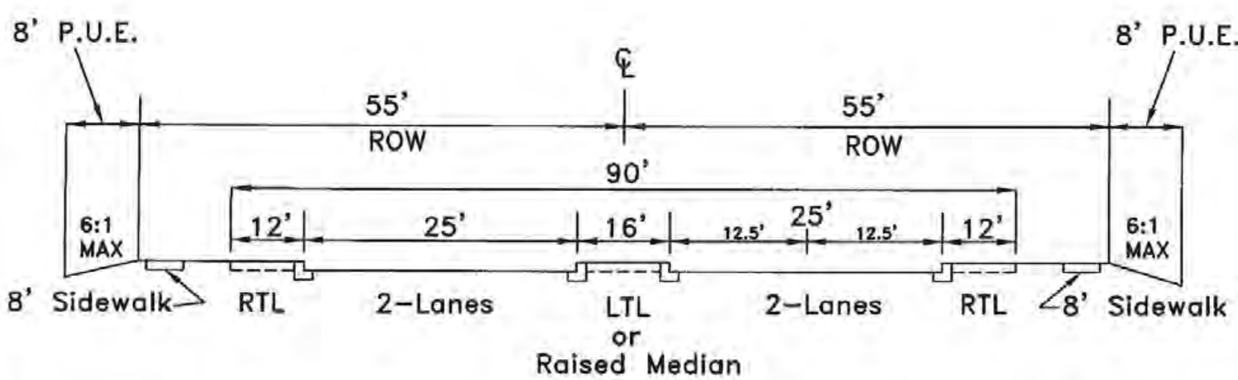
Source: MAG I-10 Hassayampa Valley Transportation Framework Study, 2007.

Figure 31 – MAG Principal Arterial Cross-Section



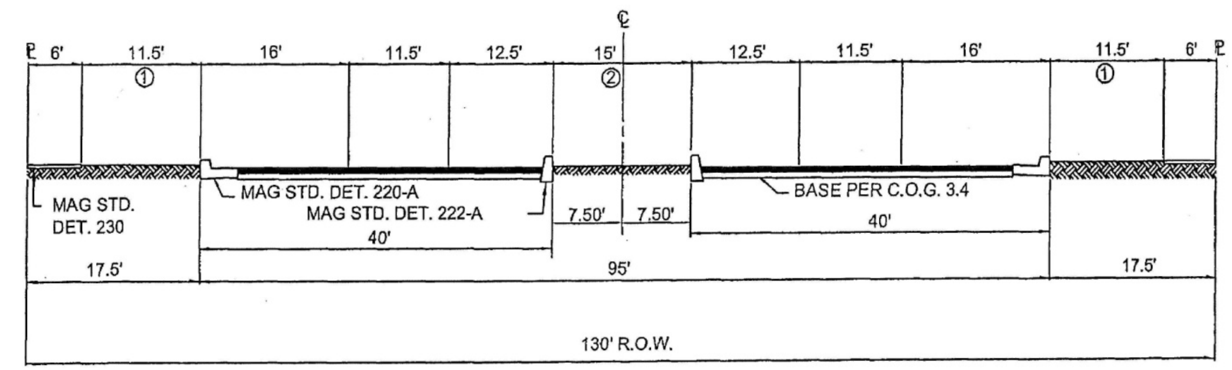
Source: City of Surprise Street Design Guidelines, 2009.

Figure 32 – City of Surprise Major Arterial Cross-Section



Source: City of Peoria Standard Detail, 2007.

Figure 33 – City of El Mirage Minor Arterial Cross-Section



Source: City of Glendale Standard Detail Index, 2002.

Figure 34 – City of Glendale Major Arterial Cross-Section

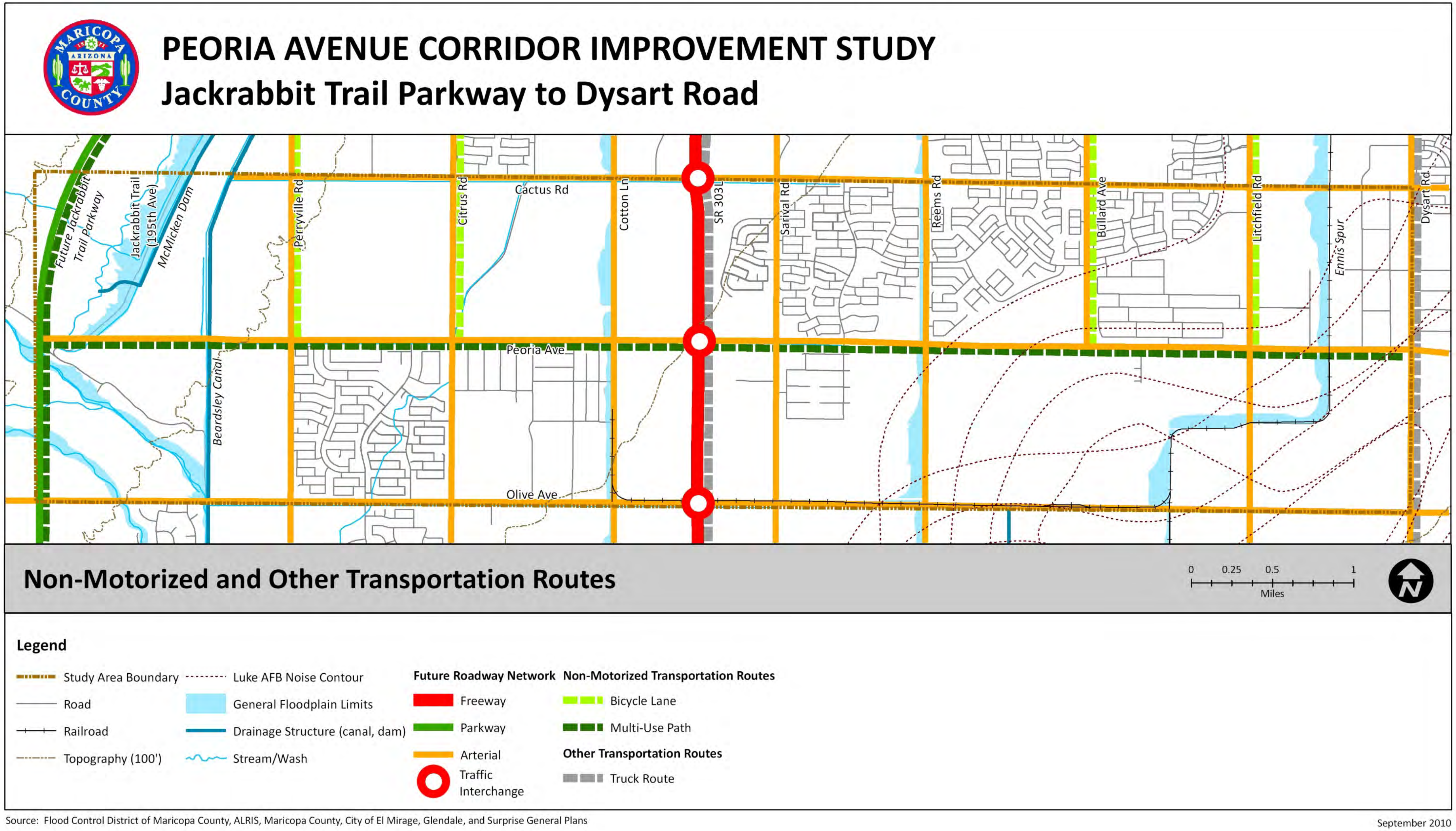


Figure 35 – Non-Motorized and Other Transportation Routes

6.0 TRAFFIC CONDITIONS

Existing Traffic Volumes

Historical traffic volumes were obtained from the City of Surprise and MCDOT for years 2008–2009 where available. In addition, Traffic Research & Analysis, Inc. (TRA) conducted traffic counts in August 2010, at several locations in the study area. The existing average daily traffic (ADT) volumes within the study area are shown in Figure 36. TRA also conducted turning movement counts at eight major intersections in the same month. These intersection volumes represent existing peak hour traffic between the hours of 7:00-9:00 a.m. and 4:00-6:00 p.m. Figure 37 displays the 2010 peak hour turning movements at each of the major intersections along Peoria Avenue.

Existing daily traffic on Peoria Avenue varies in the study area from approximately 900 vehicles per day (vpd) at the west end to 9,000 vpd between Bullard Avenue and Litchfield Road. A majority of the north/south grid cross streets currently carry more traffic than Peoria Avenue. With the exception of SR 303L, Litchfield Road has the highest existing cross street daily traffic volume (16,500 to 14,600 vpd) in the study area.

Future Traffic Projections

MAG provided design year 2031 traffic volume projections for use in this study. MAG maintains a regional traffic forecasting model based on projected socioeconomic data, which provides numerous outputs including daily traffic and peak hour traffic. MAG network simulations were provided for two design years under the build scenario. For the purposes of this study, the “build scenario” network corresponds to three traffic lanes in each direction of travel and includes (beyond the study area limits) a future river crossing of the Agua Fria River. The 2031 build traffic volume projections are shown in Figure 38, ranging from approximately 10,000 vpd to 31,000 vpd.

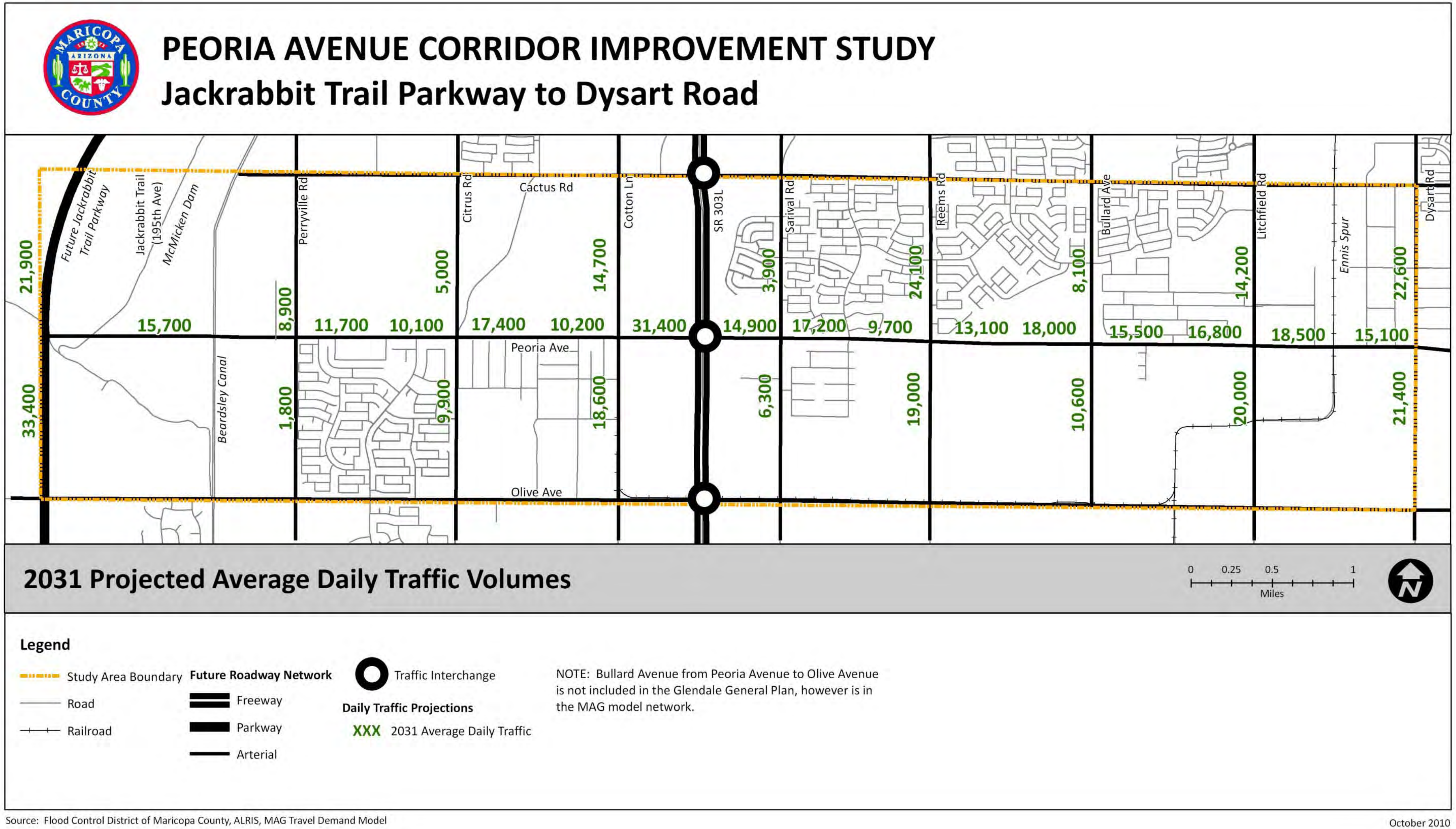


Figure 36 – Existing ADT Volumes

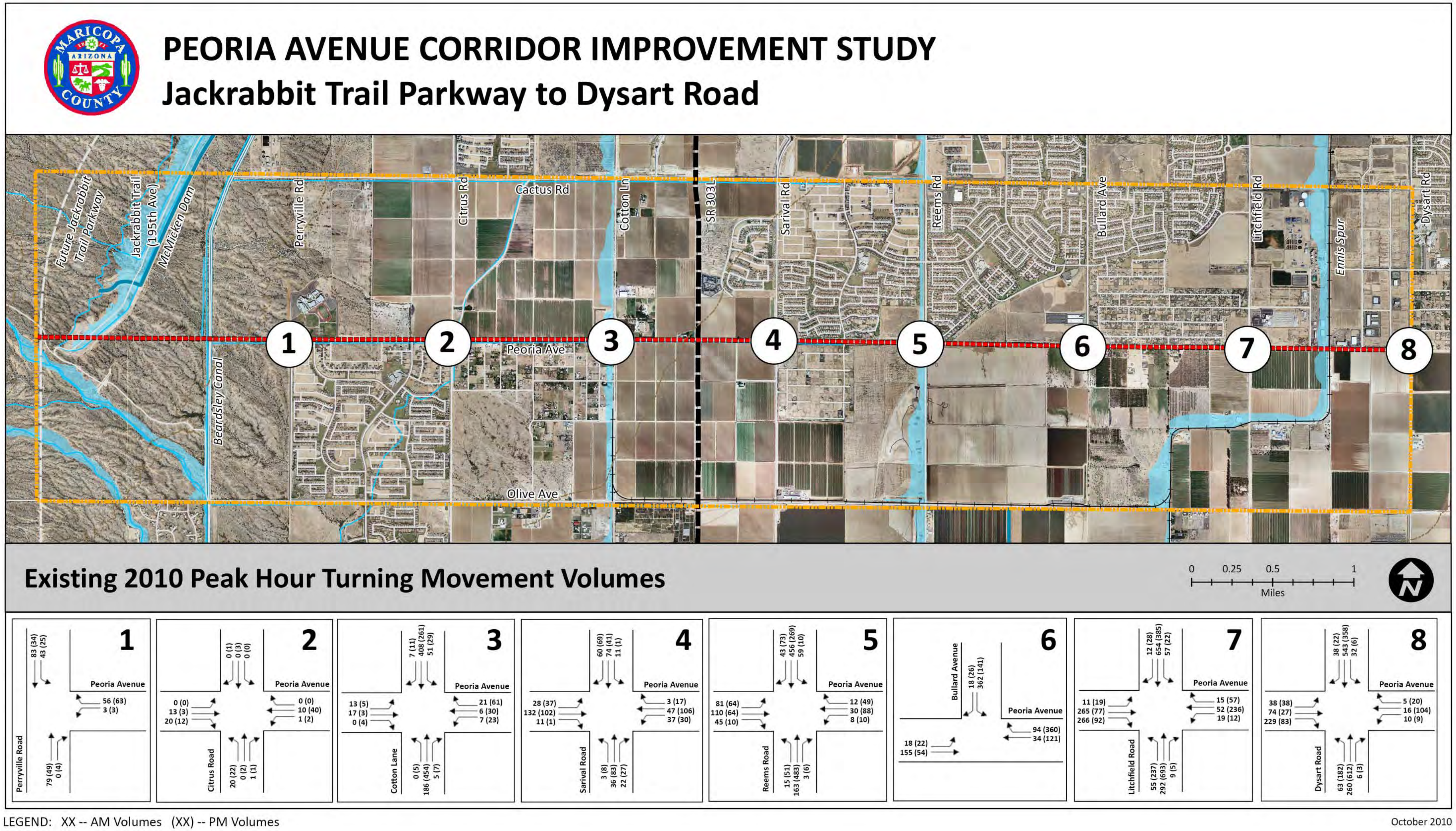
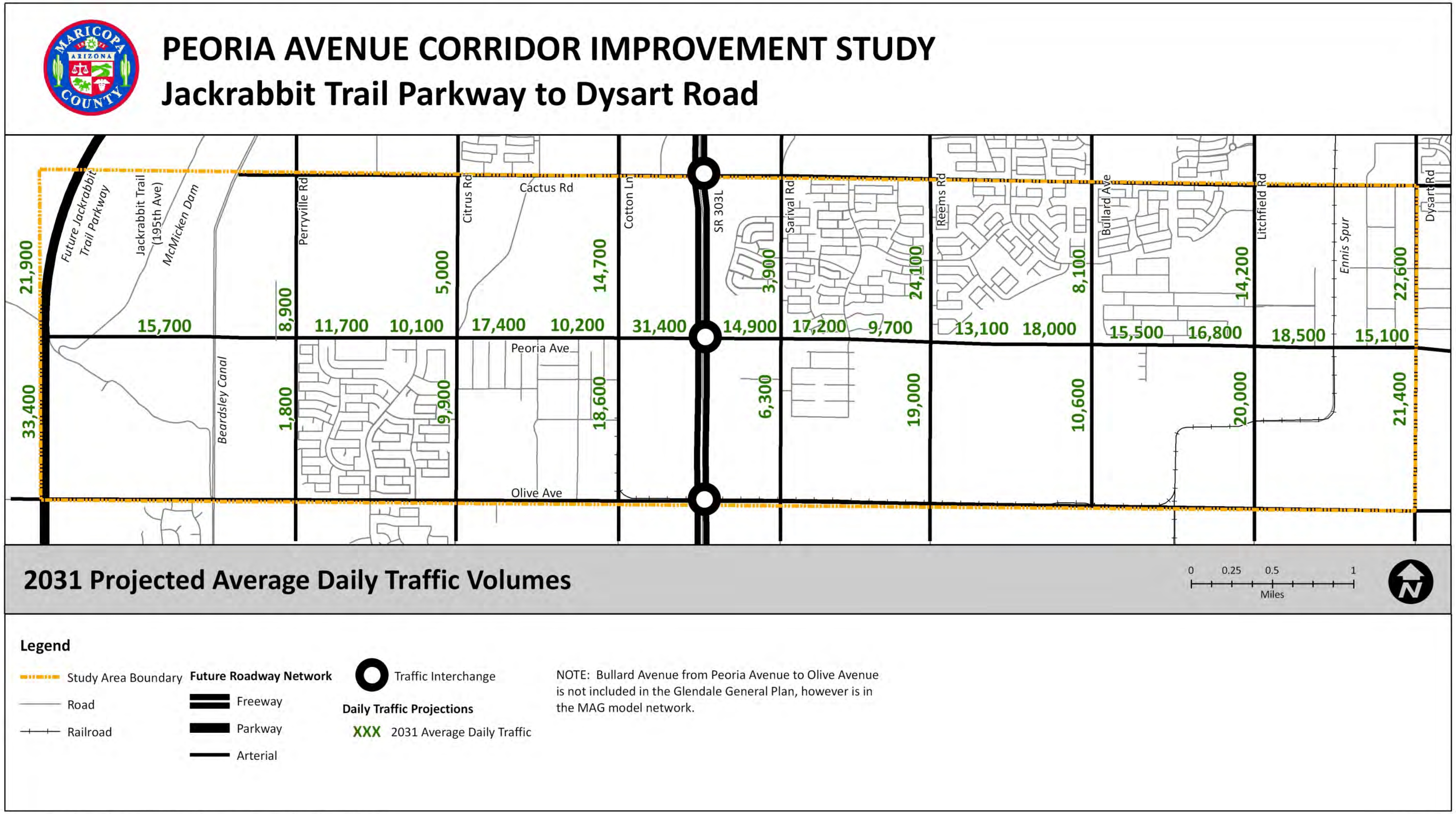


Figure 37 – Existing 2010 Peak Hour Turning Movement Volumes



Source: Flood Control District of Maricopa County, ALRIS, MAG Travel Demand Model

October 2010

Figure 38 – 2031 Projected ADT Volumes

7.0 PRELIMINARY ISSUES, OPPORTUNITIES, AND SPECIAL INTEREST AREAS

Table 9 presents preliminary issues and opportunities identified as part of the Peoria Avenue Corridor Improvement Study. The list was developed from observations in the field, review of existing studies and plans, and discussions with the Technical Advisory Committee.

Table 9 – Preliminary Issues and Opportunities

Topic	Location	Description
Opportunity		
Roadway	Peoria Avenue between Perryville Road and Citrus Road	Full street cross-section built out; tie into and utilize existing improvements
	Corridor-wide	Maximize use of existing half-streets
Major Utility	Corridor-wide	Burying local power lines for corridor consistency
	Corridor-wide	Converting irrigation ditches into pipes to increase corridor safety
Issue/Constraint		
Roadway	Peoria Avenue and SR 303L	Planned upgrade to freeway, including traffic interchange at Peoria Avenue
	Corridor-wide	Peoria Avenue forms boundary between multiple jurisdictions, causing undefined ultimate control and responsibility of corridor (e.g.,land to the north of Peoria Avenue is incorporated by Surprise, land to the south of Peoria Avenue and east of Ennis Spur incorporated by El Mirage, some land south of Peoria Avenue incorporated by Glendale, including 10-foot wide strip annex)
Major Utility	Parallel to SR 303L	Installation of future APS West Valley-North 230kV power transmission line
	Peoria Avenue, between Litchfield Road and Ennis Spur	30-inch reclaimed water line and reclaimed water delivery headers
	Corridor-wide	Numerous well sites directly adjacent to Peoria Avenue right-of-way
	Corridor-wide	Underground city water and sewer lines and appurtenances
	Corridor-wide	Underground Southwest Gas natural gas lines
	Corridor-wide	Qwest overhead and underground telephone lines

Table 9 Continued

Topic	Location	Description
Issue/Constraint		
Drainage	Beardsley Canal, west of Perryville Road	Major drainage structure
	McMicken Dam, west of Beardsley Canal	Major drainage structure; cannot cross
	Waterfall Wash, west of Beardsley Canal and south of McMicken Dam	Major drainage feature that crosses Peoria Avenue section line
	South side of Peoria Avenue, west half of corridor	Parallel private irrigation ditches
	Adjacent to Cotton Lane, Reems Road, and Ennis Spur	Flood channels/100-year floodplains
	Peoria Avenue and Citrus Road	MWD underground cross-cut canal
Topography	Peoria Avenue section line, south of McMicken Dam	Existing fissures
	Peoria Avenue and Sarival Road	Existing fissures
Land Ownership	East of Beardsley Canal	State Trust Land
Existing Development	Northeast corner of Peoria Avenue and Perryville Road	Shadow Ridge High School
	South of Peoria Avenue, Perryville Road to Citrus Road	Cortessa master planned community; active development
	South of Peoria Avenue, Citrus Road to Cotton Lane	Adjacent custom home development; individual driveway access to Peoria Avenue; built out
	North of Peoria Avenue, SR 303L to Sarival Road	Limited development within Sycamore Farms master-planned community; active development
	North of Peoria Avenue, Sarival Road to Reems Road	Greer Ranch master planned community; active development
	South of Peoria Avenue, Sarival Road and half-mile east	Twelve Oaks Estate master planned community; active development
	North of Peoria Avenue, Reems Road to Bullard Avenue	Rancho Gabriela master planned community; built out
	North of Peoria Avenue, Bullard Avenue to Litchfield Road	Copper Canyon Ranch master planned community; active development
	North of Peoria Avenue, Ennis Spur to Dysart Road	Skyway Business Park; active development

Table 9 Continued

Topic	Location	Description
Issue/Constraint		
Future Development	North of Peoria Avenue, Beardsley Canal to half-mile east of Perryville Road; South of Peoria Avenue Beardsley Canal to Perryville Road	Zanjero Trails master planned community
	North of Peoria Avenue, half-mile east of Perryville Road to Cotton Lane	Prasada master planned community
	South of Peoria Avenue, Citrus Road to Cotton Lane	Zanjero Pass master planned community; south of existing development directly adjacent to Peoria Avenue
	South of Peoria Avenue, SR 303L to Sarival Road	Glendale 303 commercial development
	North of Peoria Avenue, Reems Road to Bullard Avenue	Two planned megachurch developments
	North of Peoria Avenue, Litchfield Road to Ennis Spur	Desert Cove Commercial Park
	South of Peoria Avenue, Ennis Spur to Dysart Road	John F. Long Industrial Complex
	Parallel to Ennis Spur	Potential industrial development
Growth Areas	Future Peoria Avenue/SR 303L traffic interchange	Major commercial employment center
	North of Peoria Avenue, Litchfield Road to Dysart Road	Major office/industrial employment center

Additionally, Table 10 presents a series of special interest areas that must be considered in any infrastructure improvements proposed.

Technical Memorandum #1
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Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Table 10 – Special Interest Areas

Special Interest Area	Description
Peoria Avenue/Ennis Spur Railroad Crossing	Improvements to Peoria Avenue will have to include close coordination with the BNSF Railway. As traffic may significantly increase along the Ennis Spur in the future, consideration could be given to a grade separation of these two transportation facilities.
Peoria Avenue from Citrus Road to Cotton Lane	Special consideration should be given to this corridor segment due to its unique circumstances, including numerous large lot homes with individual driveway access on the south side, the future Prasada master planned community on the north side, and the use of this segment by school buses for access to Shadow Ridge High School.
Beardsley Canal to Jackrabbit Trail Parkway	Planning an extension of Peoria Avenue west of Perryville Road to the future Jackrabbit Trail Parkway will require close consideration of environmental and drainage features, including coordination with MWD and FCDMC. This extension will include a crossing of the Beardsley Canal, and is in close proximity to the McMicken Dam and Waterfall Wash. In addition, any planned community circulation connections to Jackrabbit Trail Parkway from the west should be understood to construct a seamless Peoria Avenue corridor.

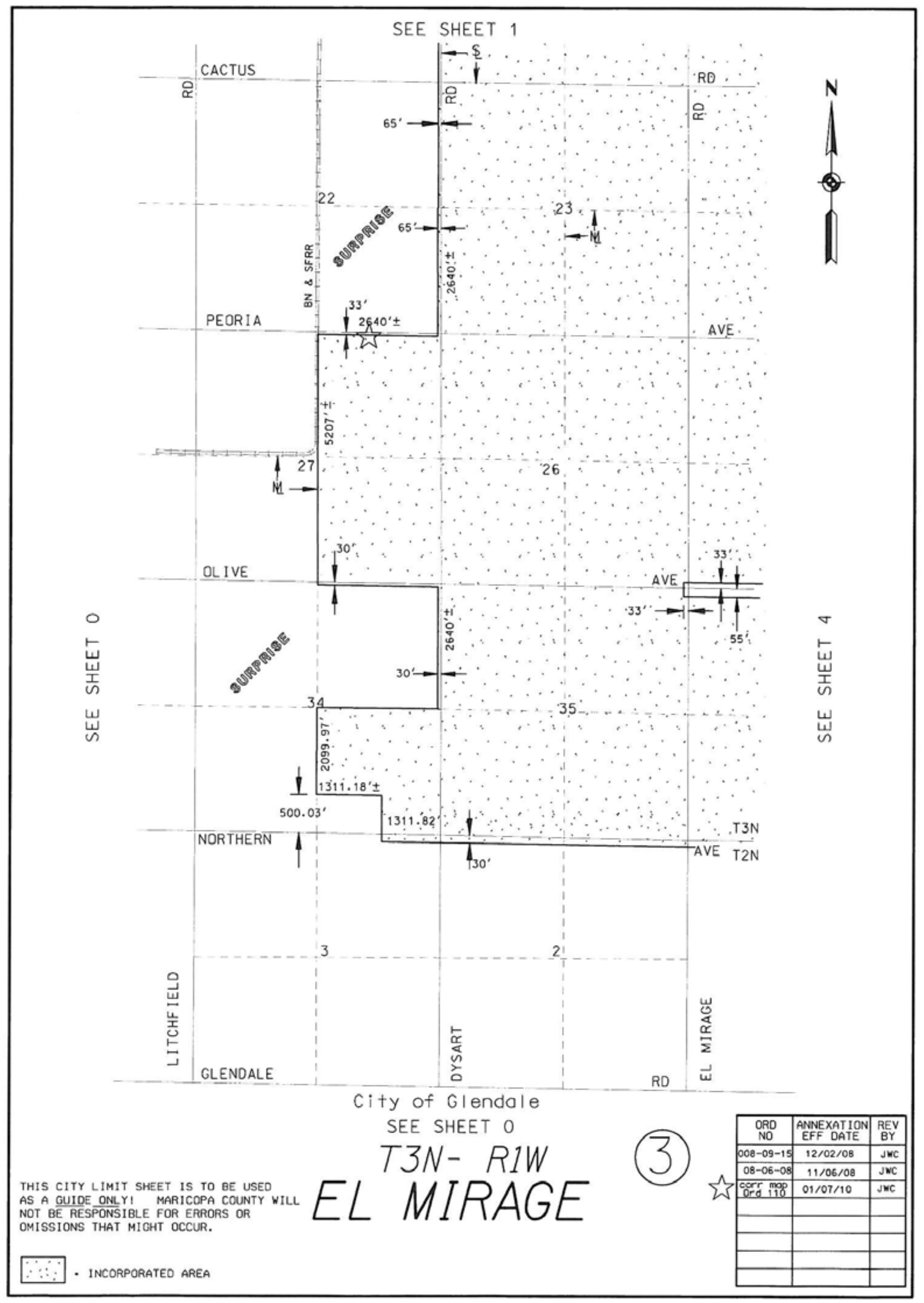
8.0 RELEVANT PLANS, REPORTS, GUIDELINES, STUDIES, AND STANDARDS

Many existing plans, reports, and guidelines were compiled, reviewed, and summarized for this project. Relevant findings, conclusions, and recommendations from these documents have been discussed throughout the working paper. A listing of such references follows.

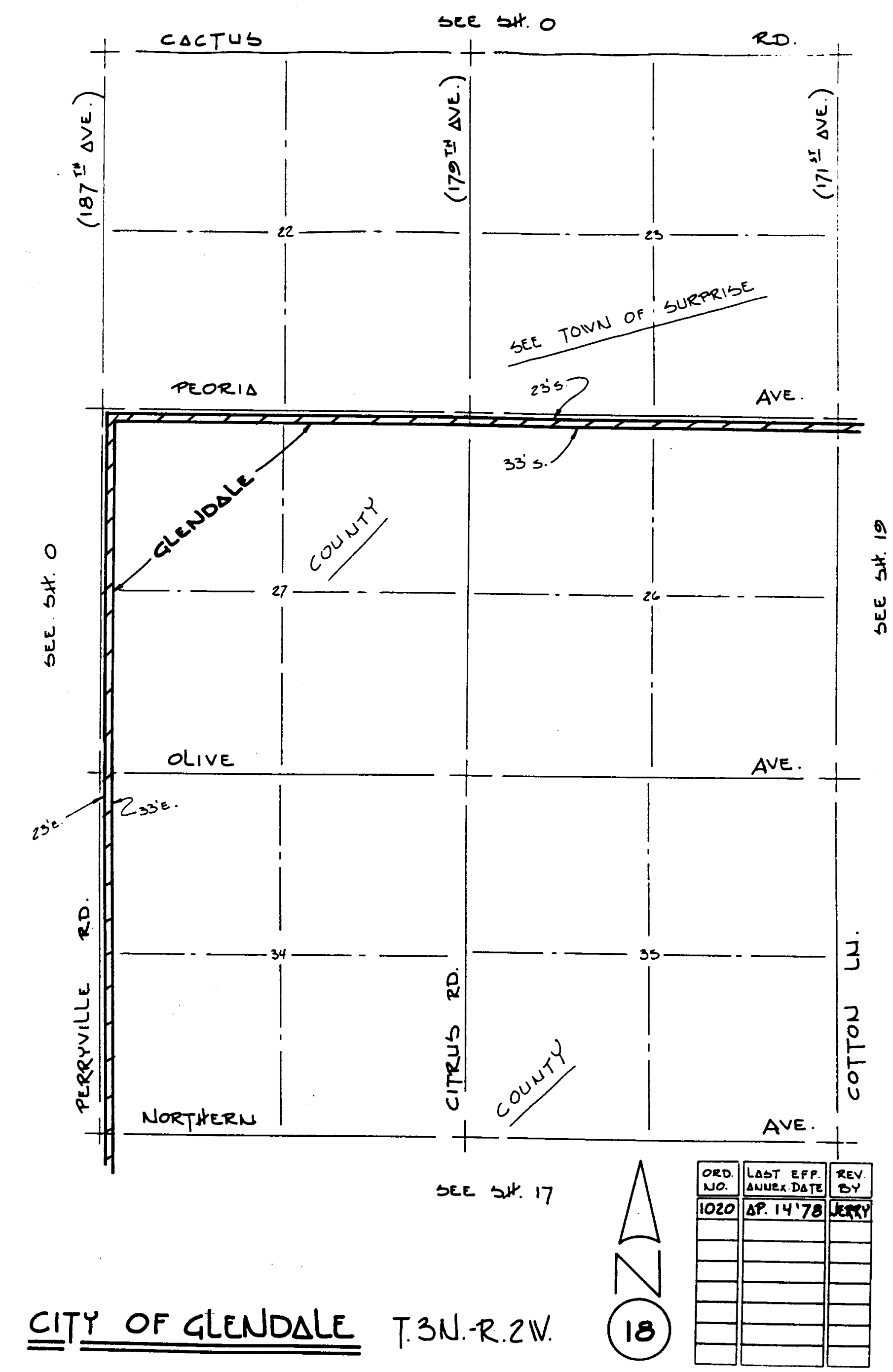
- ADOT SR 303L 60% Project Plans
- APS West Valley-North Power Line and Substation Project, 2005
- Arizona Geological Survey Earth Fissure Map of Maricopa County, December 2009
- City of El Mirage FY 2009-2019 Capital Improvement Plan, 2009
- City of El Mirage General Plan, 2010
- City of Glendale FY 2010-2019 Capital Improvement Plan, 2009
- City of Glendale General Plan, 2002
- City of Glendale Major General Plan Amendments, 2005
- City of Glendale Zoning Ordinance, 2009
- City of Surprise Development Master Plans (Copper Canyon Ranch/Mountain Gate, Desert Cove, Greer Ranch, Prasada, Rancho Gabriela, Sycamore Farms, Zanjero Trails)
- City of Surprise Designated Truck Routes, 2007
- City of Surprise Developments Status, 2010
- City of Surprise General Plan, 2008
- City of Surprise Major General Plan Amendments, 2010
- City of Surprise Transportation Plan, 2005
- City of Surprise FY 2010-2014 Capital Improvement Plan, 2009
- City of Surprise Zoning Ordinance, 2010
- FCDMC Loop 303/White Tanks ADMP, 2003
- FCDMC McMicken Dam Fissure Zone Remediation Project
- FCDMC Wittman ADMP, 2007
- MAG TIP, 2010
- MAG Desert Spaces Plan, 2003
- MAG Interstate 10/Hassayampa Valley Transportation Framework Study, 2008
- MAG RTP, 2010
- Maricopa County Comprehensive Plan, 2002
- Maricopa County Major Streets and Routes Plan (Atlas and Policy Document), 2004
- Maricopa County McMicken Dam Scenic Corridor Guidelines
- Maricopa County Olive Avenue Scenic Corridor Guidelines
- Maricopa County Regional Trail System Plan, 2004
- Maricopa County Transportation System Plan, 2007
- Maricopa County Zoning Ordinance, 2010
- MCDOT Design Guideline Recommendations for the Arizona Parkway, 2008
- MCDOT TIP FY 2011-2015, 2010

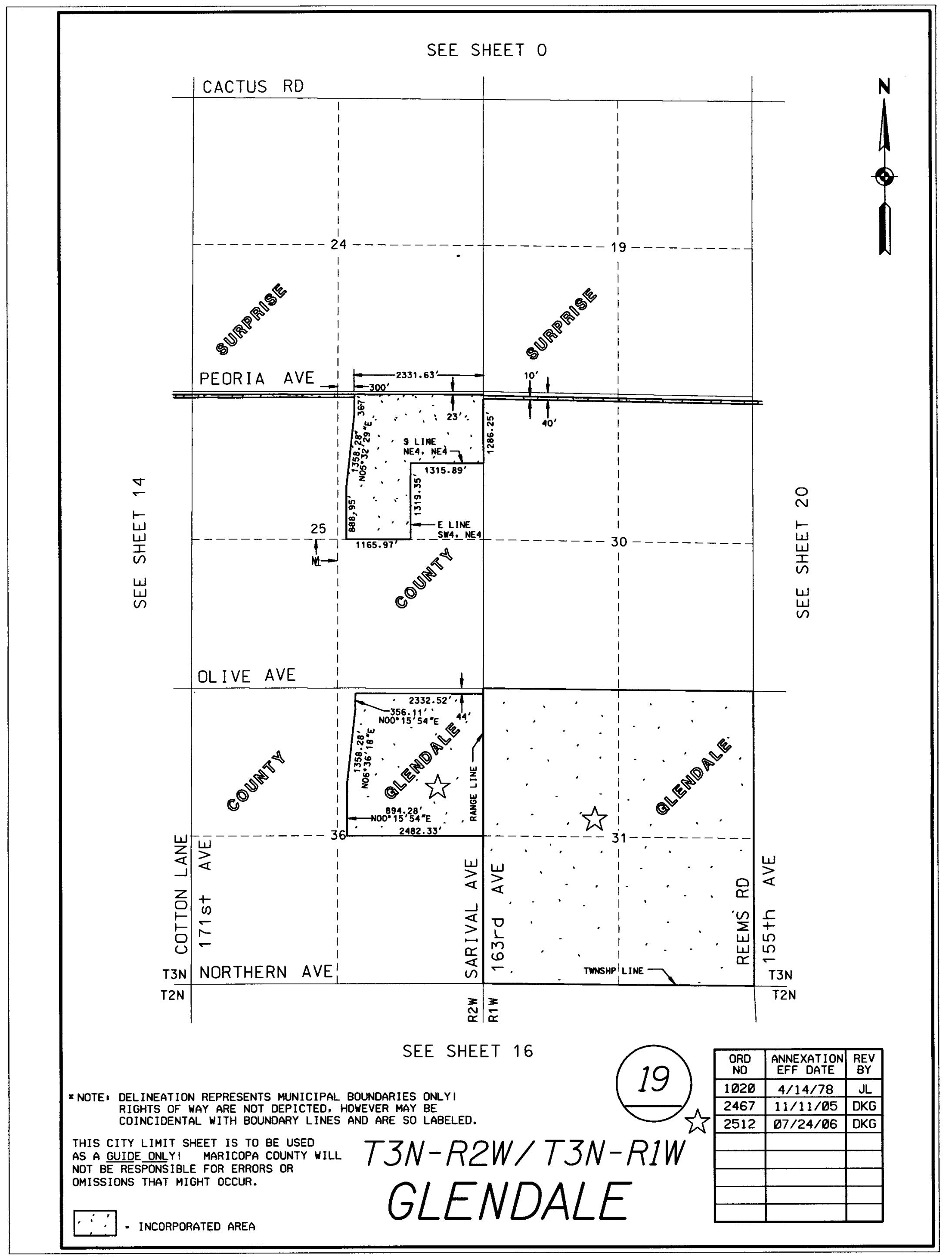
Technical Memorandum #1
Existing and Future Corridor Features
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Appendix A: City Limits Map



Technical Memorandum #1
Existing and Future Corridor Features
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road





Technical Memorandum #1
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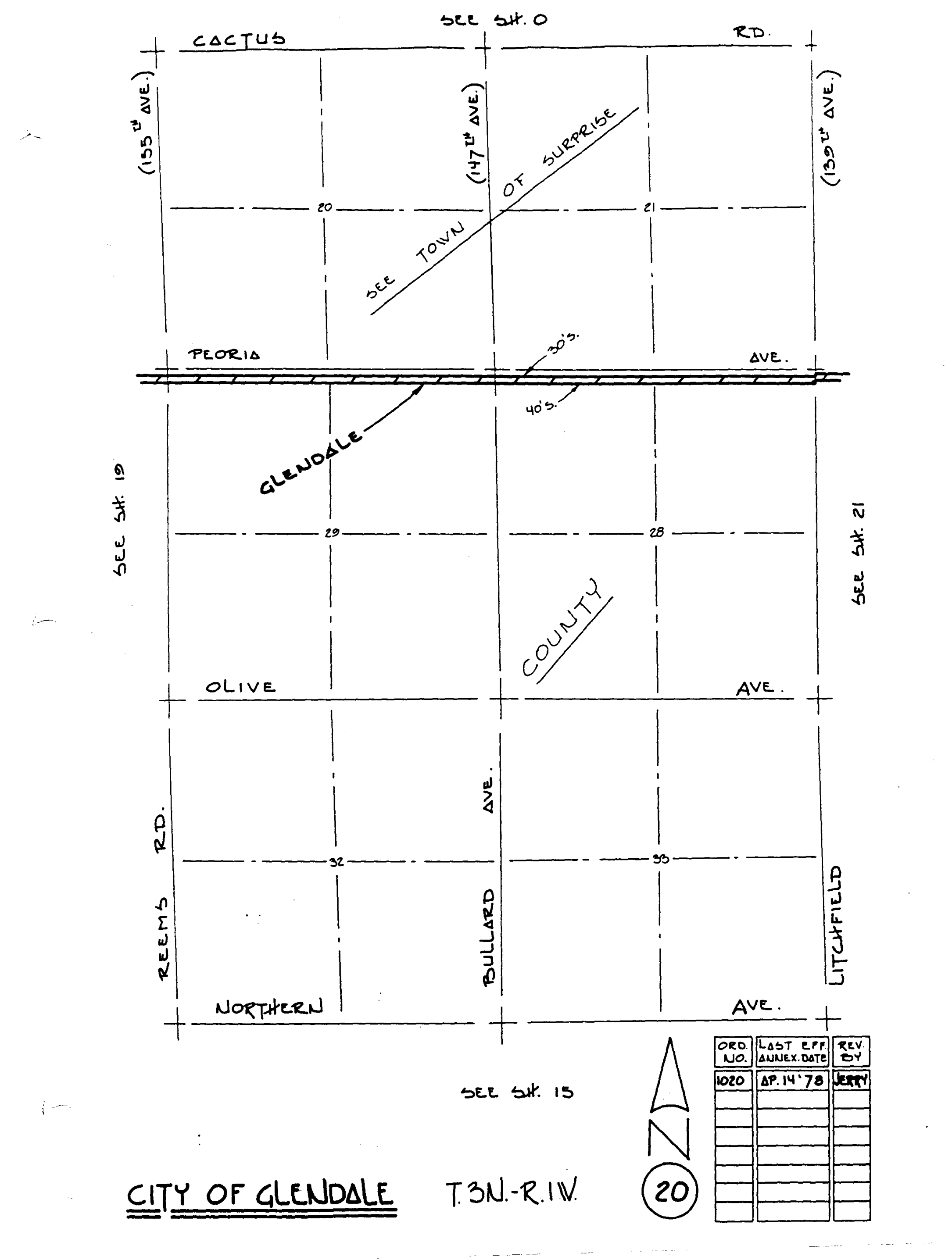
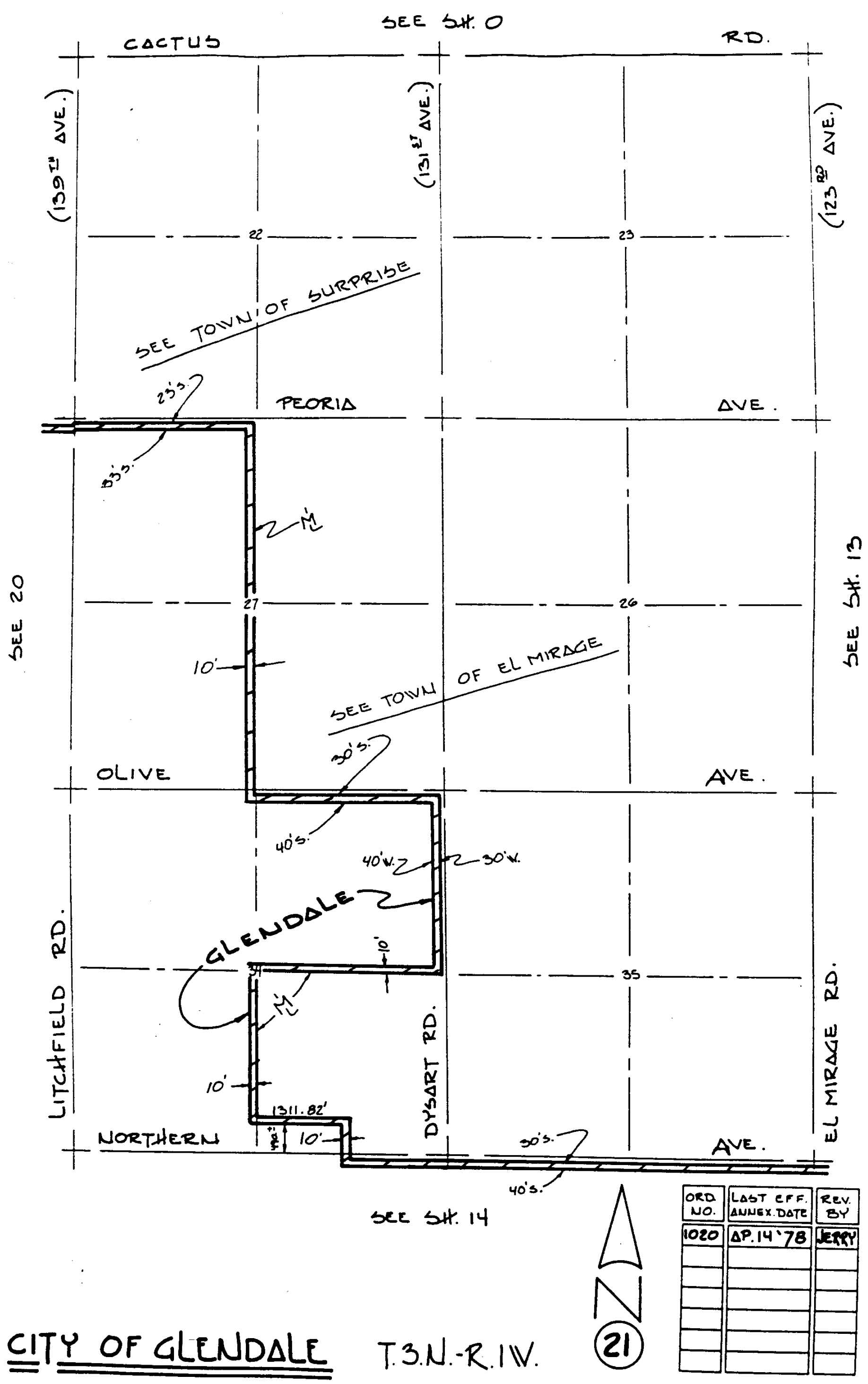
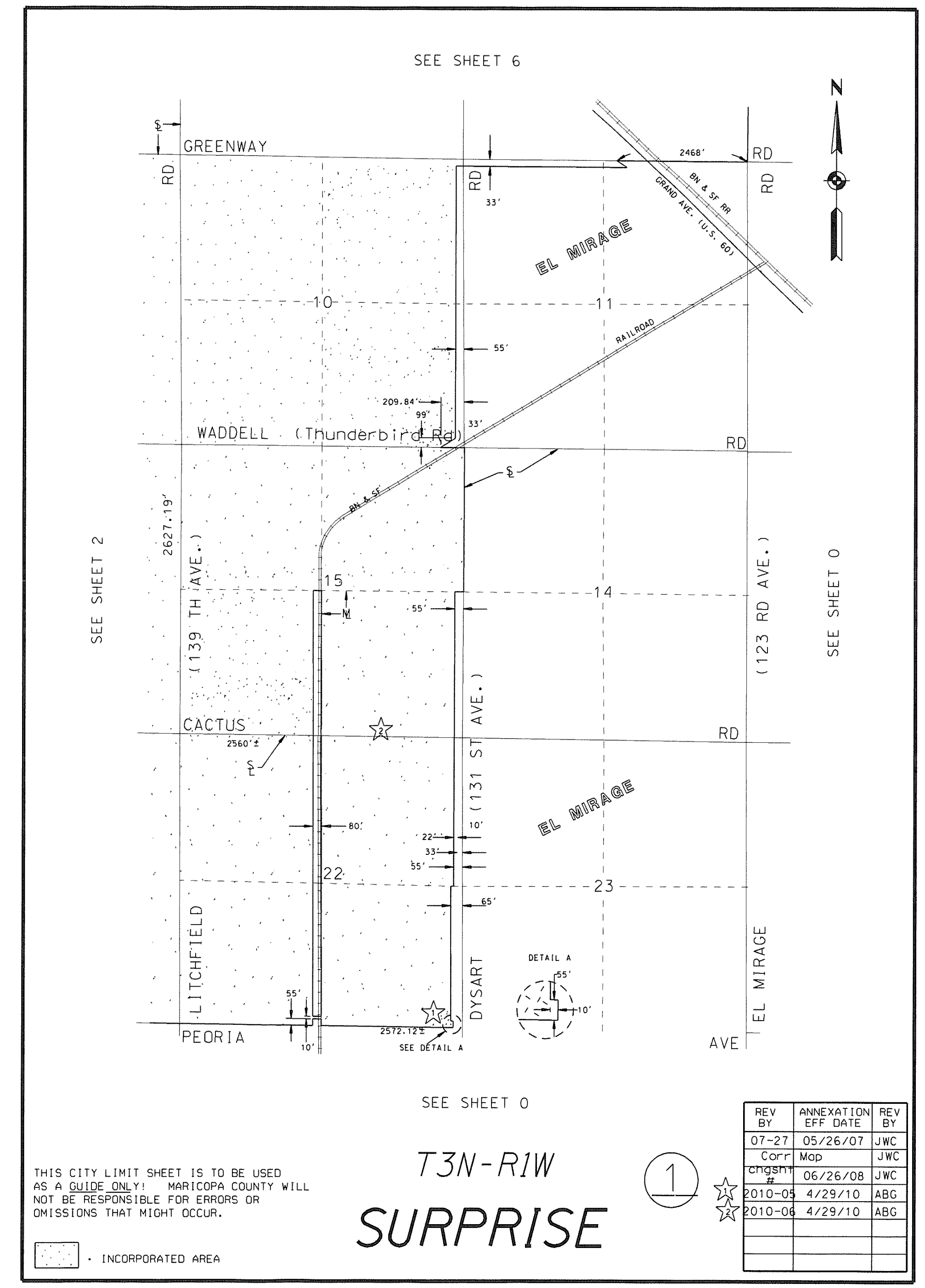
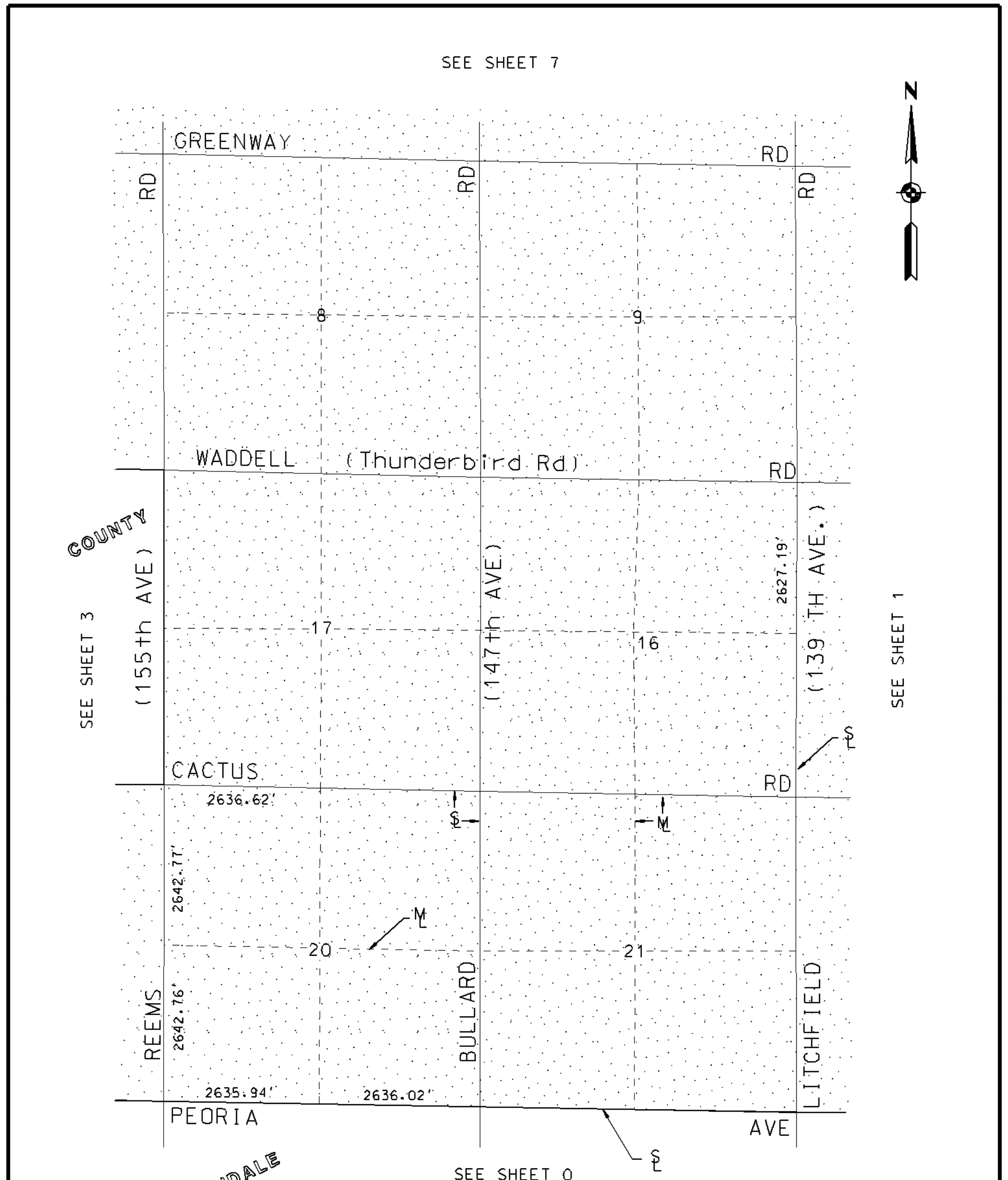
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road





Technical Memorandum #1
Existing and Future Corridor Features
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road





SURPRISE

T3N-R1W

2

THIS CITY LIMIT SHEET IS TO BE USED AS A GUIDE ONLY! MARICOPA COUNTY WILL NOT BE RESPONSIBLE FOR ERRORS OR OMISSIONS THAT MIGHT OCCUR.

- INCORPORATED AREA

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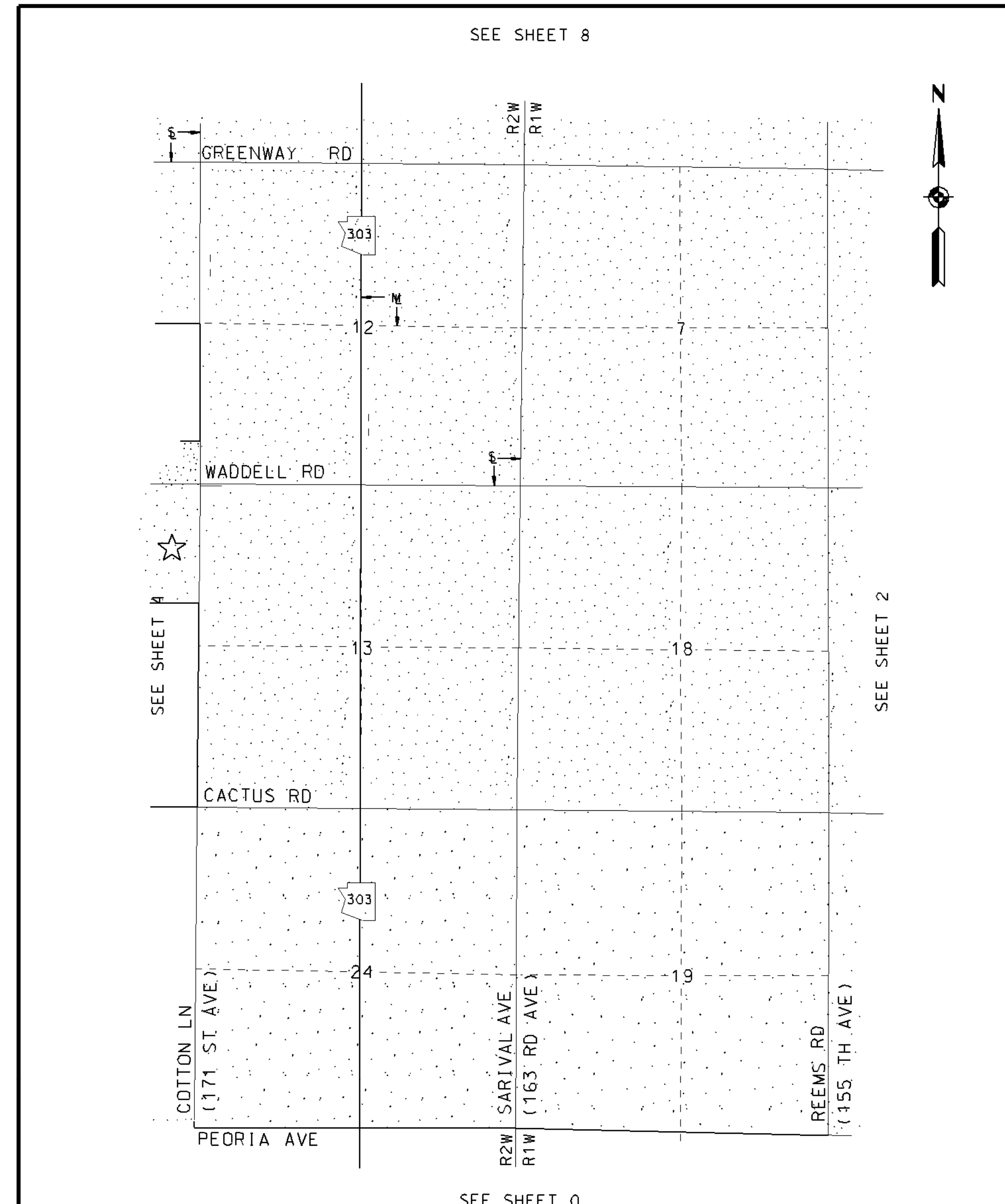
02-50	03/12/02	DKG
02-26	09/22/02	DKG
03-14	07/12/03	DKG
03-11	08/24/03	DKG
1151-05	BOS 02/15/06	DKG
08-03	02/24/08	JWC
chgsht #	06/26/08	JWC

Technical Memorandum #1
Existing and Future Corridor Features
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road



T3N-R2W, T3N-R1W

3

SURPRISE

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- INCORPORATED AREA

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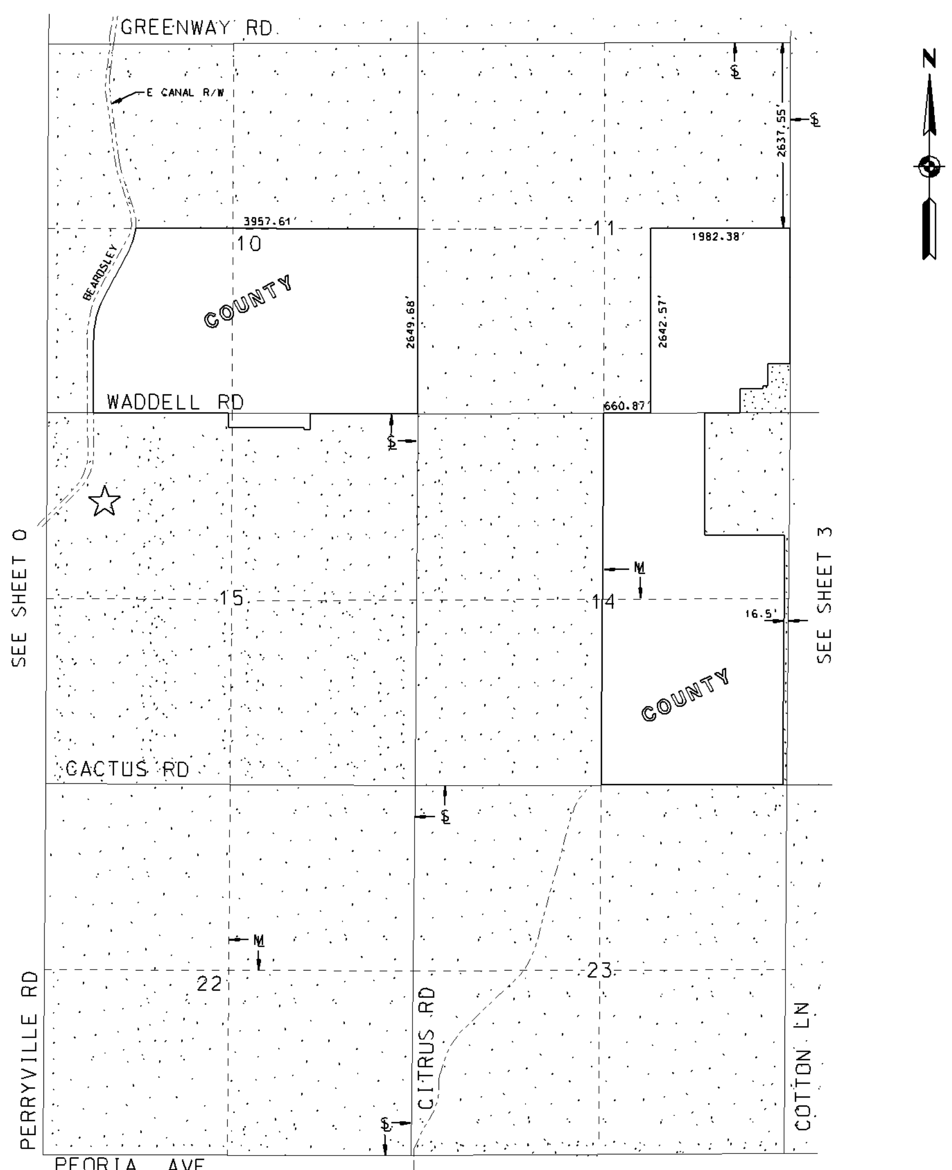
08-31	9/14/08	JWC

SEE SHEET 9



SEE SHEET 0

CURVE	RADIUS	DELTA
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C2	1362.90'	10°33'40"
C3	1362.90'	14°47'05"

THIS CITY LIMIT SHEET IS TO BE USED AS A GUIDE ONLY! MARICOPA COUNTY WILL NOT BE RESPONSILLE FOR ERRORS OR OMISSIONS THAT MIGHT OCCUR.

· INCORPORATED AREA

T3N-R2W

SURPRISE

4

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chgsht #	06/26/08	JWC
08-31	09/14/08	JWC
08-21	08/20/08	JWC
08-34	10/11/08	JWC

Appendix B
Technical Memorandum No. 2: Environmental Overview

Peoria Avenue Corridor Improvement Study: Jackrabbit Trail Parkway to Dysart Road

Technical Memorandum #2: Environmental Overview

January 2011

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Appendices

List of Abbreviations and Acronyms

ADA	Arizona Department of Agriculture
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AFB	Air Force Base
AGFD	Arizona Game & Fish Department
AMA	Active Management Area
ASLD	Arizona State Land Department
AWLW	Arizona Wildlife Linkages Workgroup
BG	Block Group
BNSF	Burlington Northern Sante Fe Railroad
CT	Census Tract
CAA	Clean Air Act
CAAA	CAA Amendments and Amendments
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act
CFR	Code of Federal Regulations
dBA	A-Weighted Decibels
EO	Environmental Overview
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FCDMC	Flood Control District of Maricopa County
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
GIS	Geographic Information Systems
L10(h)	The sound level that is exceeded ten percent of the time (the 90th percentile) during an hour
Leq(h)	Hourly Equivalent Sound Level
LWCF	Land and Water Conservation Fund
MAG	Maricopa Association of Governments
MBTA	Migratory Bird Treaty Act of 1918
MCDOT	Maricopa County Department of Transportation
MPA	Municipal Planning Area
MWD	Maricopa Water District
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NAC	Noise Abatement Criteria
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
$PM_{2.5}$	Fine Particulate Matter
PM_{10}	Coarse Particulate Matter
ppm	Parts per Million
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SR	State Route
TIP	Transportation Improvement Program
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tank

1.0 INTRODUCTION

The Maricopa Association of Governments (MAG) prepared the Interstate 10/Hassayampa Valley Roadway Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demand for the build out of the area west of State Route 303 (SR 303L). This long range regional transportation study identified the need for a roadway network consisting of freeways, parkways, and major arterial roads.

The Hassayampa Framework Study recommends an extension of Peoria Avenue west from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial from the future Jackrabbit Trail Parkway to Sarival Avenue. The study area for this project includes Peoria Avenue from the future Jackrabbit Trail Parkway alignment to Dysart Road (Peoria Avenue Corridor). The study area generally encompasses a two-mile-wide corridor centered on the existing Peoria Avenue. The study area is shown in Figure 1.

This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise (Surprise), the City of Glendale (Glendale), and the City of El Mirage (Mirage), the study will also develop access management guidelines, determine design standards based upon which jurisdiction anticipates annexing the roadway, and develop an implementation plan. In general, the purpose of this Corridor Improvement Study is to provide the Maricopa County Department of Transportation (MCDOT) and other jurisdictions with a future “footprint” of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

The key objectives of this Corridor Improvement Study are to:

- Define and assess strategic issues within the project study area;
- Develop and evaluate conceptual alternative alignments within the corridor study area;
- Recommend a preferred alignment;
- Develop consensus for the preferred alignment;
- Define the characteristics of the preferred alignment; and
- Develop an implementation plan.

This technical memorandum identifies the known existing environmental conditions including the physical, natural, and socioeconomic environment, as well as cultural resources. The information in the Environmental Overview (EO) is based on data available from county, municipal, state, and federal databases, personal interviews, and a field review of the study area. The EO provides known information to assist in the identification of potential environmental concerns in the study area that would need to be considered in evaluating and prioritizing alternatives for future project development. Future improvements would require further study, analysis and documentation under applicable environmental statues. If federal funds are used for such improvements, requirements of the National Environmental Policy Act (NEPA) and associated federal statues would apply.

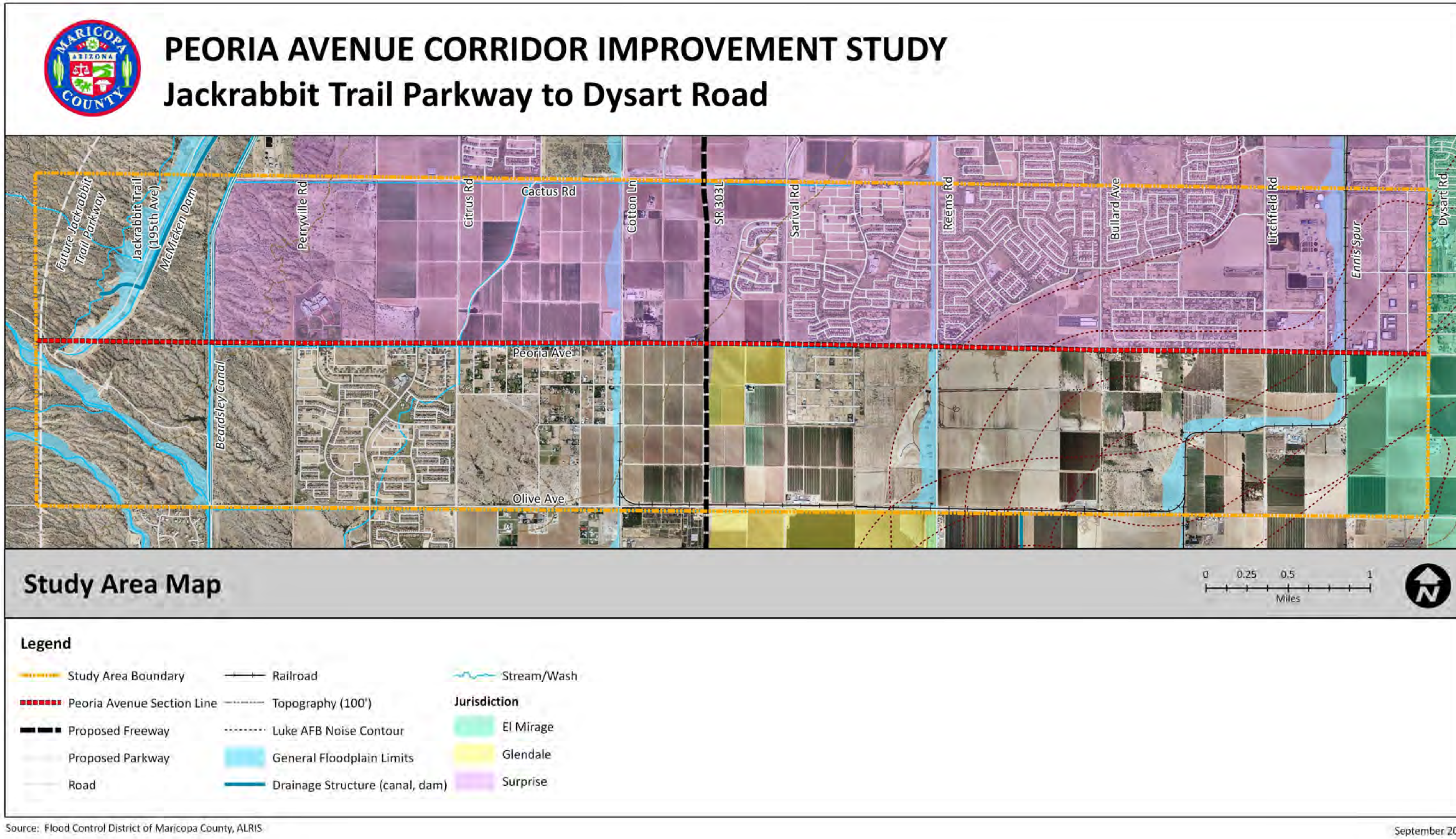


Figure 1 – Vicinity Map

2.0 SOCIOECONOMIC ENVIRONMENT

The socioeconomic environment includes jurisdictional boundaries, land ownership, existing land use, and planned development. Geographic Information Systems (GIS) data coverage created by the Arizona State Land Department (ASLD) and MAG, and municipal land use plans were used in identifying jurisdiction, ownership, existing land use, and planned land use. The presence of parks or recreation areas was determined using aerial imagery, as well as GIS data coverage from local municipalities and MAG.

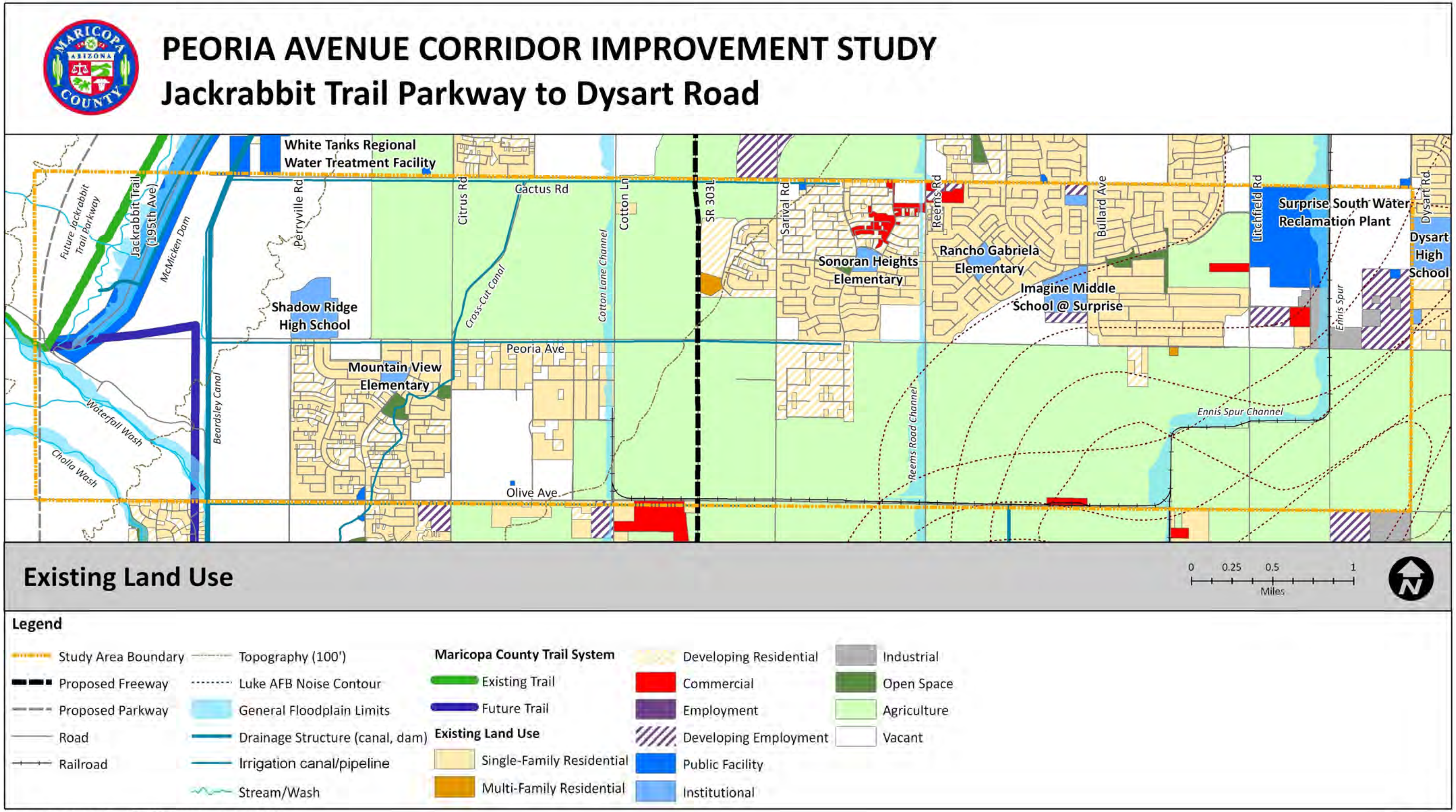
Jurisdiction and Ownership

For the purposes of this overview, land ownership is identified in terms of public or private control, while land jurisdiction refers to the city, town, county, state, or federal agency or agencies exercising governmental authority over an area. The majority of the land in the study area is privately-owned, with approximately 20 percent of the westernmost study area publicly-owned by the ASLD. While much of the private land is owned by individual property owners, there are several major land holdings in the study area including the Flood Control District of Maricopa County (FCDMC), Maricopa Water District (MWD), the Dysart Unified School District #89 (Maricopa County Tax Assessor 2010), and major master-planned community land owners.

The study area includes land within the municipal planning areas (MPA) of the City of El Mirage, City of Glendale, City of Surprise, and Maricopa County. An MPA is defined as the geographic area in which the municipal planning process is carried out, and can include both incorporated and unincorporated areas. Land within the El Mirage and Surprise MPA's is largely incorporated within the study area, while land within the City of Glendale MPA is mostly unincorporated. Maricopa County has planning and zoning authority over the unincorporated areas, including areas within an MPA. Planning and zoning authority for unincorporated State Trust land is shared jointly by ASLD and the County.

Existing Land Use

Much of the land within the study area is categorized as vacant (i.e., undeveloped) or agriculture. There are several single-family residential subdivisions that are built or under development, as well as three elementary schools, one middle school, and one high school. Several existing homes, not associated with the subdivisions, are located adjacent to Peoria Avenue. Small clusters of industrial and commercial development are scattered throughout the area. Existing land use is shown in Figure 2.



Source: Flood Control District of Maricopa County, ALRIS, MAG

December 2010

Figure 2 – Existing Land Use

Planned Development

The Peoria Avenue corridor is located in an area of projected development within Maricopa County. With the exception of the southeast portion of the study area, which is affected by the noise contours of the Luke Air Force Base (AFB), much of the study area is anticipated to reside within master planned communities. Approximately half of the major residential communities located within the study area are built or actively in the development phase.

Based upon long-range planning efforts conducted by each jurisdiction, the majority of the vacant and agricultural land will be converted to single-family residential housing in master planned communities and mixed use developments in the future. Commercial and industrial development will expand, but remain scattered throughout the study area.

Title VI/Environmental Justice

The United State Environmental Protection Agency defines Environmental Justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (Environmental Protection Agency 1998). Environmental Justice is based on Title VI of the Civil Rights Act of 1964, as amended, which prohibits discrimination on the basis of race, color, or national origin, by recipients of federal financial assistance. Executive Order 12898, issued February 11, 1994, provides that each federal agency, to the greatest extent practicable and permitted by law, shall make achieving Environmental Justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

A minority person is defined as an individual who is racially classified as African American, Native American or Alaskan Native, Asian, Native Hawaiian or Pacific Islander, some other race, or two or more races. Hispanics are also considered minorities regardless of their racial affiliation. Elderly refers to individuals who are older than 60 years of age. Low-income is defined as a person whose household income is at or below federal government poverty guidelines. The disabled population refers to individuals five years and older that have disability status and are non-institutionalized. Female head-of-household is a family household where there is a female with no spouse present, regardless of whether she has any children less than 18 years of age.

Demographic data obtained from the 2000 U.S. Census were used to compare the demographic profile of the study area with that of El Mirage, Glendale, Surprise, and Maricopa County. Census block group (BG) data were used to identify disabled, gender, income, age, and minority populations. The study area is comprised of six BGs. The population distribution is summarized in Table 1.

An evaluation of the demographic data indicates that there may be a disabled population and a minority population within the study area. Census Tract (CT) 610.07, BG 1, located North of

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Jackrabbit Trail Parkway to Dysart Road

Peoria Avenue between Cotton Lane and the Beardsley Canal, contains a population with a high percentage of disabled persons (Table 1). However, aerial imagery reveals that much of the BG that lies within the study area is used for agriculture or is undeveloped. The data also indicate that CT 610.07, BG 4, located north of Peoria Avenue between Cotton Lane and Bullard Avenue, has a high percentage of minority persons (Table 1). However, the 2000 Census Data predates the construction of a large residential subdivision currently located within this BG. Additional analysis and data collection would be required to determine the presence of any protected populations within the study area.

Table 1 – Population Distribution

Census Tract, Block Group	506.02, BG 2	610.06, BG 3	610.06, BG 3	610.07, BG 1	610.07, BG 3	610.07, BG 4	Total Tracts	City of El Mirage	City of Glendale	City of Surprise	Maricopa County
Total Population #	2,721	1,699	3,767	499	970	109	9,765	7,518	218,596	30,886	3,072,149
Total Minority #	396	309	469	162	242	90	1,668	2,604	53,675	4,219	696,758
Total Minority %	15%	18%	12%	32%	25%	**83% ***	17%	35%	25%	14%	23%
Age 60 years and over #	263	270	377	47	100	0	1,057	663	22,842	10,549	465,849
Age 60 years and over %	10%	16%	10%	9%	10%	0%	11%	9%	10%	34%	15%
Total population for whom disabled is determined #	2,545	1,577	3,500	466	842	109	9,039	6,569	197,407	28,239	2,802,278
Disabled #	491	410	624	131	145	7	1,808	1,655	36,136	5,608	504,992
Disabled %	19%	26%	18%	**28% ***	17%	6%	20%	25%	18%	20%	18%
Total population for whom poverty is determined #	2,710	1,699	3,735	499	970	109	9,722	7,441	215,389	30,763	3,027,299
Below Poverty Level #	151	90	325	0	25	0	591	1,181	25,688	2,689	355,668
Below Poverty Level %	6%	5%	9%	0%	3%	0%	6%	16%	12%	9%	12%
Households #	861	570	1,165	181	333	20	3,130	2,063	75,697	12,474	1,133,048
Female Head of Household #	89	65	134	34	32	0	354	446	19,672	2,178	303,905
Female Head of Household %	10%	11%	12%	19%	10%	0%	11%	22%	26%	17%	27%

* Bold text indicates Census Tract Block Groups with potential environmental justice or Title VI populations.
Source: US Census Bureau 2000

Section 4(f) Resources

Section 4(f) of the Department of Transportation Act of 1966 (49 USC 303) prohibits the use of land of significant publicly owned parks, recreation areas, wildlife and waterfowl refuges, and land of a historic site for transportation projects unless the Federal Highway Administration (FHWA) determines that there is no feasible and prudent avoidance alternative and that all possible planning to minimize harm has occurred (FHWA 2005).

Only federally-funded transportation projects are subject to the Section 4(f) requirement. If a project uses federal funds to acquire land protected by Section 4(f), or if the project affects any 4(f) resources, an evaluation of the impacts must be conducted.

White Tank Mountain Regional Park sits outside of the study area, just to the west of Jackrabbit Trail. The main entrance to the park is on Olive Avenue, which is one mile south of Peoria Avenue. There is a segment of the Maricopa Trail within the study area, along the west side of the McMicken Dam near the White Tank Mountain Regional Park (Figure 2). The Maricopa Trail (Figure 2) connects regional parks within the Maricopa County Park System. An additional segment of the trail is planned within the study limits, but not yet built. The new segment would connect the existing segment to the Beardsley Canal. There are no wildlife or waterfowl refuge areas within the study area.

While there are no other City or County parks within the study area, there are several community or "pocket" parks within developed communities. School playgrounds may qualify as Section 4(f) resources if they are publicly owned, open to the public, have a major recreational purpose, and are considered by the community to be a significant resource. Shadow Ridge High School is located immediately adjacent to Peoria Avenue in the western limits of the study area. There are several other schools within the study limits, though not immediately adjacent to Peoria Avenue: Mountain View Elementary, Sonoran Heights Elementary, Rancho Gabriela Elementary, and Imagine Middle School.

Some historic sites on or eligible for the National Register of Historic Places (NRHP) are also afforded protection by Section 4(f). FHWA's determination of adverse effect under 36 Section 106 (see page 30) does not mean that Section 4(f) automatically applies, nor should it be presumed that the lack of an adverse effect finding (no historic properties adversely affected) means that Section 4(f) will not apply. Section 4(f) applicability should be considered on a case-by-case basis.

There is currently a limited amount of information inventorying historic properties within the study area. Of the known sites within the study area, the Beardsley Canal and the Ennis spur of the BNSF Railway (BNSF) would potentially be afforded protection under Section 4(f). The Beardsley Canal, an historic canal, is partially located within the study area. While numerous sections of the canal are considered eligible, the section within the study area has not been evaluated. A portion of a historic railroad, the Ennis spur of the BNSF, crosses Peoria Avenue just east of 136th Avenue. The segment of the railroad that lies within the study area has not been evaluated for NRHP eligibility. Further evaluation to determine the eligibility status of these two sites and to survey for the presence of additional sites would be required prior to construction.

Section 6(f) Resources

The Land and Water Conservation Fund Act (LWCF) was signed into law on September 3, 1964 as Public Law 88-578, 16 U.S.C. 4601-4. The Act was established to provide a funding source for acquisition of park and recreation lands by federal, state, and local governments. As part of

the Act, the provisions under Section 6(f)(3) mandates that these investments are protected, but realizes that changes in land use especially in growing urban areas can impact these protected resources. As detailed in the following excerpt from the Act, the LWCF contains a provision to protect these areas from conversions (National Park Service 2010).

> SEC. 6(f)(3) *No property acquired or developed with assistance under this section shall, without the approval of the Secretary, be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.*

The 2008 Statewide Comprehensive Outdoor Recreation Plan (Arizona State Parks 2007) was reviewed to determine whether any LWCF funds were expended within the study area. No Section 6(f) funded properties are currently located within the Peoria Avenue study area. Section 6(f) funds were used to construct the nearby White Tank Mountain Regional Park, but this is outside of the study area. If a park were to be developed within the study area and LWCF funds were used to construct the park, requirements under the provisions of Section 6(f) could apply. In the event this were to occur, coordination with the Arizona State Parks LWCF Grants Coordinator and the National Park Service would be required, regardless of construction funding.

3.0 PHYSICAL AND NATURAL ENVIRONMENT

This section describes the existing physical and natural environment including topography, physiography, biotic communities, wildlife, sensitive species and habitat, water resources, visual character, noise, air quality, and hazardous materials. The information in this section was gathered from several sources, including local, state, and federal regulatory agencies having jurisdiction within the area. The agencies include the Arizona Department of Environmental Quality (ADEQ), Arizona Game & Fish Department (AGFD) and U.S. Fish and Wildlife Service (USFWS). The characteristics of the physical and natural environment were also identified from preliminary surveys of the area. The preliminary surveys were conducted by driving the portions of the project area that can be accessed by road and walking surveys of selected representative portions of the project area that could not be accessed by car.

Topography and Physiography

The study area is located within the Basin and Range Physiographic Province of Central Arizona (Hendricks 1985), which is characterized by numerous mountain ranges with broad valleys or basins between them. Portions of the Basin and Range province are composed of broad areas of alluvial fans and fan terraces, separated by isolated desert mountains. The White Tank Mountains, located just west of the study area (shown in Figure 3), are an example of isolated desert mountains found in the Basin and Range province.

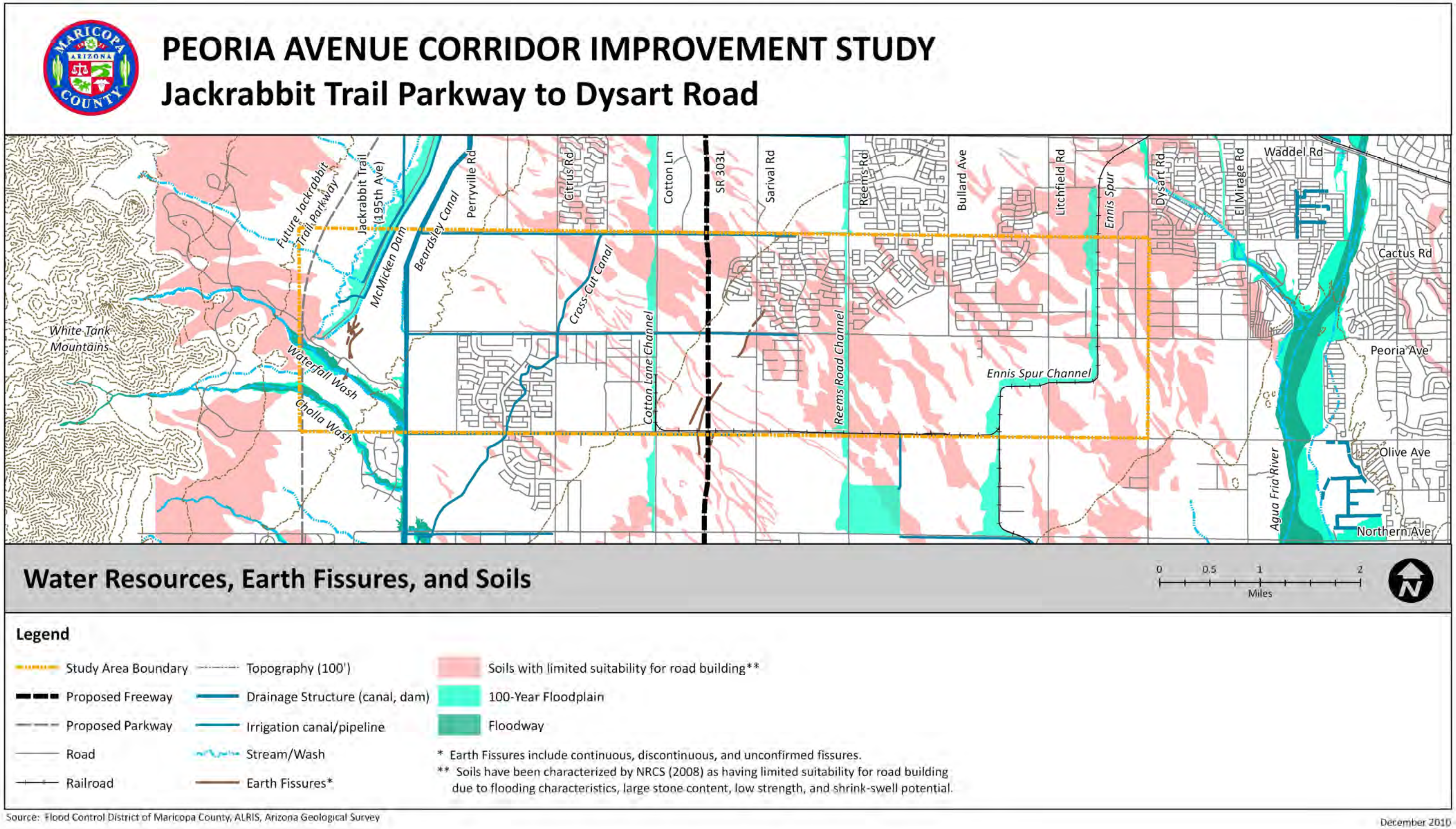

Figure 3 – Water Resources, Earth Fissures, and Soils

The study area is generally flat with an elevation range of 1,094 to 1,402 feet above mean sea level. The drainage pattern slopes southeast toward the Agua Fria River, located east of the study area. Major topographic features in the vicinity of the study area include the White Tank Mountains at the western end of the corridor and the Agua Fria River located east of the corridor. Many small washes remain in the undeveloped portions of the study area, but the majority of the land is farmed or has been developed for residential uses. The majority of the surface water in the study area is controlled using drainage channels and retention basins. The Maricopa Water District maintains a mix of open lateral canals and underground pipes that extend along Cactus Road, Peoria Avenue, and Dunlap Avenue between Sarival Road and the Beardsley Canal. The existing Peoria Avenue alignment crosses floodplains at some of the major north-south roads, discussed in more detail on page 21. The McMicken Dam/Trilby Wash Basin, a flood control structure, is also located within the study area. The Beardsley Canal crosses perpendicular to the Peoria Avenue alignment at the western end of the study area. There are two ephemeral desert washes located south of McMicken Dam and west of the Beardsley Canal that may be affected depending on the alignment selected for Peoria Avenue in that area. Water resources are discussed further on page 19.

As shown in Figure 3, there are areas of soils with high shrink-swell potential located on both the western and eastern boundaries of the study area. These soils are one of several soil units present throughout the study area that are rated as having "limited suitability for road building" by the Natural Resources Conservation Service (NRCS) (2008), due to flooding characteristics, large stone content, low strength, and shrink-swell potential (Figure 3). There are no hydric soils, which can be an indicator of wetland conditions, within the study area.

Prime and Unique Farmlands

The Farmland Protection Policy Act (FPPA) was passed in 1981 with the intent to minimize the impact of federal programs that involve converting farmland to non-agricultural uses. As a result, federal agencies must identify important farmland within the study area that would be affected by the project. Impacts can be direct, as with the conversion of agricultural land use to non-agricultural use, or indirect, if, for example, a new roadway blocks access to cropland. If there are adverse effects associated with a project that is tied to a federal action/aid, the FPPA requires that measures be considered to reduce those effects.

Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance. Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with a minimum input of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Prime farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods. The criteria for identification of prime farmlands are entirely related to soil and other physical characteristics. The land could be cropland, pasture land, range land, forest land, or other land, but not urban built-up land or water.

Unique farmland is defined as land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season and moisture supply needed to produce a sustained high quality or high yields of a specific crop in an economic manner when treated and managed according to acceptable farming methods.

Farmland of statewide or local importance is defined as farmland soils that fail to meet one of the requirements of prime or unique farmland, but are important for the production of food, feed, fiber, or forage crops. They include those soils that are nearly prime farmland and that economically produce high yields of crops when treated or managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.

As shown in Figure 4, no prime or unique farmlands are located west of Perryville Road. East of Perryville Road all of the soils surrounding Peoria Avenue are classified as either prime or unique farmland. Much of the soils are considered prime farmland if irrigated, with pockets or soils that are considered prime farmland if both irrigated and either protected from flooding or not frequently flooded during the growing season. There are also several small inclusions of unique farmland (NRCS 2010).

If federal funds are used for improvements to Peoria Avenue that would require the acquisition of right-of-way, a farmland impact assessment will need to be performed in accordance with the FPPA. This would entail a formal request to see whether prime or unique farmland are within the proposed right-of-way and documentation that alternative routes were explored to attempt to avoid these lands. If no other alternative is available, no penalty is imposed and no mitigation is required. If the land under consideration is already in or committed for urban development, a farmland impact assessment is still required.

Land Subsidence and Earth Fissures

Land subsidence has been identified in several south-central Arizona locations. This phenomenon occurs when water is pumped from underground aquifers and the weight of the overlying material compresses the empty aquifer, causing the land to settle and the ground surface to sink. The amount of subsidence varies by location; subsidence between five and 15 feet occurred throughout the study area between 1957 and 1991 (Schumann 1995). As a result, flooding has increased in some areas and required the Dysart Drain to be re-leveled at a cost of $16 million; agricultural fields and irrigation ditches also had to be re-leveled and repaired (Arizona Department of Water Resources [ADWR] 1999).

Groundwater pumping and subsequent land subsidence can also cause earth fissures. These are cracks in the ground surface that occur due to uneven land subsidence. Fissures can form gullies as much as 50 feet wide and 10 to 15 feet deep; they can eventually reach as deep as the water table (ADWR 1999). Existing and potential locations of earth fissures have been mapped south of McMicken Dam, at SR 303L near Olive Avenue, and at Peoria Avenue near

Sarival Road (Arizona Geological Survey 2009). Once fissures start to form, they tend to increase in number and length, spreading at uneven speeds and directions for several miles.

The effects of land subsidence and earth fissures can be significant, causing damage to infrastructure, increasing flood potential, worsening groundwater pollution by allowing contaminants to flow directly into the water table, and accelerating soil erosion (ADWR 1999). Continued land subsidence and accompanying earth fissures will likely occur in this area as long as groundwater overdraft continues.

Vegetation

The study area is located within the Lower Colorado River Valley Subdivision of the Sonoran Desertscrub Biotic Community (Brown 1994), which is found throughout southwestern Arizona at elevations below 3,500 feet. The corridor was originally developed for agricultural use with scattered residences and industrial properties, but is now a patchwork of agricultural, industrial, residential, and community facilities. Some undisturbed desert areas remain, mainly on State Trust Land and land west of Perryville Road at the western end of the study area abutting White Tank Mountain Regional Park. There is an isolated desert remnant area located north of Olive Avenue between Citrus Road and Cotton Lane. Isolated desert remnants are relatively small tracts of desert that are enclosed by developed land. They have lower conservation value than undisturbed desert because they are no longer connected to undisturbed desert and are likely to have some measure of disturbance as a result of the surrounding land uses.

Plant Communities

The vegetation in the areas of undisturbed desert consists mainly of scattered trees, shrubs and cacti. Common species include palo verde (*Parkinsonia* sp.), mesquite (*Prosopis* sp.), ironwood (*Olneya tesota*), desert broom (*Baccharis sarothroides*), creosote bush (*Larrea tridentata*), brittlebush (*Encelia farinosa*), bursage (*Ambrosia deltoidea*), cholla (*Cylindropuntia* spp.), barrel cactus (*Ferocactus* sp.), and saguaro (*Carnegiea gigantea*). Various forbs occur throughout the area, including fiddleneck (*Amsinckia menziesii*), cryptantha (*Cryptantha* sp.) and plantain (*Plantago* spp). Table 2 contains a list of plants confirmed within the study area based on the August 2010 field visit and vouchers stored at the Arizona State University Vascular Plant Herbarium; because it is based on only a cursory field visit, it does not contain all species that may be present.

The agricultural land within the study area contains mainly crop plants with additional vegetation typical of desert agriculture-dominated landscapes located at field edges and around residences. This vegetation includes large trees, such as eucalyptus and pine, that were used to serve as windbreaks, or were planted around historic farm houses or businesses. A few orchard remnants were also noted during the preliminary survey.

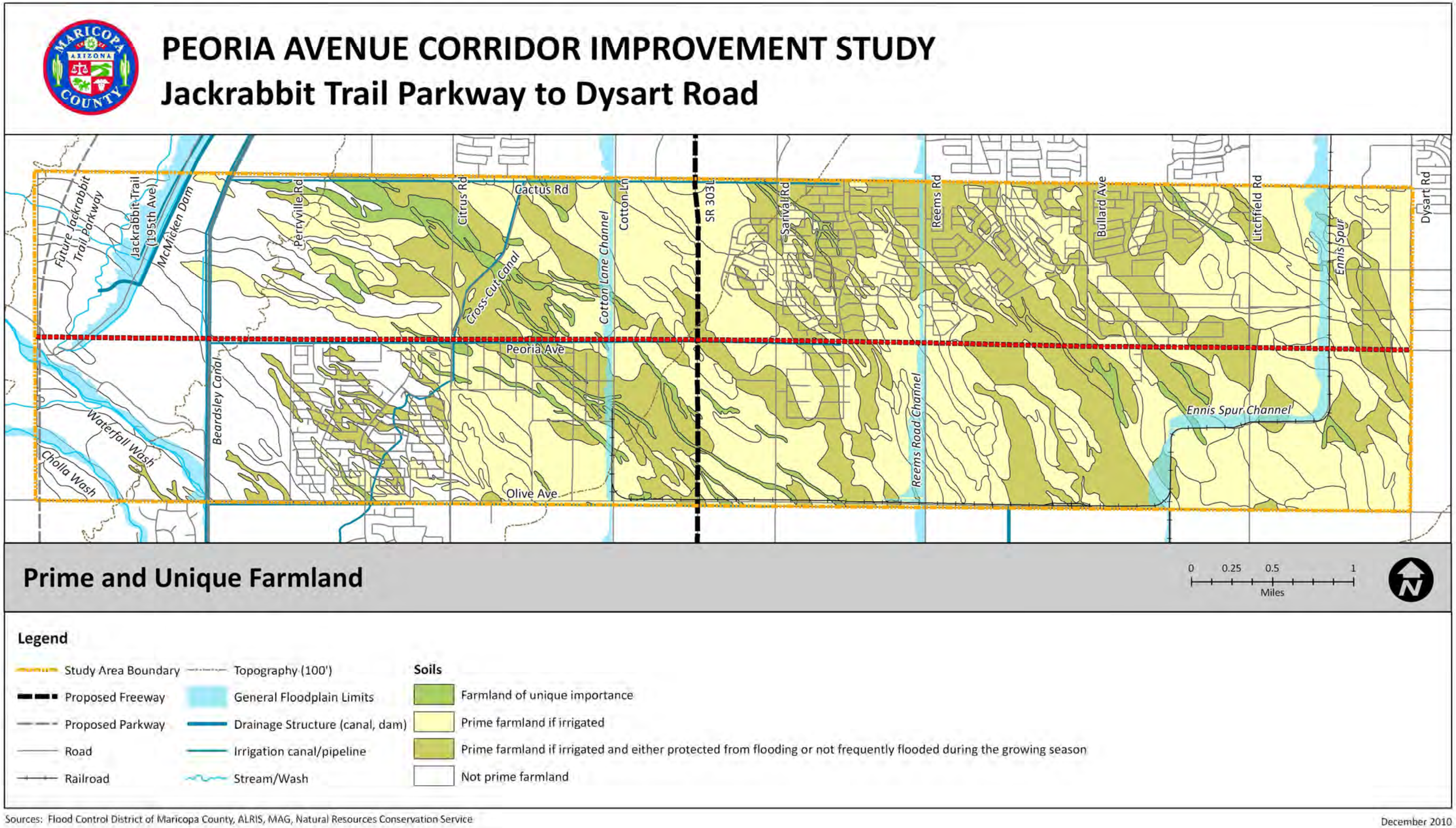

Figure 4 – Prime and Unique Farmland

Residential areas and subdivisions within the study area contain both native and non-native landscape plants. Native plants that have been grown for landscaping purposes are not subject to Arizona's native plant protection laws; native plants that have been salvaged from the desert may be transplanted by the holder of the native plant permit without additional requirements.

Table 2 – Plant Species Known to Occur Within the Study Area

Common Name	Scientific Name	Family	Status [1]
Desert broom	*Baccharis sarothroides*	Asteraceae	
Brittlebush	*Encelia farinosa*	Asteraceae	
Bursage	*Ambrosia deltoidea*	Asteraceae	
Fleabane	*Erigeron lobatus*	Asteraceae	
Chinchweed	*Pectis papposa* var. *papposa*	Asteraceae	
Fiddleneck	*Amsinckia menziesii*	Boraginaceae	
Cryptantha	*Cryptantha* sp.	Boraginaceae	
Cryptantha	*Cryptantha nevadensis*	Boraginaceae	
Combseed	*Pectocarya platycarpa*	Boraginaceae	
Popcornflower	*Plagiobothrys arizonicus*	Boraginaceae	
Pepperweed	*Lepidium lasiocarpum*	Brassicaceae	
Sahara mustard	*Brassica tournefortii*	Brassicaceae	Invasive
London rocket	*Sisymbrium irio*	Brassicaceae	
Cholla	*Cylindropuntia* sp.	Cactaceae	SR
Barrel cactus	*Ferocactus* sp.	Cactaceae	SR
Prickly pear cactus	*Opuntia* sp.	Cactaceae	SR
Saguaro	*Carnegiea gigantea*	Cactaceae	HS, SR
Tumbleweed	*Salsola tragus*	Chenopodiaceae	Invasive
Pygmy weed	*Crassula connata*	Crassulaceae	
Desert starvine	*Brandegea bigelovii*	Cucurbitaceae	
Milkvetch	*Astragalus didymocarpus*	Fabaceae	
Blue palo verde	*Parkinsonia florida*	Fabaceae	SA
Ironwood	*Olneya tesota*	Fabaceae	SA, HR
Little-leaf palo verde	*Parkinsonia microphylla*	Fabaceae	SA
Lupine	*Lupinus sparsiflorus*	Fabaceae	
Mesquite	*Prosopis* sp.	Fabaceae	SA, HR
Ocotillo	*Fouquieria splendens*	Fouquieraceae	SR
Stork's bill	*Erodium cicutarium*	Geraniaceae	
Phacelia	*Phacelia distans*	Hydrophyllaceae	
Blue fiestaflower	*Pholistoma auritum*	Hydrophyllaceae	
Chia	*Salvia columbariae*	Lamiaceae	
Bluedicks	*Dichelostemma capitatum* ssp. *pauciflorum*	Liliaceae	SR
Cheeseweed	*Malva parviflora*	Malvaceae	
Globemallow	*Sphaeralcea ambigua*	Malvaceae	
Globemallow	*Sphaeralcea coulteri*	Malvaceae	
Desert Indianwheat	*Plantago ovata*	Plantaginaceae	
Woolly plantain	*Plantago patagonica*	Plantaginaceae	
Arizona brome	*Bromus arizonicus*	Poaceae	
Red brome	*Bromus rubens*	Poaceae	Invasive

Table 2 Continued

Common Name	Scientific Name	Family	Status [1]
Bluegrass	*Poa bigelovii*	Poaceae	
Mediterranean grass	*Schismus arabicus*	Poaceae	
Star gilia	*Gilia stellata*	Polemoniaceae	
Citrus tree	*Citrus sinensis*	Rutaceae	
Owl's clover	*Castilleja exserta*	Scrophulariaceae	
Creosote bush	*Larrea tridentata*	Zygophyllaceae	

[1] Protected Native Plant Categories, established by the Arizona Department of Agriculture:
HS: Highly Safeguarded - Highly protected plants; salvage, collection and scientific research permits required to move plants or harvest any parts of them.
SR: Salvage Restricted - Collection or destruction by permit only.
SA: Salvage Assessed - These plants have a significant value if salvaged.
HR: Harvest Restricted - Permits required to remove plant by-products (fuel wood).
Sources: ASU Herbarium, Field Survey 8/24/2010, Arizona Department of Agriculture

Native Plants

Several naturally occurring protected native plants were observed in the study area (Table 2). These include palo verde (Parkinsonia spp.), mesquite (*Prosopis* spp.), ironwood (*Olneya tesota*), ocotillo (*Fouquieria splendens*), saguaro (*Carnegiea gigantea*), barrel cactus (*Ferocactus* sp.), prickly pear (*Opuntia* sp.), and cholla (*Cylindropuntia* spp.). The Arizona Department of Agriculture (ADA) protects these native plant species. Preparation of a native plant salvage plan is recommended; at a minimum, notice of the intended destruction of protected plants must be disseminated to the public and the ADA 60 days prior to beginning the action, as specified in ARS 3-904 (ADA 2010).

Invasive Species

Invasive plant species including Sahara mustard (*Brassica tournefortii*), red brome (*Bromus rubens*), and tumbleweed (*Salsola tragus*) were observed during a preliminary field review of the study area in August 2010. Standard precautions to avoid introducing and/or spreading invasive plants should be practiced during construction. These precautions include washing all earth moving and hauling equipment at the contractor's storage facility prior to entering the construction site, seeding all disturbed soils that will not be landscaped or otherwise permanently stabilized by construction using species native to the project vicinity, and inspecting all construction equipment and removing all attached plant/vegetation and soil/mud debris prior to leaving the construction site. Typically, contractors must develop invasive species control plans prior to beginning work.

Rare Plants

The Arizona Game and Fish Department (AGFD) On-Line Environmental Review Tool was queried on August 12, 2010 (Search ID No. 20100812012960, Appendix A). The query revealed that a variety of Englemann's Prickly-Pear (*Opuntia engelmannii* var. *flavispina*), also known as Cactus Apple, has been reported to occur within three miles of the Corridor. A search of herbarium vouchers from the Arizona State University Vascular Plant Herbarium showed that this variety of prickly pear was collected just inside the boundary of the White Tank Mountain

Regional Park, just outside the western end of the study area, in 1977. This plant may be present within the study area. It is listed as a Salvage Restricted Protected Native Plant by the Arizona Department of Agriculture (ADA 2010).

Wildlife and Wildlife Movement

The relatively undisturbed desert land within the study area offers potential habitat for many desert wildlife species of all sizes. The proximity and connectivity to the White Tank Mountain Regional Park likely allows use of the area by larger animals than would often be found in land adjacent to urban areas. Typical species that may be found in these parts of the study area include deer (*Odocoileus* sp.), coyote (*Canis latrans*), javelina (*Pecari tajacu*), rabbit or hare (*Family Lagomorph*), round-tailed ground squirrel (*Spermophilus tereticaudus*), small rodents, and possibly mountain lion (*Puma concolor*). Many bird species are also likely present, including cactus wren (Campylorhynchus *brunneicapillus*), roadrunner (*Geococcyx californianus*), Gambel's quail (*Callipepla gambelii*), and likely western burrowing owls (*Athene cunicularia*). Reptile species that may occur in the area include Sonoran desert tortoise (*Gopherus agassizii*), western rattlesnake (*Crotalus oreganus*), diamondback rattlesnake (*Crotalus atrox*), Gila monster (*Heloderma suspectum*), and gopher snakes (*Pituophis* spp.).

A significant portion of the study area has long been developed for agricultural uses. However, many species use agricultural areas as habitat. Agricultural fields offer some nesting and foraging habitat for birds, small rodents, and other small mammals. Species that might occur in the area include coyotes, raptors, rabbits, a variety of seasonally migrant songbirds, and an array of small mammals, amphibians, reptiles, perching birds and songbirds. As residential and commercial uses develop, a variety of wildlife species adapted to urban conditions will continue to use vegetation in residential and commercial landscaping, parks, and remaining agricultural fields.

The Peoria Avenue Corridor extends from one half-mile east of the White Tank Mountain Regional Park eastern almost to the Agua Fria River. This area could serve as an important wildlife corridor. A Feasibility Study for the Trilby Wash has been initiated by the U.S. Army Corps of Engineers (USACE) and FCDMC to develop and evaluate potential flood control solutions for the Trilby Wash, McMicken Dam, and outflow channels to the Agua Fria River. AGFD will be involved with the study to facilitate use of an ecosystem restoration approach and tie into a regional connectivity plan to preserve wildlife habitat linkages between the White Tank Mountains and surrounding wildlands as well as to create recreational opportunities within the urban environment (AGFD 2009a). Maintaining access between large habitat blocks, such as the White Tank Mountain Regional Park, and natural corridors in the landscape, such as the Agua Fria River, is key to maintaining native biodiversity as much as possible in the metropolitan area. The Peoria Avenue Corridor could provide such a connection if low-cost wildlife connectivity features are considered during the design process. Guidelines for facilitating wildlife connectivity have been developed by the Arizona Wildlife Linkages Workgroup (AWLW 2006), the AGFD (AGFD 2006a, 2008a, 2009b), and Arizona Missing

Linkages (www.corridordesign.org); consideration of the guidelines in the design process for the Peoria Avenue Corridor is recommended.

Special Status Species

Threatened and Endangered Species

The Endangered Species Act (ESA), passed in 1973, is a federal law to protect and recover imperiled species and their habitats. Under the ESA, species are designated as threatened or endangered by the USFWS. "Endangered" species are in danger of extinction throughout all or a significant portion of their range. "Threatened" species are likely to become endangered within the foreseeable future (USFWS 2010). "Candidate" species are those for which USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. They receive no statutory protection under the ESA (USFWS 2007).

A qualified biologist, Kristin Gade (AECOM), reviewed the list of Threatened and Endangered Species for Maricopa County from the USFWS (Table 3). The AGFD On-Line Environmental Review Tool was queried on December 6, 2010 (Appendix A). The On-Line Environmental Review Tool contains records for special status species reports that have been made to AGFD. These include species listed as threatened, endangered, or candidates for listing by USFWS, Critical Habitat areas listed under the Endangered Species Act, eagles protected by the Bald and Golden Eagle Act, sensitive species listed by the Bureau of Land Management or US Forest Service, species with special status in Mexico or the Navajo Nation, and Arizona Wildlife Species of Concern. This includes species that are also protected under the Migratory Bird Treaty Act of 1918 (MBTA), but not all species protected under the MBTA are included in the database. The query indicated that no threatened or endangered species have been reported within three miles of the study area. No proposed or designated Critical Habitat is present within three miles of the study area. Sprague's pipit (Anthus spraguei), a small sparrow-sized bird, was added to the list of federally-protected species for Maricopa County as a Candidate species as of October 28, 2010. This species is rare in Arizona, but could potentially use cultivated, dry Bermuda grass, alfalfa fields mixed with dry grass, or fallow fields within the project area during its wintering season from October through March. Sightings have been reported to AGFD only from Santa Cruz and Cochise counties (AGFD 2010). As the project development process continues, the county species list and critical habitat designations should be re-evaluated to determine whether consultation with the USFWS will be necessary.

Migratory Bird Treaty Act

The MBTA is a federal act that protects birds that migrate within the United States or between the United States and other countries, as they may not otherwise be afforded protection when they are not full-time residents in a single state. The act protects most bird species. The AGFD On-Line Environmental Review did not indicate that any species protected under the MBTA have been observed within three miles of the study area. Although western burrowing owls (*Athene cunicularia*) have not been reported to the AGFD as occurring nearby, they are likely to occur in the desert and agricultural portions of the study area, particularly near canals. No burrowing owls were observed during the preliminary field review, but the field review was not conducted at the optimal time for spotting burrowing owls (dawn or dusk). A survey for burrowing owls should be performed prior to construction so that any owls that might be impacted can be relocated following the guidelines from AGFD (2007).

Table 3 – Federally-Listed Species Known to Occur in Maricopa County, Arizona

Common Name	Scientific Name	Status	Suitable Habitat Present?	Occupied Habitat Present?	Critical Habitat Present?	Species Affected?	Critical/ Suitable Habitat Affected?
Arizona cliffrose	*Purshia subintegra*	E	No	No	N/A	No	N/A
Bald eagle	*Haliaeetus leucocephalus*	T	No	No	N/A	No	N/A
California least tern	*Sterna antillarum browni*	E	No	No	N/A	No	N/A
Desert pupfish	*Cyprinodon macularius*	E	No	No	N/A	No	N/A
Gila topminnow	*Poeciliopsis occidentalis occidentalis*	E	No	No	N/A	No	N/A
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	E	No	No	N/A	No	N/A
Mexican spotted owl	*Strix occidentalis lucida*	T (CH)	No	No	No	No	No
Mountain plover	*Charadrius montnaus*	PT	No	No	N/A	No	N/A
Razorback sucker	*Xyrauchen texanus*	E (CH)	No	No	No	No	No
Sonoran pronghorn	*Antilocapra americana sonoriensis*	E	No	No	N/A	No	N/A
Southwestern willow flycatcher	*Empidonax traillii extimus*	E (CH)	No	No	No	No	No
Woundfin	*Plagopterus argentissimus*	E	No	No	N/A	No	N/A
Yuma clapper rail	*Rallus longirostris yumanensis*	E	No	No	N/A	No	N/A
Roundtail chub	*Gila robusta*	C	No	No	N/A	No	N/A
Sprague's pipit	*Anthus spragueii*	C	Yes	No	N/A	No	No
Tucson shovel-nosed snake	*Chionactus occipitalis klauberi*	C	No	No	N/A	No	N/A
Yellow-billed cuckoo	*Coccyzus americanus*	C	No	No	N/A	No	N/A

Notes: **E** = Endangered; **T** = Threatened; **C** = Candidate; **CH**= Designated Critical Habitat within 3 Miles of Study Area; **PT** = Proposed Threatened.

Source: *Federally listed species for Maricopa County (October 28, 2010)*. Obtained from USFWS on Dec. 6, 2010.

Arizona Special Status Species

In addition to the rare plant species discussed on page 11, the only other species identified by the AGFD On-Line Environmental Review Tool as occurring within three miles of the study area is the lowland leopard frog (*Rana yavapaiensis*), which is designated by the state of Arizona as “Wildlife of Special Concern.” One sighting of the frog in the general area of SR 303L near the study area had been reported to AGFD as of February 2008 (AGFD 2008b). This species of frog inhabits and breeds in natural and man-made aquatic systems in desert grasslands to pinyon-juniper forests (AGFD 2006b). Man-made systems that support the lowland leopard frog can include cattle tanks, canals, irrigation sloughs, wells, abandoned swimming pools and ornamental backyard ponds. The frogs require shallow water with emergent and perimeter vegetation for basking habitat and deep water areas with root masses, undercut banks, and/or debris piles for refuge from predators and hibernation locations (AGFD 2006b). They can survive in semi-permanent aquatic systems by retreating into deep mud cracks, mammal burrows or rock fissures (Howland *et al.* 1997 as cited in AGFD 2006b). No likely habitat for lowland leopard frogs was observed during the preliminary survey. It is possible that such habitat might occur on agricultural land that was not surveyed or in some of the open lateral canals located in residential yards and undeveloped land along Peoria Avenue. If aquatic systems that meet the description will be impacted by the construction of the Peoria Avenue corridor improvements, mitigation measures to protect lowland leopard frogs and their habitat should be implemented. In addition, design guidelines for culverts to facilitate wildlife crossings should be implemented for this project (AGFD 2006a).

As the project progresses, the review tool should be re-queried to determine whether any additional sightings of special status species have been reported near the project area to AGFD or any additional species have been designated as having special status.

Water Resources

The following subsections discuss groundwater and surface water resources within the study area, including major watercourses, water distribution by the Maricopa Water District, flood control structures, permitting under Sections 401 and 404 of the Clean Water Act, and floodplains.

Groundwater

The study area is located within the West Salt River Valley subbasin of the Phoenix Active Management Area (AMA) for groundwater (ADWR 1999). In 1980, the state of Arizona established the groundwater AMAs in areas where groundwater overdraft was occurring with the goal of achieving balanced withdrawal and recharge over time. Groundwater levels in the West Salt River Valley subbasin have declined substantially since groundwater pumping began in the early 1900s. There are two large cones of depression in the groundwater levels within the subbasin due to groundwater pumping near Luke Air Force Base and in Deer Valley near the Hedgpeth Hills (ADWR 1999). Between 1923 and 1977, water levels declined by more than 300 feet in these areas (Ross 1978, as cited in ADWR 1999). Most of the groundwater in the subbasin flows toward the two cones of depression.

In general, groundwater in the Phoenix AMA is of acceptable quality for most uses. Most of the groundwater supplies in the Phoenix AMA meet federal and state drinking water standards, though contaminant levels exceed primary safe drinking water standards in a few areas. Within the study area, tests at four wells have resulted in concentrations of fluoride and arsenic that exceed the permissible levels in the Safe Drinking Water Act and two wells had levels of fluoride only that exceeded the standard (ADWR 2010). These contaminants can occur naturally in the groundwater due to their presence in some geologic formations.

Surface Water

There are no wetlands or major natural watercourses in the study area. The drainage throughout the area has generally been redirected for use by agriculture and to allow residential and industrial development. Two ephemeral washes, Waterfall Wash and Cholla Wash, run through the southwest corner of the study area, south of McMicken Dam and west of the Beardsley Canal (Figure 2). The Beardsley Canal, a man-made watercourse constructed to deliver water, is the only major watercourse in the study area. Surface water does not drain into the canal.

The planned drainage channel improvements along Reems Road and SR 303L may cause the drainage channels to be considered jurisdictional if they drain to natural watercourses. The future drainage channel improvements along SR 303L will drain storm water to the Gila River. The Reems Road channel will connect to the Dysart Drain, which drains to the Agua Fria River. Both of these channels would likely be considered "Waters of the U.S.," which are under the jurisdiction of the USACE per Section 404 of the Clean Water Act. If so, placement of permanent fill, rip-rap, and construction or extension of bridges and box culverts in these watercourses would require Section 404 permitting. Waterfall and Cholla Washes are both ephemeral washes located south of McMicken Dam and west of the Beardsley Canal. They may be considered jurisdictional in the future if they flow into the future Jackrabbit Trail drainage channel. The future Jackrabbit Trail drainage channel, portions of which are in planning and design stages, is located two to three miles south of the study area and will ultimately connect to the Gila River. A Jurisdictional Determination report should be completed for the project once the alignment is set and the project is scheduled to go to design to aid in determining permit requirements.

Irrigation

The MWD owns and operates the Beardsley Canal and several water delivery structures east of the canal and west of Bullard Avenue. This includes the Cross-Cut Canal and Pipeline and several lateral canals within the study area, as shown in Figure 3 and described below. The canals and pipelines do not appear to connect to any natural drainage channels.

The Beardsley Canal flows from north to south and is parallel to the White Tank Mountains. The canal crosses Cactus Road and Olive Avenue within the study area. The extension of Peoria Avenue will have to cross over it to reach the future Jackrabbit Parkway alignment. The canal begins near Lake Pleasant south of the New Waddell Dam, crosses the Agua Fria River, and heads generally south and west to cross US 60 northwest of SR 303L. It then parallels the

McMicken Dam for several miles before turning due south midway between the Perryville Road and Jackrabbit Trail alignments, ending near Indian School Road.

The Cross-Cut Canal is an open canal from Cactus Road south to Peoria Avenue. It runs between Citrus Road and Cotton Lane (Figure 2). South of Peoria Avenue, the canal becomes an underground pipeline which runs south down Citrus Road to Olive Avenue and then west along Olive Avenue to 183rd Avenue, where it turns south and leaves the study area.

There are lateral channels and pipelines running along Cactus Road, Peoria Avenue, and Olive Avenue between the Beardsley Canal and Reems Road, as well as north-south laterals along portions of Cotton Lane, Sarival Lane and SR 303L.

Flood Control

There are 100-year floodplains present within the study area (Figure 2). The floodplains generally occur in a north-south alignment, and follow the Beardsley Canal, McMicken Dam, two natural washes (Waterfall Wash and Cholla Wash), Cotton Lane and Reems Road. A 100-year floodplain also runs along a portion of the Ennis Spur of the BNSF. Floodwaters from the railroad drain into the Dysart Ditch, which empties into the Agua Fria River.

McMicken Dam, which is under the jurisdiction of the FCDMC, is located within the study area. FCDMC has conducted several studies to support future projects related to flood control and development in the study area and surrounding vicinity. Construction of these channels is planned and/or ongoing. Planned drainage channels in the study area include the SR 303L Channel and Basin (which will drain to the Gila River), the Reems Road Channel (which will direct storm water from Reems Road into the Dysart Drain), and the BNSF/Ennis Spur Channel and Basin. The main drainage channel in the vicinity of the study area is the existing Dysart Detention Basin and Dysart Drain, located south of the study area between Estrella Parkway and the Agua Fria River.

There are also flood control facilities such as channels and retention basins within the commercial and residential developments within the study area. These facilities are privately owned but follow local and county design standards and ordinances for on-site retention of the 100-year 2-hour storm event, the acceptance of pavement runoff for the half street adjacent to the development, and the conveyance of upstream off-site flows through street/roadside channel systems. Future development projects within the study area would likely include similar channel and retention basin facilities.

The majority of the floodwaters detained by the McMicken Dam remain in the Trilby Wash Basin. Planned drainage projects within the study area are discussed in more detail in Technical Memo #1, and there is a more detailed drainage analysis in Technical Memo #3.

Visual Resources

The study area is situated within a semi-rural area that includes historic agricultural and industrial developments. The area is a patchwork of agricultural, industrial, residential, and public uses, and is rapidly transforming from the rural, open desert setting into one with new residential and commercial developments. Some undisturbed desert areas remain in the corridor, mainly in the western end of the study area abutting the White Tank Mountain Regional Park. The undeveloped landscape exhibits shades of brown and tans of the Sonoran desert, with greens from the desert scrub that covers much of it.

The study area is generally flat, with elevations ranging from 1094 to 1402 feet above sea level. As shown in Figure 5, the terrain gently rises northwest as it approaches the base of the White Tank Mountains. Just west of the study area the White Tank Mountains rise sharply from its base to a peak of over 4,000 feet. Middle ground (0.25 – 3 miles) and background (beyond 3 miles) views of the White Tank Mountains can be seen from much of the study area, with minimal obstruction.

Typically, residential viewers are more sensitive to perceivable changes in their surrounding landscape than other types of land uses. Within the study area the majority of residents live in newer, walled communities, which would likely obstruct immediate views of a roadway project. There are some older homes, outside of these communities, that could potentially be exposed to foreground (0 - .25 miles) views of the project. Due to the flat terrain, the main views of the project will be immediate foreground views. Middle ground and background views from within the study area were not analyzed because the lack of elevation makes these types of views unlikely.

Recreational viewers in the vicinity of the study area would be users of the White Tank Regional Park (approximately one-half mile west of the study area) and the Maricopa Trail (Figure 5). The natural landscape and open views draw visitors to the Maricopa Trail, as well as the hiking, bicycle and equestrian trails that crisscross the Park, and to the picnic areas and armadas that are scattered throughout the Park. Figure 6 shows the view of the study area from the White Tank Mountain Regional Park. Visitors to the Park and the Maricopa Trail would be highly sensitive to changes in the landscape. Much of the eastern side of the Park has middle ground and background views of the study area.

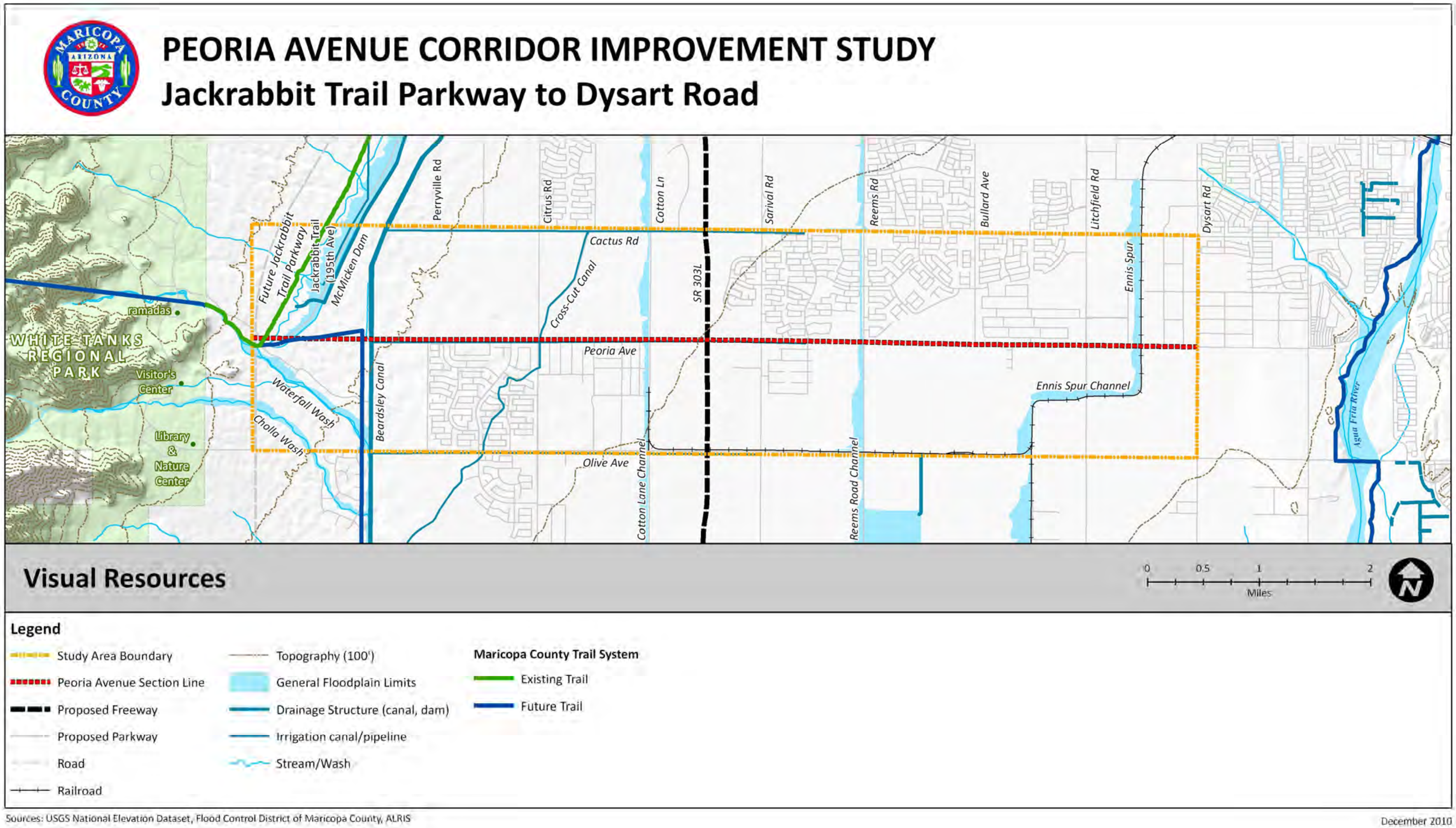

Figure 5 – Visual Resources

Figure 6 – Photo Taken from the Library and Nature Center at the White Tank Regional Park Looking East-Northeast.

Maricopa County has designated a series of corridors as scenic for a number of reasons, including their prominent views or vistas, native landscaping, or unique characteristics that attract residents in search of a distinct quality of life. As part of a public process, design guidelines (e.g., landscape, habitat, character, height, lighting, signage, fencing, etc.) have been developed to direct and enhance planning of such corridors as development occurs, with the intent generally being to highlight, promote, and preserve the scenic and environmental characteristics of the community, while also minimizing the impacts that rapid urban growth may have on an area, and helping accommodate future population growth. Two scenic corridors exist within the study area:

- The Olive Avenue Scenic Corridor has been designated because of its access to the White Tank Mountain Regional Park, which is a major recreational destination in Maricopa County.
- The McMicken Dam Scenic Corridor has been designated for similar reasons, as well as its role as a segment of the Maricopa County Regional Trail System.

As alternatives are developed for Peoria Avenue, coordination should occur with these past studies, if the alternative alignments intersect these corridors in any way.

Noise

MCDOT considers mitigation for receptors predicted to be impacted by increased noise levels associated with proposed transportation projects. MCDOT has developed a Noise Abatement Policy that provides additional guidance in determining the need, feasibility, and reasonableness

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of noise abatement or reduction measures on roadway projects, regardless of funding source (MCDOT 2010).

The MCDOT Policy determines traffic noise impacts based upon the FHWA Noise Abatement Criteria (NAC), contained in 23 CFR 772. The FHWA NAC specify an allowable traffic noise level for different categories of land uses and activities. The MCDOT Noise Abatement Policy states that impacts occur if the noise level "approaches" the FHWA NAC (Table 4). MCDOT defines approach as one dBA below the FHWA NAC (Table 4). Impacts also occur if the predicted noise levels result in a substantial noise level increase of 15 dBA or more when compared to the existing noise levels.

Table 4 – FHWA Noise Abatement Criteria (Hourly Sound Level in A-Weighted Decibels [dBA]) [1]

Activity Category	Activity Leq(h)	Criteria [2] L10(h)	Evaluation Location	Activity Description
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to its intended purpose.
B [3]	67	70	Exterior	Residential
C [3]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E [3]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F				Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G				Undeveloped lands that are not permitted.

[1] Either Leq(h) or L10(h) may be used on a project, but not both. Leq is defined as the hourly equivalent steady-state sound level which contains the same acoustic energy as the time-varying sound level during that hour. L10(h) is defined as the sound level that is exceeded ten percent of the time (the 90th percentile) during an hour.
[2] The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.
[3] Includes undeveloped lands permitted for this activity category.
Source: FHWA 2010

Noise activity categories B, C, D, E, F, and G occur within the study area. Much of the land within the study limits falls under Land Use Category F or G, and includes agricultural land, industrial facilities, and undeveloped lands that are not permitted. Category B land uses include several master-planned residential communities that are still under development. The residential land uses are concentrated in two areas: north of Peoria Avenue between SR 303L and Litchfield Road, and south of Peoria Avenue between Perryville Road and Cotton Lane. Category C and D land uses, mainly schools, are generally located near the residential areas.

Category E land uses are concentrated north of Peoria Avenue near its intersection with Dysart Road. As development in the study area progresses, these areas would need to be evaluated for the presence of any new sensitive noise receptors.

According to the MCDOT *Noise Abatement Policy*, road projects that create additional through-lane capacity, include a change in horizontal alignment greater than 10 feet, or a change in vertical alignment greater than 3 feet must be evaluated to determine if noise abatement or reduction measures are warranted. If a roadway improvement project along Peoria Avenue would add capacity or result in a change in vertical or horizontal alignment as described above, a noise impact analysis would be required. This is regardless of funding source. The analysis should be performed in accordance with 23 CFR 772, and following MCDOT *Noise Abatement Policy*.

The 65, 70, and 75 dBA noise contours for Luke Air Force Base intersect Peoria Avenue within the study area. Land-use restrictions apply to areas that fall within the 65+ dBA noise contours, but these provisions are primarily focused on restricting residential land uses. Transportation land use has a high noise-level compatibility and can be located within the higher noise zones.

Air Quality

The 1970 Clean Air Act (CAA) and the 1990 CAA Amendments (CAAA), along with the NEPA require that air quality impacts be addressed in the preparation of environmental documents. The level of effort used to evaluate these impacts may vary from a simplified description to a detailed micro-scale analysis, depending on factors such as the type of document to be prepared, the project location and size, the meteorology of the project area, the air quality attainment status of the area, and the state air quality standards. Under the CAAA, areas are classified by levels of ambient air pollution existing at the time of the 1990 amendments, and by whether they attain the National Ambient Air Quality Standards (NAAQS) or are in non-attainment of the standards, as described in the following paragraphs. Primary standards set limits to protect public health, including the health of “sensitive” populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protections against decreased visibility and damage to animals, crops, vegetation and buildings.

The CAAA established NAAQS for six pollutants. These pollutants, referred to as the “Criteria Pollutants,” are carbon monoxide (CO), nitrogen dioxide, ozone, particulate matter (PM), sulfur dioxide and lead. In 1987, the standard for particulate matter was revised by the U.S. Environmental Protection Agency (EPA) from total suspended particulate matter, consisting of aerosols with diameters up to approximately 45 microns, to those aerosols with aerodynamic diameters of 10 microns or less. This standard is referred to as PM_{10}.

In 1997, the EPA revised the standards for both particulate matter and ozone. It revised the PM_{10} standard, added standards for particulates with diameters of 2.5 microns or less ($PM_{2.5}$) and revised the method for the determination of exceedances. In 2006, due to a lack of evidence linking health problems to long-term exposure to coarse particulates, the EPA revoked the annual PM_{10} standard (effective December 17, 2006). For ozone, the 1-hour standard was

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replaced with an 8-hour standard. In addition, the concentration of ozone standard was lowered from 0.12 parts per million (ppm) to 0.08 ppm, and the method for determination of exceedances was revised. To ensure effective transition to the new standards, the existing standards will remain in effect until it is determined that they have been met. Arizona standards are identical to the NAAQS summarized in Table 5.

Nonattainment Areas

The CAAA authorized the EPA to designate those areas that have not met the NAAQS as non-attainment, and directed it to classify them according to their degree of severity. States that fail to attain the NAAQS for any of the criteria pollutants are required to submit State Implementation Plans (SIP), which outline those actions that will be taken to attain compliance. The study area lies within the Phoenix non-attainment area for 8-hour ozone and PM_{10}, and the Phoenix maintenance area for CO. There are no exceedances of the NAAQS for the pollutants nitrogen dioxide, sulfur dioxide, lead, or $PM_{2.5}$ in Maricopa County.

Table 5 – National Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standards	Secondary
Carbon Monoxide	1-hour [1]	35 ppm	None
	8-hour [1]	9 ppm	None
Lead	Rolling 3-Month Average	0.15 $\mu g/m^3$ [2]	Same as Primary
	Quarterly Average	1.5 $\mu g/m^3$	Same as Primary.
Nitrogen Dioxide	Annual	53 ppb [3]	Same as Primary
	1-hour [4]	100 ppb	None
PM_{10}	24-hour [5]	150 $\mu g/m^3$	Same as Primary
$PM_{2.5}$	Annual [6]	15.0 $\mu g/m^3$	Same as Primary
	24-hour [7]	35.0 $\mu g/m^3$	Same as Primary
Ozone	8-hour [8]	0.075 (2008 standard)	Same as Primary
	8-hour [9]	0.08 (1997 standard)	Same as Primary
	1-hour [10]	0.12 ppm	Same as Primary
Sulfur Dioxide	Annual	0.03 ppm	0.5 ppm (3-hour averaging time) [1]
	24-hour [1]	0.14 ppm	
	1-hour	75 ppb [11]	None

$\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million
ppb = parts per billion
(1) Not to be exceeded more than once per year.
(2) Final rule signed October 15, 2008.
(3) The official level of the annual NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard
(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).
(5) Not to be exceeded more than once per year on average over 3 years.
(6) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).
(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) EPA is in the process of reconsidering these standards (set in March 2008).
(10) (a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1.
(11) (a) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

Source: US Environmental Protection Agency 2010

Conformity

Since 1977, federal agencies and metropolitan planning organizations have been required by Section 176(c) of the CAAA to ensure that all transportation projects conform to the approved air quality SIP. The conformity determinations for federal actions related to transportation projects must meet the requirements of 40 CFR Parts 51 and 93. According to 40 CFR 93.116, an FHWA-sponsored project must not cause or contribute to any new violations, nor delay attainment of any NAAQS. In assessing air quality impacts from proposed transportation projects, analysis typically focuses on vehicle emissions of CO. Other pollutants, such as PM_{10}, $PM_{2.5}$, and nitrogen dioxide are also components of vehicular emissions; however, CO accounts

for the majority of vehicle emissions. Ozone, nitrogen oxides, and hydrocarbons are pollutants that are regional in nature, and as such, cannot be meaningfully evaluated at the project level. Since the EPA has not yet released guidance for performing quantitative PM analysis for project-level transportation improvements, a qualitative analysis is required.

Because CO emissions are associated with motor vehicles and transportation projects, and because the project is located in a CO maintenance area, CO is a pollutant of concern for a quantitative project-level analysis. Because the study area is located in a PM_{10} non-attainment area, a qualitative assessment of PM_{10} impacts would also need to be conducted.

As individual roadway projects are developed, evaluation to determine current NAAQS attainment status will be needed. Should the EPA develop guidelines for quantifying impacts for additional pollutants of concern, additional project-level analysis may be required.

In compliance with conformity requirements, any corridor improvement projects will need to be included in an approved Transportation Improvement Program (TIP) at least one year and no more than three years before construction. This TIP must conform to the SIP. Certain transportation projects are exempted from conformity requirements. These generally include safety improvements, transit and transportation support activities.

During a construction project, disturbance of the soil by heavy equipment and tracking of dirt onto roadways, if uncontrolled, increases fugitive dust, in turn affecting local air quality. In addition, construction-related traffic delays, combined with exhaust emissions from construction-related equipment, elevate levels of pollutants. Such impacts would be temporary and eliminated once construction is complete. Any construction activity located within Maricopa County must obtain permits and adhere to local air quality rules and ordinances, including Maricopa County Rules 310 and 310.01.

Hazardous Materials

Hazardous materials are regulated by the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). ADEQ implements CERCLA, commonly known as Superfund, and its amendment, the Superfund Amendments and Reauthorization Act (SARA) of 1986. The inherent environmental concerns associated with hazardous materials require a preliminary investigation into the location of permitted and non-regulated hazardous material sites within the study area.

In August 2010, a regulatory database search for hazardous materials was conducted for the study area. The search consisted of both Federal and state environmental record sources, and included data sources provided by the EPA, ADEQ, and ADWR. Fire insurance, topographical maps and aerial maps were also reviewed. The results are attached in Appendix B. A review of the records search identified the following hazardous material related information:

- Registered underground storage tanks (USTs) were identified at 6 properties. The tanks have been permanently removed from 4 of the sites. The existing USTs are located at

13501 West Peoria Avenue and 9000-10000 North Litchfield Avenue; the USTs at both locations are used for diesel and gasoline storage.

- Two leaking USTs were identified at 9801 North Litchfield Road. Both tanks were closed in September 2009 and the surrounding soil met regulatory levels for closure.
- In 1993, 55 gallons of phosphoric acid were spilled at 14702 West Olive Avenue.
- In 1994, illegal dumping of empty drums, debris, and pesticides was reported on a dirt road parallel to the railroad tracks ¼ mile east of Litchfield Road between Peoria Avenue and Olive Avenue.
- In 1997, 40,000 pounds of anhydrous ammonia were released into the atmosphere when a forklift sheared off a valve on a tank at 17102 West Olive Avenue.
- There are 424 drywells registered with the ADEQ Dry Well Registration Database within the study area. Dry wells are constructed for the purpose of collecting storm water. The wells are registered to schools, housing developments, ranches, water supply and treatment facilities, and businesses (Allands 2010).
- There are 94 groundwater wells registered with the ADWR at locations within the study area (Allands 2010). The wells are registered to housing developments, water companies, individuals, businesses, the City of Surprise, the City of Phoenix, and a ranch. The listed depths-to-water range from 350 to 885 feet below ground surface (bgs). The location data provided in the listing is not adequate to determine precisely where the wells are located within the study area. It is possible that some wells may be impacted depending on the alignment selected for the project. Wells would need to be properly abandoned if they are disturbed.

Some instances of debris dumping, mainly construction materials, were observed during the field visit in August 2010. No obviously hazardous materials were visible. Locations with dumped materials were located along less traveled portions of the roads, including the north side of Olive Avenue between Cotton Lane and Citrus Road and the south side of Peoria Avenue between Sarival Road and Reems Road. No visual indications of contamination were observed that would be contacted during road construction activities within the study area.

Many groundwater wells and drywells are located within the study area and may be impacted depending on the alignment selected for the project. One ranch was identified as having soil contamination associated with their USTs, but the regulatory case file has been closed and residual contamination does not exceed Arizona cleanup guidelines (Allands 2010). There are industrial and agricultural activities within the area that have numerous aboveground storage tanks, but there are no reports of unaddressed contamination issues.

Based on the results of the database search and field visit, further investigation of hazardous materials issues are recommended for this project. Once the construction area has been established, additional research and visual inspection should be performed to evaluate the potential presence of groundwater wells, dry wells, and/or surface contamination within the construction zone. Prior to project construction activities, performing a Phase I/II site assessment on the property acquired for the project would provide information necessary to determine environmental conditions and reduce exposure from hazmat contamination.

4.0 CULTURAL RESOURCES

Cultural resources include archaeological or cultural sites, standing structures, and other historic properties considered to be eligible for or listed on the NRHP. Section 106 of the National Historic Preservation Act (NHPA) of 1966 (16 U.S. Code Part 470 et seq.) mandates that federal agencies consider the impact of their undertakings on historic properties within a project's area of potential effect. If adverse effects on historic, archaeological, or cultural properties are identified, then agencies must attempt to avoid, minimize, or mitigate impacts to resources considered important in our nation's history or prehistory.

Several federal, state and local laws have been enacted to preserve cultural resources. The NHPA requires that projects defined in 36 CFR Part 800.16(y) as "Federal Undertakings" be evaluated for their impacts to historic properties. Section 106 of the NHPA defines a process of consultation that federal agencies follow to evaluate impacts on historic properties. NEPA (40 CFR Part 1500) requires that projects with a "Federal Action" be evaluated for impacts to the human and natural environment. Other legislation, including the Archaeological Resources Protection Act of 1979 (16 U.S. Code Part 470aa-mm) and the Native American Graves Protection and Repatriation Act of 1990 (25 U.S. Code Part 138), also ensures the proper treatment of cultural resources for projects that occur on federal lands, are funded by federal monies, or that require a federally issued permit. Similarly, Arizona Revised Statutes sections 41-841 through 41-847 and 861 through 881 protect cultural resources and Native American graves during undertakings within the state that do not fall under federal jurisdiction. The Arizona State Historic Preservation Act of 1982 directs state agencies to consider impacts that their projects may have on historic properties that they own or control.

Sources examined for this overview include files at the State Historic Preservation Office (SHPO) and the AZSITE electronic database at the Arizona State Museum, University of Arizona, which houses Arizona's cultural resources inventory. Records reviewed show that the study area consists of a patchwork of approximately 24 cultural resource inventories undertaken from 1987 to 2004. Inventory levels range from unsurveyed to completely surveyed, with the majority of sections only partially surveyed. Not all archaeological inventories conducted may appear on AZSITE if they were undertaken on private land, as private land owners are not required to report inventories to public officials. Additionally, previously identified sites not surveyed within the last ten years may require re-survey.

The existing cultural resource inventories identify 22 sites within the study area. The majority of NRHP-eligible sites and those requiring testing are located west of the proposed SR 303L. While numerous sections of the historic Beardsley Canal are considered eligible, the section within the study area has not been evaluated. The BNSF (formerly Atchison, Topeka and Santa Fe) has been determined Eligible under Criterion A. However, the segment of the BNSF within the study area, the Ennis Spur, has not been evaluated for NRHP eligibility.

There are no records of historic property inventories within the study area with the exception of the eastern limits within Glendale, AZ. Surveyed historic properties within Glendale are outside the study area. A preliminary field review observed residences and structures present on the parcels adjacent to Peoria Avenue that could potentially be 50 years old or older. Typically, historic properties are at least 50 years old, but younger properties may be considered for listing if they are of exceptional importance. Should project design include any of these parcels, the structure may need to be evaluated for their eligibility for inclusion in the NRHP.

As large areas remain unsurveyed, an intensive Class III cultural resources inventory of the final right-of-way should be undertaken prior to any ground-disturbing activities. Class III pedestrian surveys must meet State Museum and SHPO standards. Similarly, possible historic properties should be evaluated with completion of Historic American Buildings Survey/Historic American Engineering Record documentation should the property be affected by the proposed project.

5.0 AGENCY AND PUBLIC INVOLVEMENT

An important component of the corridor improvement study is the dissemination of information to public agency and private stakeholders and the solicitation of their input. As the planning process continues, MCDOT will be meeting with appropriate stakeholders (listed below) to identify concerns, discuss relevant issues, gather input, and build consensus. In addition to the stakeholders listed below, MCDOT will also be coordinating with the principal land developers within the study area and private property owners:

- Arizona Department of Transportation
- Arizona Public Service
- Arizona Game and Fish Department
- Arizona State Land Department
- City of El Mirage
- City of Glendale
- City of Surprise
- Dysart School District
- Flood Control District of Maricopa County
- Luke Air Force Base
- Maricopa Association of Governments
- Maricopa County Planning and Development
- Maricopa County Parks and Recreation
- Maricopa Water District

The project will also include a public outreach effort. It is anticipated this effort will include three public open house meetings and presentations to city councils.

6.0 ENVIRONMENTAL SUMMARY

Based upon the preliminary evaluation of the environmental considerations discussed in the previous chapters of this document, no known environmental issues have been identified in the study area that would pose a fatal flaw to the improvement of Peoria Avenue. However, a full environmental study was not conducted at this level of analysis, and for some topics available information does not cover the entire study area. Additionally, new environmental concerns not outlined in this document may develop prior to project implementation. Design considerations

are likely to change based upon results of the surveys and technical impact evaluations. As such, further analysis and identification of relevant environmental concerns will be required once the scope of the project is determined. Figure 7 identifies the locations of 100-year floodplains, potential Section 4(f) sites (schools, recreation trails, and historic sites), earth fissures, potential hazardous material sites, and wells.

It is anticipated that the following surveys, impact evaluations, and permit determinations will need to be conducted prior to implementing any roadway improvements along Peoria Avenue. The level of effort and required documentation for the evaluations will depend upon the scope of the project and, to an extent, federal funding/involvement.

<u>Surveys and Impact Evaluations</u>

- Socioeconomic impact analysis
- Native plant survey
- Biological evaluation
- Special status species surveys
- Visual impact evaluation
- Traffic noise impact evaluation
- Hazardous materials assessment
- Cultural resources survey

<u>Surveys and Impact Evaluations Tied to Federal Aid/Action</u>

- Air quality analysis
- Environmental Justice evaluation
- Section 4(f) inventory and analysis
- Prime and unique farmlands impact assessment

<u>Permitting and Planning Requirements</u>

- Jurisdictional Determination to determine if watercourses within the study area would be considered "Waters of the US." Dependent upon the findings, placement of permanent fill, rip-rap, and construction/extension of bridges/box culverts in the following watercourses would likely require Section 404 permitting: Reems Road Channel, Future drainage channels along SR 303L, Waterfall Wash, and Cholla Wash.
- Maricopa County air quality rules, ordinances, and permits for construction activities
- Air Quality conformity requirements for corridor improvement projects are that the project be included in an approved TIP at least one year and no more than three years before construction. This TIP must conform to the SIP.

<u>Design and Construction Considerations:</u>

- Geotechnical evaluation to determine engineering constraints related to soils of limited suitability for road building, land subsidence, and earth fissures.
- Guidelines for Facilitating Wildlife Connectivity, developed by the AWLW.
- Design guidelines for culverts, developed by AGFD, to facilitate wildlife crossings.

- Scenic corridor design guidelines, if the project intersects the Olive Avenue or McMicken Dam Scenic Corridors.

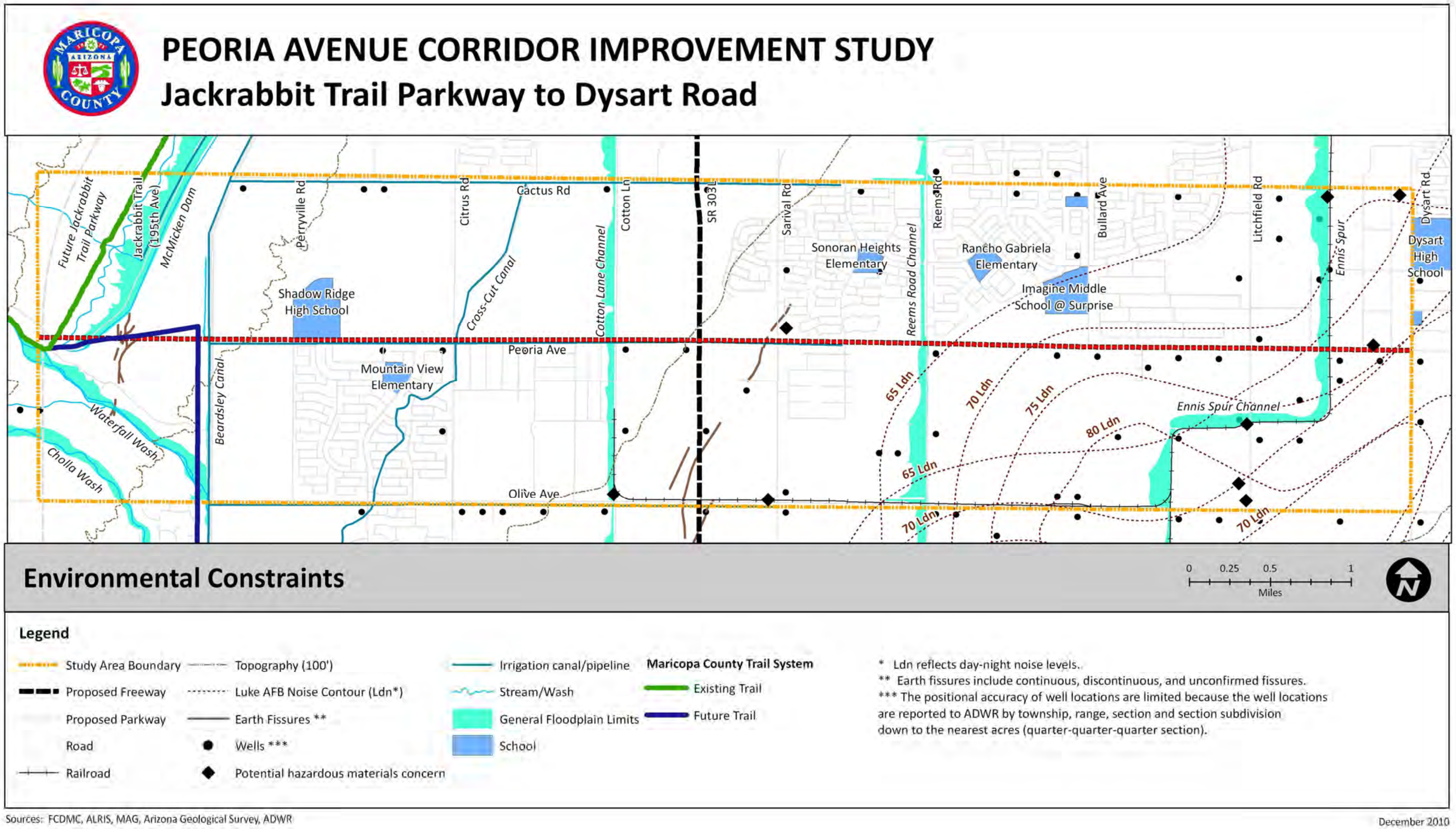

Figure 7 – Environmental Constraints

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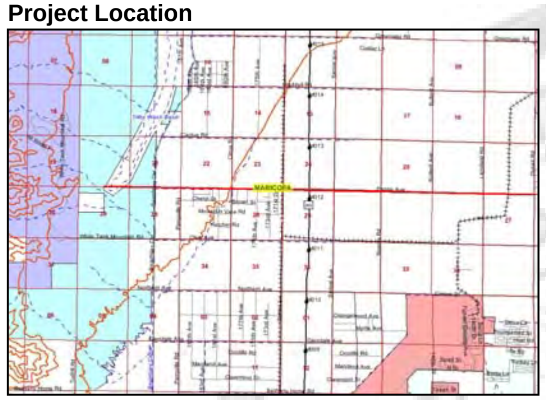
Technical Memorandum #2
Environmental Overview
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Appendix A

Project Location



Project Name: Peoria Ave. CIS
Submitted By: Kristin Gade
On behalf of: MARICOPA
Project Search ID: 20101206013878
Date: 12/6/2010 11:38:16 AM
Project Category: Transportation & Infrastructure,Road construction (including staging areas),Realignment/ new roads
Project Coordinates (UTM Zone 12-NAD 83): 368704.955, 3716528.208 meter
Project Length: 13549.191 meter
County: MARICOPA
USGS 7.5 Minute Quadrangle ID: 1247
Quadrangle Name: WADDELL
Project locality is currently being scoped

Location Accuracy Disclaimer

Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Receipt is solely responsible for the project location and thus the correctness of the Project Review Receipt content.

The Department appreciates the opportunity to provide in-depth comments and project review when additional information or environmental documentation becomes available.

Special Status Species Occurrences/Critical Habitat/Tribal Lands within 3 miles of Project Vicinity:

Name	Common Name	FWS	USFS	BLM	State
Opuntia engelmannii var. flavispina					SR
Rana yavapaiensis	Lowland Leopard Frog	SC	S	S	WSC

Please review the entire receipt for project type recommendations and/or species or location information and retain a copy for future reference. If any of the information you provided did not accurately reflect this project, or if project plans change, another review should be conducted, as this determination may not be valid.

Arizona's On-line Environmental Review Tool:

1. This On-line Environmental Review Tool inquiry has generated recommendations regarding the potential impacts of your project on Special Status Species (SSS) and other wildlife of Arizona. SSS include all U.S. Fish and Wildlife Service federally listed, U.S. Bureau of Land Management sensitive, U.S. Forest Service sensitive, and Arizona Game and Fish Department (Department) recognized species of concern.
2. These recommendations have been made by the Department, under authority of Arizona Revised Statutes Title 5 (Amusements and Sports), 17 (Game and Fish), and 28 (Transportation). These recommendations are preliminary in scope, designed to provide early considerations for all species of wildlife, pertinent to the project type you entered.
3. This receipt, generated by the automated On-line Environmental Review Tool does not constitute an official project review by Department biologists and planners. Further coordination may be necessary as appropriate under the National Environmental Policy Act (NEPA) and/or the Endangered Species Act (ESA).

The U.S. Fish and Wildlife Service (USFWS) has regulatory authority over all federally listed species under the ESA. Contact USFWS Ecological Services Offices: http://arizonaes.fws.gov/.

Phoenix Main Office
2321 W. Royal Palm Road, Suite 103
Phoenix, AZ 85021
Phone 602-242-0210
Fax 602-242-2513

Tucson Sub-Office
201 North Bonita, Suite 141
Tucson, AZ 85745
Phone 520-670-6144
Fax 520-670-6154

Flagstaff Sub-Office
323 N. Leroux Street, Suite 101
Flagstaff, AZ 86001
Phone 928-226-0614
Fax 928-226-1099

Disclaimer:

1. This is a preliminary environmental screening tool. It is not a substitute for the potential knowledge gained by having a biologist conduct a field survey of the project area.
2. The Department's Heritage Data Management System (HDMS) data is not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there.
3. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity. Such surveys may reveal previously undocumented population of species of special concern.
4. HDMS data contains information about species occurrences that have actually been reported to the Department.

Arizona Game and Fish Department Mission

To conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and

management programs, and to provide wildlife resources and safe watercraft and off-highway vehicle recreation for the enjoyment, appreciation, and use by present and future generations.

Project Category: Transportation & Infrastructure,Road construction (including staging areas),Realignment/ new roads

Project Type Recommendations:

All degraded and disturbed lands should be restored to their natural state. Vegetation restoration projects (including treatments of invasive or exotic species) should have a completed site-evaluation plan (identifying environmental conditions necessary to re-establish native vegetation), a revegetation plan (species, density, method of establishment), a short and long-term monitoring plan, including adaptive management guidelines to address needs for replacement vegetation.

Based on the project type entered; coordination with Arizona Department of Environmental Quality may be required (http://www.azdeq.gov/).

Based on the project type entered; coordination with County Flood Control districts may be required.

Based on the project type entered; coordination with State Historic Preservation Office may be required http://azstateparks.com/SHPO/index.html

Based on the project type entered; coordination with U.S. Army Corps of Engineers may be required (http://www.spl.usace.army.mil/regulatory/phonedir.html)

During planning and construction, minimize potential introduction or spread of exotic invasive species. Invasive species can be plants, animals (exotic snails), and other organisms (e.g. microbes), which may cause alteration to ecological functions or compete with or prey upon native species and can cause social impacts (e.g. livestock forage reduction, increase wildfire risk). The terms noxious weed or invasive plants are often used interchangeably. Precautions should be taken to wash all equipment utilized in the project activities before and after project activities to reduce the spread of invasive species. Arizona has noxious weed regulations (Arizona Revised Statutes, Rules R3-4-244 and R3-4-245). See Arizona Department of Agriculture website for restricted plants http://www.azda.gov/PSD/quarantine5.htm. Additionally, the U.S. Department of Agriculture has information regarding pest and invasive plant control methods including: pesticide, herbicide, biological control agents, and mechanical control: http://www.usda.gov/wps/portal/usdahome. The Department regulates the importation, purchasing, and transportation of wildlife and fish (Restricted Live Wildlife), please refer to the hunting regulations for further information http://www.azgfd.gov/h_f/hunting_rules.shtml.

During the planning stages of your project, please consider the local or regional needs of wildlife in regards to movement, connectivity, and access to habitat needs. Loss of this permeability prevents wildlife from accessing resources, finding mates, reduces gene flow, prevents wildlife from re-colonizing areas where local extirpations may have occurred, and ultimately prevents wildlife from contributing to ecosystem functions, such as pollination, seed dispersal, control of prey numbers, and resistance to invasive species. In many cases, streams and washes provide natural movement corridors for wildlife and should be maintained in their natural state. Uplands also support a large diversity of species, and should be contained within important

wildlife movement corridors. In addition, maintaining biodiversity and ecosystem functions can be facilitated through improving designs of structures, fences, roadways, and culverts to promote passage for a variety of wildlife.

Hydrological considerations: design culverts to minimize impacts to channel geometry, or design channel geometry (low flow, overbank, floodplains) and substrates to carry expected discharge using local drainages of appropriate size as templates. Aquatic wildlife considerations: reduce/minimize barriers to migration of amphibians or fish (e.g. eliminate falls). Terrestrial wildlife: washes and stream corridors often provide important corridors for movement. Overall culvert width, height, and length should be optimized for movement of the greatest number and diversity of species expected to utilize the passage. Culvert designs should consider moisture, light, and noise, while providing clear views at both ends to maximize utilization. For many species, fencing is an important design feature that can be utilized with culverts to funnel wildlife into these areas and minimize the potential for roadway collisions. Guidelines for culvert designs to facilitate wildlife passage can be found at http://www.azgfd.gov/hgis/guidelines.aspx.

Minimization and mitigation of impacts to wildlife and fish species due to changes in water quality, quantity, chemistry, temperature, and alteration to flow regimes (timing, magnitude, duration, and frequency of floods) should be evaluated. Minimize impacts to springs, in-stream flow, and consider irrigation improvements to decrease water use. If dredging is a project component, consider timing of the project in order to minimize impacts to spawning fish and other aquatic species (including spawning seasons), and to reduce spread of exotic invasive species. We recommend early direct coordination with Project Evaluation Program for projects that could impact water resources, wetlands, streams, springs, and/or riparian habitats.

Planning: consider impacts of lighting intensity on mammals and birds and develop measures or alternatives that can be taken to increase human safety while minimizing potential impacts to wildlife. Conduct wildlife surveys to determine species within project area, and evaluate proposed activities based on species biology and natural history to determine if artificial lighting may disrupt behavior patterns or habitat use.

Preconstruction - Consider design structures and construction plans that minimize impacts to channel geometry (i.e. width/depth ratio, sinuosity, allow overflow channels) to avoid alteration of hydrological function. Identify whether wildlife species use the structure for roosting or nesting during anticipated construction period. Plan the timing of construction/maintenance to minimize impacts to wildlife species. In addition to the species list generated by the Arizona's On-line Environmental Review Tool, the Department recommends that surveys be conducted at the bridge and in the vicinity of the bridge to identify additional or currently undocumented bat, bird, or aquatic species in the project area. To minimize impacts to birds and bats, as well as aquatic species, consider conducting maintenance and construction activities outside the breeding/maternity season (breeding seasons for birds and bats usually occur spring - summer). Examining the crevices for the presence of bats prior to pouring new paving materials. When bats are present, the top of the crevices should be sealed to prevent material from dripping or falling through the cracks and potentially onto bats. If bats are present, maintenance and construction (including paving and milling) activities should be conducted during nighttime hours, if possible, when the fewest number of bats will be roosting. Consider incorporating roosting habitat for bats into bridge designs. Minimize impacts to the vegetation community. A revegetation plan should be developed to replace impacted communities. Unavoidable impacts to vegetation should be mitigated on-site whenever possible. During construction: Erosion control structures and drainage features should be used to prevent introduction of sediment laden runoff into the waterway. Minimize instream construction activity. If culverts are planned, mitigate impacts to wildlife and fish movement. Guidelines for bridge designs to facilitate wildlife passage can be found at http://www.azgfd.gov/hgis/guidelines.aspx.

Recommendations will be dependant upon goals of the fence project and the wildlife species expected to be impacted by the project. General guidelines for ensuring wildlife-friendly fences include: barbless wire on the top and bottom with the maximum fence height 42", minimum height for bottom 16". Modifications to this design may be considered for fencing anticipated to be routinely encountered by elk, bighorn sheep or pronghorn (e.g., Pronghorn fencing would require 18" minimum height on the bottom). Please refer to the Department's Fencing Guidelines located at http://www.azgfd.gov/hgis/guidelines.aspx.

The Department recommends that wildlife surveys are conducted to determine if noise-sensitive species occur within the project area. Avoidance or minimization measures could include conducting project activities outside of breeding seasons.

The Department requests further coordination to provide project/species specific recommendations, please contact Project Evaluation Program directly.

Trenches should be covered or back-filled as soon as possible. Incorporate escape ramps in ditches or fencing along the perimeter to deter small mammals and herptefauna (snakes, lizards, tortoise) from entering ditches.

Project Location and/or Species recommendations:

Heritage Data Management System records indicate that one or more native plants listed on the Arizona Native Plant Law and Antiquities Act have been documented within the vicinity of your project area (refer to page 1 of the receipt). Please contact:
Arizona Department of Agriculture
1688 W Adams
Phoenix, AZ 85007
Phone: 602-542-4373

Recommendations Disclaimer:

1. Potential impacts to fish and wildlife resources may be minimized or avoided by the recommendations generated from information submitted for your proposed project.
2. These recommendations are proposed actions or guidelines to be considered during **preliminary project development**.
3. Additional site specific recommendations may be proposed during further NEPA/ESA analysis or through coordination with affected agencies.
4. Making this information directly available does not substitute for the Department's review of project proposals, and should not decrease our opportunity to review and evaluate additional project information and/or new project proposals.
5. The Department is interested in the conservation of all fish and wildlife resources, including those Special Status Species listed on this receipt, and those that may have not been documented within the project vicinity as well as other game and nongame wildlife.
6. **Further coordination requires the submittal of this initialed and signed Environmental Review Receipt with a cover letter and project plans or documentation that includes project narrative, acreage to be impacted, how construction or project activity(s) are to be accomplished, and project locality information (including site map).**
7. Upon receiving information by AZGFD, please allow 30 days for completion of project reviews. Mail requests to:

Project Evaluation Program, Habitat Branch
Arizona Game and Fish Department
5000 West Carefree Highway
Phoenix, Arizona 85086-5000
Phone Number: (623) 236-7600

Fax Number: (623) 236-7366

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4. This Environmental Review is based on the project study area that was entered. The review must be redone if the project study area, location, or the type of project changes. If additional information becomes available, this review may need to be reconsidered.
5. A signed and initialed copy of the Environmental Review Receipt indicates that the entire receipt has been read by the signer of the Environmental Review Receipt.

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If the Environmental Review Receipt and supporting material are not mailed to the Department or other appropriate agencies within six (6) months of the Project Review Receipt date, the receipt is considered to be null and void, and a new review must be initiated.

Print this Environmental Review Receipt using your Internet browser's print function and keep it for your records. Signature of this receipt indicates the signer has read and understands the information provided.

Signature:________________________________

Date: ________________________________

Proposed Date of Implementation: ___________________

Arizona's On-line Environmental Review Tool
Search ID: 20101206013878
Project Name: Peoria Ave. CIS
Date: 12/6/2010 11:38:21 AM

Please provide point of contact information regarding this Environmental Review.

Application or organization responsible for project implementation

Agency/organization:____________________

Contact Name: ______________________

Address: _________________

City, State, Zip: ___________________

Phone: ___________________

E-mail: ________________________

Person Conducting Search (if not applicant)

Agency/organization:____________________

Contact Name: ______________________

Address: _________________

City, State, Zip: ___________________

Phone: ___________________

E-mail: ________________________

 APPLICATION INITIALS: ___________

Appendix B

Table B-1. Regulatory Database Search Summary

Database	Date of Database	Approximate Minimum Search Distance (miles)	Reported Facilities
Standard Federal ASTM Environmental Record Sources			
NPL (National Priorities List) / Proposed NPL / DOD (Department of Defense Sites)	08/10	Within corridor boundaries	0
Delisted National Priorities List	08/10	Within corridor boundaries	0
CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System)/No Further Remedial Action Planned (NFRAP)	08/10	Within corridor boundaries	0
RCRA (Resource Conservation and Recovery Act) Large and Small Quantity Generators	08/10	Within corridor boundaries	1
RCRA – CORRACTS TSDFs (Corrective Action Treatment, Storage, and Disposal Facilities)	08/10	Within corridor boundaries	0
RCRA – Non-CORRACTS TSDFs	08/10	Within corridor boundaries	0
ERNS (Emergency Response Notification System)	08/10	Within corridor boundaries	3
Standard State ASTM Environmental Record Sources			
WQARF (Water Quality Assurance Revolving Fund) Areas	08/10	Within corridor boundaries	0
Superfund Program List (replaces ACIDS)	08/04	Within corridor boundaries	0
Solid Waste Facilities/Landfill Sites – Operating and Closed	05/99 & 05/04	Within corridor boundaries	0
Brownfields / Voluntary Remediation Program	08/10	Within corridor boundaries	1
Registered USTs (Underground Storage Tanks)	01/10	Within corridor boundaries	6
LUSTs (Leaking Underground Storage Tanks) Incident Reports	01/10	Within corridor boundaries	1
Additional Environmental Record Sources			
RCRA Compliance Facilities	11/09	Within corridor boundaries	0
Hazardous Materials Incidents Emergency Response Logbook	1984-06/01	Within corridor boundaries	0
ADEQ Drywell Registration Database	08/10	Within corridor boundaries	424
Fire Insurance Maps	Various	Within corridor boundaries	0
Topographical / Aerial Maps	See text	Within corridor boundaries	1
DRYCLEANER	06/06	Within corridor boundaries	0
Arizona Department of Water Resources Well Registration Database	08/10	Within corridor boundaries	See Text

Table B-2. Registered Dry Wells within the Study Area

FACILITY	ADDRESS	BEG REG #	END REG #	TOTAL WELLS
Dysart Middle School	11405 N Dysart Rd	10704		1
Dysart High School	11405 N Dysart Rd	26060	26072	13
Dysart High School	11405 N Dysart Rd	27138		1
Rancho Gabriela Water Supply Facility Exp	13627 W Cactus Rd	41808		1
Cactus Ward Building	15880 W Cactus Rd	44394	44395	2
Surprise Fire Station No. 307	16171 W Cactus Rd	40214		1
Sarah Ann Ranch	NEC Citrus Rd & Cactus Rd	33403	33478	76
Varamonte - Parcels 1 To 6	NWC Litchfield Rd & Cactus Rd	32063	32083	21
Arsenic Treatment Plant At Rancho Gabriela	S of Cactus Rd, Approx .25 Mi E Of Litchfield Rd	43480		1
Rancho Gabriela Phases 3 & 4a	SEC Cactus & Reems Rds	27635	27660	26
Mountain Gate - Phase 3	SEC Cactus Rd & Bullard Ave	27014	27025	12
Mountain Gate - Phase 4	SEC Cactus Rd & Bullard Ave	27026	27034	9
Mountain Gate - Phase 5	SEC Cactus Rd & Bullard Ave	27035	27042	8
Kenly Farms	SEC Litchfield Rd & Cactus Rd	31660	31664	5
Imagine Charter School	SWC Bullard Ave & Cactus Rd	31025	31027	3
(No Name)	SWC Bullard Ave & Cactus Rd	35671		1
Rancho Gabriela Phases 2 & 4	SWC Bullard Rd & Cactus Rd	25622	25651	30
Diesel Eagle	13374 West Peoria	15968	15970	3
Mountain Gate - Phase I & Ii	NEC Peoria Ave & Bullard Ave	25552	25571	20
Greer Ranch South Infrastructure	NEC Peoria Ave & Sarival Rd	29032	29056	25
Dysart High School No. 4	NEC Perryville Rd & Peoria Ave	43434	43478	45
Wyngate At Sycamore Farms	NEC State Route 303 & Peoria Ave	43975	43978	4
Ministorage At Gabriella Plaza	NWC Bullard Ave & Peoria Ave	42636	42639	4
Cortessa	NWC Citrus Rd & Olive Rd	32520	32579	60
White Tank Foothills	SWC Citrus Rd & Olive Ave	33710	33736	27
Shadow Ridge High School Fine Arts Facility	10909 N Perryville Rd	44940	44943	4
White Tanks WTP	Cactus Rd, Approx 3 Mi W Of 303	44934	44937	4
Spa 1 South WRF	11401 N 136th Ave	43279		1
Canyon Pipe & Supply	10779 N Milgard Way	43207	43210	4
Skycom Business Park	11081 & 11113 N Milgard Way	38968	38969	2
Sunstate Plumbing Inc	11051 N 132nd Ave	37806	37807	2
New Dysart District Office Support Facility	SWC Litchfield Rd & Desert Cove Rd	44482	44489	8

Table B-3. Arizona Department of Water Resources Well Report

ID	T	N/S	R	E/W	S	Q1	Q2	Q3	WU	WD	WL	DIA	NAME
601886	3	N	1	W	19	NE	NW	NW	A	943	475	16	Aranda Properties Inc
601885	3	N	1	W	19	NE	NW	NW	A	1595	500	18	Courtland Homes Inc
481950	3	N	1	W	19	NE	SW	SW	A				Lennar Communities
481755	3	N	1	W	19	NE	SW	SW	D				Lennar Communities Development, Inc.
601888	3	N	1	W	19	NW	NW	NW	A	592	520	18	Courtland Homes Inc
212491	3	N	1	W	19	NW	SW	NW	E	1070	393	18	Arizona American Water Company
200469	3	N	1	W	19	SE	NW	NE	T				Lennar Communities
601887	3	N	1	W	19	SW	NW	NW	A	1100	550	0	Lennar Communities Development, Inc.
400419	3	N	1	W	20	NE	NE	NE					R G 2223, Inc
607537	3	N	1	W	20	NE	NW	NW	A	1200	535	20	R G 2223, Inc
593638	3	N	1	W	20	NE	SE	SE	E	1517		16	City Of Surprise Water Services Dept
608547	3	N	1	W	20	NW	NW	NW	D	2051	485	18	R.G. 2223 Inc
086408	3	N	1	W	20	NW	NW	NW	A	1239	0	16	Continental Fund 213, Llc
400495	3	N	1	W	20	NW	NW	NW	D				R.G. 2223 Inc
621514	3	N	1	W	21	NE	NW	NW	A	1200	550	20	Richmond American Homes Of Az Inc
610110	3	N	1	W	21	NW	NW	NW	A	1500	430	20	William Lyons Homes Inc
621515	3	N	1	W	21	SE	NE	NE	D	775	0	8	Smith,P L
572866	3	N	1	W	22				N	200			City Of Surprise
628487	3	N	1	W	22	NE	NW	NW	A	670	400	20	Skyway Business Park Ii Llc
214668	3	N	1	W	22	NE	NW	NW	F				Surprise/Dysart Llc
572867	3	N	1	W	22	NW	NE	SE	T	415	365	5	Surprise City Of
218388	3	N	1	W	22	NW	NE	SE		152		12	City Of Surprise
218387	3	N	1	W	22	NW	NE	SE		157		12	City Of Surprise
218390	3	N	1	W	22	NW	NE	SE		150		12	City Of Surprise
218391	3	N	1	W	22	NW	NE	SE		150		12	City Of Surprise
218389	3	N	1	W	22	NW	NE	SE		153		12	City Of Surprise
605189	3	N	1	W	22	NW	NW	NW	A	840	379	18	Surprise, City Of
218658	3	N	1	W	22	NW	NW	NW					City Of Surprise
605188	3	N	1	W	22	NW	SW	NE	A	780	350	20	Surprise, City Of
519048	3	N	1	W	22	SW	NE	NE	D	1001	438	8	Sage Development,
520176	3	N	1	W	22	SW	NE	NE	C	0	0	0	Sage Development,
564527	3	N	1	W	22	SW	SW	SW	M	380	335	10	Surprise City Of
909845	3	N	1	W	27					125		6	City Of Phoenix Aviation Dept.
610631	3	N	1	W	27	NE	NE	NW	A	1820	520	20	John F Long Family Revocable Living Trust U/A/D 2/26/2008
610625	3	N	1	W	27	NE	NW	NW	A	1050	520	20	John F Long Family Revocable Living Trust U/A/D 2/26/2008
610626	3	N	1	W	27	NE	NW	SW	A	1050	520	20	John F Long Family Revocable Living Trust U/A/D 2/26/2008
609454	3	N	1	W	27	NW	SE	NW	A	1500	410	20	Mckee,R H
609452	3	N	1	W	27	SW	NE	NW	A	1000	450	20	Mckee,R H
597682	3	N	1	W	27	SW	NW	NW	M	120	300	2	Phoenix, City Of,
579041	3	N	1	W	27	SW	NW	NW	N				City Of Phoenix Aviation Department
597681	3	N	1	W	27	SW	NW	NW	M	0	7300	2	Phoenix, City Of,
597683	3	N	1	W	27	SW	NW	NW	M	120	7300	2	City Of Phoenix Aviation Department
609455	3	N	1	W	27	SW	NW	NW	D	800	400	14	Mckee,R H
625816	3	N	1	W	28	NE	NE	NW	A	1157	515	18	Property Reserve Arizona Llc
625817	3	N	1	W	28	NE	NW	NW	A	1150	450	18	Property Reserve Arizona Llc
631810	3	N	1	W	28	NE	NW	NW	D	475	419	0	Pleshe & Lesniewicz,
625815	3	N	1	W	28	NE	SE	SE	A	1170	510	18	Property Reserve Arizona Llc
610821	3	N	1	W	28	NW	NE		A	1100	600	20	Beals,K R
903067	3	N	1	W	28	NW	NE	NW	D	640	420	4	Sperry Trading
208837	3	N	1	W	28	NW	NE	NW	D				Webster
210465	3	N	1	W	28	NW	NE	NW	D	680	540	5	Anway
210409	3	N	1	W	28	NW	NE	SE	D	600	400	5	Waldron
626942	3	N	1	W	28	NW	NW	NW	A	1090	545	20	Justice Brothers
609453	3	N	1	W	28	SE	NW	NW	A	1200	450	16	City Of Phoenix
802266	3	N	1	W	28	SW	NW	NE	D	0	450	6	Tkr Enterprises
803677	3	N	1	W	28	SW	NW	NE	D	0	450	6	Wyatt, James,D
626943	3	N	1	W	29	NE	NE	NW	A	927	545	20	Justice Brothers
610103	3	N	1	W	29	NW	NW	NW	A	1200	430	20	Woolf Brothers,
201563	3	N	1	W	29	SE	SE	SE	T	450	0	6	Amerigas
801047	3	N	1	W	29	SE	SE	SE	F	780	519	8	Woolf Brothers,
610104	3	N	1	W	29	SE	SE	SW	A	1350	430	20	Woolf Brothers,
610102	3	N	1	W	29	SW	NW	NW	A	1400	430	20	Woolf Brothers,
584309	3	N	1	W	30	SE	NE	SW	N	1500	475		The London Group
589039	3	N	1	W	30	SE	NW	SE	D				Rose Garden Estates, Llc
606610	3	N	1	W	30	SW	SW	SW	D	705	450	8	Property Reserve Arizona Llc
612994	3	N	2	W	21	NE	NW	NE	A	534	356	20	Maricopa Co Mun Wtr
213494	3	N	2	W	22	NE	NW	NW	A				Property Reserve Arizona
213214	3	N	2	W	22	NE	NW	NW	A				Fulton Homes
604504	3	N	2	W	22	NE	NW	NW	A	1100	0	20	Property Reserve Arizona, L.L.C.
538332	3	N	2	W	22	NW	NE	NE	D	640	470	8	Property Reserve Inc
612997	3	N	2	W	23	NE	NE	NE	A	1032	481	20	Maricopa Co Mun Wtr
612995	3	N	2	W	23	NE	NE	NE	B	1000	420	16	Maricopa Water District
612996	3	N	2	W	23	NW	NE	NE	A	1000	493	20	Maricopa Co Mun Wtr
500768	3	N	2	W	24	NE	NW	NW	A	1050	580	16	Taylor Trust Farms Llc
617465	3	N	2	W	24	NE	NW	NW	A	1050	530	16	Taylor Trust Farms Llc
617464	3	N	2	W	24	NW	NW	SW	A	1160	540	20	Moore Ranches Inc,
212494	3	N	2	W	24	SE	NW	SE	T				Taylor Woodrow
641284	3	N	2	W	25	NE	SE	NW	D	750	550	8	Jarrell,D E

ID	T	N/S	R	E/W	S	Q1	Q2	Q3	WU	WD	WL	DIA	NAME
612998	3	N	2	W	25	NW	NE	NE	A	1000	471	16	Maricopa Co Mun Wtr
606609	3	N	2	W	25	NW	NW	NW	A	2567	885	18	Property Reserve Arizona, Llc
606608	3	N	2	W	25	SE	NW	NW	A	1200	650	20	Property Reserve Arizona, Llc
606607	3	N	2	W	25	SW	NW	NW	A	930	650	18	Property Reserve Arizona, L.L.C.
612999	3	N	2	W	26	NW	NE	NE	A	1000	459	20	Maricopa Co Mun Wtr
624692	3	N	2	W	26	SW	SE	SE	D	888	452	20	Arizona-American Water Co
216251	3	N	2	W	27	NE	NE	NE	A				Stardust Development Inc
613001	3	N	2	W	27	NE	NE	NE	A	489		16	Maricopa Water District
613000	3	N	2	W	27	NE	NW	NW	A	1030	471	16	Maricopa Co Mun Wtr
213859	3	N	2	W	27	NE	SE	SE	B	1478		21	Stardust Development Inc
577658	3	N	2	W	27	SE	NE	NE	C				Macanudo Investors Ltd Partnership
205432	3	N	2	W	27	SW	SE	SE	T	1620	427	19	Arizona American Water Company
801074	3	N	2	W	29	NW	SE	SE	D	0	0	11	Thorton Lumber Co,
511416	3	N	2	W	29	NW	SE	SE	D	0	0	0	Thornton Lumber Co,
614441	3	N	2	W	29	NW	SE	SW	D	0	0	0	Thornton Lumber Co,
590348	3	N	2	W	29	NW	SW	SW	D	700	560	6	White Tank Ranch Llc

Appendix C
Technical Memorandum No. 3: Drainage Overview

Peoria Avenue Corridor Improvement Study: Jackrabbit Trail Parkway to Dysart Road

Technical Memorandum #3: Conceptual Drainage Report

April 2011

Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Technical Memorandum #3
Conceptual Drainage Report

Prepared for:

MARICOPA ARIZONA COUNTY

Registered Professional Engineer (Civil) 32316 JAVIER O. GUANA Date Signed 07-18-11 ARIZONA, U.S.A.

Expires 03/31/2013

Prepared by:

Andes Engineering
11811 North Tatum Boulevard
Suite 3031
Phoenix, Arizona 85028

In Association With:

AECOM

April 2011

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32316
JAVIER O. GUANA
Date Signed 07-18-11
ARIZONA, U.S.A.
Expires 03/31/2013

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Registered Professional Engineer (Civil)
32316
JAVIER O. GUANA
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ARIZONA, U.S.A.
Expires 03/31/2013

List of Abbreviations

ADMP	Area Drainage Master Plan
ADMPU	Area Drainage Master Plan Update
ADMS	Area Drainage Master Study
ADMSU	Area Drainage Master Study Update
ADWR	Arizona Department of Water Resources
CBC	Concrete Box Culvert
DDMSW	Drainage Design Management System
FCDMC	Flood Control District of Maricopa County
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FRS	Flood Retarding Structure
HMS	Hydrologic Map Series
MCDOT	Maricopa County Department of Transportation
MWD	Maricopa Water District
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
USACOE	United States Army Corps of Engineers

1.0 INTRODUCTION

1.1 Project Location

The Maricopa Association of Governments (MAG) prepared the Interstate 10/Hassayampa Valley Roadway Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the build out of the area west of State Route 303 (SR 303L). This long range regional transportation study identified the need for a roadway network consisting of freeways, parkways, and major arterial roads.

The Hassayampa Framework Study recommended an extension of Peoria Avenue west from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial from the future Jackrabbit Trail Parkway to Sarival Avenue. The study area for this project includes Peoria Avenue from the future Jackrabbit Trail Parkway alignment to Dysart Road (Peoria Avenue Corridor). The study area generally encompasses a 2-mile wide corridor centered on the existing Peoria Avenue. The study area is shown in Figure 2.

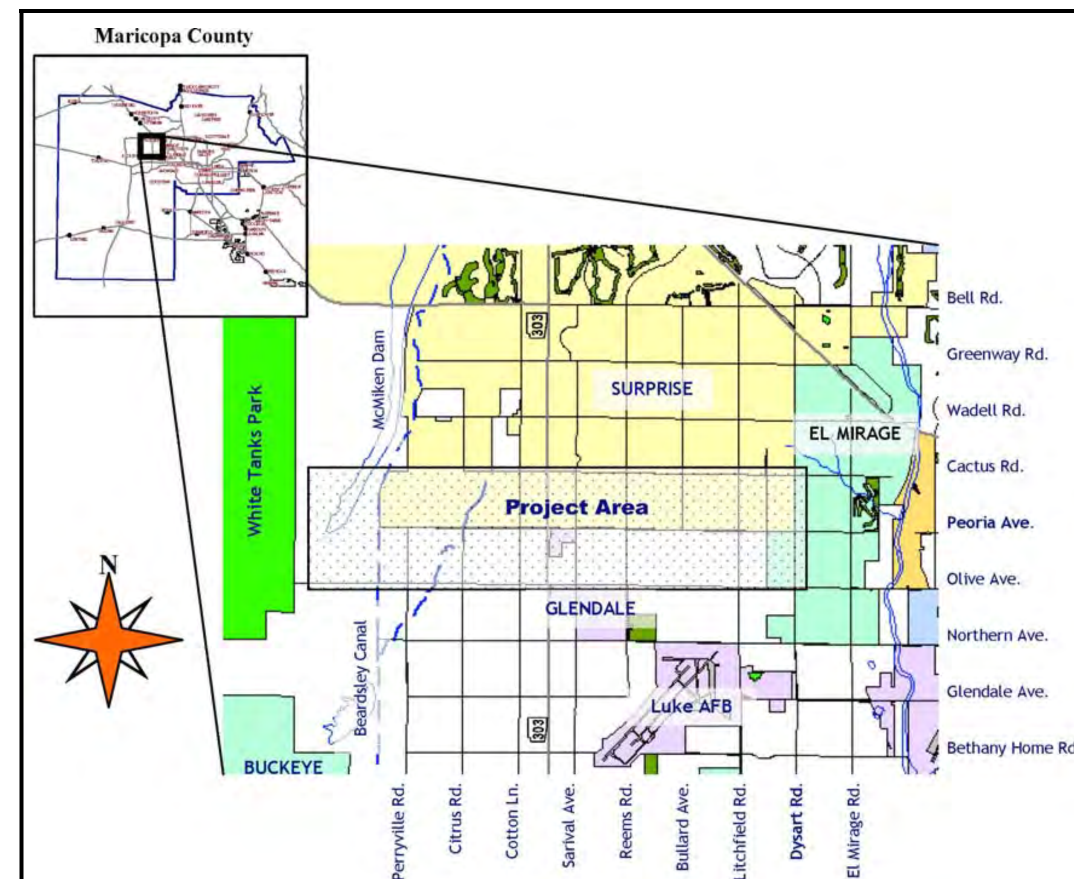


Figure 1 - Vicinity Map

This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also develop access management guidelines, determine design standards based upon which jurisdiction anticipates annexing the roadway, and develop an implementation plan. In general, the purpose of this Corridor Improvement Study is to provide the Maricopa County Department of Transportation (MCDOT) and other jurisdictions with a future "footprint" of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

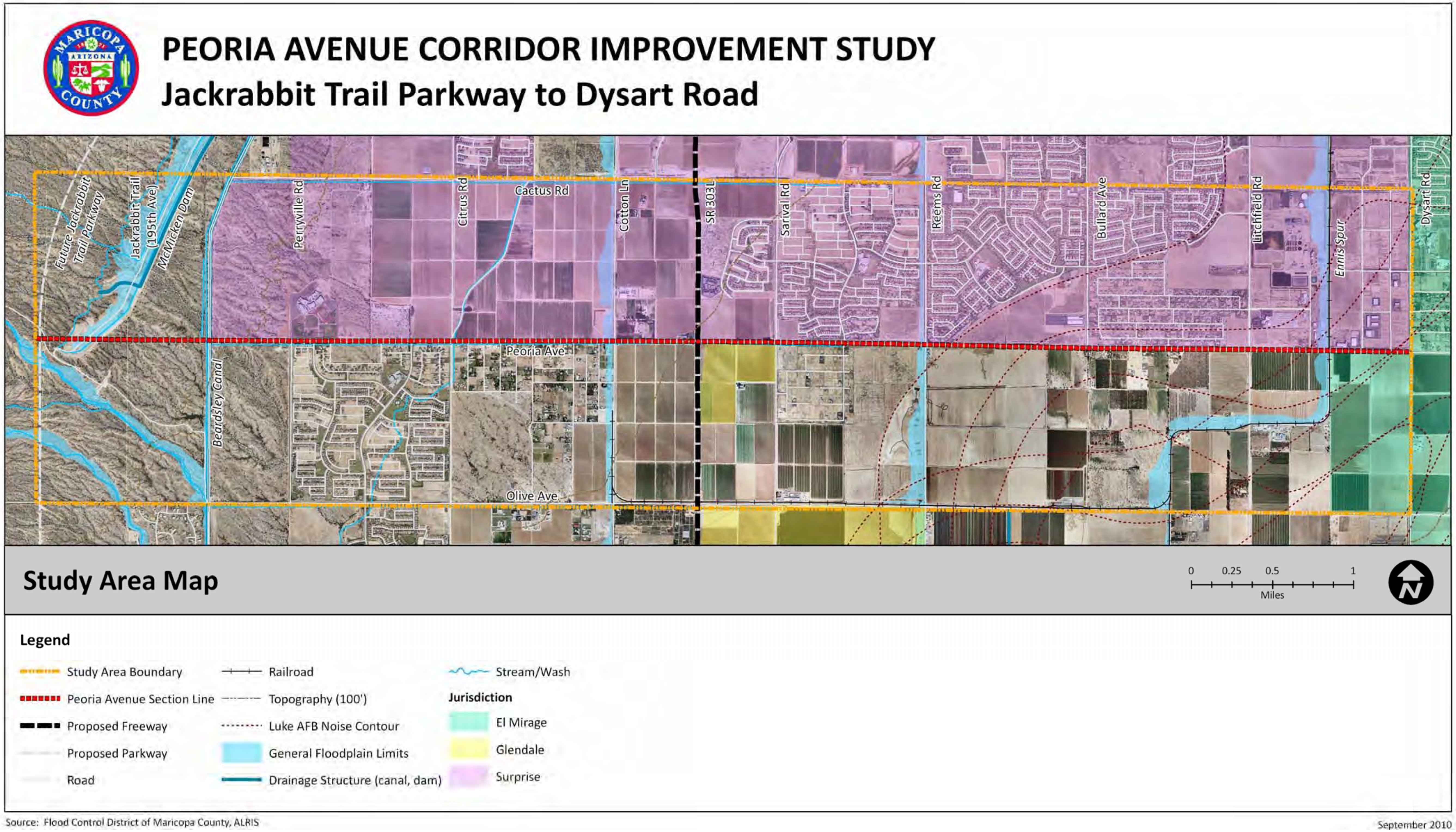
The key objectives of this Corridor Improvement Study are to:

- Define and assess strategic issues within the project study area;
- Develop and evaluate conceptual alternative alignments within the corridor study area;
- Recommend a preferred alignment;
- Develop consensus for the preferred alignment;
- Define the characteristics of the preferred alignment; and
- Develop an implementation plan.

1.2 Purpose of This Report

This report summarizes data collected from the Flood Control District of Maricopa County (FCDMC) studies, Arizona Department of Water Resources (ADWR) reports, Arizona Department of Transportation (ADOT) design documentation, private development drainage reports and field reviews. The data includes peak flows and field conditions. The report also includes an inventory of existing drainage infrastructure within the project area.

Figure 2 – Study Area Map



2.0 FLOOD CONTROL FACILITIES

2.1 Existing Facilities

The FCDMC operates and maintains two flood control facilities within the project area:

- McMicken Dam
- Reems Road Channel and Basin

2.1.1 McMicken Dam

McMicken Dam is a flood control structure that is almost 11 miles long and follows an alignment offset from the Beardsley Canal, beginning at Peoria Avenue west of Perryville Road and extending north and east to Happy Valley Road west of Bullard Avenue. A watershed of approximately 220 square miles to the north and west of the structure contributes runoff to the dam. Its storage capacity is 23,800 Acre-ft. The dam was constructed in the mid 1950's by the United States Army Corps of Engineers (USACOE) and is operated and maintained by the FCDMC. The dam detains storm runoff and meters outflows through a channel located at the northeast end of the structure. The emergency spillway is located just southwest of the intersection between the dam and US 60 and has a design peak flow of 22,000 cfs. The maximum height of the dam is approximately 34', with a crest width of 12'. The Peoria Avenue section line intersects the detention basin located immediately south of the dam. The basin is designed for the 500-year event.

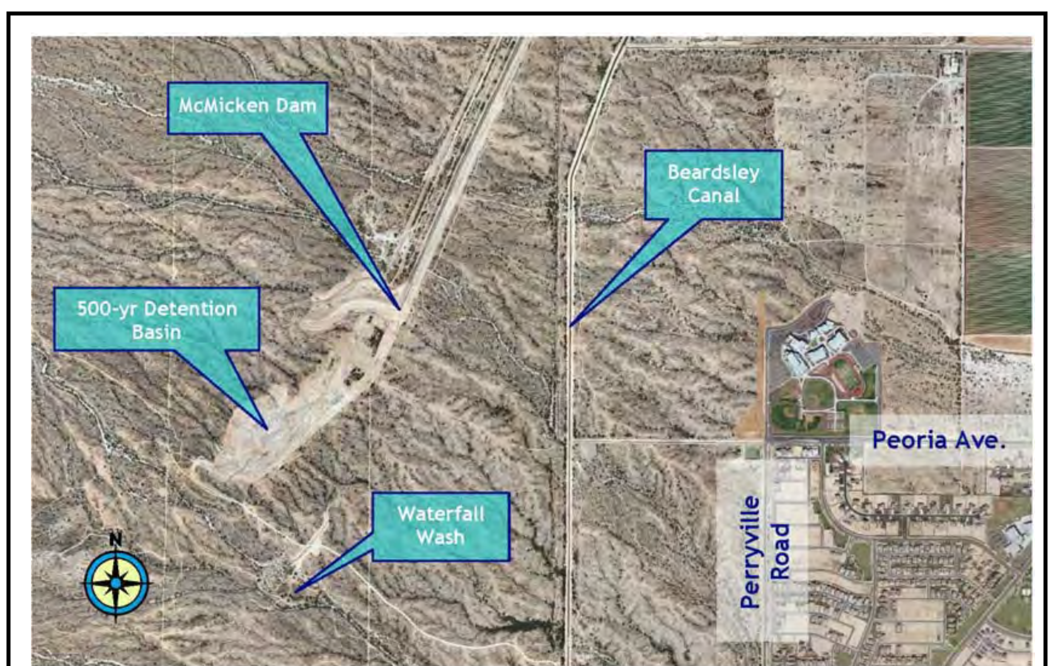


Figure 3 - McMicken Dam near Peoria Avenue

The detention basin and the section of the dam south of Waddell Road are located in a fissure risk zone. The detention basin was created when the FCDMC removed the final 0.5 mile segment of the dam within the area determined to have the highest fissure risk potential and replaced it with a realigned soil-cement dam segment located outside of said area (Figure 3 shows the current condition). Construction began in March of 2005 and was completed in August of 2006.

FCDMC and USACOE are considering alternatives for the overall rehabilitation or replacement of the dam in order to address safety issues. Detailed analyses were completed in 2007, but at this time there is no set schedule for the selection of a preferred alternative or further development of the rehabilitation project. The level of flood protection is not expected to change regardless of the selected alternative; therefore no direct impact is expected for the Peoria Avenue corridor.

2.1.2 Reems Road Channel and Basin

The Reems Road Channel and Basin is a regional flood control facility that was recommended in the Loop 303/White Tanks Area Drainage Master Plan (ADMP) to intercept and convey the 100-year stormwater event. The ultimate facility includes a channel flowing south along Reems Road from Bell Road to the Reems Basin, an off-line detention basin located ¼ mile south of Peoria Avenue, continuing to the outfall at the Falcon Dunes golf course/detention basin, which drains into the Dysart Drain.

The purpose of the channel is to protect Reems Road and the land to the east, including the City of Surprise wastewater treatment plant and various utilities. Without the channel a majority of the stormwater flow would be carried within the Reems Road roadway prism, with large flows overtopping and sheetflowing to the southeast.

In the summer of 2009 the FCDMC completed the construction of the segment of the project south of Peoria Avenue, including a 6-barrel 10'x4'x142' CBC, an approximately 1.5-mile-long earthen channel mostly on the west side of Reems Road, the Reems detention basin and culvert crossings at Olive Avenue and Reems Road. The

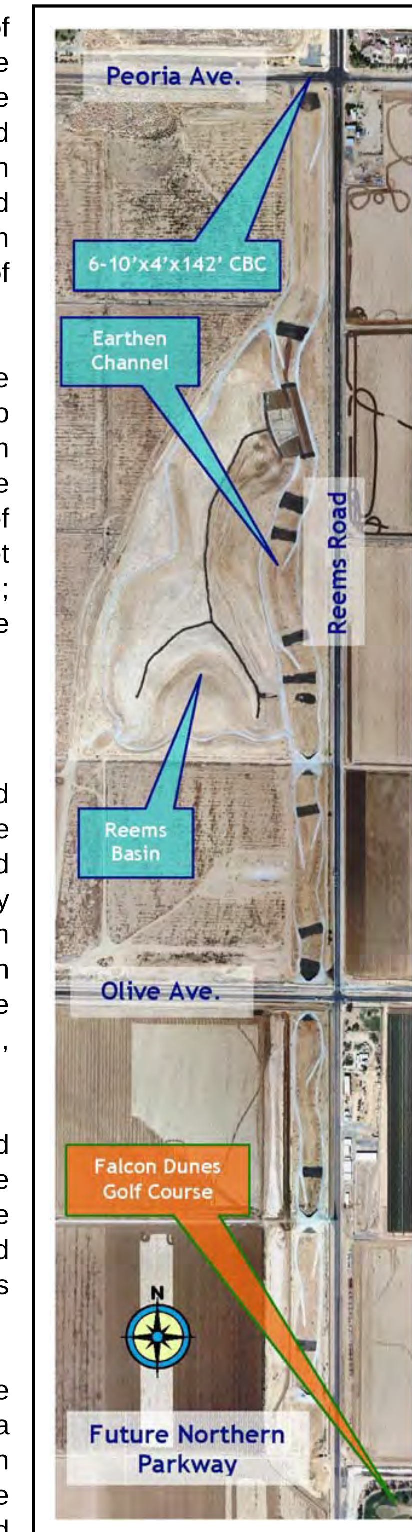


Figure 4 - Reems Channel and Basin

FCDMC retains ownership and maintenance of these facilities. A Letter of Map Revision (LOMR) reflecting the floodplain mitigation as a result of the project is pending approval.

Ownership, funding, design, construction and maintenance of the segment of the channel north of Peoria Avenue are the responsibility of the City of Surprise. The city is to partner with private developers to complete its portion of the project north of Cactus Road with a currently undefined schedule.

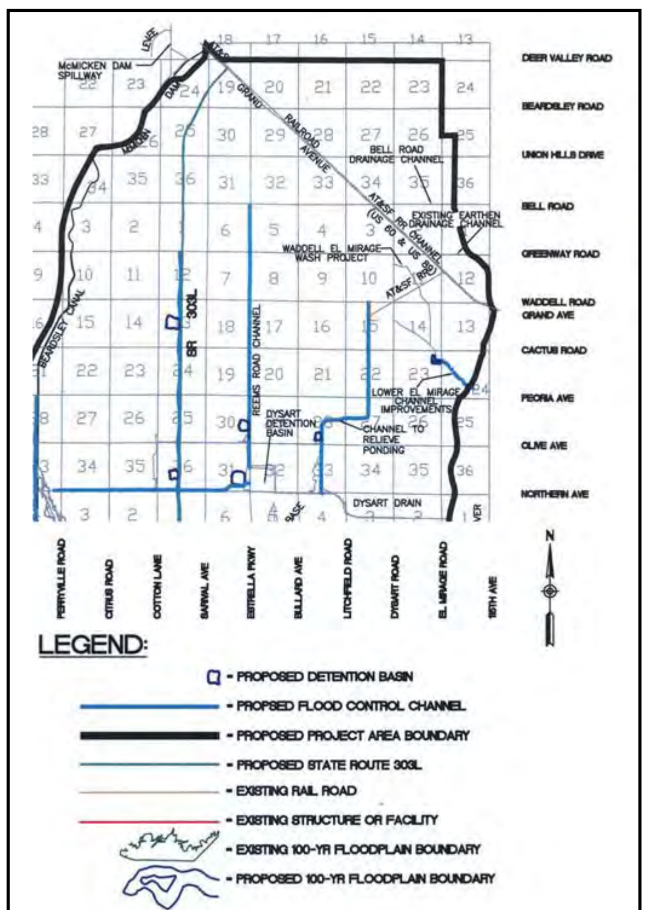
2.2 Previous Studies

2.2.1 Loop 303 Corridor / White Tanks Area Drainage Master Plan Update

In February of 2005 the FCDMC completed the "Loop 303 Corridor / White Tanks Area Drainage Master Plan Update" (the White Tanks ADMPU). The White Tanks ADMPU updated the ADMP previously completed in 1995 with the purpose of developing alternatives for structural flood control improvements to mitigate flood hazards. The proposed alternatives address higher runoff rates associated with the onset of development of rangeland and agricultural land to an urban environment.

The White Tanks ADMPU study area covers the entire project area. The greater ADMPU study area is bounded by the White Tank Mountains to the west, McMicken Dam/Deer Valley Road to the north, the Agua Fria River to the east, and Gila River to the south. The area includes the portions of the incorporated areas of Avondale, Buckeye, El Mirage, Glendale, Goodyear, Litchfield Park, Peoria, Sun City, and Surprise, as well as unincorporated areas of Maricopa County.

Three development alternatives recommended in the ADMPU fall within this project's study area: the SR 303L Channel and Basins, the Reems Road Channel and Basin and the BNSF Railway Channel and Basin. These facilities are discussed in greater detail in other sections of this report. Figure 2.3 shows the location of alternatives as portrayed in a graphic included in the



Source: FCDMC

Figure 5 - White Tanks ADMPU Recommended Alternatives

White Tanks ADMPU report.

Peak flow data summarized in this technical memorandum is derived from the hydrologic models created for the ADMPU. The models have been updated since completion of the ADMPU. The latest version includes NOAA 14 rainfall depth values and reflects the design of channels and basins along SR 303L and Reems Road.

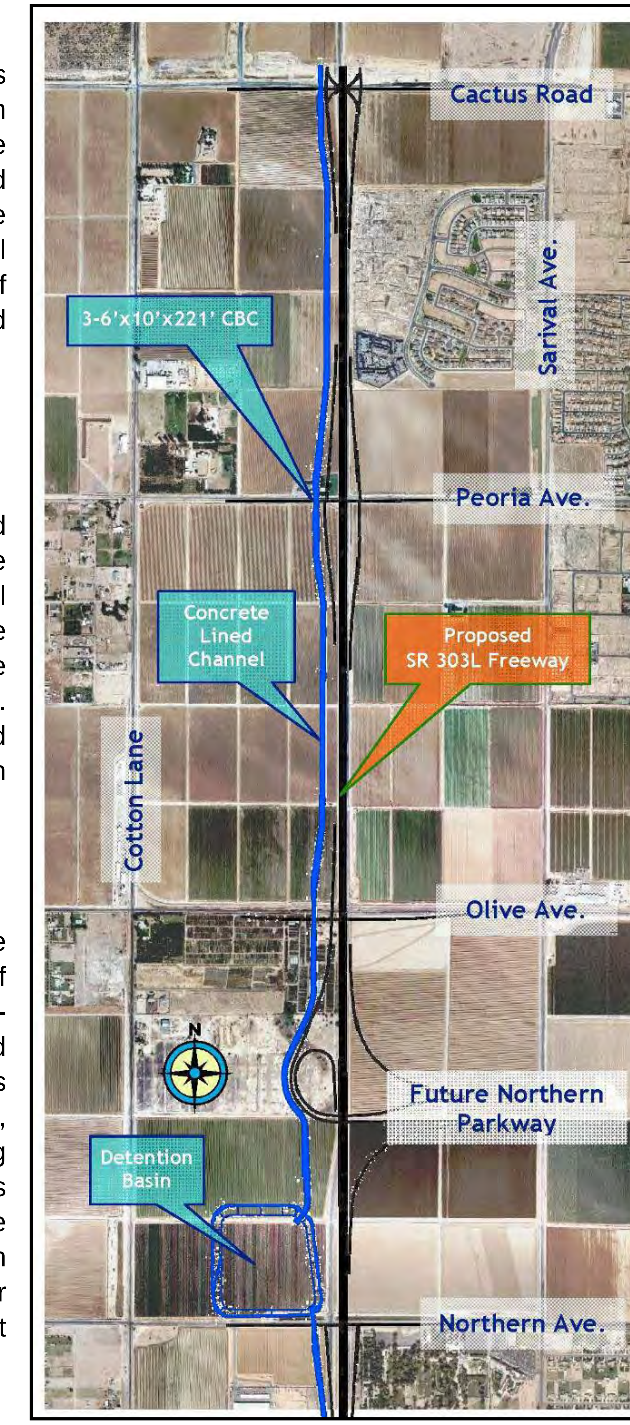
2.3 Improvement Projects

FCDMC, ADOT, the City of Surprise and the City of Glendale are partnering for the development of the regional flood control facilities recommended in the White Tanks ADMPU. Section 2.1.2 covers the Reems Road Channel and Basin project. The SR 303L Channel and Basins and the BNSF Railway Channel and Basin projects are discussed below.

2.3.1 SR 303L Channel and Basins

FCDMC and ADOT are working on the design of an 18-mile-long system of channels and basins that will provide 100-year flood protection for SR 303L and lands to the east. The channel system is located on the west side of SR 303L, beginning at Bell Road and extending south to the Gila River. ADOT is responsible for the development of the system from Bell Road to Van Buren Street and the FCDMC is responsible for the segment between Van Buren Street and the outfall at the Gila River.

ADOT's portion of the channel system is in the final stages of design. Preliminary design was completed in 2008 in two sections, Bell Road to Peoria Avenue and Peoria Avenue to Thomas Road. Final



Source: ADOT

Figure 6 - Proposed SR 303L Channel

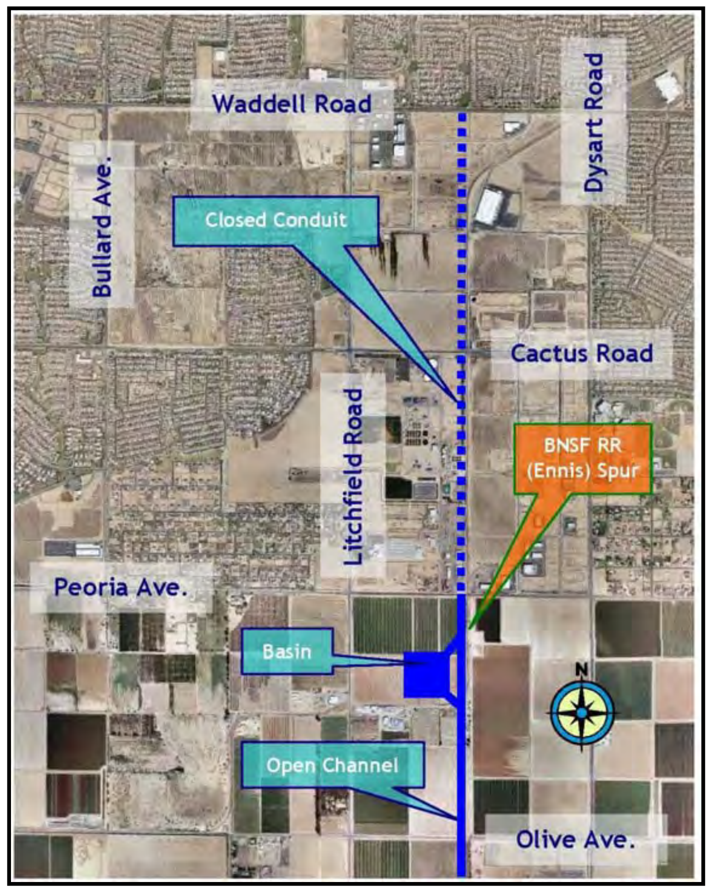
design of the segment from Peoria Avenue to Northern Avenue is currently underway and is expected to be complete by the end of 2010, with construction scheduled to start in the spring of 2011.

The channel system in the vicinity of Peoria Avenue consists of a concrete-lined open channel with box culverts at major roadway intersections and detention basins located on the north side of Cactus Road and the north side of Northern Avenue. The culvert crossing at Peoria Avenue is a 3-10'x6'x221' CBC, with winged inlet and outlet transitions to a 40'-wide channel at the top, with 2:1 side slopes and 6' of depth.

2.3.2 BNSF Railway (Ennis Spur) Channel and Basin

FCDMC is in the initial stages of development of a 100-year event channel and basin system that would parallel the existing railroad track that runs north-south along the half-section line between Litchfield Road and Dysart Road. The system would begin at Waddell Road, collecting runoff approaching from the north-west and conveying it to the south to its outfall at the proposed channel on the north side of the Northern Parkway.

Conceptual design for the segment of the system in the vicinity of Peoria Avenue includes an open channel on the west side of the railroad tracks to the south of Peoria Avenue, a closed conduit system to the north of Peoria Avenue due to limited right-of-way availability, and a detention basin on the north side of Olive Avenue.



Source: FCDMC

Figure 7 - Proposed Ennis Spur Channel And Basin

Design and construction of the channel and basin are not yet programmed, but are expected to proceed within 5 to 10 years. The proposed general alignment of the channel and location of the basin are shown in Figure 7.

2.4 Privately Owned Facilities

The agricultural character of the area has been changing in recent years to an urban environment. Commercial and residential developments along the corridor have introduced changes to runoff patterns and include flood control facilities such as channels and retention basins that are maintained by entities other than municipal and county agencies. The design and construction of these facilities has been monitored by the City of Surprise and the FCDMC through the permitting process, and therefore follow local and county design standards and ordinances. The most relevant requirements are the on-site retention of the 100-year 2-hour storm event, the acceptance of pavement runoff for the half street adjacent to the development, and the conveyance of upstream off-site flows through street/roadside channel systems.

2.4.1 Shadow Ridge High School - Channels and Basin

The Shadow Ridge High School is located on the northeast corner of the Peoria Avenue and Perryville intersection. Off-site flows approaching the school are routed around the site through a natural wash on the north side, and a system of channels and detention basin along the west and south sides. See Figure 8.

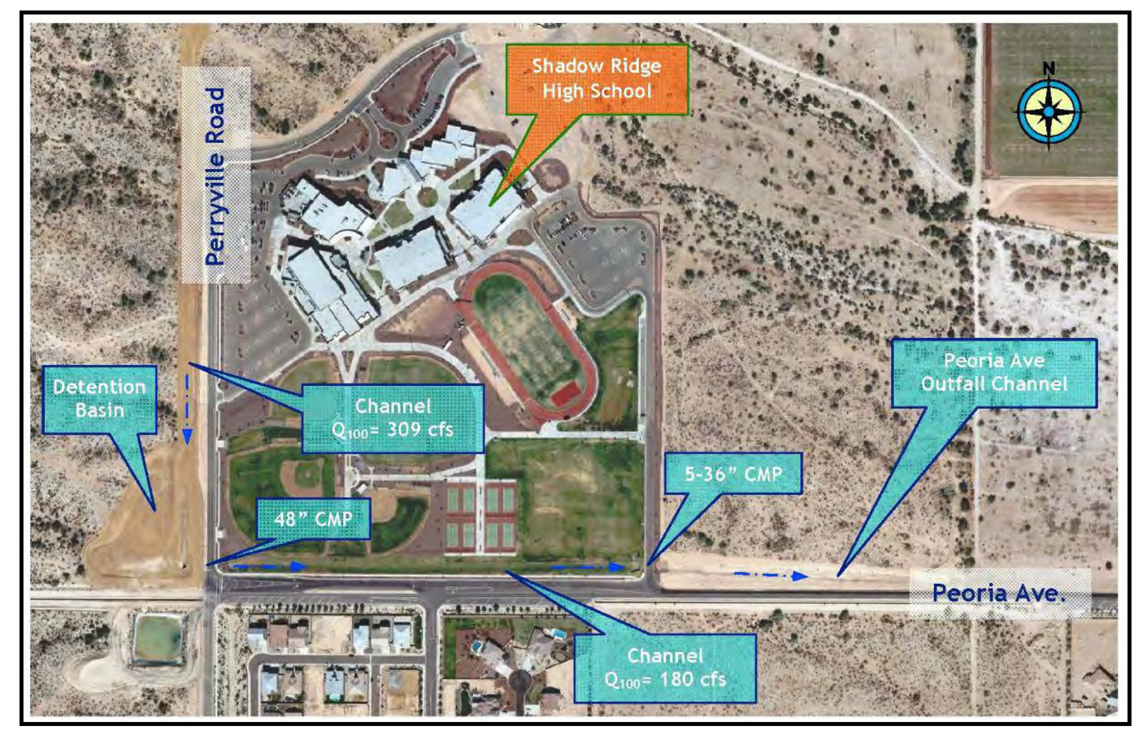


Figure 8 - Shadow Ridge High School Off-site Drainage Facilities

A 1,450'-long unlined channel along the west side of Perryville Roads collects off-site runoff and routes it to a detention basin located on the northwest corner of the Perryville Road and Peoria Avenue intersection. A single 48" pipe culvert under Perryville Road meters flows out of the basin into a 1,400'-long grass-lined triangular open channel that flows east along the north side of Peoria Avenue, which in turn discharges through 5-36" pipe culverts under the southeast roadway school entrance into a 1,100'-long temporary unlined channel. The temporary channel was graded through the adjacent undeveloped land to the east and eventually terminates, allowing runoff to continue east on Peoria Avenue. The school's on-site retention basins were constructed immediately north of the Peoria Avenue roadside channel.

2.4.2 Greer Ranch Subdivision - Channel

Greer Ranch is a residential subdivision located on the north side of Peoria Avenue from Sarival Avenue to Reems Road. Off-site runoff approaching from the northwest is routed around the site, using berms along Cactus Road on the north side and raised entrances along Sarival Avenue on the west side to keep runoff on the roadway's prism. A channel along the north side of Peoria Avenue was built to convey 820 cfs (roughly 50% of the 100-year event that flows along the roadway) from Sarival Avenue east to the Reems Road Channel. It should be noted that peak flow data used in this section and in Figure 9 is taken from the Greer Ranch Drainage Report of 2003. The segments of the channel along the undeveloped parcels at the Sarival Avenue and Reems Road corners are unlined, while grass and desert landscape are used for lining in front of the residential lots. A 3-10'x4' CBC was built at the channel crossing of Greer Ranch Parkway.

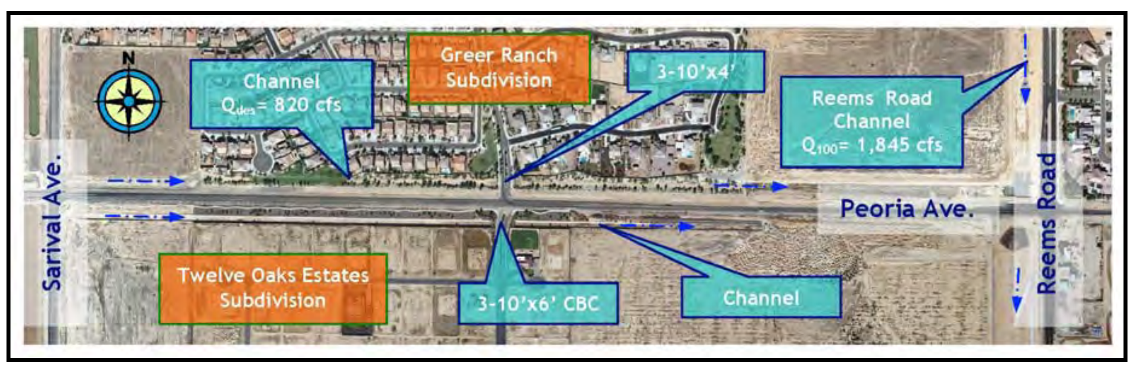


Figure 9 - Greer Ranch and Twelve Oaks Estates Off-site Drainage Facilities

2.4.3 Twelve Oaks Estates – Channel

Twelve Oaks Estates is a residential subdivision of large lots for custom home construction that is partially occupied. A hard-lined open channel was constructed along the south side of Peoria Avenue to convey breakout off-site flows from the northwest, as well as on-site and pavement runoff. The channel begins at Sarival Avenue and daylights to the east, about 1,100' short of the Reems Road Channel. A 3-10'x6' CBC was constructed at the channel intersection with 159th Avenue.

It should be noted that the northwest quadrant of the intersection of Sarival Avenue and Peoria Avenue is subject to flooding as no culvert connections to the aforementioned offsite channels exist across either roadway.

2.4.4 Copper Canyon Subdivision - Channel

Copper Canyon (previously known as Mountain Gate) is a residential subdivision located on the north side of Peoria Avenue from Bullard Avenue to Litchfield Road. Off-site runoff from the west is collected in an unlined channel along the west side of Bullard Avenue. The Bullard Avenue channel flows south and outfalls into a channel on the north side of Peoria Avenue through a 2-6'x3' CBC. From the CBC the Peoria Avenue roadside channel takes flows from the Bullard Avenue channel and the roadway from the west and extends east to Litchfield Road. The channel is designed for a peak flow of 480 cfs (almost the entire 100-year event of 487 cfs) and has no outfall, as it assumed that future developers will extend the channel to the south along Litchfield Road. Another channel along the west side of Litchfield Road meets the end of the Peoria Avenue channel at the roadway intersection, contributing 342 cfs. A 3-10'x3' CBC was constructed at the channel intersection with 143rd Avenue.

In the existing condition, during a rainfall event the combined runoff from the two channels is retained within the channel sections until capacity is exceeded and breaks over the roadway intersection to the south and east. Extensive flooding has been observed at the intersection, requiring closures and pumping of ponded water.

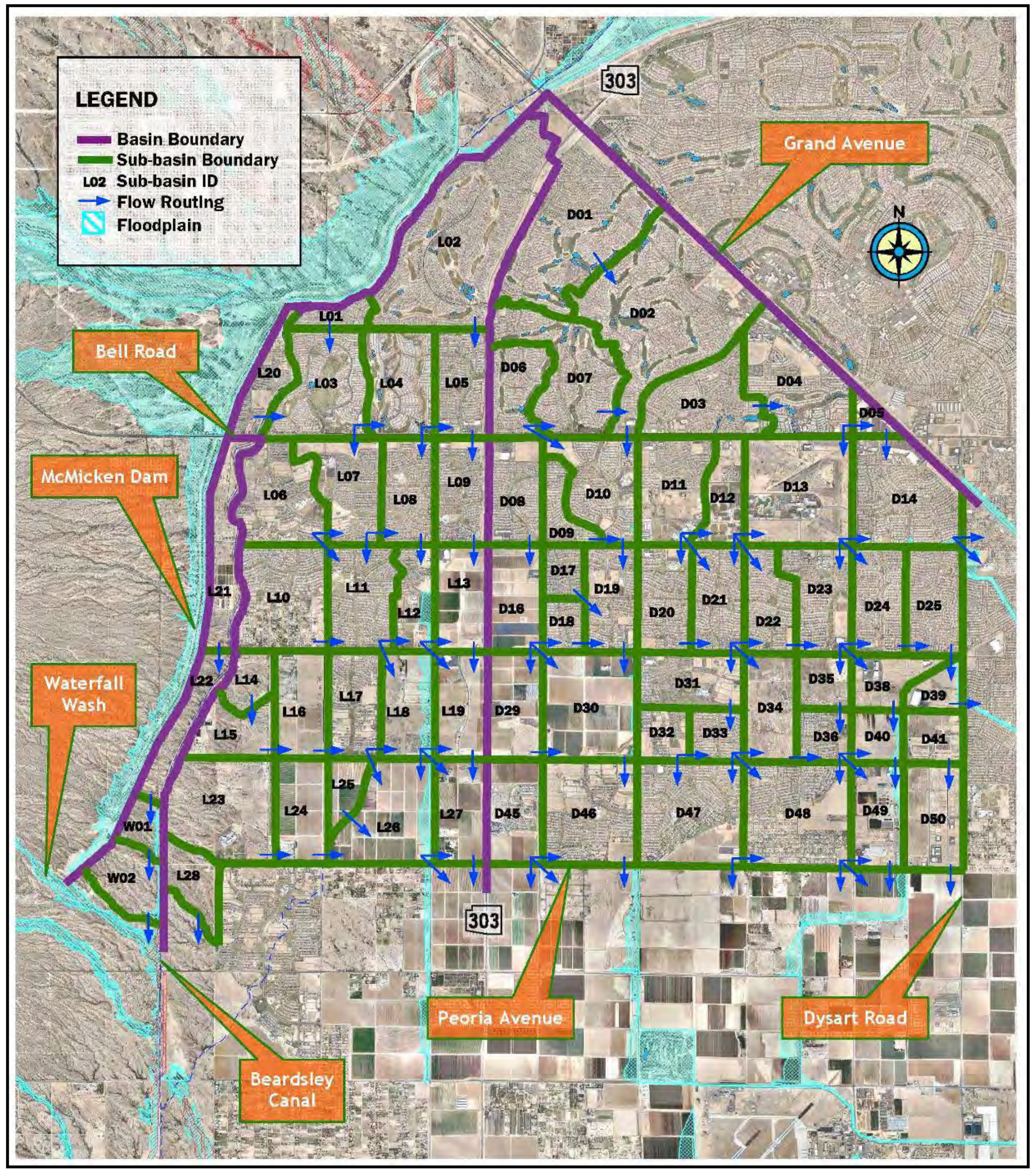
Figure 10 – Copper Canyon Off-site Drainage Facilities

2.5 Future Development

Future development projects along the north side of Peoria Avenue are likely to follow the off-site runoff management practices as the previously mentioned subdivisions. Planning documentation for the proposed Zanjero Trails (Beardsley Canal to Perryville Road) and Prasada developments (Shadow Ridge High School to Cotton Lane) include channels along the west side of Perryville Road and Cotton Lane that would discharge into a channel along the north side of Peoria Avenue for which the SR 303L Channel would be the outfall. On-site retention of the 100-year 2-hour event at all future developments will reduce the amount of off-site runoff that reaches Peoria Avenue.

3.0 HYDROLOGY

The map below shows the contributing watershed for the project area. The prefix in the sub-basin ID indicates the major basin in which it is located.



Source: FCDMC

Figure 11 - Peoria Avenue Watershed Map

The hydrologic delineation and model were developed in the White Tanks ADMPU. The delineation and the model have been revised several times in the last few years in order to incorporate on-going changes to land use and the design of capital improvements such as the SR 303L and the Reems Road channel systems. The model referenced in this report was provided by the FCDMC and includes the latest revisions made in 2009.

Three major basins cover the project area, defined by the basin's outfall feature:

- Basin W: located between the McMicken Dam and the Beardsley Canal. Flows are routed to the White Tanks flood retarding structures to the south. Sub-basins L21 and L22 are within Basin W.
- Basin L: located between the Beardsley Canal and the SR 303L freeway. Flows are routed to the SR 303L channel system.
- Basin D: located east of the SR 303L freeway. The ultimate outfall for this basin is the Dysart Drain, located along the north and east boundaries of Luke Air Force Base.

3.1 Peak Flows

HEC-1 models of the contributing watershed were completed as part of the White Tanks ADMPU. The FCDMC continued updating the HEC-1 models after completion of the ADMPU in order to account for changes to the watershed, including design and construction of regional flood control infrastructure. The models referenced in this report are included in the WT1FC02.DAT (Major Basin 1) and FCIP-MB2.DAT (Major Basin 2) HEC-1 files, created by HDR Engineering in August and September of 2009 for the FCDMC. The models correspond to the 100-year 24-hour future condition with capital improvement projects in place (SR 303L, Reems Road and Ennis spur Channels). Revisions in October of 2009 and January of 2010 are noted on the files by the FCDMC (storage, routing and diversion corrections for Major Basin 1).

For the purpose of estimating 50-year peak flow data, the models were modified by replacing the 100-year precipitation data (with areal reduction factors) in the original JD cards with 50-year precipitation data. The 50-year 24-hour precipitation depth value of 2.996" representative of the Peoria Avenue watershed was obtained using the NOAA 14 tool included in the FCDMC's Drainage Design Management Software (DDMSW). The modified models were run for the 50-year event. A summary of sub-basin flow data is presented in Table 1.

Tables and graphics with original data are included in Appendix II. Relevant pages of the output files for the modified models are included in Appendix III.

It should be noted that peak flow data used in Section 2 of this technical memorandum was derived from older versions of the HEC-1 model, which did not include FCDMC capital improvement projects, used NOAA 2 precipitation values, and differed with the current model in other aspects such as routing, storage and sub-basin delineation. The HEC-1 model is expected to be updated in the future to account for new designs of capital improvement and private development projects.

Table 1 – Summary of Off-site Peak Flows (1 of 4)

	Drainage Area ID	Area (sq.mi.)	100-Year Peak Flow (cfs)	50-Year Peak Flow (cfs)	Notes
Basin W	L21	0.52	273	173	
	L22	0.36	87	50	
	CPL22	0.89	0	0	
	W01	0.19	151	91	
	CPW01	1.08	150	90	Beardsley Canal @ Peoria Ave.
	W02	0.39	544	364	
	CPW02	1.47	454	82	
	CPW04	4.01	3313	2082	Waterfall Wash @ JT
Basin L	L01	0.16	268	221	
	L02	1.88	1737	1416	
	L20	0.35	390	317	
	L03	0.79	958	785	
	CPL03	1.29	60	8	
	L04	0.63	663	534	
	CPL04	1.93	17	0	
	L05	0.49	660	549	
	CPL05	4.30	636	88	SR 303L @ Bell Road
	L06	0.70	914	754	
	L07	0.63	816	673	
	CPL07	2.62	37	7	
	L08	0.49	647	544	
	CPL08	3.74	36	5	
	L09	0.49	657	547	
	CPL09	4.78	574	82	SR 303L @ Greenway Road
	L10	0.84	845	672	
	L11	0.62	744	607	
	CPL11	4.09	439	156	
	L12	0.36	586	494	
	CPL12	5.56	385	109	
	L13	0.48	860	731	
	CPL13	8.90	502	87	SR 303L @ Waddell Road
	L14	0.23	269	211	
	L15	0.37	438	347	
	CPL15	0.60	0	0	
	L16	0.50	582	463	
	CPL16	1.10	0	0	
	L17	0.50	586	473	
	CPL17	1.61	0	0	
	L18	0.50	604	484	
	CPL18	7.67	44	10	
	L19	0.49	877	745	
	CPL19	11.50	511	89	SR 303L @ Cactus Road
	L23	0.90	922	727	
	L24	0.50	624	496	
	CPL24	1.40	0	0	Peoria Ave. @ Citrus Rd.
	L25	0.24	261	208	

Table 1 – Summary of Off-site Peak Flows (2 of 4)

	Drainage Area ID	Area (sq.mi.)	100-Year Peak Flow (cfs)	50-Year Peak Flow (cfs)	Notes
Basin L	L26	0.76	980	790	
	CPL26	10.07	5	0	Peoria Ave. @ Cotton Ln.
	DL26SE	10.07	0	0	Cotton Ln. South xing Peoria Ave.
	L27	0.51	906	769	
	CPL27	14.41	518	97	SR 303L @ Peoria Ave.
Basin D	D01	1.56	1347	1085	
	D02	1.84	1750	1422	
	D06	0.46	616	513	
	D07	0.89	919	751	
	CPD07	1.35	348	17	
	CPD02	4.76	617	31	Reems Rd. @ Bell Rd.
	D09	0.26	360	298	
	D10	0.63	787	650	
	CPD10	5.65	500	54	Reems Rd. @ Greenway Rd.
	D08	0.51	661	550	
	D16	0.52	922	783	
	CPD16	1.03	263	50	
	D18	0.20	321	262	
	CPD18	1.23	22	6	
	D17	0.20	324	266	
	D19	0.51	577	466	
	CPD19	7.58	437	35	Reems Rd. @ Wadell Rd.
	D29	0.51	910	773	
	CPD29	1.54	250	62	
	D30	0.91	1541	1310	
	CPD30	9.01	594	107	Reems Rd. @ Cactus Rd.
	D45	0.49	780	654	
	DD451	0.49	24	3	Sarival Ave. South xing Peoria Ave.
	DD452	0.49	68	8	
	D46	0.92	982	801	
	CPD46	10.41	573	106	Reems Rd. @ Peoria Ave.
	D03	0.72	960	783	
	D04	0.89	1149	949	
	CPD04	1.61	1062	487	
	D05	0.16	325	277	
	CPD05	1.78	337	274	
	D11	0.66	807	667	
	D12	0.35	438	365	
	CPD12	1.01	258	54	
	D13	1.03	1329	1093	
	CPD13	3.65	220	54	
	D14	0.94	1126	932	
	CPD14	4.76	188	33	Greenway Rd. leaving to East

Table 1 – Summary of Off-site Peak Flows (3 of 4)

	Drainage Area ID	Area (sq.mi.)	100-Year Peak Flow (cfs)	50-Year Peak Flow (cfs)	Notes
Basin D	DD111	0.66	564	356	South xing Greenway Rd.
	DD112	0.66	45	33	
	DD121	1.01	111	16	
	DD122	1.01	60	19	
	DD131	3.65	8	2	
	DD132	3.65	48	12	
	D20	0.50	595	484	
	CPD20	1.16	291	120	
	D21	0.50	565	460	
	CPD21	2.00	244	101	
	D22	0.45	562	459	
	CPD22	2.46	37	13	
	CPD23	5.64	38	12	
	D24	0.49	538	438	
	CPD24	6.13	64	16	
	D25	0.50	574	466	
	CPD25	6.63	69	15	
	D39	0.18	354	296	
	CPD39	6.81	67	14	South of Wadell Leaving to East
	DD211	2.00	172	76	South xing Waddell Rd.
	DD212	2.00	44	20	
	DD231	5.64	4	1	
	DD232	5.64	4	1	
	D35	0.25	444	367	
	D38	0.32	446	368	
	CPD38	6.22	6	2	
	D31	0.50	667	543	
	CPD31	2.50	166	72	
	D32	0.25	361	297	
	D33	0.25	377	312	
	CPD33	3.00	160	64	
	D34	0.50	697	571	
	CPD34	3.50	67	26	
	D36	0.25	404	333	
	CPD36	7.64	63	24	
	D40	0.24	451	378	
	CPD40	8.20	5	2	RR Spur @ Cactus Rd.
	D47	1.00	1066	868	
	CPD47	3.99	74	28	
	DD47SE	3.99	65	25	Bullard Ave. South xing Peoria Ave.
	D48	1.00	949	765	
	CPD48	9.63	74	25	
	DD481	9.63	63	21	Litchfield Rd. South xing Peoria Ave.
	DD482	9.63	3	1	
	D49	0.49	724	598	
	CPD49	10.69	724	598	RR Spur @ Peoria Ave.

Technical Memorandum #3
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Table 1 – Summary of Off-site Peak Flows (4 of 4)

	Drainage Area ID	Area (sq.mi.)	100-Year Peak Flow (cfs)	50-Year Peak Flow (cfs)	Notes
B. D	D41	0.25	557	474	
	D50	0.50	774	653	
	CPD50	0.76	11	0	Dysart Rd. @ Peoria Ave.

Source: FCDMC

3.2 Floodways and Floodplains

Figure 3.2 shows the floodways and floodplains that have been delineated within the project area. The only designated floodway is the Waterfall Wash. Floodplains have been delineated at the McMicken Dam flood pool, the 500-year detention basin, as well as along Cotton Lane, Reems Road, and the BNSF Railway (Ennis) Spur. Table 3.2 is a summary of Flood Insurance Rate Maps (FIRM) that cover the project area. The FIRM plats are included in Appendix IV.

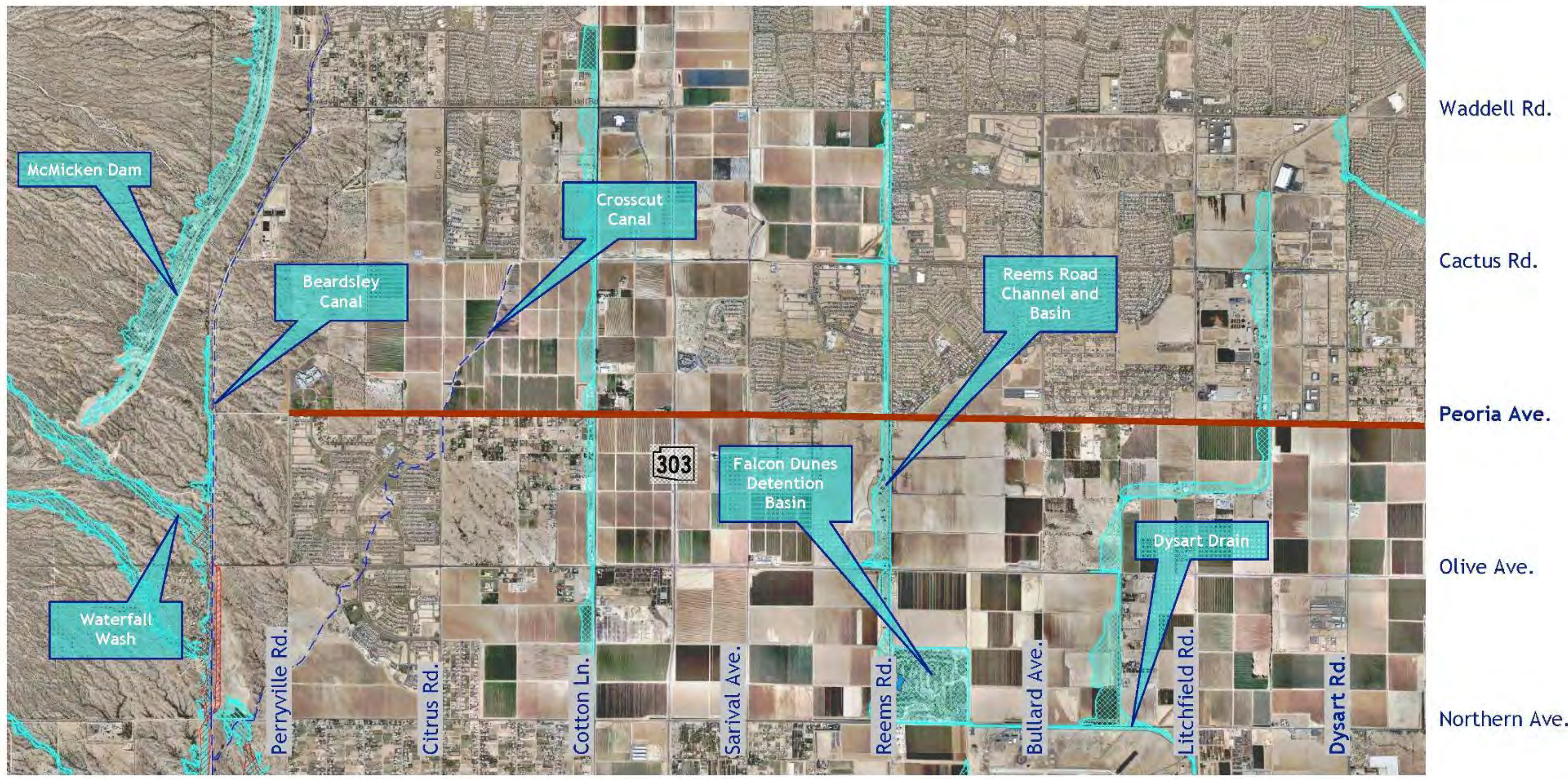
The floodplain along Reems Road is to be eliminated once the pending LOMR for the Reems Road Channel and Basin project is approved. There are no other revisions currently being processed.

Table 2 - Flood Insurance Rate Maps Summary

Map Number	Revision Date
04013C1140H	September 30, 2005
04013C1145H	September 30, 2005
04013C1165J	September 30, 2005
04013C1580H	September 30, 2005
04013C1585H	September 30, 2005
04013C1605J	September 30, 2005

Source: FEMA

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road



Floodplains Map

Not to Scale

N

Legend

Floodplain

Andes Engineering

Source: FCDMC

September 2010

Figure 12 – Floodplains Map

4.0 GROUNDWATER

The project area is located within the West Salt River Valley groundwater sub-basin of the Phoenix Active Management Area. The primary sources of groundwater are the upper alluvial units bounded by the Wickenburg and Hieroglyphic Mountains to the north, and the White Tank Mountains to the west.

Extensive agricultural development that requires continued irrigation of crops exists in the area west of the Beardsley Canal. Groundwater pumping through water wells is widely used in the vicinity of Peoria Avenue. Table is 4.1 is a summary of active water wells in the proximity of Peoria Avenue, sorted by location from west to east.

Table 3 – Active Water Wells near Peoria Avenue

Well ID	Location Relative To Peoria Avenue	Nearest Crossroad	Well Depth (ft)	Water Level Below Ground Surface (ft)
613000	South	Citrus Rd.	1030	471
216251	South	Citrus Rd.	n/a	n/a
613001	South	Citrus Rd.	489	n/a
612999	South	175th Ave.	1000	459
606609	South	Cotton Ln.	2567	885
911652	North	Cotton Ln.	n/a	n/a
612998	South	SR 303L	1000	471
610103	South	Reems Rd.	1200	430
626943	South	Bullard Ave.	927	344
626942	South	Bullard Ave.	1090	545
208837	South	144th Dr.	n/a	n/a
210465	South	144th Dr.	680	540
903067	South	144th Dr.	640	420
610821	South	144th Dr.	1100	600
210409	South	144th Dr.	600	400
625817	South	144th Dr.	1150	450
631810	South	144th Dr.	475	419
625816	South	144th Dr.	1157	515
564527	North	Litchfield Rd.	380	335
610626	South	132nd Ave.	1050	520
610625	South	132nd Ave	1050	520
610631	South	132nd Ave.	1820	520
610627	South	Dysart Rd.	1000	520
610628	South	Dysart Rd.	1150	520

Source: ADWR

Data from the Arizona Department of Water Resources (ADWR) Hydrologic Map Series (HMS) Report No. 35 (Nov. 2002 to Feb. 2003) indicates that ground water levels for wells in the vicinity of the project area ranges between 300' and 500' below ground surface. A similar range of water level values is observed in the HMS Report No. 12 of 1982. The 300' to 500' range

agrees with data shown in Table 4.1 and in Hydrograph Charts plotted by ADWR for some of the listed wells. ADWR and FCDMC documentation indicate that since the 1980's local groundwater has recharged, with levels increasing from 50' to 150' from the low levels observed after approximately 40 years of decline. Supporting ADWR documentation is included in Appendix IV.

5.0 EARTH FISSURES AND GROUND SUBSIDENCE

5.1 Reems Road Channel Evaluation

In 2007 the FCDMC completed a Preliminary Ground Subsidence and Earth Fissure Evaluation as part of the Reems Road Channel and Basin project. The evaluation reports on historic groundwater and subsidence conditions.

According to the aforementioned report, the area has undergone significant subsidence due to groundwater withdrawal since groundwater pumping commenced in the west valley. The overall depression extends from the White Tank Mountains to the vicinity of the Luke Air Force Base, with a major subsidence depression of about 15' in depth and a 4-mile-radius centered on the Reems Road and Olive Avenue intersection.

Between the 1940's and the 1980's groundwater levels dropped an average of 250'. Consequently by 1990, subsidence in the area had reached 18' compared to 1957 USGS elevations. However, since active management of the aquifer began in the 1980's, water levels have recovered and only about 0.8 to 0.9 ft of additional subsidence was observed between 1990 and 2003.

Two earth fissure risk zones have been identified within the project area. The first is located at the southern end of the McMicken Dam, where a remediation project realigned the dam and created the 500-year detention basin. The second is located to the southeast of the Peoria Avenue and Sarival Avenue intersection, as shown in Figure 5.1. Evidence of the earth fissure was observed at the vertical displacement of the pavement surface of Olive Avenue, just east of the intersection with SR 303L.

Source: FCDMC

Figure 13 – Earth Fissure Map near Reems Road

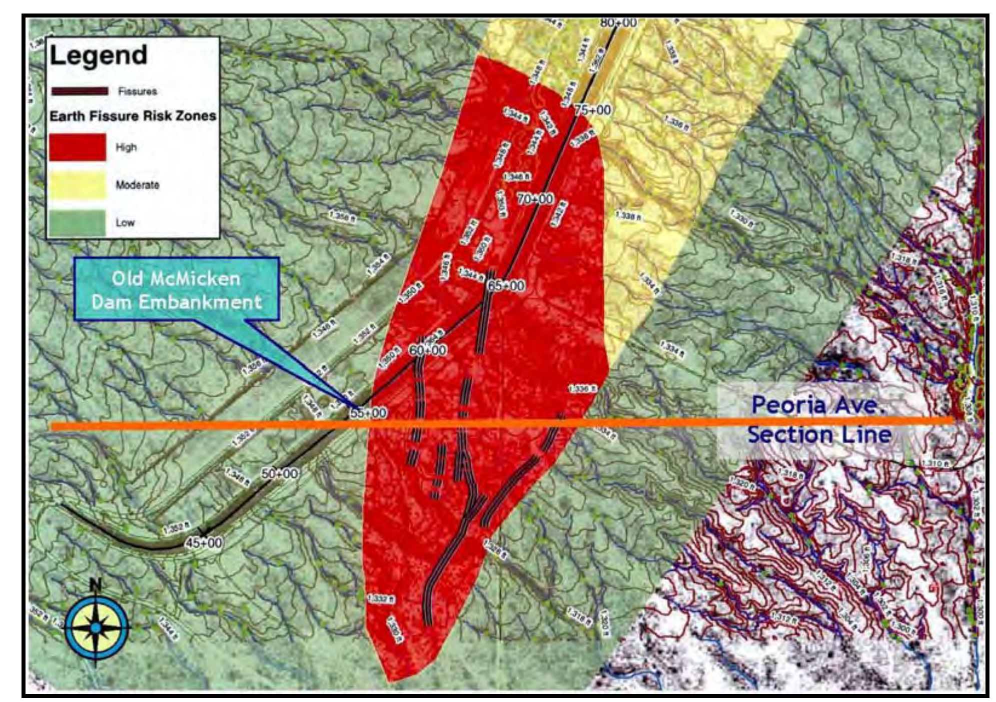
The report concludes that although additional subsidence is possible, if ground water levels continue to recover then the rate of subsidence is likely to decline.

5.2 McMicken Dam Evaluation

The Earth Fissure Investigation Report of the McMicken Dam area was completed in 2003 by the FCDMC. The investigation was intended to detect and characterize the distribution and nature of earth fissures located in the vicinity of the southernmost six-mile portion of McMicken Dam.

According to the report, 2' to 3' of ground subsidence caused by groundwater withdrawal was observed in the vicinity of the intersection of the McMicken Dam and the Peoria Avenue section line for the period between 1947 and 1981. Less than 1' of additional subsidence has occurred since 1981.

Ground subsidence may have contributed to the development of earth fissures in the area. The report documents the investigation of earth fissures (the Fenne Knoll fissures) around the southern end of the McMicken Dam. The Fenne Knoll fissures are near-vertical discontinuities with uneroded widths of about ¼ " to ½", extending to about 20' in depth. The fissure complex contains small gullies that changed little in the 20 years before the 2003 investigation, as well as other cracks that are concealed at the surface. It was the likely presence of high hazard fissures under the southern end of the McMicken Dam foundation that prompted its reconstruction in 2006. The location of the Fenne Knoll fissures is shown in Figure 14.



Source: FCDMC

Figure 14 – Fenne Knoll Fissures Map

6.0 PROPOSED DRAINAGE IMPROVEMENTS

The proposed ultimate roadway section for Peoria Avenue within the study limits includes three lanes of travel in each direction, raised median, exterior curb and gutter, and sidewalks. Turn lanes and frontage roads are proposed for traffic flow and access control reasons. Widening of the existing Peoria Avenue would be symmetrical about the section line, or to the north or south as required to address physical, development and right-of-way constraints. The roadway right-of-way width would be 120' or greater as needed to accommodate turn lanes and frontage roads.

Maricopa County Drainage Policies and Standards for an arterial roadway require a drainage system with the capacity to:

- Maintain one 12-foot dry driving lane in each direction, and flow depths not to exceed curb height for the 10-year storm event.
- Convey the 50-year frequency flow in adjacent channels, with a maximum allowed depth of 6" over the pavement surface for the 100-year frequency flow.
- Keep the headwater elevation at culvert crossings below the lowest adjacent road subgrade for the 50-year frequency flow, with a maximum allowed depth of 6" over the pavement surface for the 100-year frequency flow.
- Maintain a minimum of 2' freeboard below the low chord of bridges for the 100-year frequency flow.

Offsite and onsite drainage improvements are recommended in order to meet the aforementioned requirements.

6.1 Offsite Drainage Improvements

Several new improvements are required along the corridor, some of which are already planned by agencies and developers, in order to complete the offsite system.

Starting at the west end, mitigation of impacts to the FCDMC's 500-year retention basin located south of the McMicken Dam will need to be implemented as a result of Peoria Avenue's crossing of the facility. Reconfiguration of the basin and/or addition of pool leveling culverts would be needed to retain safety, function, operation and capacity requirements. Management of outflows from the basin to Waterfall Wash and the presence of earth fissures and monitoring devices should also be addressed. A bridge crossing of Waterfall Wash would be required should the roadway alignment be shifted to the south of the basin.

Culvert crossings of Peoria Avenue are proposed to implement a pass-through concept for the small washes downstream of the dam in the segment between the basin and the Beardsley Canal. Future development plans may eliminate the need for offsite improvements as a result of onsite retention requirements that would intercept flows upstream of Peoria Avenue.

Onsite retention for Zanjero Trails east of the Beardsley Canal to Perryville Road will prevent offsite flows from reaching Peoria Avenue. The existing channel along the north side of Peoria Avenue at Shadow Ridge High School is planned to be extended east in the development plans of Zanjero Trails and Prasada. The channel would convey flows east to Cotton Lane, where box culverts across Cotton Lane to the east and Peoria Avenue to the south would split flows in order to maintain historic patterns, according to Prasada's concept. A new channel would need to be constructed along the north side of Peoria Avenue from Cotton Lane to the SR 303L channel in order to provide an ultimate outfall. The latter channel is not in any developers plans at this time and will need to be coordinated with FCDMC and ADOT for compliance with SR 303L design parameters. A culvert crossing of Peoria Avenue is proposed in order to discharge into the SR 303L channel downstream of the freeway channel's box culvert.

Onsite retention will also prevent offsite flows from reaching Peoria Avenue in the segment between SR 303L and Sarival Avenue. A culvert crossing of Sarival Avenue and a channel extension to the east is proposed along the north side of Peoria Avenue to allow the conveyance of flows from the Sarival Avenue Channel to the Greer Ranch Channel, eliminating current flooding problems at the Sarival Avenue intersection. The existing Greer Ranch channel conveys flows to the Reems Road Channel.

No additional facilities are proposed for the segment between Reems Road and Litchfield Road, as onsite retention and the existing Copper Canyon channel already address offsite requirements. A culvert crossing of the intersection of Litchfield Road and Peoria Avenue and a new channel along the south side of Peoria Avenue are proposed to convey flows from the Copper Canyon channel to the future BNSF Railroad (Enis) spur channel. The south side of Peoria Avenue is proposed for the channel because of conflicts with existing development and private retention basins on the north side.

Additional offsite facilities are not required east of the BNSF railroad spur as a result of onsite retention north of Peoria Avenue. A pipe culvert that crosses the intersection of Dysart Road and Peoria Avenue will need to be extended as a result of the Peoria Avenue widening. Consequently, a roadside channel along the west side of Dysart Road would need to be relocated to make way for the widened intersection.

Figure 15 shows off-site drainage crossings along the corridor centerline. 100-year and 50-year peak flows are shown at 10 drainage crossings.

Table 4 is a summary of existing, planned by third parties, and proposed (in this study) culvert crossings of Peoria Avenue and crossroads. Table 5 is a summary of existing, planned and proposed channels.

The proposed culvert and channel improvements at the intersections of Peoria Avenue with Sarival Avenue and Litchfield Road could be completed ahead of the ultimate roadway widening in order to resolve recurrent flooding problems. The opportunity to include these improvements in the ongoing development efforts by ADOT and FCDMC of the SR 303L and BNSF Railroad spur regional drainage facilities could be explored and coordinated with the benefit of providing relief much earlier than if left to future private development to complete. Additional design will be required in order to establish parameters and determine capacity of culverts and channels needed to convey runoff from the intersections to the flood control channels.

Table 4 – Existing, Planned and Proposed and Culverts

Size and Type	Location Relative To Peoria Avenue	Crossroad	Status	Owner (Blank if Undefined)
48"x150' RCP	Crossing	n/a	Proposed	
48"x210' RCP	Crossing	n/a	Proposed	
48"x140' RCP	Crossing	n/a	Proposed	
10'x6'x160' CBC	Crossing	n/a	Proposed	
48"x135' CMP	North	Perryville Road	Existing	Municipal
5-36"x60' CMP	North	Shadow Ridge HS	Existing	Municipal
5-36"x60' CMP	North	183rd Avenue	Planned	Zanjero Trails
3-12'x4'x150' CBC	North	Citrus Road	Planned	Prasada
3-12'x4'x65' CBC	North	175th Avenue	Planned	Prasada
4-8'x4'x190' CBC	Crossing	Cotton Lane	Planned	Prasada
3-10'x4'x135' CBC	North	Cotton Lane	Planned	Prasada
2-72"x330' CMP	Crossing	SR 303L	Proposed	
3-10'x6'x221' CBC	Crossing	SR 303L	Planned	ADOT
3-8'x6'x130' CBC	North	Sarival Avenue	Proposed	
3-10'x4'x90' CBC	North	Greer Ranch Pkwy	Existing	Greer Ranch
3-10'x6'x90' CBC	South	Greer Ranch Pkwy	Existing	Twelve Oaks Estates
6-10'x4x142' CBC	Crossing	Reems Road	Existing	FCDMC
2-6'x3'x122' CBC	North	Bullard Avenue	Existing	Municipal
3-10'x3'x66' CBC	North	143rd Avenue	Existing	Copper Canyon
3-10'x6'x226' CBC	Crossing	Litchfield Road	Proposed	
Ennis Spur RCP	Crossing	BNSF RR Spur	Planned	FCDMC
36"x40' RCP	Crossing Extension	Dysart Road	Proposed	

Table 5 – Existing, Planned and Proposed Channels

Top Width	Location Relative To Peoria Avenue And Termini	Length	Status	Owner (Blank if Undefined)
27'	North Perryville Rd. to HS Entrance	1,420'	Existing	Shadow Ridge High School
32'	North HS Entrance to 183rd Ave.	1,060'	Planned	Zanjero Trails
80'	North 183rd Ave. to Citrus Road	2,540'	Planned	Prasada
83'	North Citrus Road to Cotton Lane	5,100'	Planned	Prasada
28' (Est.)	North Cotton Lane to SR 303L	2,145'	Proposed	

Table 5 – Existing, Planned and Proposed Channels (Continued)

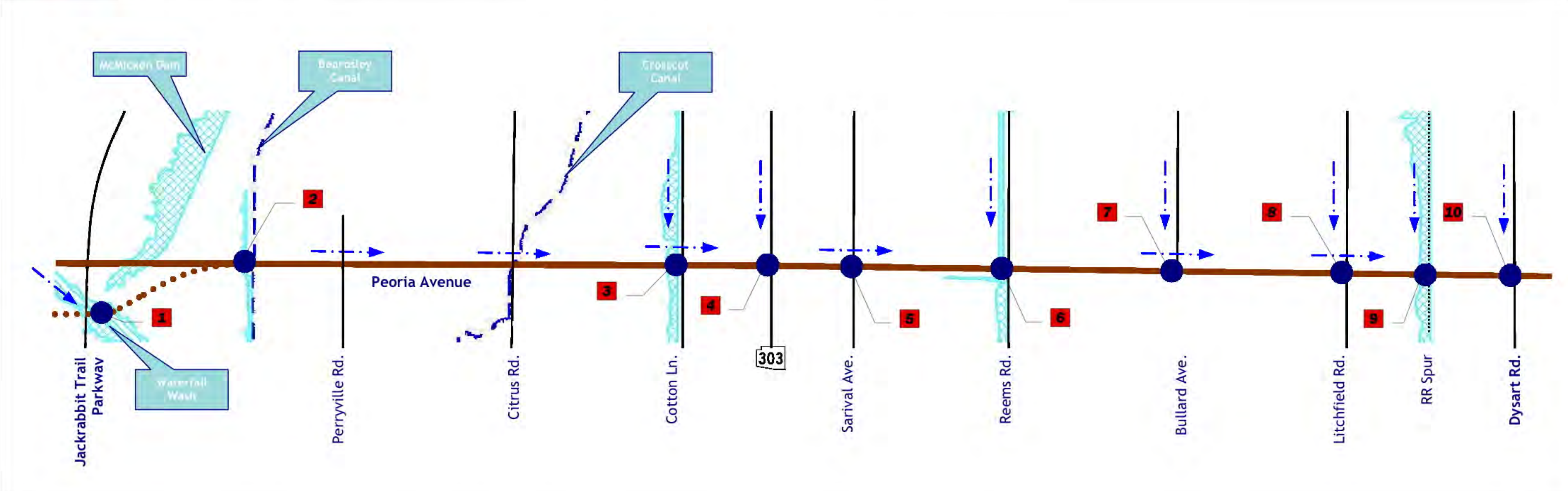
Top Width	Location Relative To Peoria Avenue And Termini	Length	Status	Owner (Blank if Undefined)
28' (Est.)	North Sarival Ave. to 161st Lane	665'	Proposed	
34'	North 161st Lane to Reems Rd.	3,865'	Existing	Greer Ranch
30'	South Sarival Ave. to 167th Dr.	3,300'	Existing	Twelve Oaks Estates
30'	North Bullard Ave. to Litchfield Rd.	5,075'	Existing	Copper Canyon
30' (Est.)	South Litchfeld Rd. to BNSF RR Spur	2,420'	Proposed	

6.2 Onsite Drainage Improvements

With the exemptions described below, onsite pavement runoff can be collected in catch basins and scuppers along Peoria Avenue, and where needed, conveyed through storm drain laterals to the nearest offsite channel or culvert. Differences in frequency and time of concentration between offsite and onsite design events, added to the excess capacity of the offsite channels related to the future reduction of offsite peak flows resulting from build-out of the watershed make viable the use of offsite facilities as outfall for onsite runoff. First-flush requirements would need to be addressed during design in order to satisfy water quality policies.

Segments of Peoria Avenue where there are no offsite channels along the roadway require storm drain trunk lines to collect flows from laterals and convey them to the nearest outfall. Such is the case in the segments between the Beardsley Canal and Perryville Road, SR 303L and Sarival Avenue, Reems Road and Bullard Avenue, and between the BNSF Railroad spur and Dysart Road. However, future development on either side of Peoria Avenue may be able to accommodate pavement runoff within their onsite retention and therefore eliminate the need for trunk lines. The onsite retention alternative is more viable where parcels of land on both sides of the roadway are undeveloped, as opposed to segments where existing private retention basins on one side may have insufficient capacity to accept larger volumes from a wider-than-existing half of Peoria Avenue.

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road



Points of Concentration along Corridor Centerline

Not to Scale

N

Legend

- Peoria Avenue
- Crossroads
- Floodplain
- Point of Concentration
- Direction of Flow

Peak Flows at Concentration Points (cfs)

Point	Q_{100}	Q_{50}	Point	Q_{100}	Q_{50}
1	2657	2104	6	573	94
2	150	87	7	65	22
3	5	0	8	66	20
4	518	80	9	724	585
5	92	8	10	11	0

Andes Engineering

Source: FCDMC – White Tanks ADMPU HEC-1 Model (2009) – Future Conditions with CIP

April 2011

Figure 15 – Points of Concentration along Corridor Centerline

7.0 REFERENCES

- Loop 303 Corridor / White Tanks Area Drainage Master Plan Update
  Existing Condition Hydrology
  URS for FCDMC
  November 2002

- Loop 303 Corridor / White Tanks Area Drainage Master Plan Update
  Final Volume IV – Level III Area Drainage Master Plan Update Report
  URS for FCDMC
  February 2005

- Preliminary Ground Subsidence and Earth Fissure Evaluation
  Reems Road Channel and Basin – Maricopa County, Arizona
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  2007

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  AMEC Earth & Environmental, Inc. for FCDMC
  2003

- Estrella Freeway, SR 303L – Initial Drainage Report
  Stage II Design (30%); Peoria Avenue – Bell Road
  PB Americas, Inc. for ADOT
  2007

- Estrella Freeway, SR 303L – Initial Drainage Report
  Stage II Design (30%); Thomas Road – Peoria Avenue
  PB Americas, Inc. for ADOT
  2008

- Jackrabbit Trail Access Control and Corridor Improvement Study
  Interstate 10 to Bell Road
  Conceptual Drainage Report
  Andes Engineering for MCDOT
  2008

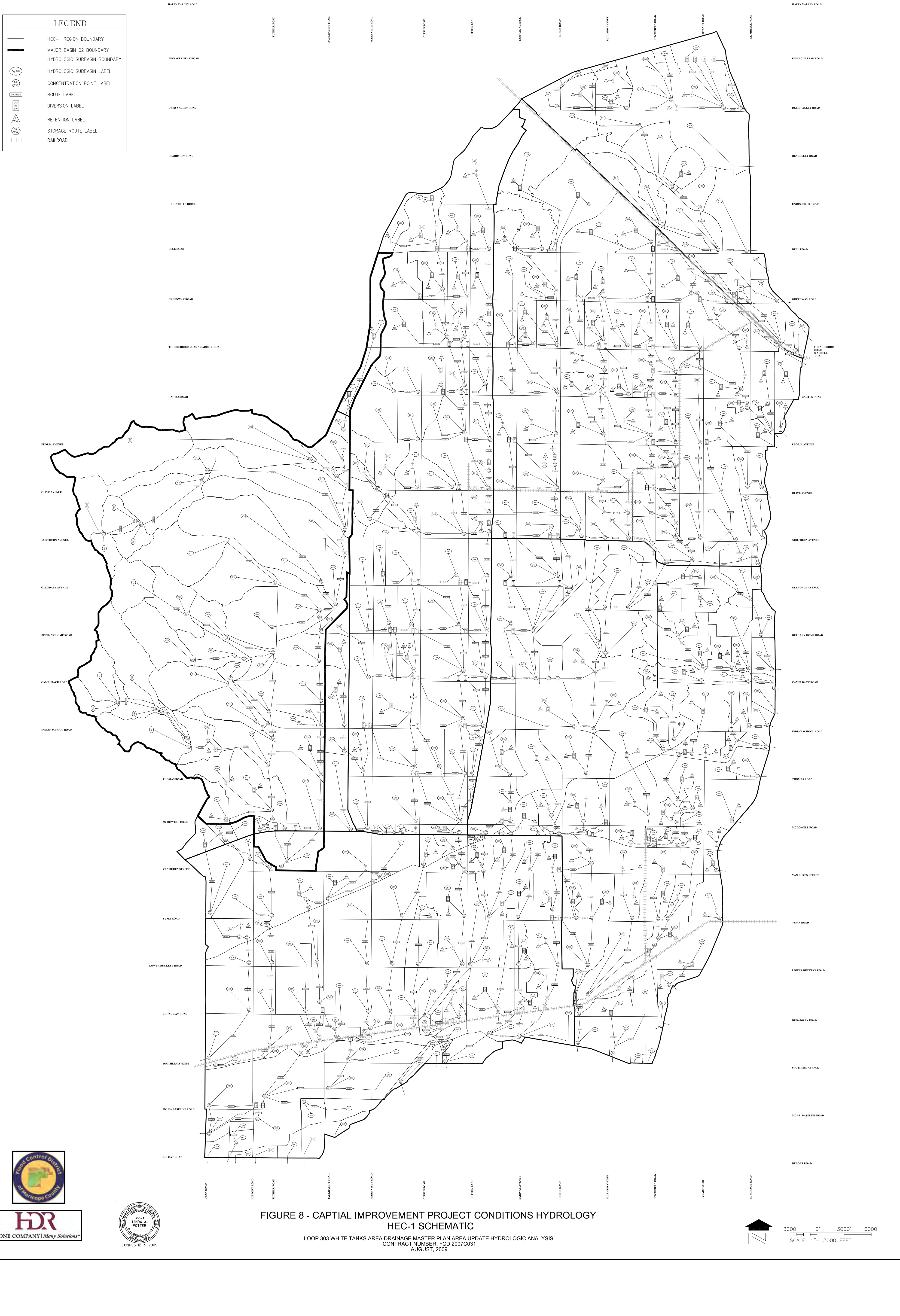
- ADWR Hydrologic Map Series Report No. 12
  Maps Showing Groundwater Conditions in the West Salt River, East Salt River, Lake Pleasant, Carefree and Fountain Hills Sub-basins of the Phoenix Active Management Area, Maricopa, Pinal and Yavapai Counties
  R.W. Reeter and W.H. Remick
  1983

- ADWR Hydrologic Map Series Report No. 35
  Maps Showing Groundwater Conditions in the Phoenix Active Management Area, Maricopa, Pinal and Yavapai Counties
  S.J. Rascona
  2003

- Developer Drainage Reports for: Phase 2 of Zanjero Trails, Prasada, Dysart High School #4 (Shadow Ridge High School), Sycamore Farms, Rancho Gabriela, Greer Ranch, Mountain Gate, Skyway Business Park and Desert Cove Commercial Park. Included in Appendix VI

APPENDIX I

ORIGINAL HYDROLOGY DATA



ONE COMPANY | Many Solutions

35571
LINDA A.
POTTER
EXPIRES 12-31-2009

FIGURE 8 - CAPTIAL IMPROVEMENT PROJECT CONDITIONS HYDROLOGY
HEC-1 SCHEMATIC

LOOP 303 WHITE TANKS AREA DRAINAGE MASTER PLAN AREA UPDATE HYDROLOGIC ANALYSIS
CONTRACT NUMBER: FCD 2007C031
AUGUST, 2009

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1****************************************                                     ****************************************
 *                                      *                                     *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                     *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN  1998                *                                     *   HYDROLOGIC ENGINEERING CENTER      *
 *         VERSION 4.1                  *                                     *        609 SECOND STREET             *
 *                                      *                                     *     DAVIS, CALIFORNIA 95616          *
 * RUN DATE   07JAN10  TIME  13:32:37   *                                     *        (916) 756-1104                *
 *                                      *                                     *                                      *
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                                            X     X  X        X     X        XX
                                            X     X  X        X               X
                                            XXXXXXX  XXXX     X       XXXXX   X
                                            X     X  X        X               X
                                            X     X  X        X     X         X
                                            X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                         HEC-1 INPUT                                         PAGE  1

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           2       ID        L303_FU_CIP_MB01 - Loop 303/ White Tanks ADMPU AHA
           3       ID        100 YEAR
           4       ID        24 Hour Storm
           5       ID        Unit Hydrograph: S-Graph
           6       ID        08/18/2009
           7       ID
           8       ID    FCDMC CONTRACT 2007C031
           9       ID    BY HDR ENGINEERING (#79902)
          10       ID    FUTURE CONDITIONS WITH CIP-AUGUST 2009
          11       ID    MAJOR BASIN 01
          12       ID    FILE NAME: FCIP-MB1.DAT
          13       ID
          14       ID      ************************************************************************
          15       ID
          16       ID      FOLLOWING ARE THE CHANGES BY FCDMC:
          17       ID      1. Storage routing correction: removed SRD14. - JWH 10-16-09
          18       ID      2. Diversion RMSBSN correction: replaced DQ card.
          19       ID      3. Routing RRMS correction: replace RY card. - JWH 01-07-2010
          20       ID      FILE NAME: WT1FC02.DAT
          21       ID
          22       ID      For details concerning changes to this HEC-1 model, please contact
          23       ID      FCDMC, H&H Branch.
          24       ID
          25       ID      ************************************************************************
          26       ID
          27       IT      5       0       0    2000
          28       IN     15
          29       IO      5
                   *DIAGRAM
                   *
          30       JD   3.480  0.0001
          31       PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
          32       PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
          33       PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
          34       PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
          35       PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
          36       PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
          37       PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
          38       PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
          39       PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
          40       PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
          41       JD   3.393     5.0
          42       JD   3.306    10.0
          43       JD   3.219    20.0
          44       JD   3.132    30.0
          45       JD   3.028    60.0
          46       JD   2.965    90.0
          47       JD   2.927   120.0
                   *
1                                         HEC-1 INPUT                                         PAGE  2

         LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          48       KK     N07BASIN
          49       KM        BASIN BOUNDARY FROM CORTE BELLA AND MCMICKEN DAM
          50       BA   0.570
          51       LG     0.16    0.25    5.40    0.30      61
          52       UI        0     107     405     604     990     931     612     389     172     105
          53       UI       36      29      29       0       0       0       0       0       0       0
          54       UI        0       0       0       0       0       0       0       0       0       0
          55       UI        0       0       0       0       0       0       0       0       0       0
          56       UI        0       0       0       0       0       0       0       0       0       0
                   *
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WT1FC02.OUT

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+                          RN25      376.   12.00          38.        12.         4.        .49
            HYDROGRAPH AT
+                        DN25RE      766.   12.25          70.        20.         7.        .49
            3 COMBINED AT
+                         CPN25      911.   12.33         133.        39.        13.        .88
            ROUTED TO
+                        N25N26      801.   12.42         132.        39.        13.        .88
            HYDROGRAPH AT
+                           N26      320.   12.33          43.        14.         5.        .26
            DIVERSION TO
+                          RN26      320.   12.33          43.        13.         4.        .26
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+                        DN26RE        6.   17.58           4.         1.         0.        .26
            2 COMBINED AT
+                         CPN26      801.   12.42         133.        40.        13.       1.14
            HYDROGRAPH AT
+                           N19      372.   12.08          35.        11.         4.        .18
            HYDROGRAPH AT
+                           N23      833.   12.25          90.        29.        10.        .52
            DIVERSION TO
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            ROUTED TO
+                        N23N24      627.   12.33          86.        24.         8.        .52
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+                          RN24      388.   12.17          22.         6.         2.        .25
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+                         DUMMY     1605.   12.42         269.        80.        27.       2.21
            4 COMBINED AT
+                         DUMMY     8156.   12.58        1574.       481.       162.      15.78
            HYDROGRAPH AT
+                           D03      960.   12.25         110.        34.        11.        .72
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            ROUTED TO
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+                          RD04     1118.   12.33          85.        24.         8.        .89
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+                        DD04RE     1065.   12.42          72.        20.         7.        .89
            2 COMBINED AT
+                         CPD04     1062.   12.42          95.        28.         9.       1.61
            DIVERSION TO
+                         DD04S      647.   12.42          30.         7.         2.       1.61
            HYDROGRAPH AT
+                        DD04SE      414.   12.42          65.        21.         7.       1.61
            ROUTED TO
+                        D04D05      308.   12.67          64.        21.         7.       1.61
            HYDROGRAPH AT
+                           D05      325.   12.17          35.        12.         4.        .16
            DIVERSION TO
+                          RD05      137.   11.92          13.         4.         1.        .16
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+	HYDROGRAPH AT	DD05RE	325.	12.17	27.	8.	3.	.16
+	2 COMBINED AT	CPD05	337.	12.67	89.	28.	9.	1.78
+	ROUTED TO	D05D14	272.	12.83	88.	28.	9.	1.78
+	DIVERSION TO	DD141S	150.	12.83	17.	4.	1.	1.78
+	HYDROGRAPH AT	DD141	122.	12.17	71.	24.	8.	1.78
+	ROUTED TO	D05D15	122.	12.92	70.	24.	8.	1.78
+	HYDROGRAPH AT	D11	807.	12.33	108.	34.	11.	.66
+	DIVERSION TO	RD11	807.	12.33	64.	18.	6.	.66
+	HYDROGRAPH AT	DD11RE	686.	12.50	55.	16.	5.	.66
+	DIVERSION TO	DD111S	564.	12.50	44.	12.	4.	.66
+	HYDROGRAPH AT	DD111	122.	12.50	11.	3.	1.	.66
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+	HYDROGRAPH AT	DD12RE	210.	12.67	23.	7.	2.	.35
+	2 COMBINED AT	CPD12	258.	12.67	28.	8.	3.	1.01
+	DIVERSION TO	DD121S	111.	12.67	10.	3.	1.	1.01
+	HYDROGRAPH AT	DD121	146.	12.67	18.	6.	2.	1.01
+	DIVERSION TO	DD122S	60.	12.67	9.	3.	1.	1.01
+	HYDROGRAPH AT	DD122	86.	12.67	10.	3.	1.	1.01
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+	HYDROGRAPH AT	DD04SE	647.	12.42	30.	7.	2.	1.61
+	ROUTED TO	D04D13	189.	13.50	30.	7.	2.	1.61
+	3 COMBINED AT	CPD13	220.	13.50	38.	10.	3.	3.65
+	DIVERSION TO	DD131S	8.	13.50	1.	0.	0.	3.65
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+	HYDROGRAPH AT	DD132	164.	13.50	29.	8.	3.	3.65
+	ROUTED TO	D13D14	136.	14.00	28.	8.	3.	3.65
+	HYDROGRAPH AT	D14	1126.	12.42	157.	50.	17.	.94

+	DIVERSION TO	RD14	1126.	12.42	150.	41.	14.	.94
+	HYDROGRAPH AT	DD14RE	64.	13.50	26.	9.	3.	.94
+	HYDROGRAPH AT	DD141	150.	12.83	17.	4.	1.	1.78
+	ROUTED TO	D0514A	122.	13.08	17.	4.	1.	1.78
+	3 COMBINED AT	CPD14	188.	14.00	67.	21.	7.	4.76
+	DIVERSION TO	DD142S	171.	14.00	61.	19.	6.	4.76
+	HYDROGRAPH AT	DD142	17.	14.00	6.	2.	1.	4.76
+	ROUTED TO	D14D15	16.	14.25	6.	2.	1.	4.76
+	HYDROGRAPH AT	D15	421.	12.17	44.	14.	5.	.22
+	DIVERSION TO	RD15	3.	1.00	1.	0.	0.	.22
+	HYDROGRAPH AT	DD15RE	421.	12.17	44.	14.	5.	.22
+	3 COMBINED AT	CPD15	423.	12.17	113.	40.	13.	4.98
+	ROUTED TO	D15D26	359.	12.42	113.	40.	13.	4.98
+	ROUTED TO	D15D28	324.	12.58	112.	40.	13.	4.98
+	HYDROGRAPH AT	D28	428.	12.17	39.	12.	4.	.25
+	DIVERSION TO	RD28	3.	4.08	2.	0.	0.	.25
+	HYDROGRAPH AT	DD28RE	428.	12.17	39.	12.	4.	.25
+	2 COMBINED AT	CPD28	481.	12.25	147.	51.	17.	5.23
+	ROUTED TO	D28AFR	467.	12.25	146.	51.	17.	5.23
+	HYDROGRAPH AT	D26	1103.	12.17	107.	33.	11.	.64
+	DIVERSION TO	RD26	1103.	12.17	107.	31.	10.	.64
+	HYDROGRAPH AT	DD26RE	13.	16.58	9.	3.	1.	.64
+	HYDROGRAPH AT	DD142	171.	14.00	61.	19.	6.	4.76
+	ROUTED TO	D14D26	159.	14.25	60.	19.	6.	4.76
+	2 COMBINED AT	CPD26	153.	14.25	62.	21.	7.	5.40
+	ROUTED TO	D26D27	150.	14.42	62.	21.	7.	5.40
+	HYDROGRAPH AT	D27	498.	12.17	52.	17.	6.	.32
+	DIVERSION TO	RD27	100.	11.92	13.	4.	1.	.32
+	HYDROGRAPH AT	DD27RE	498.	12.17	45.	12.	4.	.32
+	2 COMBINED AT	CPD27	491.	12.17	100.	33.	11.	5.72
+	ROUTED TO	SRD27	491.	12.17	100.	33.	11.	5.72
+	ROUTED TO	D27D42	345.	12.58	96.	33.	11.	5.72
+	HYDROGRAPH AT	D20	595.	12.33	72.	22.	7.	.50
+	DIVERSION TO	RD20	595.	12.33	72.	21.	7.	.50
	HYDROGRAPH AT							

+		DD20RE	6.	18.33	5.	1.	0.	.50
+	HYDROGRAPH AT	DD111	564.	12.50	44.	12.	4.	.66
+	ROUTED TO	D11D20	292.	12.92	42.	12.	4.	.66
+	2 COMBINED AT	CPD20	291.	12.92	42.	14.	5.	1.16
+	ROUTED TO	D20D21	210.	13.42	40.	14.	5.	1.16
+	HYDROGRAPH AT	D21	565.	12.33	72.	22.	7.	.50
+	DIVERSION TO	RD21	565.	12.33	72.	20.	7.	.50
+	HYDROGRAPH AT	DD21RE	9.	15.92	6.	2.	1.	.50
+	HYDROGRAPH AT	DD112	45.	12.50	6.	2.	1.	.66
+	ROUTED TO	D11D21	20.	13.33	5.	2.	1.	.66
+	HYDROGRAPH AT	DD121	111.	12.67	10.	3.	1.	1.01
+	ROUTED TO	D12D21	76.	12.83	9.	3.	1.	1.01
+	4 COMBINED AT	CPD21	244.	13.33	57.	20.	7.	2.00
+	DIVERSION TO	DD211S	172.	13.33	43.	15.	5.	2.00
+	HYDROGRAPH AT	DD211	72.	13.33	15.	5.	2.	2.00
+	DIVERSION TO	DD212S	44.	13.33	11.	4.	1.	2.00
+	HYDROGRAPH AT	DD212	28.	13.33	4.	1.	0.	2.00
+	ROUTED TO	D21D22	18.	13.75	3.	1.	0.	2.00
+	HYDROGRAPH AT	D22	562.	12.33	67.	21.	7.	.45
+	DIVERSION TO	RD22	562.	12.33	67.	19.	6.	.45
+	HYDROGRAPH AT	DD22RE	8.	16.75	5.	2.	1.	.45
+	HYDROGRAPH AT	DD122	60.	12.67	9.	3.	1.	1.01
+	ROUTED TO	D12D22	35.	13.25	8.	3.	1.	1.01
+	3 COMBINED AT	CPD22	37.	13.67	14.	5.	2.	2.46
+	ROUTED TO	D22D23	35.	13.83	14.	5.	2.	2.46
+	HYDROGRAPH AT	D23	649.	12.33	82.	25.	8.	.54
+	DIVERSION TO	RD23	649.	12.33	82.	25.	8.	.54
+	HYDROGRAPH AT	DD23RE	5.	23.08	2.	0.	0.	.54
+	HYDROGRAPH AT	DD131	8.	13.50	1.	0.	0.	3.65
+	ROUTED TO	D13D23	6.	14.08	1.	0.	0.	3.65
+	3 COMBINED AT	CPD23	38.	13.92	14.	6.	2.	5.64
+	DIVERSION TO	DD231S	4.	13.92	1.	1.	0.	5.64
+	HYDROGRAPH AT	DD231	34.	13.92	13.	5.	2.	5.64
+	DIVERSION TO	DD232S	4.	13.92	2.	1.	0.	5.64
+	HYDROGRAPH AT	DD232	30.	13.92	11.	5.	2.	5.64

+	ROUTED TO	D23D24	29.	14.17	11.	5.	2.	5.64
+	HYDROGRAPH AT	D24	538.	12.42	71.	21.	7.	.49
+	DIVERSION TO	RD24	538.	12.42	71.	21.	7.	.49
+	HYDROGRAPH AT	DD24RE	4.	21.08	2.	1.	0.	.49
+	HYDROGRAPH AT	DD132	48.	13.50	8.	2.	1.	3.65
+	ROUTED TO	D13D24	40.	13.92	8.	2.	1.	3.65
+	3 COMBINED AT	CPD24	64.	14.00	18.	7.	2.	6.13
+	ROUTED TO	D24D25	62.	14.25	18.	7.	2.	6.13
+	HYDROGRAPH AT	D25	574.	12.33	72.	22.	7.	.50
+	DIVERSION TO	RD25	574.	12.33	69.	19.	6.	.50
+	HYDROGRAPH AT	DD25RE	21.	13.58	9.	3.	1.	.50
+	2 COMBINED AT	CPD25	69.	14.25	25.	9.	3.	6.63
+	ROUTED TO	D25D39	67.	14.42	25.	9.	3.	6.63
+	HYDROGRAPH AT	D39	354.	12.08	30.	9.	3.	.18
+	DIVERSION TO	RD39	354.	12.08	30.	9.	3.	.18
+	HYDROGRAPH AT	DD39RE	0.	.00	0.	0.	0.	.18
+	2 COMBINED AT	CPD39	67.	14.42	25.	9.	3.	6.81
+	ROUTED TO	D39D42	52.	15.42	24.	9.	3.	6.81
+	HYDROGRAPH AT	D42	1338.	12.25	155.	48.	16.	.99
+	DIVERSION TO	RD42	1338.	12.25	142.	38.	13.	.99
+	HYDROGRAPH AT	DD42RE	123.	12.83	28.	9.	3.	.99
+	3 COMBINED AT	CPD42	345.	12.58	143.	52.	17.	9.87
+	ROUTED TO	SRD42	178.	12.83	118.	44.	15.	9.87
+	ROUTED TO	D42D53	174.	13.08	117.	44.	15.	9.87
+	HYDROGRAPH AT	D53	195.	12.17	16.	5.	2.	.12
+	DIVERSION TO	RD53	195.	12.17	16.	5.	2.	.12
+	HYDROGRAPH AT	DD53RE	0.	.00	0.	0.	0.	.12
+	2 COMBINED AT	CPD53	174.	13.08	117.	44.	15.	9.99
+	ROUTED TO	SRD53	54.	21.08	36.	10.	3.	9.99
+	ROUTED TO	D53D54	46.	21.67	35.	10.	3.	9.99
+	HYDROGRAPH AT	D43	651.	12.33	77.	24.	8.	.50
+	DIVERSION TO	RD43	651.	12.33	72.	19.	6.	.50
+	HYDROGRAPH AT	DD43RE	43.	13.08	13.	5.	2.	.50
+	ROUTED TO	D43D54	27.	14.25	13.	5.	2.	.50
+	HYDROGRAPH AT	D54	369.	12.25	34.	10.	3.	.27

+	DIVERSION TO	RD54	290.	12.17	16.	5.	2.	.27
+	HYDROGRAPH AT	DD54RE	369.	12.25	21.	6.	2.	.27
+	3 COMBINED AT	CPD54	335.	12.25	36.	18.	6.	10.76
+	HYDROGRAPH AT	D44	625.	12.33	78.	24.	8.	.54
+	DIVERSION TO	RD44	625.	12.33	60.	16.	5.	.54
+	HYDROGRAPH AT	DD44RE	323.	12.58	26.	8.	3.	.54
+	HYDROGRAPH AT	D55	249.	12.25	24.	7.	2.	.19
+	DIVERSION TO	RD55	249.	12.25	20.	5.	2.	.19
+	HYDROGRAPH AT	DD55RE	92.	12.50	7.	2.	1.	.19
+	HYDROGRAPH AT	D56	276.	12.25	30.	9.	3.	.22
+	DIVERSION TO	RD56	103.	12.00	8.	2.	1.	.22
+	HYDROGRAPH AT	DD56RE	276.	12.25	25.	7.	2.	.22
+	4 COMBINED AT	DUMMY	587.	12.25	76.	32.	11.	11.71
+	3 COMBINED AT	DUMMY	8183.	12.50	1649.	512.	172.	32.72
+	HYDROGRAPH AT	D52	658.	12.42	82.	24.	8.	.59
+	DIVERSION TO	RD52	12.	10.67	7.	2.	1.	.59
+	HYDROGRAPH AT	DD52RE	658.	12.42	81.	22.	7.	.59
+	ROUTED TO	D52D66	441.	13.08	81.	22.	7.	.59
+	HYDROGRAPH AT	D66	440.	12.25	49.	16.	5.	.30
+	DIVERSION TO	RD66	440.	12.25	49.	16.	5.	.30
+	HYDROGRAPH AT	DD66RE	0.	.00	0.	0.	0.	.30
+	2 COMBINED AT	CPD66	441.	13.08	81.	22.	7.	.89
+	ROUTED TO	D66D67	435.	13.17	81.	22.	7.	.89
+	HYDROGRAPH AT	D67	467.	12.25	52.	17.	6.	.32
+	DIVERSION TO	RD67	317.	12.08	24.	7.	2.	.32
+	HYDROGRAPH AT	DD67RE	467.	12.25	34.	10.	3.	.32
+	2 COMBINED AT	CPD67	550.	12.33	114.	31.	10.	1.20
+	HYDROGRAPH AT	D76	171.	12.25	19.	6.	2.	.11
+	DIVERSION TO	RD76	128.	12.08	9.	3.	1.	.11
+	HYDROGRAPH AT	DD76RE	171.	12.25	12.	3.	1.	.11
+	ROUTED TO	D76D77	143.	12.33	12.	3.	1.	.11
+	HYDROGRAPH AT	D77	630.	12.17	65.	22.	7.	.36
+	2 COMBINED AT	CPD77	665.	12.25	76.	25.	8.	.47
+	3 COMBINED AT	DUMMY	8751.	12.50	1804.	558.	188.	34.40
	HYDROGRAPH AT							

+		D35	444.	12.17	38.	12.	4.	.25
+	DIVERSION TO	RD35	444.	12.17	38.	12.	4.	.25
+	HYDROGRAPH AT	DD35RE	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	DD231	4.	13.92	1.	1.	0.	5.64
+	ROUTED TO	D23D35	3.	14.50	1.	1.	0.	5.64
+	2 COMBINED AT	CPD35	3.	14.50	1.	1.	0.	5.90
+	DIVERSION TO	DD35S	1.	14.50	0.	0.	0.	5.90
+	HYDROGRAPH AT	DD35SE	3.	14.50	1.	0.	0.	5.90
+	ROUTED TO	D35D38	3.	15.17	1.	0.	0.	5.90
+	HYDROGRAPH AT	D38	446.	12.25	52.	16.	5.	.32
+	DIVERSION TO	RD38	446.	12.25	52.	16.	5.	.32
+	HYDROGRAPH AT	DD38RE	0.	.00	0.	0.	0.	.32
+	HYDROGRAPH AT	DD232	4.	13.92	2.	1.	0.	5.64
+	ROUTED TO	D23D38	4.	14.83	1.	1.	0.	5.64
+	3 COMBINED AT	CPD38	6.	14.92	2.	1.	0.	6.22
+	ROUTED TO	D38D40	5.	16.33	2.	1.	0.	6.22
+	HYDROGRAPH AT	D32	361.	12.25	38.	12.	4.	.25
+	DIVERSION TO	RD32	361.	12.25	38.	12.	4.	.25
+	HYDROGRAPH AT	DD32RE	0.	.00	0.	0.	0.	.25
+	DIVERSION TO	DD32S	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	DD32SE	0.	.00	0.	0.	0.	.25
+	ROUTED TO	D32D33	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	D31	667.	12.25	73.	22.	7.	.50
+	DIVERSION TO	RD31	667.	12.25	73.	22.	7.	.50
+	HYDROGRAPH AT	DD31RE	0.	.00	0.	0.	0.	.50
+	HYDROGRAPH AT	DD211	172.	13.33	43.	15.	5.	2.00
+	ROUTED TO	D21D31	166.	13.50	42.	15.	5.	2.00
+	2 COMBINED AT	CPD31	166.	13.50	42.	15.	5.	2.50
+	ROUTED TO	D31D33	150.	13.67	42.	15.	5.	2.50
+	HYDROGRAPH AT	D33	377.	12.25	38.	12.	4.	.25
+	DIVERSION TO	RD33	377.	12.25	35.	9.	3.	.25
+	HYDROGRAPH AT	DD33RE	31.	12.75	7.	2.	1.	.25
+	3 COMBINED AT	CPD33	160.	13.67	48.	17.	6.	3.00
+	DIVERSION TO	DD331S	87.	13.67	26.	9.	3.	3.00
+	HYDROGRAPH AT	DD331	73.	13.67	22.	8.	3.	3.00

+	DIVERSION TO	DD332S	34.	13.67	11.	4.	1.	3.00
+	HYDROGRAPH AT	DD332	39.	13.67	11.	4.	1.	3.00
+	ROUTED TO	D33D34	34.	14.08	11.	4.	1.	3.00
+	HYDROGRAPH AT	D34	697.	12.25	75.	24.	8.	.50
+	DIVERSION TO	RD34	697.	12.25	75.	24.	8.	.50
+	HYDROGRAPH AT	DD34RE	0.	.00	0.	0.	0.	.50
+	HYDROGRAPH AT	DD212	44.	13.33	11.	4.	1.	2.00
+	ROUTED TO	D21D34	38.	13.75	11.	4.	1.	2.00
+	3 COMBINED AT	CPD34	67.	13.92	22.	8.	3.	3.50
+	ROUTED TO	D34D36	62.	14.33	21.	8.	3.	3.50
+	HYDROGRAPH AT	D36	404.	12.17	38.	12.	4.	.25
+	DIVERSION TO	RD36	404.	12.17	35.	9.	3.	.25
+	HYDROGRAPH AT	DD36RE	22.	12.75	7.	2.	1.	.25
+	HYDROGRAPH AT	DD35SE	1.	14.50	0.	0.	0.	5.90
+	ROUTED TO	D35D36	0.	15.25	0.	0.	0.	5.90
+	3 COMBINED AT	CPD36	63.	14.42	24.	9.	3.	7.64
+	DIVERSION TO	DD361S	58.	14.42	22.	9.	3.	7.64
+	HYDROGRAPH AT	DD361	5.	14.42	2.	1.	0.	7.64
+	DIVERSION TO	DD362S	5.	14.42	2.	1.	0.	7.64
+	HYDROGRAPH AT	DD362	0.	.00	0.	0.	0.	7.64
+	ROUTED TO	D36D40	0.	.00	0.	0.	0.	7.64
+	HYDROGRAPH AT	D40	451.	12.17	40.	12.	4.	.24
+	DIVERSION TO	RD40	451.	12.17	40.	12.	4.	.24
+	HYDROGRAPH AT	DD40RE	0.	.00	0.	0.	0.	.24
+	3 COMBINED AT	CPD40	5.	16.33	2.	1.	0.	8.20
+	ROUTED TO	D4049A	4.	16.83	2.	1.	0.	8.20
+	ROUTED TO	D4049B	4.	17.25	2.	1.	0.	8.20
+	HYDROGRAPH AT	D47	1066.	12.42	152.	47.	16.	1.00
+	DIVERSION TO	RD47	1066.	12.42	152.	47.	16.	1.00
+	HYDROGRAPH AT	DD47RE	0.	.00	0.	0.	0.	1.00
+	HYDROGRAPH AT	DD32SE	0.	.00	0.	0.	0.	.25
+	ROUTED TO	D3247A	0.	.00	0.	0.	0.	.25
+	ROUTED TO	D3247B	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	DD331	87.	13.67	26.	9.	3.	3.00
+	ROUTED TO	D3347A	78.	14.00	26.	9.	3.	3.00

+	ROUTED TO	D3347B	74.	14.25	25.	9.	3.	3.00
+	3 COMBINED AT	CPD47	74.	14.25	25.	9.	3.	3.99
+	DIVERSION TO	DD47S	65.	14.25	22.	8.	3.	3.99
+	HYDROGRAPH AT	DD47SE	9.	14.25	3.	1.	0.	3.99
+	ROUTED TO	D47D48	7.	15.42	3.	1.	0.	3.99
+	HYDROGRAPH AT	D48	949.	12.50	134.	39.	13.	1.00
+	DIVERSION TO	RD48	949.	12.50	134.	39.	13.	1.00
+	HYDROGRAPH AT	DD48RE	1.	22.08	0.	0.	0.	1.00
+	HYDROGRAPH AT	DD332	34.	13.67	11.	4.	1.	3.00
+	ROUTED TO	D33D48	28.	14.83	10.	4.	1.	3.00
+	HYDROGRAPH AT	DD361	58.	14.42	22.	9.	3.	7.64
+	ROUTED TO	D3648A	53.	14.92	22.	9.	3.	7.64
+	ROUTED TO	D3648B	52.	15.08	22.	9.	3.	7.64
+	4 COMBINED AT	CPD48	74.	15.08	32.	13.	4.	9.63
+	DIVERSION TO	DD481S	63.	15.08	28.	11.	4.	9.63
+	HYDROGRAPH AT	DD481	11.	15.08	5.	2.	1.	9.63
+	DIVERSION TO	DD482S	3.	15.08	1.	0.	0.	9.63
+	HYDROGRAPH AT	DD482	8.	15.08	4.	1.	0.	9.63
+	ROUTED TO	D48D49	8.	15.42	4.	1.	0.	9.63
+	HYDROGRAPH AT	D49	724.	12.25	75.	24.	8.	.49
+	DIVERSION TO	RD49	27.	11.17	11.	4.	1.	.49
+	HYDROGRAPH AT	DD49RE	724.	12.25	73.	20.	7.	.49
+	HYDROGRAPH AT	DD362	5.	14.42	2.	1.	0.	7.64
+	ROUTED TO	D36D49	4.	16.00	2.	1.	0.	7.64
+	4 COMBINED AT	CPD49	724.	12.25	78.	23.	8.	10.69
+	ROUTED TO	D49D63	519.	12.33	72.	22.	7.	10.69
+	HYDROGRAPH AT	D60	710.	12.17	87.	30.	10.	.40
+	DIVERSION TO	RD60	710.	12.17	70.	20.	7.	.40
+	HYDROGRAPH AT	DD60RE	192.	12.50	31.	10.	3.	.40
+	HYDROGRAPH AT	DD481	63.	15.08	28.	11.	4.	9.63
+	ROUTED TO	D48D60	61.	15.33	27.	11.	4.	9.63
+	2 COMBINED AT	CPD60	304.	12.50	57.	22.	7.	10.04
+	ROUTED TO	D60D63	106.	12.67	49.	19.	6.	10.04
+	HYDROGRAPH AT	D63	454.	12.08	49.	17.	6.	.22
	DIVERSION TO							

+		RD63	454.	12.08	43.	12.	4.	.22
+	HYDROGRAPH AT	DD63RE	47.	12.58	14.	5.	2.	.22
+	HYDROGRAPH AT	DD482	3.	15.08	1.	0.	0.	9.63
+	ROUTED TO	D48D63	2.	19.42	1.	0.	0.	9.63
+	4 COMBINED AT	CPD63	519.	12.33	128.	46.	15.	11.31
+	ROUTED TO	SRD63	105.	13.50	85.	45.	15.	11.31
+	ROUTED TO	D63D64	104.	13.92	84.	45.	15.	11.31
+	HYDROGRAPH AT	D62	492.	12.17	54.	18.	6.	.25
+	DIVERSION TO	RD62	492.	12.17	45.	13.	4.	.25
+	HYDROGRAPH AT	DD62RE	82.	12.42	17.	6.	2.	.25
+	DIVERSION TO	DD621S	60.	12.42	13.	4.	1.	.25
+	HYDROGRAPH AT	DD621	22.	12.42	4.	1.	0.	.25
+	DIVERSION TO	DD622S	9.	12.42	2.	1.	0.	.25
+	HYDROGRAPH AT	DD622	13.	12.42	2.	1.	0.	.25
+	ROUTED TO	D62D64	5.	13.42	2.	1.	0.	.25
+	HYDROGRAPH AT	D64	534.	12.17	59.	20.	7.	.27
+	DIVERSION TO	RD64	534.	12.17	48.	13.	4.	.27
+	HYDROGRAPH AT	DD64RE	133.	12.42	21.	7.	2.	.27
+	3 COMBINED AT	CPD64	127.	13.75	98.	51.	17.	11.84
+	ROUTED TO	D64D74	125.	14.33	98.	51.	17.	11.84
+	HYDROGRAPH AT	D73A	389.	12.17	40.	13.	4.	.24
+	DIVERSION TO	RD73A	389.	12.17	24.	7.	2.	.24
+	HYDROGRAPH AT	DD73AR	303.	12.25	21.	6.	2.	.24
+	HYDROGRAPH AT	DD621	60.	12.42	13.	4.	1.	.25
+	ROUTED TO	D6273A	37.	12.92	12.	4.	1.	.25
+	2 COMBINED AT	CPD73A	303.	12.25	33.	10.	3.	.49
+	ROUTED TO	D73A74	145.	12.42	31.	10.	3.	.49
+	HYDROGRAPH AT	D74	538.	12.25	70.	24.	8.	.31
+	DIVERSION TO	RD74	538.	12.25	61.	17.	6.	.31
+	HYDROGRAPH AT	DD74RE	77.	12.67	21.	7.	2.	.31
+	HYDROGRAPH AT	DD622	9.	12.42	2.	1.	0.	.25
+	ROUTED TO	D62D74	5.	14.50	2.	1.	0.	.25
+	4 COMBINED AT	CPD74	174.	14.17	130.	66.	22.	12.39
+	ROUTED TO	SRD74	111.	18.08	101.	62.	22.	12.39
+	HYDROGRAPH AT	D78A	307.	12.25	41.	14.	5.	.18

+	DIVERSION TO	RD78A	307.	12.25	36.	10.	3.	.18
+	HYDROGRAPH AT	DD78AR	45.	12.75	12.	4.	1.	.18
+	2 COMBINED AT	CPD78A	117.	17.92	106.	66.	23.	12.58
+	ROUTED TO	D78ACP	117.	18.00	106.	65.	23.	12.58
+	HYDROGRAPH AT	D41	557.	12.08	47.	14.	5.	.25
+	DIVERSION TO	RD41	557.	12.08	47.	14.	5.	.25
+	HYDROGRAPH AT	DD41RE	4.	19.25	2.	1.	0.	.25
+	ROUTED TO	D41D50	3.	21.42	2.	1.	0.	.25
+	HYDROGRAPH AT	D50	774.	12.25	92.	29.	10.	.50
+	DIVERSION TO	RD50	774.	12.25	92.	26.	9.	.50
+	HYDROGRAPH AT	DD50RE	11.	16.00	8.	3.	1.	.50
+	2 COMBINED AT	CPD50	11.	16.00	9.	3.	1.	.76
+	ROUTED TO	D5064A	10.	17.75	8.	3.	1.	.76
+	HYDROGRAPH AT	D64A	748.	12.25	80.	26.	9.	.50
+	DIVERSION TO	RD64A	748.	12.25	80.	26.	9.	.50
+	HYDROGRAPH AT	DD64AR	0.	.00	0.	0.	0.	.50
+	2 COMBINED AT	CPD64A	10.	17.75	8.	3.	1.	1.25
+	ROUTED TO	64A74A	10.	18.42	8.	3.	1.	1.25
+	HYDROGRAPH AT	D74A	775.	12.25	91.	30.	10.	.49
+	DIVERSION TO	RD74A	775.	12.25	73.	20.	7.	.49
+	HYDROGRAPH AT	DD74AR	258.	12.50	31.	10.	3.	.49
+	2 COMBINED AT	CPD74A	257.	12.50	32.	13.	4.	1.75
+	ROUTED TO	D74A78	200.	12.58	31.	13.	4.	1.75
+	2 COMBINED AT	CP7874	128.	12.67	114.	74.	26.	14.32
+	ROUTED TO	78A78B	125.	18.17	114.	73.	26.	14.32
+	HYDROGRAPH AT	D06	616.	12.33	77.	23.	8.	.46
+	DIVERSION TO	RD06	616.	12.33	60.	16.	5.	.46
+	HYDROGRAPH AT	DD06RE	252.	12.67	24.	7.	2.	.46
+	DIVERSION TO	DD06S	0.	.00	0.	0.	0.	.46
+	HYDROGRAPH AT	DD06SE	252.	12.67	24.	7.	2.	.46
+	ROUTED TO	D06D07	162.	12.75	23.	7.	2.	.46
+	HYDROGRAPH AT	D07	919.	12.50	134.	40.	13.	.89
+	DIVERSION TO	RD07	919.	12.50	116.	31.	10.	.89
+	HYDROGRAPH AT	DD07RE	250.	13.00	29.	9.	3.	.89
+	2 COMBINED AT	CPD07	348.	13.00	51.	16.	5.	1.35

+	ROUTED TO	D07D02	252.	13.08	50.	16.	5.	1.35
+	HYDROGRAPH AT	D01	1347.	12.58	212.	63.	21.	1.56
+	DIVERSION TO	RD01	1347.	12.58	184.	49.	16.	1.56
+	HYDROGRAPH AT	DD01RE	334.	13.17	46.	14.	5.	1.56
+	ROUTED TO	D01D02	146.	14.42	42.	14.	5.	1.56
+	HYDROGRAPH AT	D02	1750.	12.50	266.	80.	27.	1.84
+	DIVERSION TO	RD02	1750.	12.50	237.	63.	21.	1.84
+	HYDROGRAPH AT	DD02RE	378.	13.08	53.	17.	6.	1.84
+	3 COMBINED AT	CPD02	617.	13.08	139.	46.	15.	4.76
+	ROUTED TO	D02D10	479.	13.33	137.	46.	15.	4.76
+	HYDROGRAPH AT	D09	360.	12.33	42.	13.	4.	.26
+	DIVERSION TO	RD09	360.	12.33	29.	8.	3.	.26
+	HYDROGRAPH AT	DD09RE	225.	12.50	18.	5.	2.	.26
+	ROUTED TO	D09D10	170.	12.58	17.	5.	2.	.26
+	HYDROGRAPH AT	DD06SE	0.	.00	0.	0.	0.	.46
+	ROUTED TO	D06D10	0.	.00	0.	0.	0.	.46
+	HYDROGRAPH AT	D10	787.	12.33	104.	32.	11.	.63
+	DIVERSION TO	RD10	787.	12.33	83.	23.	8.	.63
+	HYDROGRAPH AT	DD10RE	354.	12.67	32.	10.	3.	.63
+	4 COMBINED AT	CPD10	500.	13.33	175.	59.	20.	5.65
+	ROUTED TO	D10D19	460.	13.50	173.	59.	20.	5.65
+	HYDROGRAPH AT	D08	661.	12.33	91.	29.	10.	.51
+	DIVERSION TO	RD08	661.	12.33	73.	20.	7.	.51
+	HYDROGRAPH AT	DD08RE	283.	12.67	29.	9.	3.	.51
+	ROUTED TO	D08D16	139.	13.08	28.	9.	3.	.51
+	HYDROGRAPH AT	D16	922.	12.17	116.	40.	13.	.52
+	DIVERSION TO	RD16	922.	12.17	94.	27.	9.	.52
+	HYDROGRAPH AT	DD16RE	263.	12.50	42.	13.	4.	.52
+	2 COMBINED AT	CPD16	263.	12.50	68.	22.	7.	1.03
+	DIVERSION TO	DD161S	213.	12.50	53.	17.	6.	1.03
+	HYDROGRAPH AT	DD161	50.	12.50	16.	5.	2.	1.03
+	DIVERSION TO	DD162S	19.	12.50	7.	3.	1.	1.03
+	HYDROGRAPH AT	DD162	30.	12.50	8.	3.	1.	1.03
+	ROUTED TO	D16D18	22.	13.42	8.	3.	1.	1.03
	HYDROGRAPH AT							

+		D18	321.	12.17	28.	9.	3.	.20
+	DIVERSION TO	RD18	321.	12.17	28.	9.	3.	.20
+	HYDROGRAPH AT	DD18RE	0.	21.42	0.	0.	0.	.20
+	2 COMBINED AT	CPD18	22.	13.42	8.	3.	1.	1.23
+	ROUTED TO	D18D19	20.	13.50	8.	3.	1.	1.23
+	HYDROGRAPH AT	D17	324.	12.17	28.	9.	3.	.20
+	DIVERSION TO	RD17	324.	12.17	28.	8.	3.	.20
+	HYDROGRAPH AT	DD17RE	2.	20.17	1.	0.	0.	.20
+	ROUTED TO	D17D19	2.	21.67	1.	0.	0.	.20
+	HYDROGRAPH AT	D19	577.	12.33	71.	21.	7.	.51
+	DIVERSION TO	RD19	577.	12.33	71.	20.	7.	.51
+	HYDROGRAPH AT	DD19RE	5.	18.58	4.	1.	0.	.51
+	4 COMBINED AT	CPD19	437.	13.50	174.	61.	20.	7.58
+	ROUTED TO	D19D30	372.	13.83	164.	59.	20.	7.58
+	HYDROGRAPH AT	D29	910.	12.17	114.	39.	13.	.51
+	DIVERSION TO	RD29	910.	12.17	93.	26.	9.	.51
+	HYDROGRAPH AT	DD29RE	251.	12.50	39.	13.	4.	.51
+	HYDROGRAPH AT	DD161	213.	12.50	53.	17.	6.	1.03
+	ROUTED TO	D16D29	157.	13.42	51.	17.	6.	1.03
+	2 COMBINED AT	CPD29	250.	12.50	88.	30.	10.	1.54
+	ROUTED TO	D29D30	198.	13.58	86.	30.	10.	1.54
+	HYDROGRAPH AT	D30	1541.	12.25	203.	70.	23.	.91
+	DIVERSION TO	RD30	1541.	12.25	174.	49.	16.	.91
+	HYDROGRAPH AT	DD30RE	282.	12.67	62.	21.	7.	.91
+	HYDROGRAPH AT	DD162	19.	12.50	7.	3.	1.	1.03
+	ROUTED TO	D16D30	14.	14.25	7.	3.	1.	1.03
+	4 COMBINED AT	CPD30	594.	13.83	292.	105.	35.	9.01
+	ROUTED TO	D30D46	573.	14.00	287.	105.	35.	9.01
+	HYDROGRAPH AT	D45	780.	12.25	92.	31.	10.	.49
+	DIVERSION TO	RD45	780.	12.25	79.	22.	7.	.49
+	HYDROGRAPH AT	DD45RE	167.	12.58	27.	9.	3.	.49
+	DIVERSION TO	DD451S	24.	12.58	4.	1.	0.	.49
+	HYDROGRAPH AT	DD451	142.	12.58	23.	7.	2.	.49
+	DIVERSION TO	DD452S	68.	12.58	11.	4.	1.	.49
+	HYDROGRAPH AT	DD452	74.	12.58	11.	4.	1.	.49

+	ROUTED TO	D45D46	31.	13.33	11.	4.	1.	.49
+	HYDROGRAPH AT	D46	982.	12.42	139.	43.	14.	.92
+	DIVERSION TO	RD46	982.	12.42	139.	42.	14.	.92
+	HYDROGRAPH AT	DD46RE	8.	22.17	4.	1.	0.	.92
+	3 COMBINED AT	CPD46	573.	14.00	290.	106.	35.	10.41
+	ROUTED TO	D46D58	552.	14.17	286.	105.	35.	10.41
+	DIVERSION TO	SSPILL	287.	14.17	125.	45.	15.	10.41
+	HYDROGRAPH AT	RMSBSN	265.	14.17	161.	60.	20.	10.41
+	HYDROGRAPH AT	RMSBSN	287.	14.17	125.	45.	15.	10.41
+	ROUTED TO	SRREEM	37.	24.50	37.	31.	15.	10.41
+	2 COMBINED AT	CPRMS	279.	14.17	186.	90.	35.	10.41
+	ROUTED TO	RRMS	276.	14.33	185.	90.	35.	10.41
+	HYDROGRAPH AT	D57	909.	12.17	109.	38.	13.	.48
+	DIVERSION TO	RD57	909.	12.17	88.	25.	8.	.48
+	HYDROGRAPH AT	DD57RE	277.	12.42	40.	13.	4.	.48
+	HYDROGRAPH AT	DD451	24.	12.58	4.	1.	0.	.49
+	ROUTED TO	D45D57	11.	13.33	4.	1.	0.	.49
+	2 COMBINED AT	CPD57	277.	12.42	43.	14.	5.	.97
+	ROUTED TO	D57D58	140.	12.75	41.	14.	5.	.97
+	HYDROGRAPH AT	D58	1239.	12.25	149.	47.	16.	.92
+	DIVERSION TO	RD58	1239.	12.25	126.	35.	12.	.92
+	HYDROGRAPH AT	DD58RE	283.	12.67	41.	13.	4.	.92
+	HYDROGRAPH AT	DD452	68.	12.58	11.	4.	1.	.49
+	ROUTED TO	D45D58	30.	13.50	11.	4.	1.	.49
+	4 COMBINED AT	CPD58	359.	14.25	243.	114.	43.	11.81
+	ROUTED TO	D5869A	352.	14.50	239.	113.	43.	11.81
+	HYDROGRAPH AT	D68A	507.	12.08	44.	15.	5.	.24
+	DIVERSION TO	RD68A	507.	12.08	42.	12.	4.	.24
+	HYDROGRAPH AT	DD68AR	18.	13.42	8.	3.	1.	.24
+	ROUTED TO	68A69A	14.	14.17	8.	3.	1.	.24
+	HYDROGRAPH AT	D69A	804.	12.17	72.	23.	8.	.46
+	DIVERSION TO	RD69A	804.	12.17	69.	19.	6.	.46
+	HYDROGRAPH AT	DD69AR	26.	13.33	11.	4.	1.	.46
+	3 COMBINED AT	CPD69A	357.	14.58	249.	117.	44.	12.52
+	ROUTED TO	D69A70	348.	15.42	247.	116.	44.	12.52

+	HYDROGRAPH AT	D68	506.	12.08	55.	19.	6.	.25
+	DIVERSION TO	RD68	506.	12.08	44.	13.	4.	.25
+	HYDROGRAPH AT	DD68RE	133.	12.33	19.	6.	2.	.25
+	DIVERSION TO	DD681S	105.	12.33	15.	5.	2.	.25
+	HYDROGRAPH AT	DD681	28.	12.33	4.	1.	0.	.25
+	DIVERSION TO	DD682S	9.	12.33	1.	0.	0.	.25
+	HYDROGRAPH AT	DD682	19.	12.33	3.	1.	0.	.25
+	ROUTED TO	D68D69	9.	12.83	3.	1.	0.	.25
+	HYDROGRAPH AT	D69	664.	12.25	71.	22.	7.	.46
+	DIVERSION TO	RD69	664.	12.25	68.	19.	6.	.46
+	HYDROGRAPH AT	DD69RE	23.	13.50	10.	4.	1.	.46
+	2 COMBINED AT	CPD69	28.	13.50	12.	4.	1.	.71
+	DIVERSION TO	DD691S	2.	13.50	1.	0.	0.	.71
+	HYDROGRAPH AT	DD691	26.	13.50	11.	4.	1.	.71
+	DIVERSION TO	DD692S	2.	13.50	1.	0.	0.	.71
+	HYDROGRAPH AT	DD692	24.	13.50	11.	4.	1.	.71
+	ROUTED TO	D69D70	20.	14.00	10.	4.	1.	.71
+	HYDROGRAPH AT	D70	330.	12.17	25.	7.	2.	.26
+	DIVERSION TO	RD70	1.	9.00	1.	0.	0.	.26
+	HYDROGRAPH AT	DD70RE	330.	12.17	25.	7.	2.	.26
+	HYDROGRAPH AT	D70A	532.	12.17	59.	20.	7.	.27
+	DIVERSION TO	RD70A	532.	12.17	49.	14.	5.	.27
+	HYDROGRAPH AT	DD70AR	104.	12.42	19.	6.	2.	.27
+	ROUTED TO	D70A70	44.	13.58	18.	6.	2.	.27
+	4 COMBINED AT	CPD70	363.	15.42	261.	125.	48.	13.76
+	ROUTED TO	SRD70	180.	20.25	176.	114.	45.	13.76
+	ROUTED TO	D70D71	180.	20.25	175.	114.	45.	13.76
+	HYDROGRAPH AT	D71	473.	12.17	50.	17.	6.	.24
+	DIVERSION TO	RD71	473.	12.17	40.	11.	4.	.24
+	HYDROGRAPH AT	DD71RE	158.	12.33	18.	6.	2.	.24
+	2 COMBINED AT	CPD71	185.	19.83	180.	116.	46.	14.00
+	ROUTED TO	D71D72	185.	19.92	180.	116.	46.	14.00
+	HYDROGRAPH AT	D59	1581.	12.25	218.	75.	25.	.99
+	DIVERSION TO	RD59	1581.	12.25	188.	53.	18.	.99
+	HYDROGRAPH AT							

+		DD59RE	280.	12.75	66.	22.	7.	.99
+	HYDROGRAPH AT	DD47SE	65.	14.25	22.	8.	3.	3.99
+	ROUTED TO	D47D59	62.	14.67	22.	8.	3.	3.99
+	2 COMBINED AT	CPD59	279.	12.75	84.	30.	10.	4.99
+	DIVERSION TO	DD59S	264.	12.75	80.	28.	9.	4.99
+	HYDROGRAPH AT	DD59SE	14.	12.75	4.	2.	1.	4.99
+	ROUTED TO	D59D61	9.	13.33	4.	2.	1.	4.99
+	HYDROGRAPH AT	D61	571.	12.25	78.	27.	9.	.35
+	DIVERSION TO	RD61	571.	12.25	67.	19.	6.	.35
+	HYDROGRAPH AT	DD61RE	95.	12.75	24.	8.	3.	.35
+	2 COMBINED AT	CPD61	87.	12.75	27.	9.	3.	5.34
+	ROUTED TO	D6172A	76.	12.83	26.	9.	3.	5.34
+	HYDROGRAPH AT	D71A	474.	12.17	53.	18.	6.	.24
+	DIVERSION TO	RD71A	474.	12.17	46.	13.	4.	.24
+	HYDROGRAPH AT	DD71AR	53.	12.58	15.	5.	2.	.24
+	HYDROGRAPH AT	DD59SE	264.	12.75	80.	28.	9.	4.99
+	ROUTED TO	D5971A	180.	13.17	77.	28.	9.	4.99
+	2 COMBINED AT	CPD71A	202.	13.17	89.	33.	11.	5.22
+	ROUTED TO	71A72A	192.	13.33	89.	33.	11.	5.22
+	HYDROGRAPH AT	D72A	508.	12.17	56.	19.	6.	.25
+	DIVERSION TO	RD72A	508.	12.17	50.	14.	5.	.25
+	HYDROGRAPH AT	DD72AR	54.	12.58	16.	5.	2.	.25
+	3 COMBINED AT	CPD72A	257.	13.42	127.	47.	16.	5.83
+	ROUTED TO	D72A72	253.	13.42	127.	47.	16.	5.83
+	HYDROGRAPH AT	D72	524.	12.17	57.	19.	6.	.26
+	DIVERSION TO	RD72	524.	12.17	48.	13.	4.	.26
+	HYDROGRAPH AT	DD72RE	93.	12.42	18.	6.	2.	.26
+	3 COMBINED AT	CPD72	265.	13.83	246.	160.	61.	20.09
+	ROUTED TO	D72D73	236.	18.08	228.	149.	57.	20.09
+	HYDROGRAPH AT	D73	447.	12.25	52.	17.	6.	.28
+	DIVERSION TO	RD73	447.	12.25	44.	12.	4.	.28
+	HYDROGRAPH AT	DD73RE	89.	12.58	16.	5.	2.	.28
+	2 COMBINED AT	CPD73	240.	18.00	232.	152.	58.	20.37
+	ROUTED TO	D73D78	239.	19.00	232.	151.	58.	20.37
+	HYDROGRAPH AT	B02	673.	12.33	86.	27.	9.	.54

+	DIVERSION TO	RB02	492.	12.17	36.	10.	3.	.54
+	HYDROGRAPH AT	DB02RE	673.	12.33	60.	17.	6.	.54
+	DIVERSION TO	DB02LR	0.	.00	0.	0.	0.	.54
+	HYDROGRAPH AT	DB02SD	673.	12.33	60.	17.	6.	.54
+	HYDROGRAPH AT	B04	641.	12.08	49.	15.	5.	.31
+	DIVERSION TO	RB04	537.	12.00	25.	7.	2.	.31
+	HYDROGRAPH AT	DB04RE	598.	12.08	29.	8.	3.	.31
+	ROUTED TO	B04B02	205.	12.58	28.	8.	3.	.31
+	HYDROGRAPH AT	DB02SD	0.	.00	0.	0.	0.	.54
+	2 COMBINED AT	CPB02	205.	12.58	28.	8.	3.	.86
+	DIVERSION TO	LR02LR	0.	.00	0.	0.	0.	.86
+	HYDROGRAPH AT	LR02SD	202.	12.58	28.	8.	3.	.86
+	ROUTED TO	LR2D78	110.	12.92	28.	8.	3.	.86
+	HYDROGRAPH AT	D78B	681.	12.42	115.	39.	13.	.53
+	DIVERSION TO	RD78B	681.	12.42	101.	28.	9.	.53
+	HYDROGRAPH AT	DD78BR	144.	13.00	33.	11.	4.	.53
+	5 COMBINED AT	CPD78B	747.	12.33	404.	271.	101.	32.08
+	ROUTED TO	78B79B	485.	12.50	310.	215.	81.	32.08
+	HYDROGRAPH AT	D51	474.	12.25	46.	13.	4.	.29
+	DIVERSION TO	RD51	197.	12.00	10.	3.	1.	.29
+	HYDROGRAPH AT	DD51RE	474.	12.25	38.	10.	3.	.29
+	ROUTED TO	D51D65	243.	13.08	37.	10.	3.	.29
+	HYDROGRAPH AT	D65	1109.	12.17	116.	37.	12.	.69
+	DIVERSION TO	RD65	1109.	12.17	116.	36.	12.	.69
+	HYDROGRAPH AT	DD65RE	8.	21.00	5.	1.	0.	.69
+	2 COMBINED AT	CPD65	243.	13.08	37.	11.	4.	.98
+	ROUTED TO	D65D75	187.	13.58	36.	11.	4.	.98
+	HYDROGRAPH AT	D79A	340.	12.17	36.	12.	4.	.17
+	DIVERSION TO	RD79A	340.	12.17	34.	10.	3.	.17
+	HYDROGRAPH AT	DD79AR	17.	13.33	7.	3.	1.	.17
+	HYDROGRAPH AT	D75	1302.	12.25	150.	49.	16.	.88
+	DIVERSION TO	RD75	1302.	12.25	129.	35.	12.	.88
+	HYDROGRAPH AT	DD75RE	256.	12.58	41.	13.	4.	.88
+	3 COMBINED AT	CPD75	254.	13.58	83.	27.	9.	2.04
+	ROUTED TO	SRD75	103.	14.42	70.	27.	9.	2.04

+	ROUTED TO	D7579B	102.	14.83	70.	27.	9.	2.04
+	HYDROGRAPH AT	D79B	538.	12.17	64.	21.	7.	.32
+	DIVERSION TO	RD79B	538.	12.17	51.	14.	5.	.32
+	HYDROGRAPH AT	DD79BR	203.	12.42	23.	7.	2.	.32
+	3 COMBINED AT	CPD79B	491.	12.58	341.	234.	87.	34.44
+	ROUTED TO	D79B80	499.	12.58	341.	234.	87.	34.44
+	HYDROGRAPH AT	D80	257.	12.08	22.	7.	2.	.13
+	DIVERSION TO	RD80	257.	12.08	17.	5.	2.	.13
+	HYDROGRAPH AT	DD80RE	124.	12.25	8.	3.	1.	.13
+	2 COMBINED AT	CPD80	514.	12.58	343.	236.	87.	34.57
+	HYDROGRAPH AT	B01	194.	12.08	16.	5.	2.	.10
+	3 COMBINED AT	DUMMY	8751.	12.58	1944.	705.	254.	69.06
+	HYDROGRAPH AT	B03	581.	12.17	61.	20.	7.	.34
+	DIVERSION TO	RB03	581.	12.17	56.	15.	5.	.34
+	HYDROGRAPH AT	DB03RE	40.	12.83	13.	5.	2.	.34
+	ROUTED TO	B03B05	33.	13.25	13.	5.	2.	.34
+	HYDROGRAPH AT	B05	610.	12.25	74.	25.	8.	.40
+	DIVERSION TO	RB05	588.	12.25	47.	13.	4.	.40
+	HYDROGRAPH AT	DB05RE	539.	12.33	38.	11.	4.	.40
+	2 COMBINED AT	CPB05	537.	12.33	50.	16.	5.	.73
+	ROUTED TO	B05B06	281.	12.58	48.	16.	5.	.73
+	HYDROGRAPH AT	B06	622.	12.17	64.	20.	7.	.40
+	DIVERSION TO	RB06	135.	11.92	16.	5.	2.	.40
+	HYDROGRAPH AT	DB06RE	622.	12.17	56.	15.	5.	.40
+	2 COMBINED AT	CPB06	620.	12.17	102.	31.	10.	1.13
+	ROUTED TO	B06B15	423.	12.67	100.	31.	10.	1.13
+	HYDROGRAPH AT	B07	309.	12.33	32.	9.	3.	.25
+	DIVERSION TO	RB07	309.	12.33	32.	9.	3.	.25
+	HYDROGRAPH AT	DB07RE	0.	.00	0.	0.	0.	.25
+	ROUTED TO	B07B09	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	B08	500.	12.08	43.	14.	5.	.23
+	DIVERSION TO	RB08	500.	12.08	43.	13.	4.	.23
+	HYDROGRAPH AT	DB08RE	7.	15.92	5.	2.	1.	.23
+	ROUTED TO	B08B09	7.	16.58	5.	2.	1.	.23
	HYDROGRAPH AT							

+	HYDROGRAPH AT	DB442	177.	12.50	59.	19.	6.	1.29
+	ROUTED TO	B44B45	167.	13.42	58.	19.	6.	1.29
+	HYDROGRAPH AT	B45	1129.	12.33	157.	53.	18.	.81
+	DIVERSION TO	RB45	1129.	12.33	113.	32.	11.	.81
+	HYDROGRAPH AT	DB45RE	744.	12.50	67.	21.	7.	.81
+	HYDROGRAPH AT	DB402	79.	12.33	13.	4.	1.	.77
+	ROUTED TO	B40B45	46.	12.83	12.	4.	1.	.77
+	HYDROGRAPH AT	DB41SE	987.	12.50	98.	28.	9.	2.18
+	ROUTED TO	B41B45	555.	13.17	93.	28.	9.	2.18
+	5 COMBINED AT	CPB45	855.	13.17	265.	85.	28.	4.05
+	ROUTED TO	B45B47	764.	13.75	256.	85.	28.	4.05
+	HYDROGRAPH AT	L01	268.	12.17	25.	8.	3.	.16
+	DIVERSION TO	RL01	268.	12.17	18.	5.	2.	.16
+	HYDROGRAPH AT	DL01RE	157.	12.33	9.	3.	1.	.16
+	ROUTED TO	L01L03	58.	12.75	8.	3.	1.	.16
+	HYDROGRAPH AT	L03	958.	12.33	116.	35.	12.	.79
+	DIVERSION TO	RL03	958.	12.33	116.	34.	11.	.79
+	HYDROGRAPH AT	DL03RE	1.	19.83	1.	0.	0.	.79
+	HYDROGRAPH AT	L20	390.	12.42	47.	14.	5.	.35
+	DIVERSION TO	RL20	390.	12.42	41.	11.	4.	.35
+	HYDROGRAPH AT	DL20RE	88.	12.83	9.	3.	1.	.35
+	ROUTED TO	L20L03	46.	13.25	9.	3.	1.	.35
+	3 COMBINED AT	CPL03	60.	13.25	17.	5.	2.	1.29
+	DIVERSION TO	DL03S	37.	12.67	15.	5.	2.	1.29
+	HYDROGRAPH AT	DL03SE	23.	13.25	2.	0.	0.	1.29
+	ROUTED TO	L03L04	18.	13.58	2.	0.	0.	1.29
+	HYDROGRAPH AT	L04	663.	12.42	82.	24.	8.	.63
+	DIVERSION TO	RL04	663.	12.42	81.	22.	7.	.63
+	HYDROGRAPH AT	DL04RE	8.	15.67	6.	2.	1.	.63
+	2 COMBINED AT	CPL04	17.	13.58	6.	2.	1.	1.93
+	DIVERSION TO	DL04S	0.	.00	0.	0.	0.	1.93
+	HYDROGRAPH AT	DL04SE	17.	13.58	6.	2.	1.	1.93
+	ROUTED TO	L04L05	6.	17.25	5.	2.	1.	1.93
+	HYDROGRAPH AT	L02	1737.	12.58	279.	85.	28.	1.88
+	DIVERSION TO	RL02	1737.	12.58	219.	59.	20.	1.88

+	HYDROGRAPH AT	DL02RE	891.	12.92	88.	26.	9.	1.88
+	ROUTED TO	L02L05	584.	13.08	87.	26.	9.	1.88
+	HYDROGRAPH AT	L05	660.	12.33	84.	27.	9.	.49
+	DIVERSION TO	RL05	660.	12.33	61.	17.	6.	.49
+	HYDROGRAPH AT	DL05RE	406.	12.50	33.	10.	3.	.49
+	3 COMBINED AT	CPL05	636.	13.08	121.	38.	13.	4.30
+	ROUTED TO	L05L09	574.	13.17	119.	38.	13.	4.30
+	HYDROGRAPH AT	L09	657.	12.33	85.	27.	9.	.49
+	DIVERSION TO	RL09	657.	12.33	85.	26.	9.	.49
+	HYDROGRAPH AT	DL09RE	6.	20.92	4.	1.	0.	.49
+	2 COMBINED AT	CPL09	574.	13.17	119.	39.	13.	4.78
+	ROUTED TO	L0913B	540.	13.25	118.	39.	13.	4.78
+	DIVERSION TO	DL13BR	314.	13.25	49.	14.	5.	4.78
+	HYDROGRAPH AT	DL13BN	225.	13.25	69.	24.	8.	4.78
+	HYDROGRAPH AT	DL13BN	314.	13.25	49.	14.	5.	4.78
+	ROUTED TO	SRL13B	22.	15.25	21.	14.	5.	4.78
+	2 COMBINED AT	CPL13B	245.	13.25	89.	39.	13.	4.78
+	ROUTED TO	L13B13	244.	13.33	89.	39.	13.	4.78
+	HYDROGRAPH AT	L13	860.	12.17	109.	38.	13.	.48
+	DIVERSION TO	RL13	860.	12.17	91.	26.	9.	.48
+	HYDROGRAPH AT	DL13RE	190.	12.50	36.	12.	4.	.48
+	HYDROGRAPH AT	L06	914.	12.33	107.	33.	11.	.70
+	DIVERSION TO	RL06	914.	12.33	107.	33.	11.	.70
+	HYDROGRAPH AT	DL06RE	0.	.00	0.	0.	0.	.70
+	DIVERSION TO	DL06S	0.	.00	0.	0.	0.	.70
+	HYDROGRAPH AT	DL06SE	0.	.00	0.	0.	0.	.70
+	ROUTED TO	L06L07	0.	.00	0.	0.	0.	.70
+	HYDROGRAPH AT	L07	816.	12.33	101.	31.	10.	.63
+	DIVERSION TO	RL07	816.	12.33	101.	31.	10.	.63
+	HYDROGRAPH AT	DL07RE	0.	.00	0.	0.	0.	.63
+	HYDROGRAPH AT	DL03SE	37.	12.67	15.	5.	2.	1.29
+	ROUTED TO	L0307A	37.	13.58	14.	5.	2.	1.29
+	ROUTED TO	L0307B	37.	13.83	14.	5.	2.	1.29
+	3 COMBINED AT	CPL07	37.	13.83	14.	5.	2.	2.62
	DIVERSION TO							

+		DL07S	7.	13.83	3.	1.	0.	2.62
+	HYDROGRAPH AT	DL07SE	29.	13.83	11.	4.	1.	2.62
+	ROUTED TO	L07L08	29.	14.00	11.	4.	1.	2.62
+	HYDROGRAPH AT	L08	647.	12.33	87.	27.	9.	.49
+	DIVERSION TO	RL08	647.	12.33	86.	23.	8.	.49
+	HYDROGRAPH AT	DL08RE	15.	14.50	8.	3.	1.	.49
+	HYDROGRAPH AT	DL04SE	0.	.00	0.	0.	0.	1.93
+	ROUTED TO	L04L08	0.	.00	0.	0.	0.	1.93
+	3 COMBINED AT	CPL08	36.	14.50	19.	7.	2.	3.74
+	ROUTED TO	L08L12	29.	15.50	18.	7.	2.	3.74
+	HYDROGRAPH AT	L10	845.	12.42	103.	30.	10.	.84
+	DIVERSION TO	RL10	845.	12.42	65.	17.	6.	.84
+	HYDROGRAPH AT	DL10RE	647.	12.58	46.	13.	4.	.84
+	ROUTED TO	L10L11	441.	12.83	45.	13.	4.	.84
+	HYDROGRAPH AT	DL06SE	0.	.00	0.	0.	0.	.70
+	ROUTED TO	L06L11	0.	.00	0.	0.	0.	.70
+	HYDROGRAPH AT	L11	744.	12.33	94.	29.	10.	.62
+	DIVERSION TO	RL11	744.	12.33	89.	24.	8.	.62
+	HYDROGRAPH AT	DL11RE	46.	13.25	15.	5.	2.	.62
+	HYDROGRAPH AT	DL07SE	7.	13.83	3.	1.	0.	2.62
+	ROUTED TO	L07L11	6.	15.25	3.	1.	0.	2.62
+	4 COMBINED AT	CPL11	439.	12.83	61.	19.	6.	4.09
+	DIVERSION TO	DL11S	3.	12.83	0.	0.	0.	4.09
+	HYDROGRAPH AT	DL11SE	434.	12.83	60.	18.	6.	4.09
+	ROUTED TO	L11L12	354.	13.00	60.	18.	6.	4.09
+	HYDROGRAPH AT	L12	586.	12.25	68.	22.	7.	.36
+	DIVERSION TO	RL12	586.	12.25	60.	16.	5.	.36
+	HYDROGRAPH AT	DL12RE	90.	12.67	16.	5.	2.	.36
+	3 COMBINED AT	CPL12	385.	13.00	89.	30.	10.	5.56
+	DIVERSION TO	DL121S	68.	13.00	16.	5.	2.	5.56
+	HYDROGRAPH AT	DL121	318.	13.00	73.	25.	8.	5.56
+	DIVERSION TO	DL122S	4.	13.00	1.	0.	0.	5.56
+	HYDROGRAPH AT	DL122	314.	13.00	72.	24.	8.	5.56
+	ROUTED TO	L12L13	280.	13.08	71.	24.	8.	5.56
+	3 COMBINED AT	CPL13	502.	13.25	176.	67.	22.	8.90

+	ROUTED TO	L13DS5	493.	13.33	176.	67.	22.	8.90
+	ROUTED TO	DS5L19	485.	13.33	175.	67.	22.	8.90
+	HYDROGRAPH AT	L14	269.	12.25	24.	7.	2.	.23
+	DIVERSION TO	RL14	269.	12.25	24.	7.	2.	.23
+	HYDROGRAPH AT	DL14RE	0.	.00	0.	0.	0.	.23
+	ROUTED TO	L14L15	0.	.00	0.	0.	0.	.23
+	HYDROGRAPH AT	L15	438.	12.25	40.	11.	4.	.37
+	DIVERSION TO	RL15	438.	12.25	40.	11.	4.	.37
+	HYDROGRAPH AT	DL15RE	0.	.00	0.	0.	0.	.37
+	2 COMBINED AT	CPL15	0.	.00	0.	0.	0.	.60
+	ROUTED TO	L15L16	0.	.00	0.	0.	0.	.60
+	HYDROGRAPH AT	L16	582.	12.33	58.	17.	6.	.50
+	DIVERSION TO	RL16	582.	12.33	58.	17.	6.	.50
+	HYDROGRAPH AT	DL16RE	0.	.00	0.	0.	0.	.50
+	2 COMBINED AT	CPL16	0.	.00	0.	0.	0.	1.10
+	ROUTED TO	L16L17	0.	.00	0.	0.	0.	1.10
+	HYDROGRAPH AT	L17	586.	12.33	72.	23.	8.	.50
+	DIVERSION TO	RL17	586.	12.33	72.	23.	8.	.50
+	HYDROGRAPH AT	DL17RE	0.	.00	0.	0.	0.	.50
+	2 COMBINED AT	CPL17	0.	.00	0.	0.	0.	1.61
+	DIVERSION TO	DL17S	0.	.00	0.	0.	0.	1.61
+	HYDROGRAPH AT	DL17SE	0.	.00	0.	0.	0.	1.61
+	ROUTED TO	L17L18	0.	.00	0.	0.	0.	1.61
+	HYDROGRAPH AT	L18	604.	12.25	58.	17.	6.	.50
+	DIVERSION TO	RL18	604.	12.25	58.	17.	6.	.50
+	HYDROGRAPH AT	DL18RE	0.	.00	0.	0.	0.	.50
+	HYDROGRAPH AT	DL11SE	3.	12.83	0.	0.	0.	4.09
+	ROUTED TO	L11L18	1.	13.75	0.	0.	0.	4.09
+	HYDROGRAPH AT	DL121	68.	13.00	16.	5.	2.	5.56
+	ROUTED TO	L12L18	48.	13.58	15.	5.	2.	5.56
+	4 COMBINED AT	CPL18	44.	13.58	14.	5.	2.	7.67
+	DIVERSION TO	DL181S	0.	.00	0.	0.	0.	7.67
+	HYDROGRAPH AT	DL181	44.	13.58	14.	5.	2.	7.67
+	DIVERSION TO	DL182S	2.	13.58	1.	0.	0.	7.67
+	HYDROGRAPH AT	DL182	42.	13.58	13.	5.	2.	7.67

+	ROUTED TO	L18L19	37.	13.92	13.	5.	2.	7.67
+	HYDROGRAPH AT	L19	877.	12.17	110.	38.	13.	.49
+	DIVERSION TO	RL19	877.	12.17	91.	26.	9.	.49
+	HYDROGRAPH AT	DL19RE	205.	12.50	37.	12.	4.	.49
+	HYDROGRAPH AT	DL122	4.	13.00	1.	0.	0.	5.56
+	ROUTED TO	L12L19	2.	14.25	1.	0.	0.	5.56
+	4 COMBINED AT	CPL19	511.	13.42	207.	79.	26.	11.50
+	ROUTED TO	L19DS7	508.	13.42	207.	79.	26.	11.50
+	ROUTED TO	DS7L27	496.	13.50	206.	79.	26.	11.50
+	HYDROGRAPH AT	L23	922.	12.33	102.	30.	10.	.90
+	DIVERSION TO	RL23	922.	12.33	102.	30.	10.	.90
+	HYDROGRAPH AT	DL23RE	0.	.00	0.	0.	0.	.90
+	ROUTED TO	L23L24	0.	.00	0.	0.	0.	.90
+	HYDROGRAPH AT	L24	624.	12.25	60.	18.	6.	.50
+	DIVERSION TO	RL24	624.	12.25	60.	18.	6.	.50
+	HYDROGRAPH AT	DL24RE	0.	.00	0.	0.	0.	.50
+	2 COMBINED AT	CPL24	0.	.00	0.	0.	0.	1.40
+	ROUTED TO	L24L26	0.	.00	0.	0.	0.	1.40
+	HYDROGRAPH AT	L25	261.	12.33	29.	8.	3.	.24
+	DIVERSION TO	RL25	261.	12.33	29.	8.	3.	.24
+	HYDROGRAPH AT	DL25RE	0.	.00	0.	0.	0.	.24
+	ROUTED TO	L25L26	0.	.00	0.	0.	0.	.24
+	HYDROGRAPH AT	DL181	0.	.00	0.	0.	0.	7.67
+	ROUTED TO	L18L26	0.	.00	0.	0.	0.	7.67
+	HYDROGRAPH AT	DL17SE	0.	.00	0.	0.	0.	1.61
+	ROUTED TO	L17L26	0.	.00	0.	0.	0.	1.61
+	HYDROGRAPH AT	L26	980.	12.25	103.	32.	11.	.76
+	DIVERSION TO	RL26	980.	12.25	103.	29.	10.	.76
+	HYDROGRAPH AT	DL26RE	9.	17.50	7.	2.	1.	.76
+	5 COMBINED AT	CPL26	5.	20.83	3.	1.	0.	10.07
+	DIVERSION TO	DL26S	0.	.00	0.	0.	0.	10.07
+	HYDROGRAPH AT	DL26SE	5.	20.83	3.	1.	0.	10.07
+	ROUTED TO	L26L27	5.	23.00	3.	1.	0.	10.07
+	HYDROGRAPH AT	L27	906.	12.17	113.	39.	13.	.51
	DIVERSION TO							

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+                  RL27     906.  12.17      91.      26.      9.     .51
        HYDROGRAPH AT
+                 DL27RE    250.  12.42      41.      13.      4.     .51
        HYDROGRAPH AT
+                  DL182      2.  13.58       1.       0.      0.    7.67
        ROUTED TO
+                 L18L27      2.  14.75       1.       0.      0.    7.67
        4 COMBINED AT
+                  CPL27    518.  13.58     225.      87.     29.   14.41
        ROUTED TO
+                 L27L34    510.  13.67     224.      87.     29.   14.41
        DIVERSION TO
+                 DL34BR     58.  13.67       4.       1.      0.   14.41
        HYDROGRAPH AT
+                 DL34BN    452.  13.67     220.      86.     29.   14.41
        HYDROGRAPH AT
+                 DL34BN     58.  13.67       4.       1.      0.   14.41
        ROUTED TO
+                 SRL34B     11.  14.00       4.       1.      0.   14.41
        2 COMBINED AT
+                  CPL34    458.  13.67     224.      87.     29.   14.41
        ROUTED TO
+                 L34B34    456.  13.75     224.      87.     29.   14.41
        HYDROGRAPH AT
+                    L33    627.  12.42      65.      17.      6.     .65
        DIVERSION TO
+                   RL33    435.  12.25      21.       5.      2.     .65
        HYDROGRAPH AT
+                 DL33RE    627.  12.42      46.      12.      4.     .65
        DIVERSION TO
+                  DL33S      1.  12.42       0.       0.      0.     .65
        HYDROGRAPH AT
+                 DL33SE    625.  12.42      46.      12.      4.     .65
        ROUTED TO
+                 L33L34    539.  12.58      46.      12.      4.     .65
        HYDROGRAPH AT
+                    L34    917.  12.17     115.      40.     13.     .51
        DIVERSION TO
+                   RL34    917.  12.17      97.      27.      9.     .51
        HYDROGRAPH AT
+                 DL34RE    181.  12.58      38.      12.      4.     .51
        HYDROGRAPH AT
+                 DL26SE      0.    .00       0.       0.      0.   10.07
        ROUTED TO
+                 L26L34      0.    .00       0.       0.      0.   10.07
        4 COMBINED AT
+                 CPL34B    517.  12.58     283.     107.     36.   15.58
        ROUTED TO
+                 34DS11    514.  12.67     282.     107.     36.   15.58
        ROUTED TO
+                 DS1139    510.  12.75     282.     107.     36.   15.58
        HYDROGRAPH AT
+                   L39A    545.  12.08      57.      20.      7.     .26
        2 COMBINED AT
+                 CPL39A    549.  12.75     311.     123.     42.   15.84
        DIVERSION TO
+                 DL39BR     63.  12.75      10.       3.      1.   15.84
        HYDROGRAPH AT
+                 DL39BN    486.  12.75     301.     121.     41.   15.84
        HYDROGRAPH AT
+                    L28    406.  12.25      42.      13.      4.     .31
        DIVERSION TO
+                   RL28    406.  12.25      41.      11.      4.     .31
        HYDROGRAPH AT
+                 DL28RE     12.  13.58       5.       2.      1.     .31
        ROUTED TO
+                 L28L29     10.  14.33       5.       2.      1.     .31
        HYDROGRAPH AT
+                    L29    303.  12.33      35.      11.      4.     .25
```



```
1******************************************                                     ***************************************
 *                                        *                                     *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                                     *   U.S. ARMY CORPS OF ENGINEERS      *
 *            JUN   1998                  *                                     *   HYDROLOGIC ENGINEERING CENTER     *
 *         VERSION 4.1                    *                                     *         609 SECOND STREET           *
 *                                        *                                     *     DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   02SEP09  TIME  19:08:35    *                                     *         (916) 756-1104              *
 *                                        *                                     *                                     *
 ******************************************                                     ***************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


     THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

     THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
     THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
     NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
     DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
     KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                       HEC-1 INPUT                                                   PAGE  1

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID        Flood Control District of Maricopa County
            2          ID        L303_FU_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
            3          ID        100 YEAR
            4          ID        24 Hour Storm
            5          ID        Unit Hydrograph: S-Graph
            6          ID        09/02/2009
            7          ID    FCDMC CONTRACT 2007C031
            8          ID    BY HDR ENGINEERING (#79902)
            9          ID    FUTURE CONDITIONS-SEPTEMBER 2009
           10          ID    MAJOR BASIN 02
           11          ID    FILE NAME: FCIP-MB2.DAT
           12          IT       5       0       0    2000
           13          IN      15
           14          IO       3
                       *DIAGRAM
                       *
           15          JD   3.941  0.0001
           16          PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
           17          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
           18          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
           19          PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
           20          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
           21          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
           22          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
           23          PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
           24          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
           25          PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
           26          JD   3.843     5.0
           27          JD   3.744    10.0
           28          JD   3.646    20.0
           29          JD   3.547    30.0
           30          JD   3.429    60.0
                       *

           31          KK     L21BASIN
           32          KM        BASIN BOUNDARY FROM MCMICKEN DAM ON THE WEST AND THE
           33          KM        BEARDSLEY CSR ON THE EAST
           34          BA   0.525
           35          LG    0.33    0.24    4.55    0.44      14
           36          UI       0      21      21      21      27      70      79      96     107     116
           37          UI     124     136     151     163     189     232     260     263     226     200
           38          UI     185     169     155     139     127     114     105      95      77      60
           39          UI      42      37      36      34      31      21      21      21      16       6
           40          UI       7       6       7       6       7       6       7       6       7       6
                       *

           41          KK  DL21REDIVERT
           42          KM        Mass grading and Storage along canal
           43          DT    RL21    81.8     0.0
           44          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           45          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
1                                       HEC-1 INPUT                                                   PAGE  2

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


           46          KK  L21L22ROUTE
           47          KM        Cross-section determined from A-team survey
           48          KM        Manning's N Value: earth w/sparse trees and brush, ponding against canal
           49          RS       1    FLOW
           50          RC   0.032   0.032   0.032    8793  0.0020    0.00
           51          RX  100.00  101.00  107.00  117.00  169.00  409.00  512.00  513.00
           52          RY  1328.1 1328.00 1326.00 1324.00 1324.10 1326.00 1328.00 1328.10
                       *
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```
                                   6-HR       24-HR       72-HR    166.58-HR
+  (AC-FT)      (HR)
     628.     34.17                628.        628.        628.         571.

   PEAK STAGE    TIME                       MAXIMUM AVERAGE STAGE
                                   6-HR       24-HR       72-HR    166.58-HR
+   (FEET)      (HR)
   1042.82     34.17            1042.82     1042.81     1042.81      1042.36

                         CUMULATIVE AREA =   20.31 SQ MI

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION    SRS60
                        TRANSPOSITION AREA     60.0 SQ MI

  PEAK OUTFLOW IS        0. AT TIME   0.00 HOURS

   PEAK FLOW     TIME                       MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR    166.58-HR
+   (CFS)       (HR)
                        (CFS)
+       0.      0.00                 0.          0.          0.           0.
                      (INCHES)     0.000       0.000       0.000        0.000
                       (AC-FT)       0.          0.          0.           0.

  PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                   6-HR       24-HR       72-HR    166.58-HR
+  (AC-FT)      (HR)
     574.     34.50                574.        574.        575.         522.

   PEAK STAGE    TIME                       MAXIMUM AVERAGE STAGE
                                   6-HR       24-HR       72-HR    166.58-HR
+   (FEET)      (HR)
   1041.83     34.50            1041.83     1041.81     1041.81      1041.41

                         CUMULATIVE AREA =   20.31 SQ MI

       ***             ***             ***             ***             ***


                         INTERPOLATED HYDROGRAPH AT    SRS60

   PEAK FLOW     TIME                       MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR    166.58-HR
+   (CFS)       (HR)
                        (CFS)
+       0.      0.00                 0.          0.          0.           0.
                      (INCHES)     0.000       0.000       0.000        0.000
                       (AC-FT)       0.          0.          0.           0.

                         CUMULATIVE AREA =   20.31 SQ MI
1
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

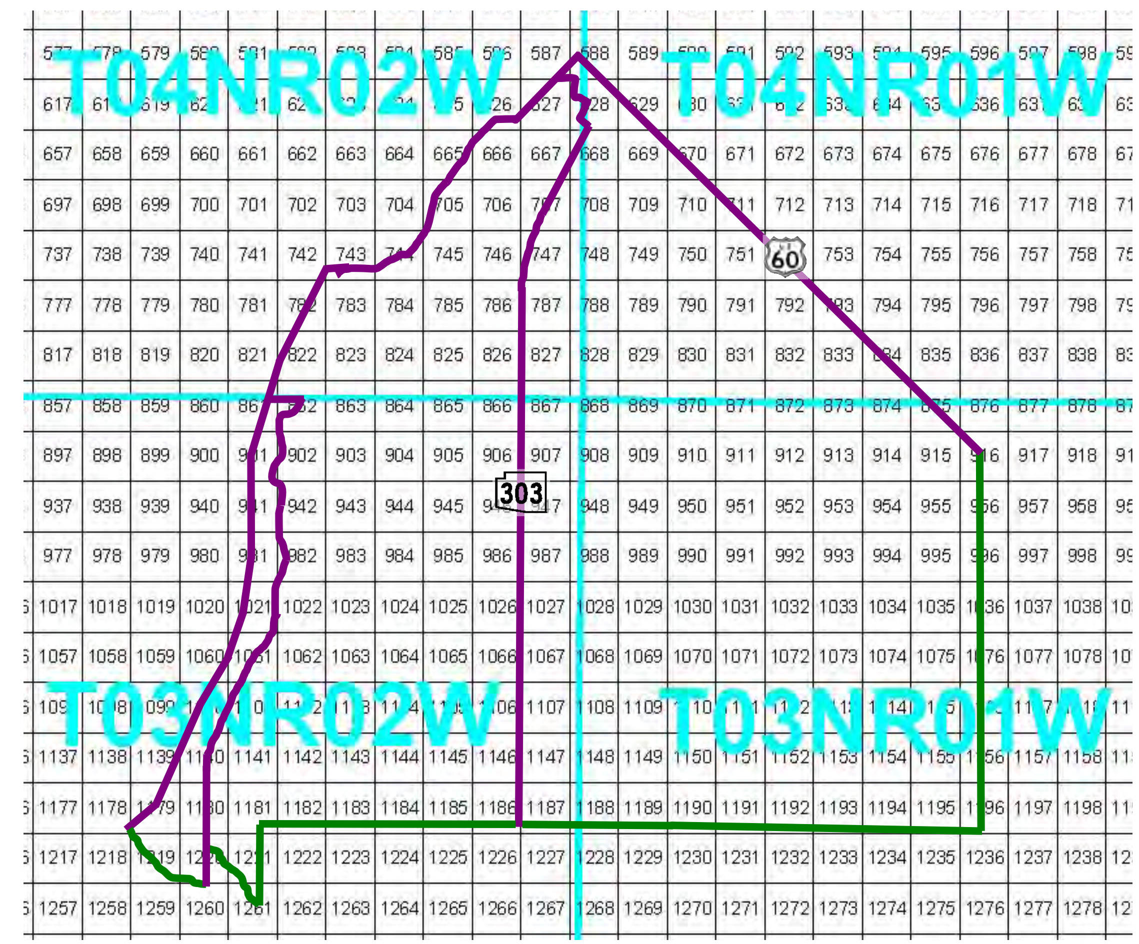
+	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	L21	273.	13.25	70.	20.	7.	0.52		
+	DIVERSION TO	RL21	273.	13.25	70.	20.	7.	0.52		
+	HYDROGRAPH AT	DL21RE	0.	0.00	0.	0.	0.	0.52		
+	ROUTED TO	L21L22	0.	0.00	0.	0.	0.	0.52		
+	HYDROGRAPH AT	L22	87.	13.67	32.	8.	3.	0.36		
+	DIVERSION TO	RL22	87.	13.67	32.	8.	3.	0.36		
+	HYDROGRAPH AT	DL22RE	0.	0.00	0.	0.	0.	0.36		
+	2 COMBINED AT	CPL22	0.	0.00	0.	0.	0.	0.89		
+	ROUTED TO	L22W01	0.	0.00	0.	0.	0.	0.89		
+	HYDROGRAPH AT	W01	151.	12.50	21.	5.	2.	0.19		
+	2 COMBINED AT	CPW01	150.	12.50	21.	5.	2.	1.08		
+	ROUTED TO	W01W02	141.	12.67	21.	5.	2.	1.08		
+	HYDROGRAPH AT	W02	544.	12.33	55.	16.	5.	0.39		

+	DIVERSION TO	DW02	544.	12.33	39.	10.	3.	0.39
+	HYDROGRAPH AT	DW02RE	335.	12.50	20.	6.	2.	0.39
+	2 COMBINED AT	CPW02	454.	12.50	41.	11.	4.	1.47
+	ROUTED TO	W02W05	343.	12.58	40.	11.	4.	1.47
+	HYDROGRAPH AT	W03	1998.	12.33	273.	83.	28.	1.97
+	ROUTED TO	W03W04	1629.	12.58	272.	83.	28.	1.97
+	HYDROGRAPH AT	W04	2200.	12.33	312.	94.	31.	2.03
+	DIVERSION TO	DW04	71.	11.08	33.	11.	4.	2.03
+	HYDROGRAPH AT	DW04RE	2200.	12.33	307.	83.	28.	2.03
+	2 COMBINED AT	CPW04	3313.	12.42	577.	165.	55.	4.01
+	ROUTED TO	W04W05	3103.	12.58	576.	165.	55.	4.01
+	HYDROGRAPH AT	W05	422.	12.33	42.	12.	4.	0.32
+	DIVERSION TO	DW05	422.	12.33	37.	10.	3.	0.32
+	HYDROGRAPH AT	DW05RE	108.	12.67	7.	2.	1.	0.32
+	3 COMBINED AT	CPW05	3406.	12.58	616.	176.	59.	5.79
+	DIVERSION TO	DW05S	1808.	12.58	320.	102.	34.	5.79
+	HYDROGRAPH AT	DW05SE	1598.	12.58	296.	74.	25.	5.79
+	ROUTED TO	W0512A	1426.	12.75	296.	74.	25.	5.79
+	HYDROGRAPH AT	W06	1115.	12.17	99.	30.	10.	0.71
+	HYDROGRAPH AT	W07	751.	12.08	75.	26.	9.	0.31
+	DIVERSION TO	DW07	399.	12.00	36.	11.	4.	0.31
+	HYDROGRAPH AT	DW07RE	751.	12.08	52.	15.	5.	0.31
+	2 COMBINED AT	CPW07	1797.	12.17	147.	44.	15.	1.02
+	ROUTED TO	W07W08	1521.	12.25	147.	44.	15.	1.02
+	HYDROGRAPH AT	W08	917.	12.08	72.	21.	7.	0.45
+	2 COMBINED AT	CPW08	2276.	12.17	217.	66.	22.	1.47
+	HYDROGRAPH AT	W09	748.	12.08	54.	16.	5.	0.34
+	DIVERSION TO	DW09	86.	11.75	9.	3.	1.	0.34
+	HYDROGRAPH AT	DW09RE	748.	12.08	50.	13.	4.	0.34
+	2 COMBINED AT	CPW09	2952.	12.17	266.	79.	26.	1.80
+	ROUTED TO	W09W10	2382.	12.25	266.	79.	26.	1.80
+	HYDROGRAPH AT	W10	2114.	12.17	217.	64.	21.	1.34
+	2 COMBINED AT	CPW10	4343.	12.25	480.	142.	48.	3.14
+	HYDROGRAPH AT	W11	1334.	12.17	132.	39.	13.	0.81
+	2 COMBINED AT	CPW11	5537.	12.25	610.	181.	60.	3.95

APPENDIX II

MODIFIED HYDROLOGIC MODEL
(50-YEAR PEAK FLOWS ESTIMATION)

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road



Peoria Avenue Watershed
on FCDMC's NOAA 14 Map No. 62

Not to Scale

N

Legend

White Tanks ADMPU Major Sub-basin Boundary
Peoria Ave. / Dysart Road Boundary

Source: FCDMC

Maricopa County Department of Transporation
Drainage Design Management System
RAINFALL DATA
Project Reference: 1001D - PEORIA AVE

 12/8/2010

ID	Method	Duration	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
DEFAULT	NOAA14	5 MIN	0.235	0.320	0.386	0.474	0.543	0.615
	NOAA14	10 MIN	0.358	0.488	0.587	0.722	0.826	0.935
	NOAA14	15 MIN	0.444	0.604	0.728	0.895	1.025	1.160
	NOAA14	30 MIN	0.598	0.814	0.980	1.205	1.380	1.562
	NOAA14	1 HOUR	0.740	1.007	1.213	1.492	1.708	1.933
	NOAA14	2 HOUR	0.845	1.133	1.355	1.656	1.889	2.132
	NOAA14	3 HOUR	0.878	1.161	1.385	1.691	1.938	2.201
	NOAA14	6 HOUR	1.011	1.302	1.534	1.853	2.104	2.365
	NOAA14	12 HOUR	1.132	1.437	1.678	2.002	2.249	2.507
	NOAA14	24 HOUR	1.435	1.854	2.182	2.637	2.996	3.372


```
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *     U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                    *     HYDROLOGIC ENGINEERING CENTER    *
 *            VERSION 4.1               *                    *          609 SECOND STREET           *
 *                                      *                    *        DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   09DEC10  TIME  15:17:54  *                    *           (916) 756-1104             *
 *                                      *                    *                                      *
 ****************************************                    ****************************************


                 X     X  XXXXXXX   XXXXX          X
                 X     X  X        X     X        XX
                 X     X  X        X               X
                 XXXXXXX  XXXX     X       XXXXX   X
                 X     X  X        X               X
                 X     X  X        X     X         X
                 X     X  XXXXXXX   XXXXX         XXX


         THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

         THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
         THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
         NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
         DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
         KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                                   PAGE  1

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1            ID        Flood Control District of Maricopa County
   2            ID        L303_FU_CIP_MB01 - Loop 303/ White Tanks ADMPU AHA
   3            ID        100 YEAR
   4            ID        24 Hour Storm
   5            ID        Unit Hydrograph: S-Graph
   6            ID        08/18/2009
   7            ID
   8            ID    FCDMC CONTRACT 2007C031
   9            ID    BY HDR ENGINEERING (#79902)
  10            ID    FUTURE CONDITIONS WITH CIP-AUGUST 2009
  11            ID    MAJOR BASIN 01
  12            ID    FILE NAME: FCIP-MB1.DAT
  13            ID
  14            ID      **************************************************************************
  15            ID
  16            ID      FOLLOWING ARE THE CHANGES BY FCDMC:
  17            ID      1. Storage routing correction: removed SRD14. - JWH 10-16-09
  18            ID      2. Diversion RMSBSN correction: replaced DQ card.
  19            ID      3. Routing RRMS correction: replace RY card. - JWH 01-07-2010
  20            ID      FILE NAME: WT1FC02.DAT
  21            ID
  22            ID      FOLLOWING ARE THE CHANGES BY ANDES ENGINEERING:
  23            ID      1. Depth-area factors in JD cards replaced for 50-year event values
  24            ID         JOG September 6, 2010
  25            ID
  26            ID      For details concerning changes to this HEC-1 model, please contact
  27            ID      FCDMC, H&H Branch.
  28            ID
  29            ID      **************************************************************************
  30            ID
  31            IT       5       0       0    2000
  32            IN      15
  33            IO       5
                *DIAGRAM
                *
  34            JD   2.996   0.001
  35            PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
  36            PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
  37            PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  38            PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  39            PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  40            PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  41            PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  42            PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  43            PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  44            PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
  45            JD   2.921     5.0
  46            JD   2.846    10.0
  47            JD   2.771    20.0
  48            JD   2.696    30.0
  49            JD   2.607    60.0
  50            JD   2.553    90.0
  51            JD   2.520   120.0
                *
1                                        HEC-1 INPUT                                                   PAGE  2

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  52            KK     N07BASIN
  53            KM        BASIN BOUNDARY FROM CORTE BELLA AND MCMICKEN DAM
  54            BA   0.570
  55            LG    0.16    0.25    5.40    0.30      61
  56            UI       0     107     405     604     990     931     612     389     172     105
  57            UI      36      29      29       0       0       0       0       0       0       0
  58            UI       0       0       0       0       0       0       0       0       0       0
  59            UI       0       0       0       0       0       0       0       0       0       0
  60            UI       0       0       0       0       0       0       0       0       0       0
```

+	HYDROGRAPH AT	N24	325.	12.17	31.	10.	3.	.25
+	DIVERSION TO	RN24	325.	12.17	23.	6.	2.	.25
+	HYDROGRAPH AT	DN24RE	184.	12.33	12.	4.	1.	.25
+	2 COMBINED AT	CPN24	677.	12.33	81.	23.	8.	.77
+	HYDROGRAPH AT	N27	143.	12.17	14.	5.	2.	.13
+	DIVERSION TO	RN27	143.	12.17	14.	5.	2.	.13
+	HYDROGRAPH AT	DN27RE	0.	.00	0.	0.	0.	.13
+	4 COMBINED AT	DUMMY	1155.	12.42	210.	62.	21.	2.21
+	4 COMBINED AT	DUMMY	6526.	12.58	1252.	379.	127.	15.78
+	HYDROGRAPH AT	D03	783.	12.25	90.	28.	9.	.72
+	DIVERSION TO	RD03	783.	12.25	90.	26.	9.	.72
+	HYDROGRAPH AT	DD03RE	10.	17.42	7.	2.	1.	.72
+	ROUTED TO	D03D04	9.	18.25	7.	2.	1.	.72
+	HYDROGRAPH AT	D04	949.	12.33	117.	37.	12.	.89
+	DIVERSION TO	RD04	949.	12.33	86.	24.	8.	.89
+	HYDROGRAPH AT	DD04RE	488.	12.58	44.	13.	4.	.89
+	2 COMBINED AT	CPD04	487.	12.58	45.	15.	5.	1.61
+	DIVERSION TO	DD04S	244.	12.58	10.	2.	1.	1.61
+	HYDROGRAPH AT	DD04SE	243.	12.58	35.	13.	4.	1.61
+	ROUTED TO	D04D05	177.	12.75	34.	13.	4.	1.61
+	HYDROGRAPH AT	D05	277.	12.17	30.	10.	3.	.16
+	DIVERSION TO	RD05	177.	12.00	14.	4.	1.	.16
+	HYDROGRAPH AT	DD05RE	277.	12.17	21.	6.	2.	.16
+	2 COMBINED AT	CPD05	274.	12.17	53.	18.	6.	1.78
+	ROUTED TO	D05D14	170.	12.33	52.	18.	6.	1.78
+	DIVERSION TO	DD141S	48.	12.33	3.	1.	0.	1.78
+	HYDROGRAPH AT	DD141	122.	12.25	49.	18.	6.	1.78
+	ROUTED TO	D05D15	122.	13.25	48.	18.	6.	1.78
+	HYDROGRAPH AT	D11	667.	12.42	89.	28.	9.	.66
+	DIVERSION TO	RD11	667.	12.42	65.	18.	6.	.66
+	HYDROGRAPH AT	DD11RE	429.	12.58	34.	10.	3.	.66
+	DIVERSION TO	DD111S	356.	12.58	27.	8.	3.	.66
+	HYDROGRAPH AT	DD111	73.	12.58	7.	2.	1.	.66
+	DIVERSION TO	DD112S	33.	12.58	4.	1.	0.	.66
+	HYDROGRAPH AT	DD112	40.	12.58	3.	1.	0.	.66

+	ROUTED TO	D11D12	22.	12.83	3.	1.	0.	.66
+	HYDROGRAPH AT	D12	365.	12.42	52.	17.	6.	.35
+	DIVERSION TO	RD12	365.	12.42	47.	13.	4.	.35
+	HYDROGRAPH AT	DD12RE	41.	13.08	11.	4.	1.	.35
+	2 COMBINED AT	CPD12	54.	13.08	14.	5.	2.	1.01
+	DIVERSION TO	DD121S	16.	13.08	4.	1.	0.	1.01
+	HYDROGRAPH AT	DD121	39.	13.08	10.	3.	1.	1.01
+	DIVERSION TO	DD122S	19.	13.08	5.	2.	1.	1.01
+	HYDROGRAPH AT	DD122	19.	13.08	5.	2.	1.	1.01
+	ROUTED TO	D12D13	10.	14.50	5.	2.	1.	1.01
+	HYDROGRAPH AT	D13	1093.	12.33	129.	41.	14.	1.03
+	DIVERSION TO	RD13	1093.	12.33	129.	41.	14.	1.03
+	HYDROGRAPH AT	DD13RE	0.	.00	0.	0.	0.	1.03
+	HYDROGRAPH AT	DD04SE	244.	12.58	10.	2.	1.	1.61
+	ROUTED TO	D04D13	55.	13.83	10.	2.	1.	1.61
+	3 COMBINED AT	CPD13	54.	13.92	14.	4.	1.	3.65
+	DIVERSION TO	DD131S	2.	13.92	1.	0.	0.	3.65
+	HYDROGRAPH AT	DD131	52.	13.92	13.	4.	1.	3.65
+	DIVERSION TO	DD132S	12.	13.92	3.	1.	0.	3.65
+	HYDROGRAPH AT	DD132	40.	13.92	10.	3.	1.	3.65
+	ROUTED TO	D13D14	32.	14.67	10.	3.	1.	3.65
+	HYDROGRAPH AT	D14	932.	12.42	131.	42.	14.	.94
+	DIVERSION TO	RD14	932.	12.42	131.	41.	14.	.94
+	HYDROGRAPH AT	DD14RE	9.	23.00	3.	1.	0.	.94
+	HYDROGRAPH AT	DD141	48.	12.33	3.	1.	0.	1.78
+	ROUTED TO	D0514A	25.	13.25	3.	1.	0.	1.78
+	3 COMBINED AT	CPD14	33.	14.67	12.	4.	1.	4.76
+	DIVERSION TO	DD142S	30.	14.67	11.	4.	1.	4.76
+	HYDROGRAPH AT	DD142	3.	14.67	1.	0.	0.	4.76
+	ROUTED TO	D14D15	3.	15.08	1.	0.	0.	4.76
+	HYDROGRAPH AT	D15	359.	12.17	37.	12.	4.	.22
+	DIVERSION TO	RD15	3.	1.00	1.	0.	0.	.22
+	HYDROGRAPH AT	DD15RE	359.	12.17	37.	12.	4.	.22
+	3 COMBINED AT	CPD15	355.	12.17	81.	29.	10.	4.98
+	ROUTED TO	D15D26	288.	12.42	81.	29.	10.	4.98

ROUTED TO

+		D15D28	258.	12.58	81.	29.	10.	4.98
+	HYDROGRAPH AT	D28	353.	12.17	32.	10.	3.	.25
+	DIVERSION TO	RD28	3.	4.50	2.	0.	0.	.25
+	HYDROGRAPH AT	DD28RE	353.	12.17	32.	10.	3.	.25
+	2 COMBINED AT	CPD28	388.	12.17	110.	39.	13.	5.23
+	ROUTED TO	D28AFR	373.	12.25	109.	39.	13.	5.23
+	HYDROGRAPH AT	D26	919.	12.17	88.	28.	9.	.64
+	DIVERSION TO	RD26	919.	12.17	88.	28.	9.	.64
+	HYDROGRAPH AT	DD26RE	0.	.00	0.	0.	0.	.64
+	HYDROGRAPH AT	DD142	30.	14.67	11.	4.	1.	4.76
+	ROUTED TO	D14D26	25.	15.33	11.	4.	1.	4.76
+	2 COMBINED AT	CPD26	24.	15.33	11.	4.	1.	5.40
+	ROUTED TO	D26D27	23.	15.58	11.	4.	1.	5.40
+	HYDROGRAPH AT	D27	414.	12.25	43.	14.	5.	.32
+	DIVERSION TO	RD27	142.	12.00	13.	4.	1.	.32
+	HYDROGRAPH AT	DD27RE	414.	12.25	35.	10.	3.	.32
+	2 COMBINED AT	CPD27	407.	12.25	44.	13.	4.	5.72
+	ROUTED TO	SRD27	406.	12.17	44.	13.	4.	5.72
+	ROUTED TO	D27D42	242.	12.67	42.	13.	4.	5.72
+	HYDROGRAPH AT	D20	484.	12.33	59.	18.	6.	.50
+	DIVERSION TO	RD20	484.	12.33	59.	18.	6.	.50
+	HYDROGRAPH AT	DD20RE	0.	.00	0.	0.	0.	.50
+	HYDROGRAPH AT	DD111	356.	12.58	27.	8.	3.	.66
+	ROUTED TO	D11D20	122.	13.17	25.	8.	3.	.66
+	2 COMBINED AT	CPD20	120.	13.17	25.	8.	3.	1.16
+	ROUTED TO	D20D21	85.	13.83	23.	8.	3.	1.16
+	HYDROGRAPH AT	D21	460.	12.42	59.	18.	6.	.50
+	DIVERSION TO	RD21	460.	12.42	59.	18.	6.	.50
+	HYDROGRAPH AT	DD21RE	0.	.00	0.	0.	0.	.50
+	HYDROGRAPH AT	DD112	33.	12.58	4.	1.	0.	.66
+	ROUTED TO	D11D21	10.	13.75	4.	1.	0.	.66
+	HYDROGRAPH AT	DD121	16.	13.08	4.	1.	0.	1.01
+	ROUTED TO	D12D21	13.	13.25	4.	1.	0.	1.01
+	4 COMBINED AT	CPD21	101.	13.83	30.	10.	3.	2.00
+	DIVERSION TO	DD211S	76.	13.83	23.	8.	3.	2.00
+	HYDROGRAPH AT	DD211	25.	13.83	7.	3.	1.	2.00

+	DIVERSION TO	DD212S	20.	13.83	6.	2.	1.	2.00
+	HYDROGRAPH AT	DD212	5.	13.83	2.	1.	0.	2.00
+	ROUTED TO	D21D22	3.	14.67	1.	1.	0.	2.00
+	HYDROGRAPH AT	D22	459.	12.33	55.	17.	6.	.45
+	DIVERSION TO	RD22	459.	12.33	55.	17.	6.	.45
+	HYDROGRAPH AT	DD22RE	0.	.00	0.	0.	0.	.45
+	HYDROGRAPH AT	DD122	19.	13.08	5.	2.	1.	1.01
+	ROUTED TO	D12D22	12.	13.83	5.	2.	1.	1.01
+	3 COMBINED AT	CPD22	13.	13.83	6.	2.	1.	2.46
+	ROUTED TO	D22D23	11.	14.33	6.	2.	1.	2.46
+	HYDROGRAPH AT	D23	531.	12.33	68.	21.	7.	.54
+	DIVERSION TO	RD23	531.	12.33	68.	21.	7.	.54
+	HYDROGRAPH AT	DD23RE	0.	.00	0.	0.	0.	.54
+	HYDROGRAPH AT	DD131	2.	13.92	1.	0.	0.	3.65
+	ROUTED TO	D13D23	2.	14.83	0.	0.	0.	3.65
+	3 COMBINED AT	CPD23	12.	14.67	6.	2.	1.	5.64
+	DIVERSION TO	DD231S	1.	14.58	1.	0.	0.	5.64
+	HYDROGRAPH AT	DD231	11.	14.67	6.	2.	1.	5.64
+	DIVERSION TO	DD232S	1.	14.58	1.	0.	0.	5.64
+	HYDROGRAPH AT	DD232	9.	14.67	5.	2.	1.	5.64
+	ROUTED TO	D23D24	9.	15.00	5.	2.	1.	5.64
+	HYDROGRAPH AT	D24	438.	12.42	58.	18.	6.	.49
+	DIVERSION TO	RD24	438.	12.42	58.	18.	6.	.49
+	HYDROGRAPH AT	DD24RE	0.	.00	0.	0.	0.	.49
+	HYDROGRAPH AT	DD132	12.	13.92	3.	1.	0.	3.65
+	ROUTED TO	D13D24	10.	14.42	3.	1.	0.	3.65
+	3 COMBINED AT	CPD24	16.	14.75	7.	3.	1.	6.13
+	ROUTED TO	D24D25	15.	15.17	7.	3.	1.	6.13
+	HYDROGRAPH AT	D25	466.	12.42	59.	18.	6.	.50
+	DIVERSION TO	RD25	466.	12.42	59.	18.	6.	.50
+	HYDROGRAPH AT	DD25RE	0.	.00	0.	0.	0.	.50
+	2 COMBINED AT	CPD25	15.	15.17	7.	3.	1.	6.63
+	ROUTED TO	D25D39	14.	15.50	7.	3.	1.	6.63
+	HYDROGRAPH AT	D39	296.	12.08	25.	8.	3.	.18
+	DIVERSION TO	RD39	296.	12.08	25.	8.	3.	.18

+	HYDROGRAPH AT	DD39RE	0.	.00	0.	0.	0.	.18
+	2 COMBINED AT	CPD39	14.	15.50	7.	3.	1.	6.81
+	ROUTED TO	D39D42	13.	16.42	7.	2.	1.	6.81
+	HYDROGRAPH AT	D42	1107.	12.33	128.	40.	13.	.99
+	DIVERSION TO	RD42	1107.	12.33	128.	38.	13.	.99
+	HYDROGRAPH AT	DD42RE	8.	20.75	6.	1.	0.	.99
+	3 COMBINED AT	CPD42	242.	12.67	47.	17.	6.	9.87
+	ROUTED TO	SRD42	136.	12.92	40.	14.	5.	9.87
+	ROUTED TO	D42D53	128.	13.17	39.	14.	5.	9.87
+	HYDROGRAPH AT	D53	159.	12.17	13.	4.	1.	.12
+	DIVERSION TO	RD53	159.	12.17	13.	4.	1.	.12
+	HYDROGRAPH AT	DD53RE	0.	.00	0.	0.	0.	.12
+	2 COMBINED AT	CPD53	128.	13.17	39.	14.	5.	9.99
+	ROUTED TO	SRD53	0.	.00	0.	0.	0.	9.99
+	ROUTED TO	D53D54	0.	.00	0.	0.	0.	9.99
+	HYDROGRAPH AT	D43	536.	12.33	63.	20.	7.	.50
+	DIVERSION TO	RD43	536.	12.33	63.	19.	6.	.50
+	HYDROGRAPH AT	DD43RE	4.	22.83	2.	0.	0.	.50
+	ROUTED TO	D43D54	4.	25.08	2.	0.	0.	.50
+	HYDROGRAPH AT	D54	298.	12.25	28.	8.	3.	.27
+	DIVERSION TO	RD54	278.	12.17	17.	5.	2.	.27
+	HYDROGRAPH AT	DD54RE	259.	12.33	14.	4.	1.	.27
+	3 COMBINED AT	CPD54	233.	12.33	12.	3.	1.	10.76
+	HYDROGRAPH AT	D44	508.	12.33	64.	20.	7.	.54
+	DIVERSION TO	RD44	508.	12.33	60.	16.	5.	.54
+	HYDROGRAPH AT	DD44RE	34.	13.17	11.	4.	1.	.54
+	HYDROGRAPH AT	D55	201.	12.25	19.	6.	2.	.19
+	DIVERSION TO	RD55	201.	12.25	19.	5.	2.	.19
+	HYDROGRAPH AT	DD55RE	3.	14.58	2.	1.	0.	.19
+	HYDROGRAPH AT	D56	222.	12.33	24.	7.	2.	.22
+	DIVERSION TO	RD56	121.	12.08	8.	2.	1.	.22
+	HYDROGRAPH AT	DD56RE	222.	12.33	18.	5.	2.	.22
+	4 COMBINED AT	DUMMY	434.	12.33	35.	11.	4.	11.71
+	3 COMBINED AT	DUMMY	6526.	12.58	1303.	400.	134.	32.72
+	HYDROGRAPH AT	D52	536.	12.42	67.	20.	7.	.59
	DIVERSION TO							

+		RD52	16.	11.25	7.	2.	1.	.59
+	HYDROGRAPH AT	DD52RE	536.	12.42	65.	17.	6.	.59
+	ROUTED TO	D52D66	382.	13.00	65.	17.	6.	.59
+	HYDROGRAPH AT	D66	364.	12.25	40.	13.	4.	.30
+	DIVERSION TO	RD66	364.	12.25	40.	13.	4.	.30
+	HYDROGRAPH AT	DD66RE	0.	.00	0.	0.	0.	.30
+	2 COMBINED AT	CPD66	382.	13.00	65.	17.	6.	.89
+	ROUTED TO	D66D67	375.	13.08	64.	17.	6.	.89
+	HYDROGRAPH AT	D67	386.	12.25	43.	14.	5.	.32
+	DIVERSION TO	RD67	359.	12.17	25.	7.	2.	.32
+	HYDROGRAPH AT	DD67RE	350.	12.33	24.	7.	2.	.32
+	2 COMBINED AT	CPD67	425.	12.33	88.	24.	8.	1.20
+	HYDROGRAPH AT	D76	143.	12.25	16.	5.	2.	.11
+	DIVERSION TO	RD76	140.	12.17	10.	3.	1.	.11
+	HYDROGRAPH AT	DD76RE	117.	12.33	8.	2.	1.	.11
+	ROUTED TO	D76D77	89.	12.42	8.	2.	1.	.11
+	HYDROGRAPH AT	D77	526.	12.17	55.	18.	6.	.36
+	2 COMBINED AT	CPD77	526.	12.17	62.	20.	7.	.47
+	3 COMBINED AT	DUMMY	6913.	12.58	1415.	434.	146.	34.40
+	HYDROGRAPH AT	D35	367.	12.17	32.	10.	3.	.25
+	DIVERSION TO	RD35	367.	12.17	32.	10.	3.	.25
+	HYDROGRAPH AT	DD35RE	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	DD231	1.	14.58	1.	0.	0.	5.64
+	ROUTED TO	D23D35	1.	15.25	1.	0.	0.	5.64
+	2 COMBINED AT	CPD35	1.	15.25	1.	0.	0.	5.90
+	DIVERSION TO	DD35S	0.	15.25	0.	0.	0.	5.90
+	HYDROGRAPH AT	DD35SE	1.	15.25	0.	0.	0.	5.90
+	ROUTED TO	D35D38	1.	16.17	0.	0.	0.	5.90
+	HYDROGRAPH AT	D38	368.	12.25	43.	14.	5.	.32
+	DIVERSION TO	RD38	368.	12.25	43.	14.	5.	.32
+	HYDROGRAPH AT	DD38RE	0.	.00	0.	0.	0.	.32
+	HYDROGRAPH AT	DD232	1.	14.58	1.	0.	0.	5.64
+	ROUTED TO	D23D38	1.	16.33	1.	0.	0.	5.64
+	3 COMBINED AT	CPD38	2.	16.33	1.	0.	0.	6.22
+	ROUTED TO	D38D40	2.	17.75	1.	0.	0.	6.22
+	HYDROGRAPH AT	D32	297.	12.25	31.	10.	3.	.25

+	DIVERSION TO	RD32	297.	12.25	31.	10.	3.	.25
+	HYDROGRAPH AT	DD32RE	0.	.00	0.	0.	0.	.25
+	DIVERSION TO	DD32S	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	DD32SE	0.	.00	0.	0.	0.	.25
+	ROUTED TO	D32D33	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	D31	543.	12.25	59.	18.	6.	.50
+	DIVERSION TO	RD31	543.	12.25	59.	18.	6.	.50
+	HYDROGRAPH AT	DD31RE	0.	.00	0.	0.	0.	.50
+	HYDROGRAPH AT	DD211	76.	13.83	23.	8.	3.	2.00
+	ROUTED TO	D21D31	72.	14.00	23.	8.	3.	2.00
+	2 COMBINED AT	CPD31	72.	14.00	22.	8.	3.	2.50
+	ROUTED TO	D31D33	65.	14.17	22.	8.	3.	2.50
+	HYDROGRAPH AT	D33	312.	12.25	32.	10.	3.	.25
+	DIVERSION TO	RD33	312.	12.25	32.	9.	3.	.25
+	HYDROGRAPH AT	DD33RE	2.	20.75	2.	0.	0.	.25
+	3 COMBINED AT	CPD33	64.	14.17	22.	8.	3.	3.00
+	DIVERSION TO	DD331S	35.	14.17	12.	4.	1.	3.00
+	HYDROGRAPH AT	DD331	30.	14.17	10.	4.	1.	3.00
+	DIVERSION TO	DD332S	15.	14.17	5.	2.	1.	3.00
+	HYDROGRAPH AT	DD332	15.	14.17	5.	2.	1.	3.00
+	ROUTED TO	D33D34	13.	14.83	5.	2.	1.	3.00
+	HYDROGRAPH AT	D34	571.	12.25	62.	19.	6.	.50
+	DIVERSION TO	RD34	571.	12.25	62.	19.	6.	.50
+	HYDROGRAPH AT	DD34RE	0.	.00	0.	0.	0.	.50
+	HYDROGRAPH AT	DD212	20.	13.83	6.	2.	1.	2.00
+	ROUTED TO	D21D34	15.	14.42	6.	2.	1.	2.00
+	3 COMBINED AT	CPD34	26.	14.75	11.	4.	1.	3.50
+	ROUTED TO	D34D36	24.	15.33	10.	4.	1.	3.50
+	HYDROGRAPH AT	D36	333.	12.17	31.	10.	3.	.25
+	DIVERSION TO	RD36	333.	12.17	31.	9.	3.	.25
+	HYDROGRAPH AT	DD36RE	2.	20.92	2.	0.	0.	.25
+	HYDROGRAPH AT	DD35SE	0.	15.25	0.	0.	0.	5.90
+	ROUTED TO	D35D36	0.	16.50	0.	0.	0.	5.90
+	3 COMBINED AT	CPD36	24.	15.33	10.	4.	1.	7.64
+	DIVERSION TO	DD361S	19.	15.50	9.	3.	1.	7.64

+	HYDROGRAPH AT	DD361	2.	15.50	1.	0.	0.	7.64
+	DIVERSION TO	DD362S	2.	15.50	1.	0.	0.	7.64
+	HYDROGRAPH AT	DD362	0.	.00	0.	0.	0.	7.64
+	ROUTED TO	D36D40	0.	.00	0.	0.	0.	7.64
+	HYDROGRAPH AT	D40	378.	12.17	33.	10.	3.	.24
+	DIVERSION TO	RD40	378.	12.17	33.	10.	3.	.24
+	HYDROGRAPH AT	DD40RE	0.	.00	0.	0.	0.	.24
+	3 COMBINED AT	CPD40	2.	17.75	1.	0.	0.	8.20
+	ROUTED TO	D4049A	2.	18.33	1.	0.	0.	8.20
+	ROUTED TO	D4049B	2.	18.75	1.	0.	0.	8.20
+	HYDROGRAPH AT	D47	868.	12.42	124.	39.	13.	1.00
+	DIVERSION TO	RD47	868.	12.42	124.	39.	13.	1.00
+	HYDROGRAPH AT	DD47RE	0.	.00	0.	0.	0.	1.00
+	HYDROGRAPH AT	DD32SE	0.	.00	0.	0.	0.	.25
+	ROUTED TO	D3247A	0.	.00	0.	0.	0.	.25
+	ROUTED TO	D3247B	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	DD331	35.	14.17	12.	4.	1.	3.00
+	ROUTED TO	D3347A	34.	14.42	12.	4.	1.	3.00
+	ROUTED TO	D3347B	28.	14.92	11.	4.	1.	3.00
+	3 COMBINED AT	CPD47	28.	14.92	11.	4.	1.	3.99
+	DIVERSION TO	DD47S	25.	14.92	10.	4.	1.	3.99
+	HYDROGRAPH AT	DD47SE	3.	14.92	1.	1.	0.	3.99
+	ROUTED TO	D47D48	2.	17.33	1.	1.	0.	3.99
+	HYDROGRAPH AT	D48	765.	12.50	108.	32.	11.	1.00
+	DIVERSION TO	RD48	765.	12.50	108.	32.	11.	1.00
+	HYDROGRAPH AT	DD48RE	0.	.00	0.	0.	0.	1.00
+	HYDROGRAPH AT	DD332	15.	14.17	5.	2.	1.	3.00
+	ROUTED TO	D33D48	9.	16.08	4.	2.	1.	3.00
+	HYDROGRAPH AT	DD361	19.	15.50	9.	3.	1.	7.64
+	ROUTED TO	D3648A	18.	16.08	9.	3.	1.	7.64
+	ROUTED TO	D3648B	18.	16.33	9.	3.	1.	7.64
+	4 COMBINED AT	CPD48	25.	16.50	13.	5.	2.	9.63
+	DIVERSION TO	DD481S	21.	16.50	11.	5.	2.	9.63
+	HYDROGRAPH AT	DD481	4.	16.50	2.	1.	0.	9.63
+	DIVERSION TO	DD482S	1.	16.50	0.	0.	0.	9.63
	HYDROGRAPH AT							

+		DD482	3.	16.50	1.	1.	0.	9.63
+	ROUTED TO	D48D49	3.	17.00	1.	1.	0.	9.63
+	HYDROGRAPH AT	D49	598.	12.25	62.	20.	7.	.49
+	DIVERSION TO	RD49	32.	11.67	11.	4.	1.	.49
+	HYDROGRAPH AT	DD49RE	598.	12.25	58.	16.	5.	.49
+	HYDROGRAPH AT	DD362	2.	15.50	1.	0.	0.	7.64
+	ROUTED TO	D36D49	1.	17.08	1.	0.	0.	7.64
+	4 COMBINED AT	CPD49	598.	12.25	60.	17.	6.	10.69
+	ROUTED TO	D49D63	402.	12.42	54.	16.	5.	10.69
+	HYDROGRAPH AT	D60	601.	12.17	74.	25.	8.	.40
+	DIVERSION TO	RD60	601.	12.17	70.	20.	7.	.40
+	HYDROGRAPH AT	DD60RE	35.	13.42	15.	5.	2.	.40
+	HYDROGRAPH AT	DD481	21.	16.50	11.	5.	2.	9.63
+	ROUTED TO	D48D60	21.	16.83	11.	5.	2.	9.63
+	2 COMBINED AT	CPD60	36.	16.67	23.	9.	3.	10.04
+	ROUTED TO	D60D63	33.	16.92	22.	9.	3.	10.04
+	HYDROGRAPH AT	D63	386.	12.08	42.	15.	5.	.22
+	DIVERSION TO	RD63	386.	12.08	42.	12.	4.	.22
+	HYDROGRAPH AT	DD63RE	11.	14.67	7.	2.	1.	.22
+	HYDROGRAPH AT	DD482	1.	16.50	0.	0.	0.	9.63
+	ROUTED TO	D48D63	1.	21.75	0.	0.	0.	9.63
+	4 COMBINED AT	CPD63	402.	12.42	71.	27.	9.	11.31
+	ROUTED TO	SRD63	52.	13.33	48.	27.	9.	11.31
+	ROUTED TO	D63D64	52.	13.83	48.	27.	9.	11.31
+	HYDROGRAPH AT	D62	418.	12.17	46.	16.	5.	.25
+	DIVERSION TO	RD62	418.	12.17	44.	13.	4.	.25
+	HYDROGRAPH AT	DD62RE	15.	14.00	8.	3.	1.	.25
+	DIVERSION TO	DD621S	11.	14.00	6.	2.	1.	.25
+	HYDROGRAPH AT	DD621	4.	14.00	2.	1.	0.	.25
+	DIVERSION TO	DD622S	2.	14.00	1.	0.	0.	.25
+	HYDROGRAPH AT	DD622	2.	14.00	1.	0.	0.	.25
+	ROUTED TO	D62D64	1.	15.58	1.	0.	0.	.25
+	HYDROGRAPH AT	D64	453.	12.17	50.	17.	6.	.27
+	DIVERSION TO	RD64	453.	12.17	47.	13.	4.	.27
+	HYDROGRAPH AT	DD64RE	25.	13.33	11.	4.	1.	.27
+	3 COMBINED AT	CPD64	66.	13.75	57.	30.	10.	11.84

+	ROUTED TO	D64D74	63.	14.83	56.	30.	10.	11.84
+	HYDROGRAPH AT	D73A	321.	12.17	33.	11.	4.	.24
+	DIVERSION TO	RD73A	321.	12.17	25.	7.	2.	.24
+	HYDROGRAPH AT	DD73AR	135.	12.42	13.	4.	1.	.24
+	HYDROGRAPH AT	DD621	11.	14.00	6.	2.	1.	.25
+	ROUTED TO	D6273A	9.	14.83	6.	2.	1.	.25
+	2 COMBINED AT	CPD73A	135.	12.42	17.	6.	2.	.49
+	ROUTED TO	D73A74	57.	12.58	16.	6.	2.	.49
+	HYDROGRAPH AT	D74	458.	12.25	60.	21.	7.	.31
+	DIVERSION TO	RD74	458.	12.25	59.	17.	6.	.31
+	HYDROGRAPH AT	DD74RE	15.	14.75	10.	3.	1.	.31
+	HYDROGRAPH AT	DD622	2.	14.00	1.	0.	0.	.25
+	ROUTED TO	D62D74	1.	16.08	1.	0.	0.	.25
+	4 COMBINED AT	CPD74	78.	16.67	72.	37.	13.	12.39
+	ROUTED TO	SRD74	53.	24.00	50.	36.	13.	12.39
+	HYDROGRAPH AT	D78A	261.	12.25	35.	12.	4.	.18
+	DIVERSION TO	RD78A	261.	12.25	35.	10.	3.	.18
+	HYDROGRAPH AT	DD78AR	8.	14.92	6.	2.	1.	.18
+	2 COMBINED AT	CPD78A	56.	23.83	52.	37.	13.	12.58
+	ROUTED TO	D78ACP	56.	23.92	52.	37.	13.	12.58
+	HYDROGRAPH AT	D41	474.	12.08	39.	12.	4.	.25
+	DIVERSION TO	RD41	474.	12.08	39.	12.	4.	.25
+	HYDROGRAPH AT	DD41RE	0.	.00	0.	0.	0.	.25
+	ROUTED TO	D41D50	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	D50	653.	12.25	77.	24.	8.	.50
+	DIVERSION TO	RD50	653.	12.25	77.	24.	8.	.50
+	HYDROGRAPH AT	DD50RE	0.	.00	0.	0.	0.	.50
+	2 COMBINED AT	CPD50	0.	.00	0.	0.	0.	.76
+	ROUTED TO	D5064A	0.	.00	0.	0.	0.	.76
+	HYDROGRAPH AT	D64A	619.	12.25	66.	21.	7.	.50
+	DIVERSION TO	RD64A	619.	12.25	66.	21.	7.	.50
+	HYDROGRAPH AT	DD64AR	0.	.00	0.	0.	0.	.50
+	2 COMBINED AT	CPD64A	0.	.00	0.	0.	0.	1.25
+	ROUTED TO	64A74A	0.	.00	0.	0.	0.	1.25
+	HYDROGRAPH AT	D74A	648.	12.25	76.	25.	8.	.49

+	DIVERSION TO	RD74A	648.	12.25	72.	20.	7.	.49
+	HYDROGRAPH AT	DD74AR	34.	13.42	14.	5.	2.	.49
+	2 COMBINED AT	CPD74A	34.	13.42	14.	5.	2.	1.75
+	ROUTED TO	D74A78	28.	13.75	14.	5.	2.	1.75
+	2 COMBINED AT	CP7874	60.	23.92	57.	40.	14.	14.32
+	ROUTED TO	78A78B	60.	24.00	57.	40.	14.	14.32
+	HYDROGRAPH AT	D06	513.	12.33	64.	19.	6.	.46
+	DIVERSION TO	RD06	513.	12.33	60.	16.	5.	.46
+	HYDROGRAPH AT	DD06RE	29.	13.25	9.	3.	1.	.46
+	DIVERSION TO	DD06S	0.	.00	0.	0.	0.	.46
+	HYDROGRAPH AT	DD06SE	29.	13.25	9.	3.	1.	.46
+	ROUTED TO	D06D07	18.	13.58	9.	3.	1.	.46
+	HYDROGRAPH AT	D07	751.	12.50	109.	33.	11.	.89
+	DIVERSION TO	RD07	751.	12.50	109.	31.	10.	.89
+	HYDROGRAPH AT	DD07RE	9.	18.17	6.	2.	1.	.89
+	2 COMBINED AT	CPD07	17.	13.67	11.	5.	2.	1.35
+	ROUTED TO	D07D02	15.	14.17	11.	5.	2.	1.35
+	HYDROGRAPH AT	D01	1085.	12.58	171.	51.	17.	1.56
+	DIVERSION TO	RD01	1085.	12.58	171.	49.	16.	1.56
+	HYDROGRAPH AT	DD01RE	12.	18.92	9.	3.	1.	1.56
+	ROUTED TO	D01D02	10.	22.08	8.	3.	1.	1.56
+	HYDROGRAPH AT	D02	1422.	12.50	217.	66.	22.	1.84
+	DIVERSION TO	RD02	1422.	12.50	217.	63.	21.	1.84
+	HYDROGRAPH AT	DD02RE	16.	19.83	10.	3.	1.	1.84
+	3 COMBINED AT	CPD02	31.	22.08	25.	10.	3.	4.76
+	ROUTED TO	D02D10	30.	22.58	25.	10.	3.	4.76
+	HYDROGRAPH AT	D09	298.	12.33	35.	11.	4.	.26
+	DIVERSION TO	RD09	298.	12.33	30.	8.	3.	.26
+	HYDROGRAPH AT	DD09RE	83.	12.67	9.	3.	1.	.26
+	ROUTED TO	D09D10	50.	12.75	9.	3.	1.	.26
+	HYDROGRAPH AT	DD06SE	0.	.00	0.	0.	0.	.46
+	ROUTED TO	D06D10	0.	.00	0.	0.	0.	.46
+	HYDROGRAPH AT	D10	650.	12.33	86.	27.	9.	.63
+	DIVERSION TO	RD10	650.	12.33	83.	23.	8.	.63
+	HYDROGRAPH AT	DD10RE	28.	13.67	12.	4.	1.	.63
	4 COMBINED AT							

+		CPD10	54.	12.75	39.	19.	6.	5.65
+	ROUTED TO	D10D19	33.	23.25	29.	15.	5.	5.65
+	HYDROGRAPH AT	D08	550.	12.33	76.	24.	8.	.51
+	DIVERSION TO	RD08	550.	12.33	72.	20.	7.	.51
+	HYDROGRAPH AT	DD08RE	30.	13.58	13.	4.	1.	.51
+	ROUTED TO	D08D16	21.	14.50	12.	4.	1.	.51
+	HYDROGRAPH AT	D16	783.	12.17	99.	34.	11.	.52
+	DIVERSION TO	RD16	783.	12.17	93.	27.	9.	.52
+	HYDROGRAPH AT	DD16RE	51.	13.33	21.	8.	3.	.52
+	2 COMBINED AT	CPD16	50.	13.33	33.	12.	4.	1.03
+	DIVERSION TO	DD161S	37.	13.33	24.	9.	3.	1.03
+	HYDROGRAPH AT	DD161	13.	13.33	9.	3.	1.	1.03
+	DIVERSION TO	DD162S	7.	13.33	5.	2.	1.	1.03
+	HYDROGRAPH AT	DD162	6.	13.33	4.	1.	0.	1.03
+	ROUTED TO	D16D18	6.	13.75	4.	1.	0.	1.03
+	HYDROGRAPH AT	D18	262.	12.17	23.	7.	2.	.20
+	DIVERSION TO	RD18	262.	12.17	23.	7.	2.	.20
+	HYDROGRAPH AT	DD18RE	0.	.00	0.	0.	0.	.20
+	2 COMBINED AT	CPD18	6.	13.75	4.	1.	0.	1.23
+	ROUTED TO	D18D19	6.	15.00	4.	1.	0.	1.23
+	HYDROGRAPH AT	D17	266.	12.17	23.	7.	2.	.20
+	DIVERSION TO	RD17	266.	12.17	23.	7.	2.	.20
+	HYDROGRAPH AT	DD17RE	0.	.00	0.	0.	0.	.20
+	ROUTED TO	D17D19	0.	.00	0.	0.	0.	.20
+	HYDROGRAPH AT	D19	466.	12.33	57.	18.	6.	.51
+	DIVERSION TO	RD19	466.	12.33	57.	18.	6.	.51
+	HYDROGRAPH AT	DD19RE	0.	.00	0.	0.	0.	.51
+	4 COMBINED AT	CPD19	35.	15.00	27.	15.	5.	7.58
+	ROUTED TO	D19D30	29.	16.42	25.	13.	4.	7.58
+	HYDROGRAPH AT	D29	773.	12.17	97.	33.	11.	.51
+	DIVERSION TO	RD29	773.	12.17	93.	26.	9.	.51
+	HYDROGRAPH AT	DD29RE	43.	13.58	20.	7.	2.	.51
+	HYDROGRAPH AT	DD161	37.	13.33	24.	9.	3.	1.03
+	ROUTED TO	D16D29	34.	15.08	23.	9.	3.	1.03
+	2 COMBINED AT	CPD29	62.	14.25	42.	16.	5.	1.54
+	ROUTED TO	D29D30	57.	14.75	41.	16.	5.	1.54

+	HYDROGRAPH AT	D30	1310.	12.25	173.	59.	20.	.91
+	DIVERSION TO	RD30	1310.	12.25	170.	49.	16.	.91
+	HYDROGRAPH AT	DD30RE	52.	14.33	30.	10.	3.	.91
+	HYDROGRAPH AT	DD162	7.	13.33	5.	2.	1.	1.03
+	ROUTED TO	D16D30	6.	15.67	5.	2.	1.	1.03
+	4 COMBINED AT	CPD30	107.	15.50	87.	35.	12.	9.01
+	ROUTED TO	D30D46	106.	16.67	86.	35.	12.	9.01
+	HYDROGRAPH AT	D45	654.	12.25	78.	26.	9.	.49
+	DIVERSION TO	RD45	654.	12.25	77.	22.	7.	.49
+	HYDROGRAPH AT	DD45RE	18.	14.67	11.	4.	1.	.49
+	DIVERSION TO	DD451S	3.	14.67	2.	1.	0.	.49
+	HYDROGRAPH AT	DD451	15.	14.67	9.	3.	1.	.49
+	DIVERSION TO	DD452S	8.	14.67	5.	2.	1.	.49
+	HYDROGRAPH AT	DD452	8.	14.67	5.	2.	1.	.49
+	ROUTED TO	D45D46	6.	16.42	4.	2.	1.	.49
+	HYDROGRAPH AT	D46	801.	12.42	114.	36.	12.	.92
+	DIVERSION TO	RD46	801.	12.42	114.	36.	12.	.92
+	HYDROGRAPH AT	DD46RE	0.	.00	0.	0.	0.	.92
+	3 COMBINED AT	CPD46	106.	16.83	88.	35.	12.	10.41
+	ROUTED TO	D46D58	102.	17.08	86.	35.	12.	10.41
+	DIVERSION TO	SSPILL	42.	17.08	35.	14.	5.	10.41
+	HYDROGRAPH AT	RMSBSN	60.	17.08	51.	20.	7.	10.41
+	HYDROGRAPH AT	RMSBSN	42.	17.08	35.	14.	5.	10.41
+	ROUTED TO	SRREEM	15.	25.50	15.	11.	5.	10.41
+	2 COMBINED AT	CPRMS	66.	17.33	60.	31.	12.	10.41
+	ROUTED TO	RRMS	66.	17.92	59.	31.	12.	10.41
+	HYDROGRAPH AT	D57	773.	12.17	93.	32.	11.	.48
+	DIVERSION TO	RD57	773.	12.17	88.	25.	8.	.48
+	HYDROGRAPH AT	DD57RE	49.	13.33	21.	7.	2.	.48
+	HYDROGRAPH AT	DD451	3.	14.67	2.	1.	0.	.49
+	ROUTED TO	D45D57	2.	16.33	1.	1.	0.	.49
+	2 COMBINED AT	CPD57	49.	13.33	22.	8.	3.	.97
+	ROUTED TO	D57D58	38.	14.00	21.	8.	3.	.97
+	HYDROGRAPH AT	D58	1019.	12.33	123.	40.	13.	.92
+	DIVERSION TO	RD58	1019.	12.33	122.	35.	12.	.92

+	HYDROGRAPH AT	DD58RE	22.	15.00	14.	5.	2.	.92
+	HYDROGRAPH AT	DD452	8.	14.67	5.	2.	1.	.49
+	ROUTED TO	D45D58	6.	16.50	5.	2.	1.	.49
+	4 COMBINED AT	CPD58	94.	18.42	84.	41.	15.	11.81
+	ROUTED TO	D5869A	93.	18.25	83.	41.	15.	11.81
+	HYDROGRAPH AT	D68A	424.	12.08	37.	13.	4.	.24
+	DIVERSION TO	RD68A	424.	12.08	37.	12.	4.	.24
+	HYDROGRAPH AT	DD68AR	3.	20.75	2.	1.	0.	.24
+	ROUTED TO	68A69A	3.	22.75	2.	1.	0.	.24
+	HYDROGRAPH AT	D69A	665.	12.17	59.	19.	6.	.46
+	DIVERSION TO	RD69A	665.	12.17	59.	19.	6.	.46
+	HYDROGRAPH AT	DD69AR	1.	21.42	1.	0.	0.	.46
+	3 COMBINED AT	CPD69A	92.	18.25	83.	41.	15.	12.52
+	ROUTED TO	D69A70	89.	19.75	80.	40.	14.	12.52
+	HYDROGRAPH AT	D68	429.	12.08	46.	16.	5.	.25
+	DIVERSION TO	RD68	429.	12.08	44.	13.	4.	.25
+	HYDROGRAPH AT	DD68RE	22.	13.42	10.	3.	1.	.25
+	DIVERSION TO	DD681S	17.	13.42	8.	3.	1.	.25
+	HYDROGRAPH AT	DD681	5.	13.42	2.	1.	0.	.25
+	DIVERSION TO	DD682S	2.	13.42	1.	0.	0.	.25
+	HYDROGRAPH AT	DD682	3.	13.42	1.	0.	0.	.25
+	ROUTED TO	D68D69	2.	14.25	1.	0.	0.	.25
+	HYDROGRAPH AT	D69	545.	12.25	58.	18.	6.	.46
+	DIVERSION TO	RD69	545.	12.25	58.	18.	6.	.46
+	HYDROGRAPH AT	DD69RE	1.	22.83	0.	0.	0.	.46
+	2 COMBINED AT	CPD69	2.	14.25	1.	1.	0.	.71
+	DIVERSION TO	DD691S	0.	14.25	0.	0.	0.	.71
+	HYDROGRAPH AT	DD691	2.	14.25	1.	0.	0.	.71
+	DIVERSION TO	DD692S	0.	14.25	0.	0.	0.	.71
+	HYDROGRAPH AT	DD692	2.	14.25	1.	0.	0.	.71
+	ROUTED TO	D69D70	2.	15.33	1.	0.	0.	.71
+	HYDROGRAPH AT	D70	258.	12.17	19.	5.	2.	.26
+	DIVERSION TO	RD70	1.	9.75	1.	0.	0.	.26
+	HYDROGRAPH AT	DD70RE	258.	12.17	19.	5.	2.	.26
+	HYDROGRAPH AT	D70A	453.	12.17	50.	17.	6.	.27
	DIVERSION TO							

+		RD70A	453.	12.17	49.	14.	5.	.27
+	HYDROGRAPH AT	DD70AR	18.	13.83	9.	3.	1.	.27
+	ROUTED TO	D70A70	14.	15.50	9.	3.	1.	.27
+	4 COMBINED AT	CPD70	258.	12.17	128.	61.	23.	13.76
+	ROUTED TO	SRD70	65.	25.75	61.	36.	13.	13.76
+	ROUTED TO	D70D71	65.	25.83	61.	36.	13.	13.76
+	HYDROGRAPH AT	D71	402.	12.17	43.	14.	5.	.24
+	DIVERSION TO	RD71	402.	12.17	40.	11.	4.	.24
+	HYDROGRAPH AT	DD71RE	22.	13.25	9.	3.	1.	.24
+	2 COMBINED AT	CPD71	65.	23.92	62.	36.	14.	14.00
+	ROUTED TO	D71D72	65.	26.00	62.	36.	14.	14.00
+	HYDROGRAPH AT	D59	1341.	12.25	186.	64.	21.	.99
+	DIVERSION TO	RD59	1341.	12.25	183.	53.	18.	.99
+	HYDROGRAPH AT	DD59RE	55.	14.42	31.	11.	4.	.99
+	HYDROGRAPH AT	DD47SE	25.	14.92	10.	4.	1.	3.99
+	ROUTED TO	D47D59	21.	15.75	10.	4.	1.	3.99
+	2 COMBINED AT	CPD59	59.	15.58	40.	14.	5.	4.99
+	DIVERSION TO	DD59S	56.	15.58	38.	14.	5.	4.99
+	HYDROGRAPH AT	DD59SE	3.	15.58	2.	1.	0.	4.99
+	ROUTED TO	D59D61	3.	16.17	2.	1.	0.	4.99
+	HYDROGRAPH AT	D61	485.	12.25	66.	23.	8.	.35
+	DIVERSION TO	RD61	485.	12.25	65.	19.	6.	.35
+	HYDROGRAPH AT	DD61RE	19.	14.50	11.	4.	1.	.35
+	2 COMBINED AT	CPD61	17.	14.50	12.	4.	1.	5.34
+	ROUTED TO	D6172A	16.	15.58	12.	4.	1.	5.34
+	HYDROGRAPH AT	D71A	404.	12.17	45.	16.	5.	.24
+	DIVERSION TO	RD71A	404.	12.17	45.	13.	4.	.24
+	HYDROGRAPH AT	DD71AR	11.	14.75	7.	3.	1.	.24
+	HYDROGRAPH AT	DD59SE	56.	15.58	38.	14.	5.	4.99
+	ROUTED TO	D5971A	54.	16.08	37.	14.	5.	4.99
+	2 COMBINED AT	CPD71A	62.	16.08	43.	16.	5.	5.22
+	ROUTED TO	71A72A	61.	16.33	43.	16.	5.	5.22
+	HYDROGRAPH AT	D72A	433.	12.17	48.	17.	6.	.25
+	DIVERSION TO	RD72A	433.	12.17	48.	14.	5.	.25
+	HYDROGRAPH AT	DD72AR	11.	14.75	7.	3.	1.	.25
+	3 COMBINED AT	CPD72A	84.	16.42	60.	22.	7.	5.83

+	ROUTED TO	D72A72	84.	16.50	60.	22.	7.	5.83
+	HYDROGRAPH AT	D72	446.	12.17	48.	17.	6.	.26
+	DIVERSION TO	RD72	446.	12.17	47.	13.	4.	.26
+	HYDROGRAPH AT	DD72RE	16.	14.00	9.	3.	1.	.26
+	3 COMBINED AT	CPD72	94.	23.92	78.	48.	18.	20.09
+	ROUTED TO	D72D73	94.	24.00	78.	48.	18.	20.09
+	HYDROGRAPH AT	D73	375.	12.25	44.	15.	5.	.28
+	DIVERSION TO	RD73	375.	12.25	43.	12.	4.	.28
+	HYDROGRAPH AT	DD73RE	11.	14.42	6.	2.	1.	.28
+	2 COMBINED AT	CPD73	96.	23.92	79.	49.	18.	20.37
+	ROUTED TO	D73D78	95.	24.08	79.	49.	18.	20.37
+	HYDROGRAPH AT	B02	552.	12.33	71.	22.	8.	.54
+	DIVERSION TO	RB02	507.	12.25	37.	10.	3.	.54
+	HYDROGRAPH AT	DB02RE	531.	12.42	43.	12.	4.	.54
+	DIVERSION TO	DB02LR	0.	.00	0.	0.	0.	.54
+	HYDROGRAPH AT	DB02SD	531.	12.42	43.	12.	4.	.54
+	HYDROGRAPH AT	B04	532.	12.08	40.	13.	4.	.31
+	DIVERSION TO	RB04	444.	12.00	26.	7.	2.	.31
+	HYDROGRAPH AT	DB04RE	444.	12.17	19.	6.	2.	.31
+	ROUTED TO	B04B02	97.	12.75	19.	6.	2.	.31
+	HYDROGRAPH AT	DB02SD	0.	.00	0.	0.	0.	.54
+	2 COMBINED AT	CPB02	97.	12.75	19.	6.	2.	.86
+	DIVERSION TO	LR02LR	0.	.00	0.	0.	0.	.86
+	HYDROGRAPH AT	LR02SD	96.	12.75	19.	6.	2.	.86
+	ROUTED TO	LR2D78	52.	13.17	18.	6.	2.	.86
+	HYDROGRAPH AT	D78B	576.	12.42	98.	34.	11.	.53
+	DIVERSION TO	RD78B	576.	12.42	97.	28.	9.	.53
+	HYDROGRAPH AT	DD78BR	22.	15.17	15.	5.	2.	.53
+	5 COMBINED AT	CPD78B	580.	12.42	155.	102.	38.	32.08
+	ROUTED TO	78B79B	289.	12.58	120.	80.	30.	32.08
+	HYDROGRAPH AT	D51	399.	12.25	38.	11.	4.	.29
+	DIVERSION TO	RD51	200.	12.00	11.	3.	1.	.29
+	HYDROGRAPH AT	DD51RE	399.	12.25	29.	8.	3.	.29
+	ROUTED TO	D51D65	176.	13.08	28.	8.	3.	.29
+	HYDROGRAPH AT	D65	918.	12.17	96.	31.	10.	.69

+	DIVERSION TO	RD65	918.	12.17	96.	31.	10.	.69
+	HYDROGRAPH AT	DD65RE	0.	.00	0.	0.	0.	.69
+	2 COMBINED AT	CPD65	176.	13.08	28.	8.	3.	.98
+	ROUTED TO	D65D75	130.	13.75	27.	8.	3.	.98
+	HYDROGRAPH AT	D79A	288.	12.17	31.	10.	3.	.17
+	DIVERSION TO	RD79A	288.	12.17	31.	10.	3.	.17
+	HYDROGRAPH AT	DD79AR	4.	19.00	3.	1.	0.	.17
+	HYDROGRAPH AT	D75	1080.	12.25	125.	41.	14.	.88
+	DIVERSION TO	RD75	1080.	12.25	124.	35.	12.	.88
+	HYDROGRAPH AT	DD75RE	22.	15.17	15.	5.	2.	.88
+	3 COMBINED AT	CPD75	130.	13.75	40.	14.	5.	2.04
+	ROUTED TO	SRD75	40.	15.58	32.	13.	4.	2.04
+	ROUTED TO	D7579B	39.	16.00	32.	13.	4.	2.04
+	HYDROGRAPH AT	D79B	452.	12.17	54.	18.	6.	.32
+	DIVERSION TO	RD79B	452.	12.17	50.	14.	5.	.32
+	HYDROGRAPH AT	DD79BR	29.	13.25	12.	4.	1.	.32
+	3 COMBINED AT	CPD79B	283.	12.58	129.	88.	32.	34.44
+	ROUTED TO	D79B80	285.	12.67	128.	87.	32.	34.44
+	HYDROGRAPH AT	D80	214.	12.08	19.	6.	2.	.13
+	DIVERSION TO	RD80	214.	12.08	17.	5.	2.	.13
+	HYDROGRAPH AT	DD80RE	10.	13.00	4.	1.	0.	.13
+	2 COMBINED AT	CPD80	285.	12.67	129.	88.	32.	34.57
+	HYDROGRAPH AT	B01	162.	12.08	14.	4.	1.	.10
+	3 COMBINED AT	DUMMY	6913.	12.58	1450.	482.	171.	69.06
+	HYDROGRAPH AT	B03	485.	12.17	51.	17.	6.	.34
+	DIVERSION TO	RB03	485.	12.17	51.	15.	5.	.34
+	HYDROGRAPH AT	DB03RE	7.	17.83	5.	1.	0.	.34
+	ROUTED TO	B03B05	6.	18.50	5.	1.	0.	.34
+	HYDROGRAPH AT	B05	511.	12.25	62.	21.	7.	.40
+	DIVERSION TO	RB05	511.	12.25	48.	13.	4.	.40
+	HYDROGRAPH AT	DB05RE	208.	12.50	24.	7.	2.	.40
+	2 COMBINED AT	CPB05	207.	12.50	24.	9.	3.	.73
+	ROUTED TO	B05B06	107.	12.83	23.	9.	3.	.73
+	HYDROGRAPH AT	B06	516.	12.25	53.	17.	6.	.40
+	DIVERSION TO	RB06	188.	12.00	16.	5.	2.	.40
	HYDROGRAPH AT							

+		DB06RE	516.	12.25	43.	12.	4.	.40
+	2 COMBINED AT	CPB06	514.	12.25	64.	20.	7.	1.13
+	ROUTED TO	B06B15	316.	12.75	63.	20.	7.	1.13
+	HYDROGRAPH AT	B07	251.	12.33	26.	8.	3.	.25
+	DIVERSION TO	RB07	251.	12.33	26.	8.	3.	.25
+	HYDROGRAPH AT	DB07RE	0.	.00	0.	0.	0.	.25
+	ROUTED TO	B07B09	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	B08	421.	12.08	36.	12.	4.	.23
+	DIVERSION TO	RB08	421.	12.08	36.	12.	4.	.23
+	HYDROGRAPH AT	DB08RE	0.	.00	0.	0.	0.	.23
+	ROUTED TO	B08B09	0.	.00	0.	0.	0.	.23
+	HYDROGRAPH AT	B09	638.	12.17	53.	17.	6.	.43
+	DIVERSION TO	RB09	632.	12.17	37.	10.	3.	.43
+	HYDROGRAPH AT	DB09RE	452.	12.25	22.	6.	2.	.43
+	3 COMBINED AT	CPB09	443.	12.25	22.	6.	2.	.91
+	ROUTED TO	SRB11	12.	13.92	11.	6.	2.	.91
+	ROUTED TO	B09B11	12.	14.83	11.	6.	2.	.91
+	HYDROGRAPH AT	B10	255.	12.08	23.	8.	3.	.16
+	DIVERSION TO	RB10	255.	12.08	23.	8.	3.	.16
+	HYDROGRAPH AT	DB10RE	0.	.00	0.	0.	0.	.16
+	ROUTED TO	B1011A	0.	.00	0.	0.	0.	.16
+	ROUTED TO	B1011B	0.	.00	0.	0.	0.	.16
+	HYDROGRAPH AT	B11	952.	12.25	97.	30.	10.	.82
+	DIVERSION TO	RB11	77.	11.75	17.	6.	2.	.82
+	HYDROGRAPH AT	DB11RE	952.	12.25	90.	24.	8.	.82
+	3 COMBINED AT	CPB11	949.	12.25	97.	30.	10.	1.89
+	ROUTED TO	B11B12	752.	12.33	95.	30.	10.	1.89
+	HYDROGRAPH AT	B12	328.	12.33	35.	10.	3.	.38
+	DIVERSION TO	RB12	4.	10.25	3.	1.	0.	.38
+	HYDROGRAPH AT	DB12RE	328.	12.33	35.	9.	3.	.38
+	2 COMBINED AT	CPB12	1076.	12.33	128.	39.	13.	2.27
+	ROUTED TO	B12B14	1053.	12.42	128.	39.	13.	2.27
+	HYDROGRAPH AT	B13	493.	12.25	46.	13.	4.	.49
+	DIVERSION TO	RB13	493.	12.25	45.	12.	4.	.49
+	HYDROGRAPH AT	DB13RE	7.	13.83	4.	1.	0.	.49
+	ROUTED TO	B13B14	5.	15.33	3.	1.	0.	.49

+	HYDROGRAPH AT	B14	374.	12.25	40.	13.	4.	.33
+	DIVERSION TO	RB14	374.	12.25	40.	12.	4.	.33
+	HYDROGRAPH AT	DB14RE	3.	23.42	1.	0.	0.	.33
+	3 COMBINED AT	CPB14	1053.	12.42	130.	41.	14.	3.09
+	ROUTED TO	B14B15	863.	12.58	128.	40.	14.	3.09
+	HYDROGRAPH AT	B15	463.	12.25	55.	18.	6.	.38
+	3 COMBINED AT	CPB15	1277.	12.50	238.	77.	26.	4.60
+	HYDROGRAPH AT	B16	171.	12.08	14.	5.	2.	.11
+	DIVERSION TO	RB16	171.	12.08	13.	3.	1.	.11
+	HYDROGRAPH AT	DB16RE	18.	12.42	4.	1.	0.	.11
+	ROUTED TO	B16B17	7.	13.00	4.	1.	0.	.11
+	HYDROGRAPH AT	B17	445.	12.25	50.	16.	5.	.33
+	DIVERSION TO	RB17	440.	12.17	34.	9.	3.	.33
+	HYDROGRAPH AT	DB17RE	349.	12.33	23.	7.	2.	.33
+	2 COMBINED AT	CPB17	348.	12.33	26.	8.	3.	.45
+	ROUTED TO	B17B18	210.	12.50	26.	8.	3.	.45
+	HYDROGRAPH AT	B18	321.	12.25	35.	11.	4.	.28
+	DIVERSION TO	RB18	321.	12.25	35.	10.	3.	.28
+	HYDROGRAPH AT	DB18RE	3.	18.83	2.	1.	0.	.28
+	2 COMBINED AT	CPB18	210.	12.50	26.	9.	3.	.73
+	ROUTED TO	B18B19	126.	12.75	25.	9.	3.	.73
+	HYDROGRAPH AT	B19	200.	12.08	17.	6.	2.	.12
+	2 COMBINED AT	CPB19	199.	12.08	40.	14.	5.	.85
+	HYDROGRAPH AT	B20	347.	12.17	34.	11.	4.	.23
+	4 COMBINED AT	DUMMY	7658.	12.58	1630.	535.	188.	74.73
+	HYDROGRAPH AT	B21	275.	12.25	31.	10.	3.	.24
+	DIVERSION TO	RB21	275.	12.25	31.	10.	3.	.24
+	HYDROGRAPH AT	DB21RE	0.	.00	0.	0.	0.	.24
+	ROUTED TO	B21B22	0.	.00	0.	0.	0.	.24
+	HYDROGRAPH AT	B22	331.	12.17	32.	11.	4.	.22
+	DIVERSION TO	RB22	4.	4.33	3.	1.	0.	.22
+	HYDROGRAPH AT	DB22RE	331.	12.17	32.	10.	3.	.22
+	2 COMBINED AT	CPB22	330.	12.17	32.	10.	3.	.46
+	HYDROGRAPH AT	B23	299.	12.33	36.	11.	4.	.27
+	DIVERSION TO	RB23	5.	9.17	3.	1.	0.	.27

+	HYDROGRAPH AT	DB23RE	299.	12.33	36.	10.	3.	.27
+	ROUTED TO	B23B24	282.	12.42	36.	10.	3.	.27
+	HYDROGRAPH AT	B24	237.	12.17	23.	7.	2.	.19
+	DIVERSION TO	RB24	237.	12.17	23.	6.	2.	.19
+	HYDROGRAPH AT	DB24RE	4.	14.83	3.	1.	0.	.19
+	2 COMBINED AT	CPB24	282.	12.42	37.	11.	4.	.46
+	ROUTED TO	B24B25	234.	12.67	37.	11.	4.	.46
+	HYDROGRAPH AT	B25	285.	12.17	26.	8.	3.	.20
+	DIVERSION TO	RB25	285.	12.17	19.	5.	2.	.20
+	HYDROGRAPH AT	DB25RE	130.	12.33	10.	3.	1.	.20
+	2 COMBINED AT	CPB25	253.	12.67	47.	14.	5.	.66
+	HYDROGRAPH AT	B26	400.	12.17	39.	13.	4.	.31
+	DIVERSION TO	RB26	400.	12.17	32.	9.	3.	.31
+	HYDROGRAPH AT	DB26RE	120.	12.42	12.	4.	1.	.31
+	ROUTED TO	B26B27	63.	12.83	12.	4.	1.	.31
+	HYDROGRAPH AT	B27	443.	12.25	54.	18.	6.	.36
+	2 COMBINED AT	CPB27	442.	12.25	63.	22.	7.	.67
+	4 COMBINED AT	DUMMY	7977.	12.58	1735.	569.	199.	76.53
+	HYDROGRAPH AT	B76	335.	12.33	37.	11.	4.	.39
+	DIVERSION TO	RB76	335.	12.33	37.	11.	4.	.39
+	HYDROGRAPH AT	DB76RE	0.	.00	0.	0.	0.	.39
+	ROUTED TO	B7676A	0.	.00	0.	0.	0.	.39
+	HYDROGRAPH AT	B75	443.	12.25	38.	12.	4.	.42
+	DIVERSION TO	RB75	443.	12.25	38.	12.	4.	.42
+	HYDROGRAPH AT	DB75RE	0.	.00	0.	0.	0.	.42
+	ROUTED TO	B75A75	0.	.00	0.	0.	0.	.42
+	HYDROGRAPH AT	B75A	342.	12.25	35.	10.	3.	.28
+	2 COMBINED AT	CPB75A	341.	12.25	35.	10.	3.	.70
+	ROUTED TO	B7576A	307.	12.33	35.	10.	3.	.70
+	HYDROGRAPH AT	B76A	432.	12.17	38.	12.	4.	.31
+	3 COMBINED AT	CPB76A	622.	12.17	72.	22.	7.	1.40
+	ROUTED TO	B76A78	626.	12.17	72.	22.	7.	1.40
+	HYDROGRAPH AT	B77	1011.	12.33	113.	33.	11.	.83
+	DIVERSION TO	RB77	873.	12.25	59.	16.	5.	.83
+	HYDROGRAPH AT	DB77RE	1011.	12.33	63.	17.	6.	.83
	ROUTED TO							

+		B77B78	398.	13.08	60.	17.	6.	.83
+	HYDROGRAPH AT	B78	495.	12.58	85.	27.	9.	.57
+	DIVERSION TO	RB78	492.	12.50	48.	14.	5.	.57
+	HYDROGRAPH AT	DB78RE	436.	12.67	47.	14.	5.	.57
+	2 COMBINED AT	CPB78A	567.	13.00	107.	31.	10.	1.40
+	DIVERSION TO	RB78BN	537.	12.92	37.	9.	3.	1.40
+	HYDROGRAPH AT	DB78BN	535.	13.08	71.	21.	7.	1.40
+	2 COMBINED AT	CPB78B	626.	12.17	136.	43.	15.	2.80
+	ROUTED TO	B78B79	392.	12.92	134.	43.	15.	2.80
+	HYDROGRAPH AT	B79	904.	12.33	110.	34.	12.	.85
+	DIVERSION TO	RB79	904.	12.33	72.	20.	7.	.85
+	HYDROGRAPH AT	DB79RE	621.	12.50	50.	15.	5.	.85
+	2 COMBINED AT	CPB79	674.	12.50	183.	57.	19.	3.64
+	ROUTED TO	B79B80	561.	12.67	182.	57.	19.	3.64
+	HYDROGRAPH AT	B80	296.	12.25	32.	10.	3.	.27
+	DIVERSION TO	RB80	296.	12.25	32.	10.	3.	.27
+	HYDROGRAPH AT	DB80RE	0.	.00	0.	0.	0.	.27
+	2 COMBINED AT	CPB80	561.	12.67	182.	57.	19.	3.91
+	ROUTED TO	SRB80	489.	13.00	181.	57.	19.	3.91
+	ROUTED TO	B80B81	480.	13.25	180.	57.	19.	3.91
+	HYDROGRAPH AT	B81	329.	12.25	33.	10.	3.	.25
+	DIVERSION TO	RB81	9.	11.25	3.	1.	0.	.25
+	HYDROGRAPH AT	DB81RE	329.	12.25	32.	9.	3.	.25
+	2 COMBINED AT	CPB81	489.	13.25	206.	66.	22.	4.16
+	ROUTED TO	SRB81	446.	13.50	205.	66.	22.	4.16
+	ROUTED TO	B81B84	438.	13.58	204.	66.	22.	4.16
+	HYDROGRAPH AT	B82	181.	12.25	18.	5.	2.	.15
+	DIVERSION TO	RB82	181.	12.25	18.	5.	2.	.15
+	HYDROGRAPH AT	DB82RE	0.	.00	0.	0.	0.	.15
+	ROUTED TO	B82B83	0.	.00	0.	0.	0.	.15
+	HYDROGRAPH AT	B83	405.	12.08	38.	13.	4.	.22
+	DIVERSION TO	RB83	21.	11.25	8.	3.	1.	.22
+	HYDROGRAPH AT	DB83RE	405.	12.08	36.	10.	3.	.22
+	2 COMBINED AT	CPB83	404.	12.08	36.	10.	3.	.37
+	ROUTED TO	SRB83	23.	12.92	19.	10.	3.	.37
+	ROUTED TO	B83B84	23.	13.08	19.	10.	3.	.37

+	HYDROGRAPH AT	B71	811.	12.42	113.	36.	12.	.96
+	DIVERSION TO	RB71	811.	12.42	113.	36.	12.	.96
+	HYDROGRAPH AT	DB71RE	0.	.00	0.	0.	0.	.96
+	ROUTED TO	B71B72	0.	.00	0.	0.	0.	.96
+	HYDROGRAPH AT	B72	1012.	12.42	136.	42.	14.	1.12
+	DIVERSION TO	RB72	1012.	12.42	91.	25.	8.	1.12
+	HYDROGRAPH AT	DB72RE	730.	12.58	60.	17.	6.	1.12
+	2 COMBINED AT	CPB72	728.	12.58	59.	17.	6.	2.08
+	ROUTED TO	B72B74	545.	12.67	59.	17.	6.	2.08
+	HYDROGRAPH AT	B73	443.	12.17	46.	15.	5.	.30
+	DIVERSION TO	RB73	443.	12.17	45.	13.	4.	.30
+	HYDROGRAPH AT	DB73RE	15.	13.83	8.	3.	1.	.30
+	ROUTED TO	SRB73	3.	24.08	3.	2.	1.	.30
+	ROUTED TO	B73B74	3.	25.08	3.	2.	1.	.30
+	HYDROGRAPH AT	B74	183.	12.08	18.	6.	2.	.11
+	DIVERSION TO	RB74	81.	12.00	8.	2.	1.	.11
+	HYDROGRAPH AT	DB74RE	183.	12.08	13.	4.	1.	.11
+	3 COMBINED AT	CPB74	558.	12.67	71.	23.	8.	2.49
+	ROUTED TO	SRB74	37.	14.33	32.	17.	7.	2.49
+	ROUTED TO	B74B84	37.	14.50	32.	17.	7.	2.49
+	HYDROGRAPH AT	B84	352.	12.17	37.	12.	4.	.22
+	DIVERSION TO	RB84	4.	6.75	3.	1.	0.	.22
+	HYDROGRAPH AT	DB84RE	352.	12.17	37.	11.	4.	.22
+	4 COMBINED AT	CPB84	479.	13.58	270.	98.	34.	7.24
+	ROUTED TO	SRB84	241.	15.67	195.	86.	32.	7.24
+	HYDROGRAPH AT	B28	875.	12.42	118.	37.	12.	.96
+	DIVERSION TO	RB28	8.	1.17	1.	0.	0.	.96
+	HYDROGRAPH AT	DB28RE	875.	12.42	118.	37.	12.	.96
+	HYDROGRAPH AT	B29	256.	12.25	32.	11.	4.	.18
+	DIVERSION TO	RB29	256.	12.25	29.	8.	3.	.18
+	HYDROGRAPH AT	DB29RE	27.	12.75	9.	3.	1.	.18
+	HYDROGRAPH AT	B30	274.	12.17	33.	11.	4.	.17
+	DIVERSION TO	RB30	274.	12.17	22.	6.	2.	.17
+	HYDROGRAPH AT	DB30RE	171.	12.33	16.	5.	2.	.17
+	ROUTED TO	SRB30	23.	13.00	16.	5.	2.	.17

+	HYDROGRAPH AT	B31	836.	12.25	90.	29.	10.	.68
+	DIVERSION TO	RB31	772.	12.17	47.	14.	5.	.68
+	HYDROGRAPH AT	DB31RE	807.	12.25	55.	16.	5.	.68
+	ROUTED TO	SRB31	32.	13.58	29.	16.	5.	.68
+	2 COMBINED AT	DUMMY	54.	13.17	45.	20.	7.	.85
+	5 COMBINED AT	DUMMY	8429.	12.58	1929.	660.	234.	85.75
+	HYDROGRAPH AT	B32	786.	12.42	104.	33.	11.	.82
+	DIVERSION TO	RB32	786.	12.42	91.	25.	8.	.82
+	HYDROGRAPH AT	DB32RE	169.	12.83	26.	8.	3.	.82
+	ROUTED TO	SRB32	0.	.00	0.	0.	0.	.82
+	ROUTED TO	B32B33	0.	.00	0.	0.	0.	.82
+	HYDROGRAPH AT	B33	484.	12.08	43.	14.	5.	.28
+	DIVERSION TO	RB33	484.	12.08	43.	14.	5.	.28
+	HYDROGRAPH AT	DB33RE	0.	.00	0.	0.	0.	.28
+	2 COMBINED AT	CPB33	0.	.00	0.	0.	0.	1.10
+	HYDROGRAPH AT	B34	208.	12.08	16.	5.	2.	.13
+	DIVERSION TO	RB34	35.	11.75	4.	1.	0.	.13
+	HYDROGRAPH AT	DB34RE	208.	12.08	14.	4.	1.	.13
+	HYDROGRAPH AT	B38	522.	12.17	50.	17.	6.	.34
+	DIVERSION TO	RB38	522.	12.17	50.	17.	6.	.34
+	HYDROGRAPH AT	DB38RE	0.	.00	0.	0.	0.	.34
+	ROUTED TO	B38B39	0.	.00	0.	0.	0.	.34
+	HYDROGRAPH AT	B37	704.	12.17	72.	24.	8.	.47
+	DIVERSION TO	RB37	704.	12.17	72.	24.	8.	.47
+	HYDROGRAPH AT	DB37RE	0.	.00	0.	0.	0.	.47
+	ROUTED TO	B37B39	0.	.00	0.	0.	0.	.47
+	HYDROGRAPH AT	B39	981.	12.25	108.	35.	12.	.77
+	DIVERSION TO	RB39	981.	12.25	108.	35.	12.	.77
+	HYDROGRAPH AT	DB39RE	0.	.00	0.	0.	0.	.77
+	3 COMBINED AT	CPB39	0.	.00	0.	0.	0.	1.58
+	ROUTED TO	SRB39	0.	.00	0.	0.	0.	1.58
+	HYDROGRAPH AT	B35	191.	12.17	15.	4.	1.	.14
+	DIVERSION TO	RB35	1.	4.67	1.	0.	0.	.14
+	HYDROGRAPH AT	DB35RE	191.	12.17	15.	4.	1.	.14
+	HYDROGRAPH AT	B36	105.	12.08	6.	2.	1.	.06
	DIVERSION TO							

+		RB36	29.	11.75	1.	0.	0.	.06
+	HYDROGRAPH AT	DB36RE	105.	12.08	6.	1.	0.	.06
+	4 COMBINED AT	DUMMY	482.	12.08	34.	9.	3.	1.91
+	3 COMBINED AT	DUMMY	8429.	12.58	1951.	666.	235.	88.76
+	HYDROGRAPH AT	B40	720.	12.25	89.	30.	10.	.51
+	DIVERSION TO	RB40	720.	12.25	67.	19.	6.	.51
+	HYDROGRAPH AT	DB40RE	364.	12.42	36.	11.	4.	.51
+	HYDROGRAPH AT	DD681	17.	13.42	8.	3.	1.	.25
+	ROUTED TO	D68B40	14.	14.00	8.	3.	1.	.25
+	2 COMBINED AT	CPB40	364.	12.42	43.	14.	5.	.77
+	DIVERSION TO	DB401S	215.	12.42	24.	8.	3.	.77
+	HYDROGRAPH AT	DB401	149.	12.42	19.	6.	2.	.77
+	DIVERSION TO	DB402S	57.	12.42	9.	3.	1.	.77
+	HYDROGRAPH AT	DB402	92.	12.42	10.	3.	1.	.77
+	ROUTED TO	B40B41	39.	12.75	10.	3.	1.	.77
+	HYDROGRAPH AT	B41	812.	12.50	118.	37.	12.	.95
+	DIVERSION TO	RB41	809.	12.42	76.	21.	7.	.95
+	HYDROGRAPH AT	DB41RE	652.	12.58	56.	16.	5.	.95
+	HYDROGRAPH AT	DD682	2.	13.42	1.	0.	0.	.25
+	ROUTED TO	D68B41	1.	16.33	1.	0.	0.	.25
+	HYDROGRAPH AT	DD691	0.	14.25	0.	0.	0.	.71
+	ROUTED TO	D69B41	0.	15.92	0.	0.	0.	.71
+	4 COMBINED AT	CPB41	657.	12.58	65.	20.	7.	2.18
+	DIVERSION TO	DB41S	624.	12.58	62.	19.	6.	2.18
+	HYDROGRAPH AT	DB41SE	33.	12.58	3.	1.	0.	2.18
+	ROUTED TO	B41B43	24.	12.83	3.	1.	0.	2.18
+	HYDROGRAPH AT	B43	594.	12.42	101.	35.	12.	.54
+	DIVERSION TO	RB43	594.	12.42	99.	28.	9.	.54
+	HYDROGRAPH AT	DB43RE	32.	14.42	17.	6.	2.	.54
+	HYDROGRAPH AT	DD692	0.	14.25	0.	0.	0.	.71
+	ROUTED TO	D69B43	0.	16.92	0.	0.	0.	.71
+	3 COMBINED AT	CPB43	34.	14.42	18.	7.	2.	2.72
+	ROUTED TO	B43B45	27.	15.42	18.	7.	2.	2.72
+	HYDROGRAPH AT	B44	728.	12.25	90.	31.	10.	.52
+	DIVERSION TO	RB44	728.	12.25	87.	25.	8.	.52
+	HYDROGRAPH AT	DB44RE	34.	13.83	17.	6.	2.	.52

+	HYDROGRAPH AT	DB401	215.	12.42	24.	8.	3.	.77
+	ROUTED TO	B40B44	78.	13.42	23.	8.	3.	.77
+	2 COMBINED AT	CPB44	85.	13.42	38.	14.	5.	1.29
+	DIVERSION TO	DB441S	10.	13.42	5.	2.	1.	1.29
+	HYDROGRAPH AT	DB441	74.	13.42	33.	12.	4.	1.29
+	DIVERSION TO	DB442S	6.	13.42	3.	1.	0.	1.29
+	HYDROGRAPH AT	DB442	68.	13.42	30.	11.	4.	1.29
+	ROUTED TO	B44B45	62.	13.50	30.	11.	4.	1.29
+	HYDROGRAPH AT	B45	948.	12.33	132.	45.	15.	.81
+	DIVERSION TO	RB45	948.	12.33	114.	32.	11.	.81
+	HYDROGRAPH AT	DB45RE	184.	12.75	38.	13.	4.	.81
+	HYDROGRAPH AT	DB402	57.	12.42	9.	3.	1.	.77
+	ROUTED TO	B40B45	24.	13.00	8.	3.	1.	.77
+	HYDROGRAPH AT	DB41SE	624.	12.58	62.	19.	6.	2.18
+	ROUTED TO	B41B45	287.	13.33	58.	19.	6.	2.18
+	5 COMBINED AT	CPB45	427.	13.33	145.	51.	17.	4.05
+	ROUTED TO	B45B47	343.	14.08	140.	51.	17.	4.05
+	HYDROGRAPH AT	L01	221.	12.17	20.	6.	2.	.16
+	DIVERSION TO	RL01	221.	12.17	19.	5.	2.	.16
+	HYDROGRAPH AT	DL01RE	15.	12.67	4.	1.	0.	.16
+	ROUTED TO	L01L03	8.	13.50	4.	1.	0.	.16
+	HYDROGRAPH AT	L03	785.	12.33	95.	28.	10.	.79
+	DIVERSION TO	RL03	785.	12.33	95.	28.	10.	.79
+	HYDROGRAPH AT	DL03RE	0.	.00	0.	0.	0.	.79
+	HYDROGRAPH AT	L20	317.	12.42	38.	11.	4.	.35
+	DIVERSION TO	RL20	317.	12.42	38.	11.	4.	.35
+	HYDROGRAPH AT	DL20RE	2.	22.08	1.	0.	0.	.35
+	ROUTED TO	L20L03	1.	24.75	1.	0.	0.	.35
+	3 COMBINED AT	CPL03	8.	13.58	4.	2.	1.	1.29
+	DIVERSION TO	DL03S	7.	13.67	4.	1.	0.	1.29
+	HYDROGRAPH AT	DL03SE	0.	.00	0.	0.	0.	1.29
+	ROUTED TO	L03L04	0.	.00	0.	0.	0.	1.29
+	HYDROGRAPH AT	L04	534.	12.42	66.	20.	7.	.63
+	DIVERSION TO	RL04	534.	12.42	66.	20.	7.	.63
+	HYDROGRAPH AT	DL04RE	0.	.00	0.	0.	0.	.63

+	2 COMBINED AT	CPL04	0.	.00	0.	0.	0.	1.93
+	DIVERSION TO	DL04S	0.	.00	0.	0.	0.	1.93
+	HYDROGRAPH AT	DL04SE	0.	.00	0.	0.	0.	1.93
+	ROUTED TO	L04L05	0.	.00	0.	0.	0.	1.93
+	HYDROGRAPH AT	L02	1416.	12.58	228.	70.	23.	1.88
+	DIVERSION TO	RL02	1416.	12.58	218.	59.	20.	1.88
+	HYDROGRAPH AT	DL02RE	110.	13.75	33.	11.	4.	1.88
+	ROUTED TO	L02L05	71.	14.00	32.	11.	4.	1.88
+	HYDROGRAPH AT	L05	549.	12.33	70.	22.	7.	.49
+	DIVERSION TO	RL05	549.	12.33	61.	17.	6.	.49
+	HYDROGRAPH AT	DL05RE	91.	12.75	17.	6.	2.	.49
+	3 COMBINED AT	CPL05	88.	14.00	45.	16.	5.	4.30
+	ROUTED TO	L05L09	82.	14.25	44.	16.	5.	4.30
+	HYDROGRAPH AT	L09	547.	12.33	71.	23.	8.	.49
+	DIVERSION TO	RL09	547.	12.33	71.	23.	8.	.49
+	HYDROGRAPH AT	DL09RE	0.	.00	0.	0.	0.	.49
+	2 COMBINED AT	CPL09	82.	14.25	44.	16.	5.	4.78
+	ROUTED TO	L0913B	79.	14.42	44.	16.	5.	4.78
+	DIVERSION TO	DL13BR	28.	14.42	13.	4.	1.	4.78
+	HYDROGRAPH AT	DL13BN	51.	14.42	30.	12.	4.	4.78
+	HYDROGRAPH AT	DL13BN	28.	14.42	13.	4.	1.	4.78
+	ROUTED TO	SRL13B	16.	15.50	12.	4.	1.	4.78
+	2 COMBINED AT	CPL13B	62.	14.50	42.	16.	5.	4.78
+	ROUTED TO	L13B13	62.	14.58	42.	16.	5.	4.78
+	HYDROGRAPH AT	L13	731.	12.17	93.	32.	11.	.48
+	DIVERSION TO	RL13	731.	12.17	90.	26.	9.	.48
+	HYDROGRAPH AT	DL13RE	38.	13.75	18.	6.	2.	.48
+	HYDROGRAPH AT	L06	754.	12.33	88.	28.	9.	.70
+	DIVERSION TO	RL06	754.	12.33	88.	28.	9.	.70
+	HYDROGRAPH AT	DL06RE	0.	.00	0.	0.	0.	.70
+	DIVERSION TO	DL06S	0.	.00	0.	0.	0.	.70
+	HYDROGRAPH AT	DL06SE	0.	.00	0.	0.	0.	.70
+	ROUTED TO	L06L07	0.	.00	0.	0.	0.	.70
+	HYDROGRAPH AT	L07	673.	12.33	83.	26.	9.	.63
+	DIVERSION TO	RL07	673.	12.33	83.	26.	9.	.63
	HYDROGRAPH AT							

+		DL07RE	0.	.00	0.	0.	0.	.63
+	HYDROGRAPH AT	DL03SE	7.	13.67	4.	1.	0.	1.29
+	ROUTED TO	L0307A	7.	14.08	3.	1.	0.	1.29
+	ROUTED TO	L0307B	7.	14.42	3.	1.	0.	1.29
+	3 COMBINED AT	CPL07	7.	14.42	3.	1.	0.	2.62
+	DIVERSION TO	DL07S	1.	14.42	1.	0.	0.	2.62
+	HYDROGRAPH AT	DL07SE	5.	14.42	3.	1.	0.	2.62
+	ROUTED TO	L07L08	5.	14.83	3.	1.	0.	2.62
+	HYDROGRAPH AT	L08	544.	12.33	73.	22.	7.	.49
+	DIVERSION TO	RL08	544.	12.33	73.	22.	7.	.49
+	HYDROGRAPH AT	DL08RE	0.	.00	0.	0.	0.	.49
+	HYDROGRAPH AT	DL04SE	0.	.00	0.	0.	0.	1.93
+	ROUTED TO	L04L08	0.	.00	0.	0.	0.	1.93
+	3 COMBINED AT	CPL08	5.	14.83	3.	1.	0.	3.74
+	ROUTED TO	L08L12	5.	15.75	2.	1.	0.	3.74
+	HYDROGRAPH AT	L10	672.	12.42	82.	24.	8.	.84
+	DIVERSION TO	RL10	672.	12.42	65.	17.	6.	.84
+	HYDROGRAPH AT	DL10RE	293.	12.75	23.	7.	2.	.84
+	ROUTED TO	L10L11	156.	13.00	22.	7.	2.	.84
+	HYDROGRAPH AT	DL06SE	0.	.00	0.	0.	0.	.70
+	ROUTED TO	L06L11	0.	.00	0.	0.	0.	.70
+	HYDROGRAPH AT	L11	607.	12.33	77.	24.	8.	.62
+	DIVERSION TO	RL11	607.	12.33	77.	24.	8.	.62
+	HYDROGRAPH AT	DL11RE	1.	20.75	1.	0.	0.	.62
+	HYDROGRAPH AT	DL07SE	1.	14.42	1.	0.	0.	2.62
+	ROUTED TO	L07L11	1.	17.33	1.	0.	0.	2.62
+	4 COMBINED AT	CPL11	156.	13.00	22.	7.	2.	4.09
+	DIVERSION TO	DL11S	0.	.00	0.	0.	0.	4.09
+	HYDROGRAPH AT	DL11SE	147.	13.00	22.	7.	2.	4.09
+	ROUTED TO	L11L12	109.	13.33	22.	7.	2.	4.09
+	HYDROGRAPH AT	L12	494.	12.25	57.	18.	6.	.36
+	DIVERSION TO	RL12	494.	12.25	57.	16.	5.	.36
+	HYDROGRAPH AT	DL12RE	8.	16.25	6.	2.	1.	.36
+	3 COMBINED AT	CPL12	109.	13.33	27.	10.	3.	5.56
+	DIVERSION TO	DL121S	18.	13.33	4.	2.	1.	5.56
+	HYDROGRAPH AT	DL121	85.	13.33	21.	8.	3.	5.56

+	DIVERSION TO	DL122S	1.	13.33	0.	0.	0.	5.56
+	HYDROGRAPH AT	DL122	84.	13.33	21.	8.	3.	5.56
+	ROUTED TO	L12L13	73.	13.50	20.	8.	3.	5.56
+	3 COMBINED AT	CPL13	87.	13.75	64.	26.	9.	8.90
+	ROUTED TO	L13DS5	84.	13.83	64.	26.	9.	8.90
+	ROUTED TO	DS5L19	79.	14.00	64.	26.	9.	8.90
+	HYDROGRAPH AT	L14	211.	12.25	19.	6.	2.	.23
+	DIVERSION TO	RL14	211.	12.25	19.	6.	2.	.23
+	HYDROGRAPH AT	DL14RE	0.	.00	0.	0.	0.	.23
+	ROUTED TO	L14L15	0.	.00	0.	0.	0.	.23
+	HYDROGRAPH AT	L15	347.	12.33	31.	9.	3.	.37
+	DIVERSION TO	RL15	347.	12.33	31.	9.	3.	.37
+	HYDROGRAPH AT	DL15RE	0.	.00	0.	0.	0.	.37
+	2 COMBINED AT	CPL15	0.	.00	0.	0.	0.	.60
+	ROUTED TO	L15L16	0.	.00	0.	0.	0.	.60
+	HYDROGRAPH AT	L16	463.	12.33	46.	14.	5.	.50
+	DIVERSION TO	RL16	463.	12.33	46.	14.	5.	.50
+	HYDROGRAPH AT	DL16RE	0.	.00	0.	0.	0.	.50
+	2 COMBINED AT	CPL16	0.	.00	0.	0.	0.	1.10
+	ROUTED TO	L16L17	0.	.00	0.	0.	0.	1.10
+	HYDROGRAPH AT	L17	473.	12.33	59.	19.	6.	.50
+	DIVERSION TO	RL17	473.	12.33	59.	19.	6.	.50
+	HYDROGRAPH AT	DL17RE	0.	.00	0.	0.	0.	.50
+	2 COMBINED AT	CPL17	0.	.00	0.	0.	0.	1.61
+	DIVERSION TO	DL17S	0.	.00	0.	0.	0.	1.61
+	HYDROGRAPH AT	DL17SE	0.	.00	0.	0.	0.	1.61
+	ROUTED TO	L17L18	0.	.00	0.	0.	0.	1.61
+	HYDROGRAPH AT	L18	484.	12.33	46.	13.	4.	.50
+	DIVERSION TO	RL18	484.	12.33	46.	13.	4.	.50
+	HYDROGRAPH AT	DL18RE	0.	.00	0.	0.	0.	.50
+	HYDROGRAPH AT	DL11SE	0.	.00	0.	0.	0.	4.09
+	ROUTED TO	L11L18	0.	.00	0.	0.	0.	4.09
+	HYDROGRAPH AT	DL121	18.	13.33	4.	2.	1.	5.56
+	ROUTED TO	L12L18	12.	14.17	4.	2.	1.	5.56
+	4 COMBINED AT	CPL18	10.	14.25	4.	2.	1.	7.67

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          DIVERSION TO
+                        DL181S      0.     .00        0.        0.        0.      7.67
          HYDROGRAPH AT
+                         DL181     10.   14.25        4.        2.        1.      7.67
          DIVERSION TO
+                        DL182S      0.   14.25        0.        0.        0.      7.67
          HYDROGRAPH AT
+                         DL182     10.   14.25        3.        1.        0.      7.67
          ROUTED TO
+                        L18L19      8.   14.92        3.        1.        0.      7.67
          HYDROGRAPH AT
+                           L19    745.   12.17       93.       32.       11.       .49
          DIVERSION TO
+                          RL19    745.   12.17       90.       26.        9.       .49
          HYDROGRAPH AT
+                        DL19RE     38.   13.75       18.        7.        2.       .49
          HYDROGRAPH AT
+                         DL122      1.   13.33        0.        0.        0.      5.56
          ROUTED TO
+                        L12L19      1.   14.58        0.        0.        0.      5.56
          4 COMBINED AT
+                         CPL19     89.   14.50       74.       31.       10.     11.50
          ROUTED TO
+                        L19DS7     88.   14.58       74.       31.       10.     11.50
          ROUTED TO
+                        DS7L27     87.   15.67       74.       31.       10.     11.50
          HYDROGRAPH AT
+                           L23    727.   12.42       80.       23.        8.       .90
          DIVERSION TO
+                          RL23    727.   12.42       80.       23.        8.       .90
          HYDROGRAPH AT
+                        DL23RE      0.     .00        0.        0.        0.       .90
          ROUTED TO
+                        L23L24      0.     .00        0.        0.        0.       .90
          HYDROGRAPH AT
+                           L24    496.   12.25       47.       14.        5.       .50
          DIVERSION TO
+                          RL24    496.   12.25       47.       14.        5.       .50
          HYDROGRAPH AT
+                        DL24RE      0.     .00        0.        0.        0.       .50
          2 COMBINED AT
+                         CPL24      0.     .00        0.        0.        0.      1.40
          ROUTED TO
+                        L24L26      0.     .00        0.        0.        0.      1.40
          HYDROGRAPH AT
+                           L25    208.   12.42       22.        6.        2.       .24
          DIVERSION TO
+                          RL25    208.   12.42       22.        6.        2.       .24
          HYDROGRAPH AT
+                        DL25RE      0.     .00        0.        0.        0.       .24
          ROUTED TO
+                        L25L26      0.     .00        0.        0.        0.       .24
          HYDROGRAPH AT
+                         DL181      0.     .00        0.        0.        0.      7.67
          ROUTED TO
+                        L18L26      0.     .00        0.        0.        0.      7.67
          HYDROGRAPH AT
+                        DL17SE      0.     .00        0.        0.        0.      1.61
          ROUTED TO
+                        L17L26      0.     .00        0.        0.        0.      1.61
          HYDROGRAPH AT
+                           L26    790.   12.25       83.       26.        9.       .76
          DIVERSION TO
+                          RL26    790.   12.25       83.       26.        9.       .76
          HYDROGRAPH AT
+                        DL26RE      0.     .00        0.        0.        0.       .76
          5 COMBINED AT
+                         CPL26      0.     .00        0.        0.        0.     10.07
          DIVERSION TO
+                         DL26S      0.     .00        0.        0.        0.     10.07
          HYDROGRAPH AT
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                                  X     X  XXXXXXX   XXXXX          X
                                  X     X  X        X     X        XX
                                  X     X  X        X               X
                                  XXXXXXX  XXXX     X       XXXXX   X
                                  X     X  X        X               X
                                  X     X  X        X     X         X
                                  X     X  XXXXXXX   XXXXX         XXX



          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                HEC-1 INPUT                                                   PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

           1           ID        Flood Control District of Maricopa County
           2           ID        L303_FU_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
           3           ID        100 YEAR
           4           ID        24 Hour Storm
           5           ID        Unit Hydrograph: S-Graph
           6           ID        09/02/2009
           7           ID    FCDMC CONTRACT 2007C031
           8           ID    BY HDR ENGINEERING (#79902)
           9           ID    FUTURE CONDITIONS-SEPTEMBER 2009
          10           ID    MAJOR BASIN 02
          11           ID    FILE NAME: FCIP-MB2.DAT
          12           ID
          13           ID    ************************************************************************
          14           ID
          15           ID    FOLLOWING ARE THE CHANGES BY ANDES ENGINEERING:
          16           ID    1. Depth-area factors in JD cards replaced for 50-year event values
          17           ID       JOG September 15, 2010
          18           ID
          19           ID    For details concerning changes to this HEC-1 model, please contact
          20           ID    FCDMC, H&H Branch.
          21           ID
          22           ID    ************************************************************************
          23           ID
          24           IT       5       0       0    2000
          25           IN      15
          26           IO       3
                       *DIAGRAM
                       *
          27           JD   2.95   0.0001
          28           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
          29           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
          30           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
          31           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
          32           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
          33           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
          34           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
          35           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
          36           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
          37           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
          38           JD   2.877     5.0
          39           JD   2.803    10.0
          40           JD   2.729    20.0
          41           JD   2.655    30.0
          42           JD   2.567    60.0
                       *

          43           KK     L21BASIN
          44           KM        BASIN BOUNDARY FROM MCMICKEN DAM ON THE WEST AND THE
          45           KM        BEARDSLEY CSR ON THE EAST
          46           BA   0.525
          47           LG    0.33    0.24    4.55    0.44      14
          48           UI       0      21      21      21      27      70      79      96     107     116
          49           UI     124     136     151     163     189     232     260     263     226     200
          50           UI     185     169     155     139     127     114     105      95      77      60
          51           UI      42      37      36      34      31      21      21      21      16       6
1                                                HEC-1 INPUT                                                   PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          52           UI       7       6       7       6       7       6       7       6       7       6
                       *

          53           KK  DL21REDIVERT
          54           KM        Mass grading and Storage along canal
          55           DT    RL21    81.8     0.0
          56           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
```

```
  PEAK STAGE    TIME                      MAXIMUM AVERAGE STAGE
                                 6-HR       24-HR       72-HR    166.58-HR
+   (FEET)      (HR)
   1039.05     24.83            1039.05     1039.07     1039.06      1039.03

                          CUMULATIVE AREA =   20.31 SQ MI

       ***              ***              ***              ***              ***

                           HYDROGRAPH AT STATION    SRS60
                         TRANSPOSITION AREA     30.0 SQ MI

 PEAK OUTFLOW IS        0. AT TIME   0.00 HOURS

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                 6-HR       24-HR       72-HR    166.58-HR
+   (CFS)       (HR)
                          (CFS)
+       0.      0.00                0.          0.          0.           0.
                         (INCHES)  0.000       0.000       0.000        0.000
                          (AC-FT)     0.          0.          0.           0.

 PEAK STORAGE   TIME                     MAXIMUM AVERAGE STORAGE
                                 6-HR       24-HR       72-HR    166.58-HR
+  (AC-FT)      (HR)
      269.     24.58               269.        269.        269.         243.

  PEAK STAGE    TIME                      MAXIMUM AVERAGE STAGE
                                 6-HR       24-HR       72-HR    166.58-HR
+   (FEET)      (HR)
   1039.05     24.58            1039.05     1039.05     1039.06      1039.02

                          CUMULATIVE AREA =   20.31 SQ MI

       ***              ***              ***              ***              ***

                           HYDROGRAPH AT STATION    SRS60
                         TRANSPOSITION AREA     60.0 SQ MI

 PEAK OUTFLOW IS        0. AT TIME   0.00 HOURS

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                 6-HR       24-HR       72-HR    166.58-HR
+   (CFS)       (HR)
                          (CFS)
+       0.      0.00                0.          0.          0.           0.
                         (INCHES)  0.000       0.000       0.000        0.000
                          (AC-FT)     0.          0.          0.           0.

 PEAK STORAGE   TIME                     MAXIMUM AVERAGE STORAGE
                                 6-HR       24-HR       72-HR    166.58-HR
+  (AC-FT)      (HR)
      242.     24.33               242.        242.        242.         219.

  PEAK STAGE    TIME                      MAXIMUM AVERAGE STAGE
                                 6-HR       24-HR       72-HR    166.58-HR
+   (FEET)      (HR)
   1039.04     24.33            1039.04     1039.03     1039.05      1039.02

                          CUMULATIVE AREA =   20.31 SQ MI

       ***              ***              ***              ***              ***


                          INTERPOLATED HYDROGRAPH AT    SRS60

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                 6-HR       24-HR       72-HR    166.58-HR
+   (CFS)       (HR)
                          (CFS)
+       0.      0.00                0.          0.          0.           0.
                         (INCHES)  0.000       0.000       0.000        0.000
                          (AC-FT)     0.          0.          0.           0.

                          CUMULATIVE AREA =   20.31 SQ MI

1
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	L21	168.	13.25	43.	13.	4.	0.52		
+	DIVERSION TO	RL21	168.	13.25	43.	13.	4.	0.52		
+	HYDROGRAPH AT	DL21RE	0.	0.00	0.	0.	0.	0.52		
+	ROUTED TO	L21L22	0.	0.00	0.	0.	0.	0.52		
+	HYDROGRAPH AT	L22	48.	13.67	18.	5.	2.	0.36		

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	DIVERSION TO	RL22	48.	13.67	18.	5.	2.	0.36
+	HYDROGRAPH AT	DL22RE	0.	0.00	0.	0.	0.	0.36
+	2 COMBINED AT	CPL22	0.	0.00	0.	0.	0.	0.89
+	ROUTED TO	L22W01	0.	0.00	0.	0.	0.	0.89
+	HYDROGRAPH AT	W01	88.	12.50	12.	3.	1.	0.19
+	2 COMBINED AT	CPW01	87.	12.50	12.	3.	1.	1.08
+	ROUTED TO	W01W02	79.	12.75	12.	3.	1.	1.08
+	HYDROGRAPH AT	W02	354.	12.33	35.	10.	3.	0.39
+	DIVERSION TO	DW02	354.	12.33	35.	10.	3.	0.39
+	HYDROGRAPH AT	DW02RE	0.	20.00	0.	0.	0.	0.39
+	2 COMBINED AT	CPW02	79.	12.75	12.	3.	1.	1.47
+	ROUTED TO	W02W05	69.	12.92	12.	3.	1.	1.47
+	HYDROGRAPH AT	W03	1285.	12.33	180.	56.	19.	1.97
+	ROUTED TO	W03W04	988.	12.58	180.	56.	19.	1.97
+	HYDROGRAPH AT	W04	1433.	12.33	204.	63.	21.	2.03
+	DIVERSION TO	DW04	163.	11.92	34.	11.	4.	2.03
+	HYDROGRAPH AT	DW04RE	1433.	12.33	191.	52.	17.	2.03
+	2 COMBINED AT	CPW04	2028.	12.42	368.	107.	36.	4.01
+	ROUTED TO	W04W05	1895.	12.58	367.	107.	36.	4.01
+	HYDROGRAPH AT	W05	271.	12.33	26.	8.	3.	0.32
+	DIVERSION TO	DW05	271.	12.33	26.	8.	3.	0.32
+	HYDROGRAPH AT	DW05RE	0.	0.00	0.	0.	0.	0.32
+	3 COMBINED AT	CPW05	1907.	12.58	376.	109.	36.	5.79
+	DIVERSION TO	DW05S	1028.	12.58	182.	61.	20.	5.79
+	HYDROGRAPH AT	DW05SE	879.	12.58	194.	48.	16.	5.79
+	ROUTED TO	W0512A	832.	12.92	194.	48.	16.	5.79
+	HYDROGRAPH AT	W06	722.	12.17	64.	20.	7.	0.71
+	HYDROGRAPH AT	W07	542.	12.08	55.	19.	6.	0.31
+	DIVERSION TO	DW07	542.	12.08	37.	11.	4.	0.31
+	HYDROGRAPH AT	DW07RE	338.	12.17	27.	8.	3.	0.31
+	2 COMBINED AT	CPW07	1049.	12.17	88.	28.	9.	1.02
+	ROUTED TO	W07W08	832.	12.25	88.	28.	9.	1.02
+	HYDROGRAPH AT	W08	632.	12.08	49.	15.	5.	0.45
+	2 COMBINED AT	CPW08	1228.	12.17	136.	42.	14.	1.47
	HYDROGRAPH AT							

APPENDIX III

FLOOD INSURANCE RATE MAPS

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles, Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was *Arizona State Plane Zone 3176 (central Arizona)*. The **horizontal datum** was *NAD83, GRS80 spheroid*. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the *National Geodetic Vertical Datum of 1929*. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(310) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:6000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

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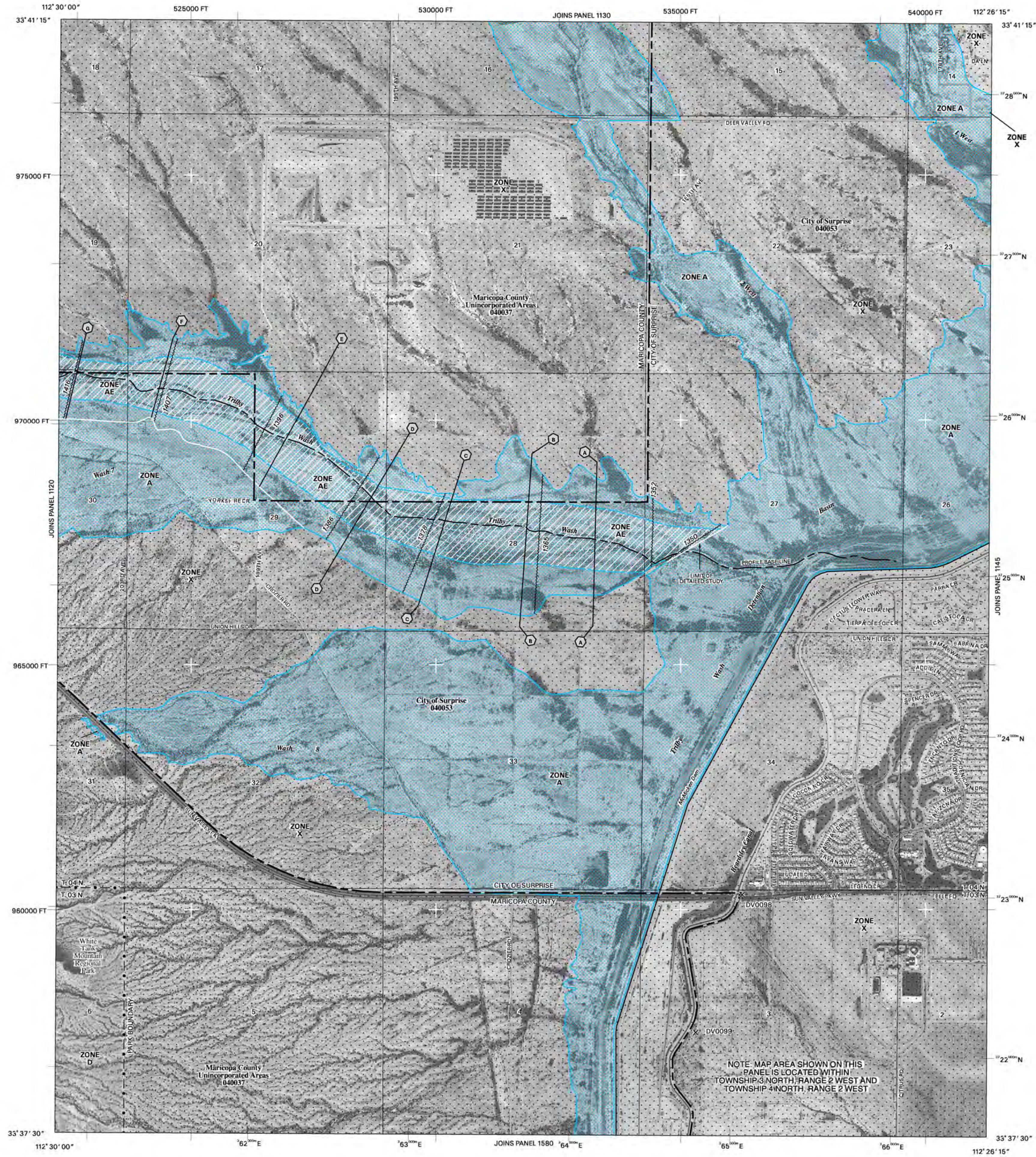

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

~~513~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

A — A	Cross section line
2 — 2	Transect line
112° 07' 08", 33° 25' 41"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
$^{42}76^{000m}$E	1000-meter Universal Transverse Mercator grid tick values zone 12
875000 FT	5000-foot grid tick values: Arizona State Plane coordinate system, central zone (FIPSZONE 3176) NAD83 (Transverse Mercator)
×DV2313	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY

Refer to Repositories Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

September 4, 1991, December 3, 1993, July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1140H

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1140 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1140	H
SURPRISE, CITY OF	040053	1140	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C1140H

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

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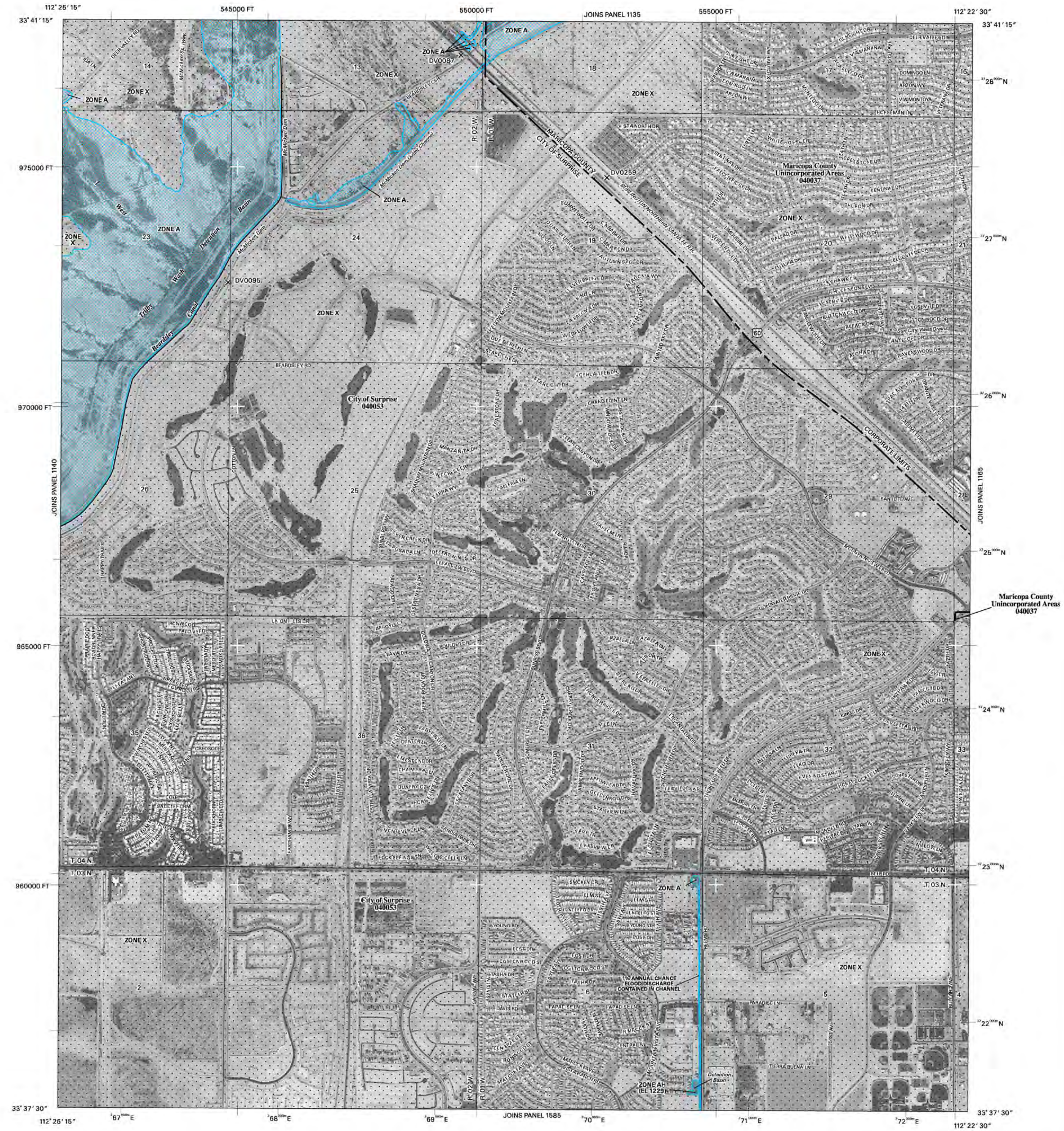

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

~~~~513~~~~ Base Flood Elevation line and value; elevation in feet*

(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

A —— A Cross section line

2 —— 2 Transect line

112° 07' 08", 33° 25' 41" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

$^{42}76^{000m}$E 1000-meter Universal Transverse Mercator grid tick values zone 12

875000 FT 5000-foot grid tick values: Arizona State Plane coordinate system, central zone (FIPSZONE 3176) NAD83 (Transverse Mercator)

× DV2313 Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 River Mile

MAP REPOSITORY
Refer to Repositories Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 4, 1991, September 30, 1995, July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1145H

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1145 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1145	H
SURPRISE, CITY OF	040053	1145	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C1145H

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency
~~~~

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles, Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was *Arizona State Plane Zone 3176 (central Arizona)*. The **horizontal datum** was *NAD83, GRS80 spheroid*. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the *National Geodetic Vertical Datum of 1929*. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(310) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:6000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

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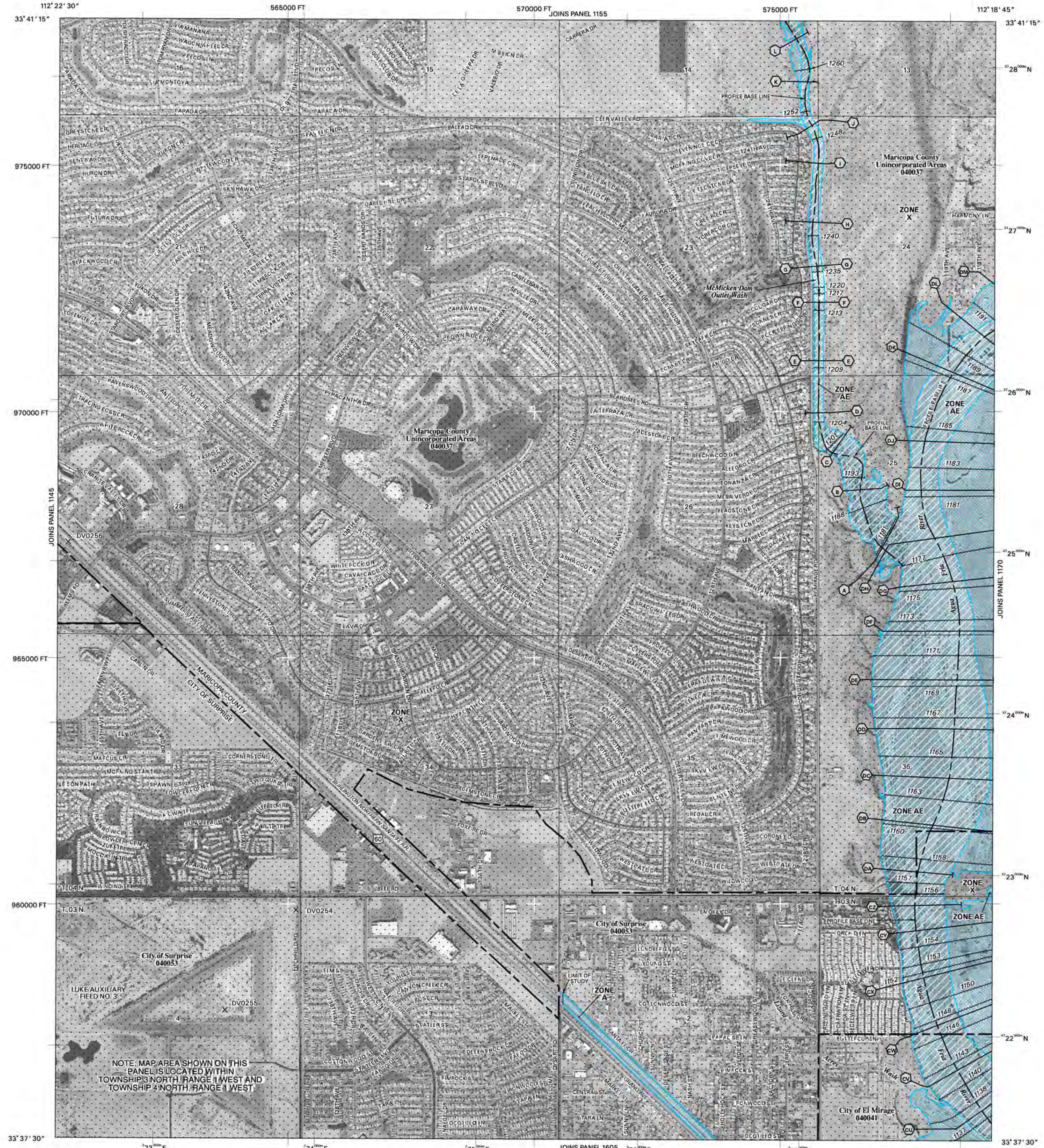

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

~~~513~~~ Base Flood Elevation line and value; elevation in feet*

(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

(A)—(A) Cross section line

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112° 07′ 08″, 33° 25′ 41″ Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

$^{37}76^{000m}$E 1000-meter Universal Transverse Mercator grid tick values zone 12

875000 FT 5000-foot grid tick values: Arizona State Plane coordinate system, central zone (FIPSZONE 3176) NAD83 (Transverse Mercator)

×DV2313 Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 River Mile

MAP REPOSITORY

Refer to Repositories Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

September 29, 1989, September 4, 1991, September 30, 1995, July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1165J

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1165 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL MIRAGE, CITY OF	040041	1165	J
MARICOPA COUNTY	040037	1165	J
SURPRISE, CITY OF	040053	1165	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C1165J

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency
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NOTES TO USERS

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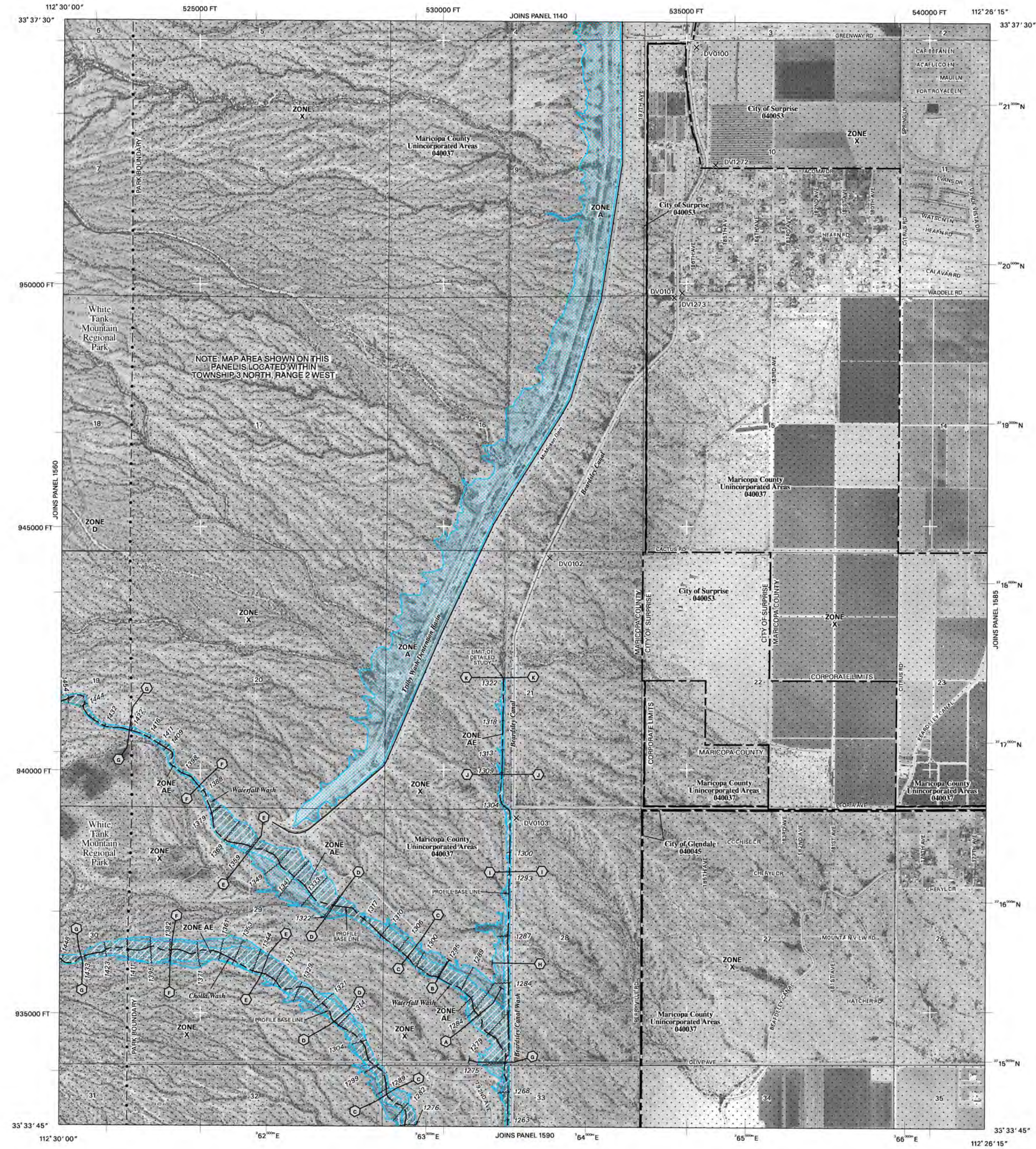

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
~~513~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

(A)———(A)	Cross section line
(2)-------(2)	Transect line
112° 07' 08", 33° 25' 41"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
$^{42}76^{000m}$E	1000-meter Universal Transverse Mercator grid tick values zone 12
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×DV2313	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to Repositories Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 4, 1991, September 30, 1995, July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

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MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1580H

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1580 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GLENDALE, CITY OF	040045	1580	H
MARICOPA COUNTY	040037	1580	H
SURPRISE, CITY OF	040053	1580	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C1580H

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

NOTES TO USERS

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LEGEND

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ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

~~~513~~~ Base Flood Elevation line and value; elevation in feet*

(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

(A)——(A) Cross section line

(2)——(2) Transect line

112° 07' 08", 33° 25' 41" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

$^{37}76^{000m}$E 1000-meter Universal Transverse Mercator grid tick values zone 12

875000 FT 5000-foot grid tick values: Arizona State Plane coordinate system, central zone (FIPSZONE 3176) NAD83 (Transverse Mercator)

×DV2313 Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 River Mile

MAP REPOSITORY
Refer to Repositories Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 4, 1991, September 30, 1995, July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1585H

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1585 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GLENDALE, CITY OF	040045	1585	H
MARICOPA COUNTY	040037	1585	H
SURPRISE, CITY OF	040053	1585	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C1585H

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency
~~~

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles, Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was *Arizona State Plane Zone 3176 (central Arizona)*. The **horizontal datum** was *NAD83, GRS80 spheroid*. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the *National Geodetic Vertical Datum of 1929*. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(310) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:6000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

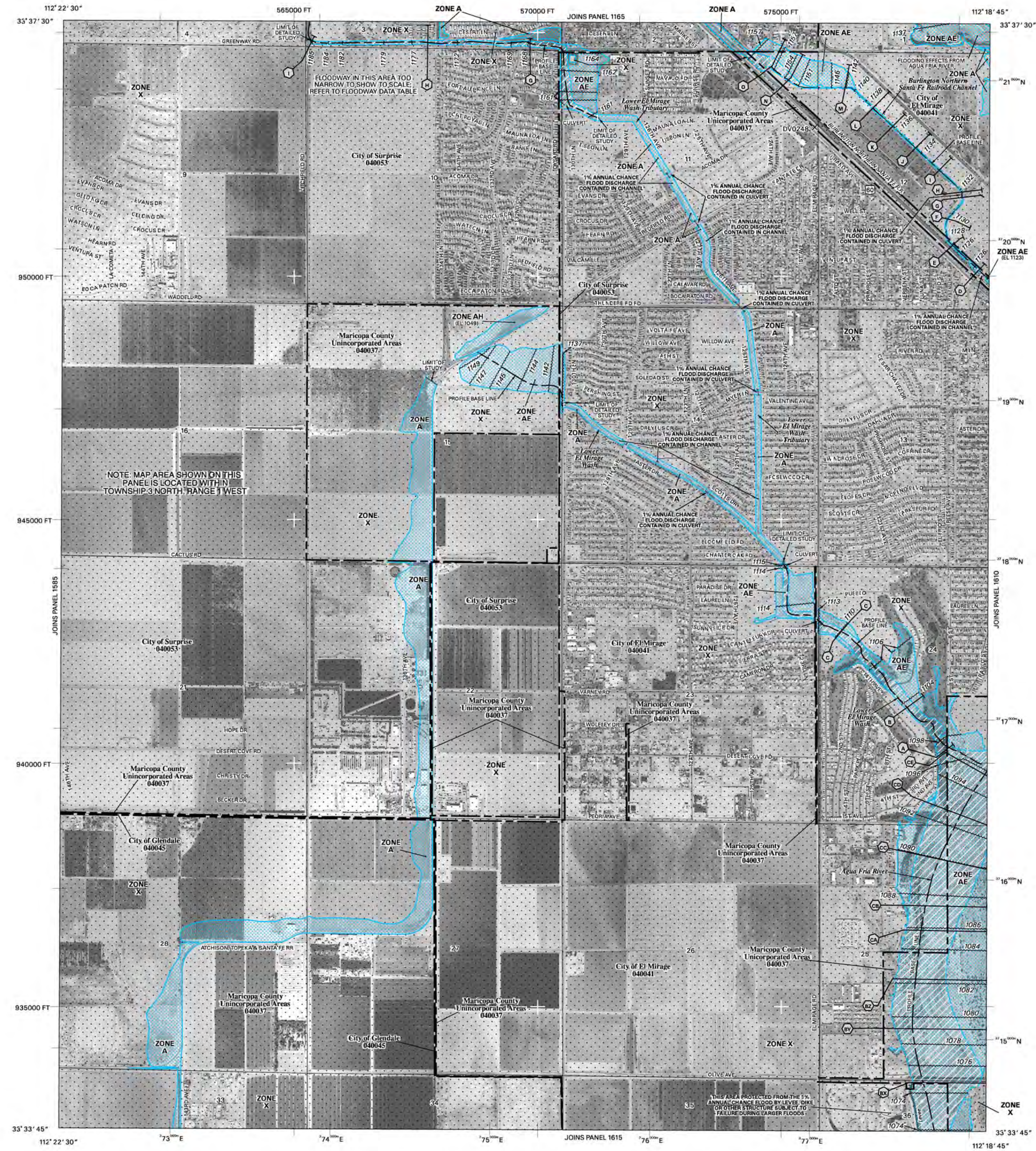
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMAMAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

A — A	Cross section line
2 — 2	Transect line
112° 07' 08", 33° 25' 41"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
76000mE	1000-meter Universal Transverse Mercator grid tick values zone 12
875000 FT	5000-foot grid tick values: Arizona State Plane coordinate system, central zone (FIPSZONE 3176) NAD83 (Transverse Mercator)
×DV2313	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY

Refer to Repositories Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

September 4, 1991, December 3, 1993, September 30, 1995, July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1605J

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1605 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL MIRAGE, CITY OF	040041	1605	J
GLENDALE, CITY OF	040045	1605	J
MARICOPA COUNTY	040037	1605	J
SURPRISE, CITY OF	040053	1605	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER

04013C1605J

MAP REVISED

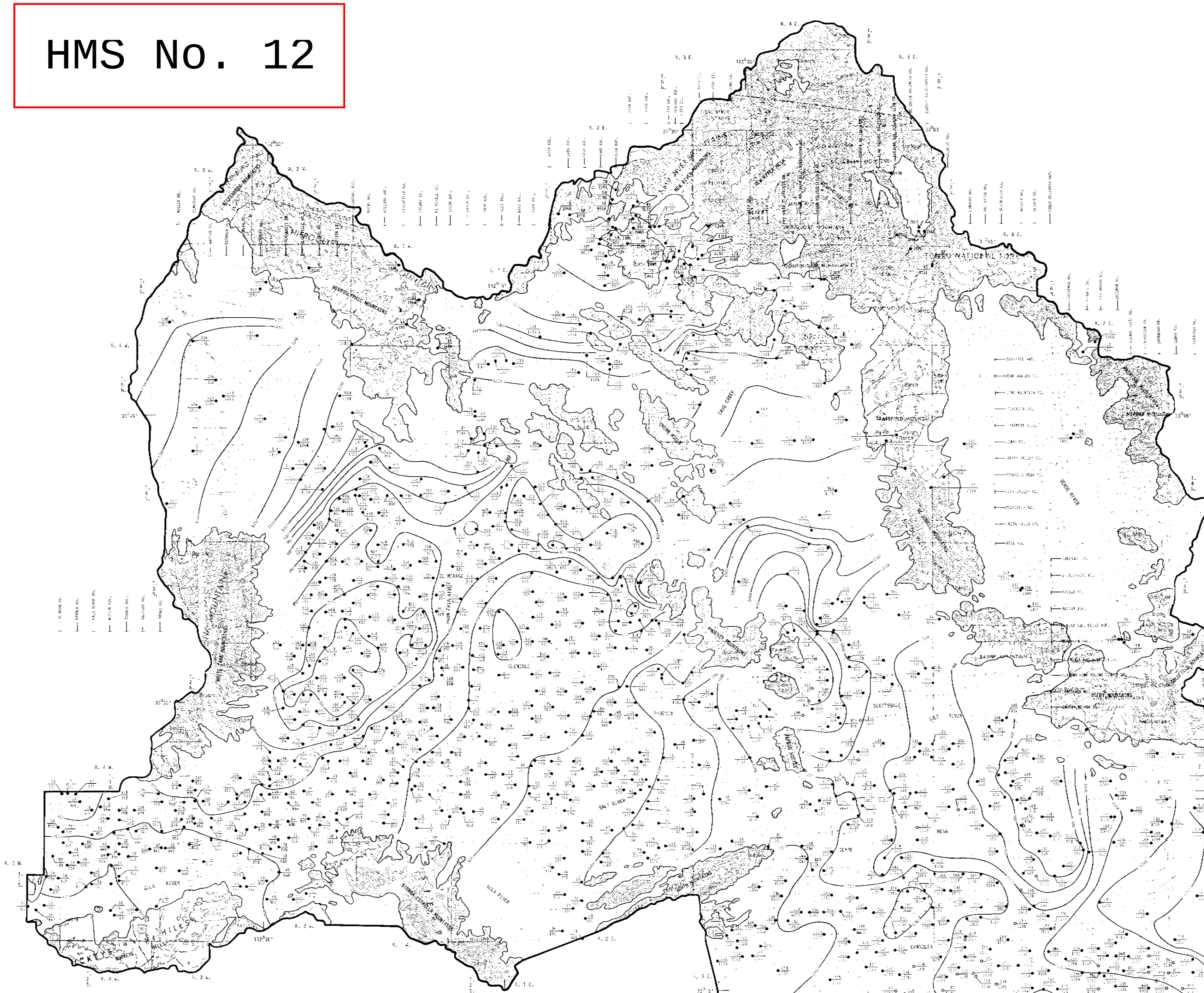
SEPTEMBER 30, 2005

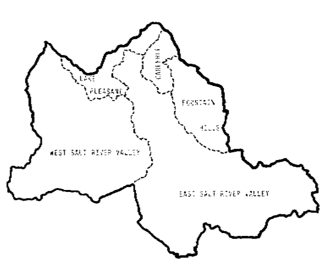
Federal Emergency Management Agency

APPENDIX IV

ADWR DOCUMENTATION

HMS No. 12





INSET
SELECTED SUB-BASINS OF THE PHOENIX ACTIVE MANAGEMENT AREA

EXPLANATION

WELL FIELD CHECKED IN 1982--First number, 68, is depth to water in feet below land surface. Second number, 1022, is the altitude of the water level in feet above mean sea level

WELL FIELD CHECKED IN 1982--Well with anomalously shallow 1982 water level. First number, 168, is depth to water in feet below land surface. Second number, 1109, is the altitude of the water level in feet above mean sea level

SPRING FIELD CHECKED IN 1982--Number, 3550, is altitude of the land surface in feet above mean sea level

VALLEY-FILL DEPOSITS--Main water-bearing unit consisting of silt, sand, clay, and gravel

BEDROCK (VOLCANIC, GRANITIC, METAMORPHIC, OR SEDIMENTARY ROCK)--Water may occur in faulted or fractured zones, joint systems, or thin veneer of alluvial or fluvial sediment overlying bedrock

WATER LEVEL CONTOUR--Shows altitude of the water level. Contour interval 50 feet. Datum is mean sea level

ARBITRARY BOUNDARY OF PHOENIX ACTIVE MANAGEMENT AREA (EXCLUDING HASSAYAMPA AND RAINBOW VALLEY SUB-BASINS)

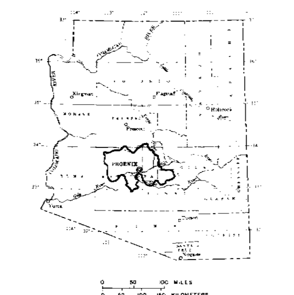
INTRODUCTION

The Phoenix Active Management Area (AMA) was created by the Groundwater Management Act of 1980 (Arizona Revised Statutes, Section 45-401 through 45-637), and includes 5,646 square miles of central Arizona. The AMA is a geographical area in which intensive groundwater management is needed because of the large and continuous groundwater overdraft. Within the AMA the Act limits withdrawal of groundwater and requires a forty-five year water conservation and management program (Arizona Department of Water Resources, 1984, p. 2). The AMA is divided into seven sub-basins; West Salt River, East Salt River, Fountain Hills, Lake Pleasant, Carefree, Hassayampa and Rainbow Valley. Studies of the Hassayampa and Rainbow Valley sub-basins have been published as separate map reports in this series (Long, 1983; Stulik, 1982); the remaining five sub-basins are discussed in this report.

The Phoenix AMA includes the largest and most populous urban area in Arizona and also has extensive agricultural development. Phoenix, the largest city in the AMA, is centrally located. Dense urbanization extends several miles east and west of Phoenix and includes the Cities of Tempe, Scottsdale, Mesa and Glendale, as well as several smaller communities. Agricultural areas include the central and southern portions of the East Salt River Valley sub-basin and the central and southwestern portions of the West Salt River Valley sub-basin. All crops must be irrigated (Hammett and Mock, 1983, p. 1).

The climate throughout the Phoenix AMA is arid. Long-term temperature and precipitation averages are areally uniform due to the low relief and other homogenizing factor which influence the area. The variations that exist are due largely to differences in elevation. The AMA is characterized by hot summers and mild winters. During July, the hottest month on average, daytime temperatures are generally between 100°F and 110°F, and nighttime temperatures between 75°F and 80°F. January, the coolest month on average has daytime temperatures generally between 60°F and 70°F. Nighttime temperatures are usually between 35°F and 40°F (Sellers and Hill, 1974, p. 376).

Yearly precipitation is limited, and averages about 7 to 8 inches AMA-wide; higher elevations receive more. There are two distinct precipitation periods in the year. During the summer, notably July and August, the area is influenced by tropical air from the Gulf of Mexico, frequently resulting in thunderstorms. These storms may be intense, but are usually of short duration and are widely scattered. Heavier late-summer rains sometimes result from tropical storms originating off the west coast of Mexico. During the winter, precipitation is associated with storms originating in the northern Pacific Ocean which move eastward across the continent after intensifying off the West Coast. Such precipitation is generally less intense, of longer duration, and more widespread than summer precipitation. Trace quantities of snow may occur during the winter.



INDEX MAP SHOWING AREA OF REPORT (SHADED)
PHOENIX ACTIVE MANAGEMENT AREA (OUTLINED)

HYDROGEOLOGY

The main sources of groundwater in the Phoenix AMA are the valley-fill deposits which underlie the West and East Salt River Valley, Fountain Hills and part of the Lake Pleasant sub-basins. The valley-fill deposits are extremely heterogenous. However, a three-fold division of the water-bearing units is possible based on lithology, which is generally consistent throughout the AMA. The units are in ascending order: the lower conglomerate unit, middle fine-grained unit, and upper alluvial unit, and are described in detail by the U.S. Bureau of Reclamation (1976, p. 11-14). Most large-capacity wells are located in areas underlain by valley-fill. Locally, water may be derived from fractured and weathered bedrock and the thin sediments along streams.

West and East Salt River Valley Sub-basins

The West and East Salt River Valley sub-basins include 3,177 square miles and are largely broad alluvial plains drained by the Salt and Gila Rivers. The sub-basins are bounded along the east by the Mazatzal, Usery, Goldfield, and Superstition Mountains; on the south by the Sacaton, Sierra Estrella, and South Mountains and the Buckeye Hills; on the west by the White Tank Mountains; and on the north by the Hieroglyphic, Wickenburg, and New River Mountains and New River Mesa. The two sub-basins are separated by the Phoenix Mountains, Papago Buttes and the Union Hills.

The primary source of groundwater in the West and East Salt River Valley sub-basins is the upper alluvial unit. The thickness of the unit ranges from 0 feet near the periphery of the sub-basins to more than 1,100 feet in the area east of Chandler, and more than 1,200 feet in the area southwest of El Mirage (U.S. Bureau of Reclamation, 1976, p. 41 and 51). Groundwater is usually unconfined, but semi-confined conditions exist locally where there is an increase of finer-grained materials. Perched conditions also exist, as evidenced by numerous wells throughout both sub-basins with cascading water, and wells with anomolously shallow water levels; particularly in the East Salt River Valley sub-basin.

A second source of groundwater is from the lower congomerate unit, penetrated by wells mainly along the periphery of the sub-basins on the south and east sides. New wells have been drilled and older wells deepened to penetrate this unit. The thickness of the conglomerate ranges from 0 to 2,000 feet or more; the thickest sections occur within the deep portions of sub-basins (U.S. Bureau of Reclamation, 1976, p. 41). Large-capacity wells completed in the valley-fill deposits yield several hundred to a few thousand gallons per minute.

Fountain Hills Sub-basin

The Fountain Hills sub-basin includes 377 square miles and is an alluvial plain. It includes the lower reach of the Verde River to its confluence with the Salt River, as well as a short reach of the Salt River and associated small drainage areas. There has been relatively little groundwater development in the Fountain Hills sub-basin. Therefore, knowledge of the hydrogeology is sparse. However, much of the sub-basin is underlain by undifferentiated valley-fill deposits that attain a thickness in excess of 1,200 feet. The valley-fill deposits may yield from a few tens to several hundred gallons per minute of water to wells. Unconsolidated alluvium along the Verde River may reach a few tens of feet thick and yield from 50 to several hundred gallons per minute of water to wells (Ross, 1977).

Lake Pleasant Sub-basin

The Lake Pleasant sub-basin covers 246 square miles and includes a short reach of the Agua Fria River, and drainages from the Hieroglyphic Mountains. The area is partly underlain by valley-fill deposits, which are generally in excess of 800 feet thick and may yield from less than 1 to 1,600 gallons per minute of water to wells. Locally, schist, gneiss, granite and volcanics, where sufficiently fractured or weathered, may yield up to 30 gallons per minute of water to wells (Littin, 1979).

Carefree Sub-basin

The Carefree sub-basin includes an area of 153 square miles in the northern part of the Phoenix AMA. Varied hydrogeologic conditions prevail in the Carefree sub-basin. Unconsolidated alluvium along Cave Creek yields from less than 1 to 50 gallons per minute of water to wells. A conglomerate, found in much of the area, yields as much as 25 gallons per minute of water to wells. Locally, schist, gneiss, granite and volcanics, where sufficiently fractured or weathered, may yield up to 30 gallons per minute of water to wells (Littin, 1979).

CHANGE IN WATER LEVEL

Withdrawal of approximately 81,000,000 acre-feet of water from the Phoenix AMA between about 1900 and 1982 (see pumpage table, sheet 2) has resulted in overdrafting of the water-bearing units. The overdrafts are reflected by water levels that have declined as much as 450 feet since 1923 at a rate that has varied between 2 and 8 feet per year (Laney and Ross, 1978; Ross, 1978). Due to an abundance of rainfall and surface water supply between 1976 and 1982, pumpage was greatly reduced and water levels rose over much of the basin during that time (see sheet 2 and table below). Direct recharge of the water-bearing units in the Phoenix AMA from rivers, washes and along mountain fronts probably accounts for a substantial portion of the observed water level rises.

RANGES OF DEPTHS TO WATER AND WATER LEVEL CHANGES

Sub-basin	Depth to Water 1983 Minimum-Maximum		Change in Water Level 1976 to 1983 Minimum-Maximum	
West Salt River Valley	4	651	- 34	+65
East Salt River Valley	12	793	-175	+93
Fountain Hills	22	490	- 59	+ 3
Lake Pleasant	10	383	- 2	+63
Carefree	9	223	+ 6	+34

For readers who prefer to use metric units rather than inch-pound units, the conversion factors for the terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
inch	25.4	millimeter
foot	0.3048	meter
mile	1.609	kilometer
square mile	2.590	square kilometer
acre	0.4047	square hectometer
acre-foot	0.001233	cubic hectometer
gallons per minute	0.06309	liters per second

5 0 5 MILES
5 0 5 10 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL
SCALE 1:125,000

BASE FROM U.S. GEOLOGICAL SURVEY
PHOENIX, AZ., 1954, REV. 1969, 1:250,000
MESA, AZ., 1954, REV. 1978, 1:250,000

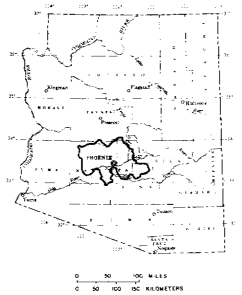
DEPTH TO WATER AND ALTITUDE OF THE WATER LEVEL, 1983 --

MAPS SHOWING GROUNDWATER CONDITIONS IN THE WEST SALT RIVER, EAST SALT RIVER, LAKE PLEASANT, CAREFREE AND FOUNTAIN HILLS SUB-BASINS OF THE PHOENIX ACTIVE MANAGEMENT AREA, MARICOPA, PINAL AND YAVAPAI COUNTIES, ARIZONA--1983

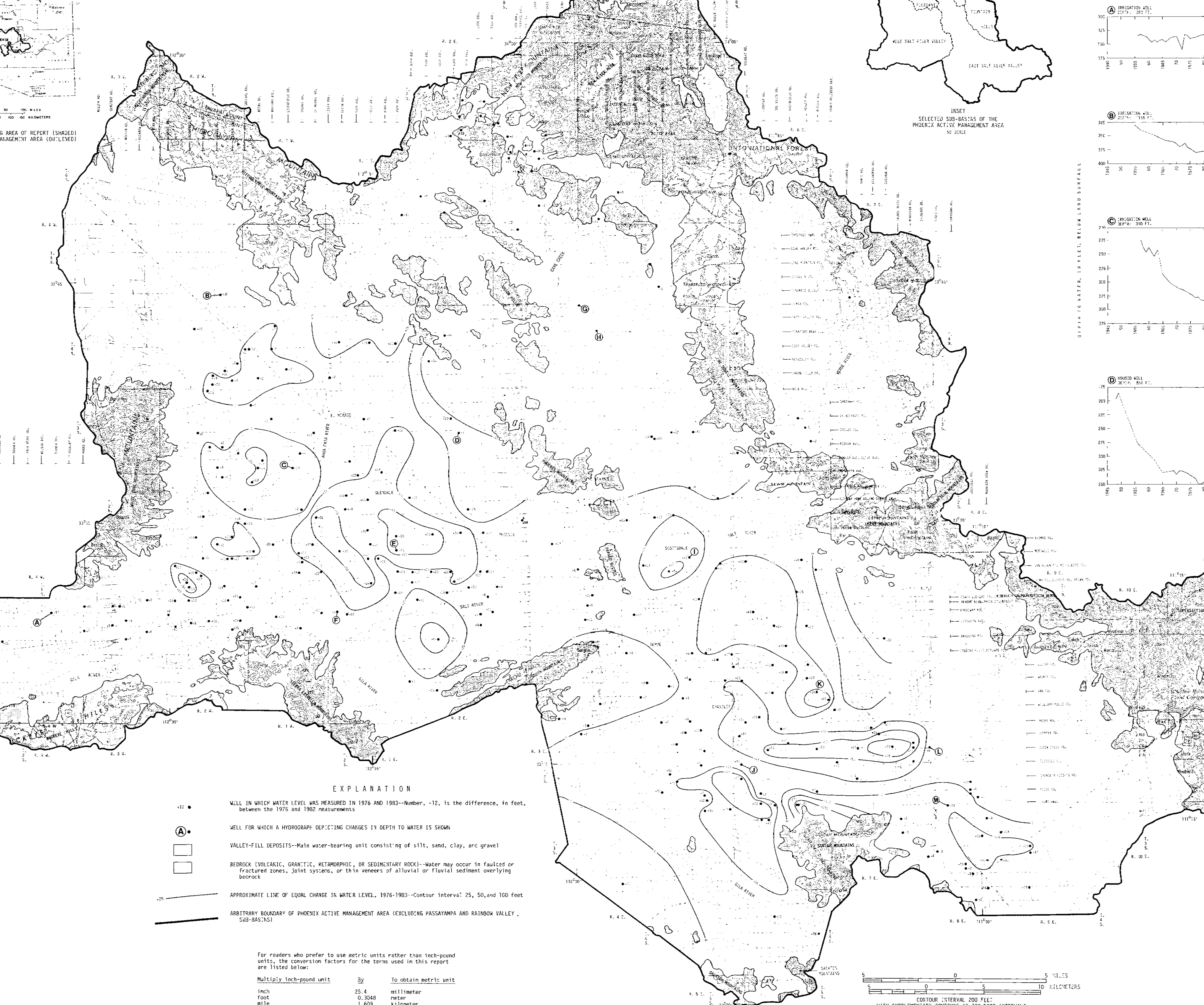
BY

R. W. REETER AND W. H. REMICK

These hydrologic maps are available upon request from the Department of Water Resources, Basic Data Unit, [illegible] South [illegible] Street, Suite 121, Phoenix, Arizona, [illegible]. The hydrologic data on which these maps are based are available, for the most part, in computer-printout form and may be consulted at the Department of Water Resources and at the U.S. Geological Survey offices located at: Federal Building, [illegible] West Congress Street, Tucson, and Valley Center, 201 North Central Avenue, Suite 1880, Phoenix, Arizona.

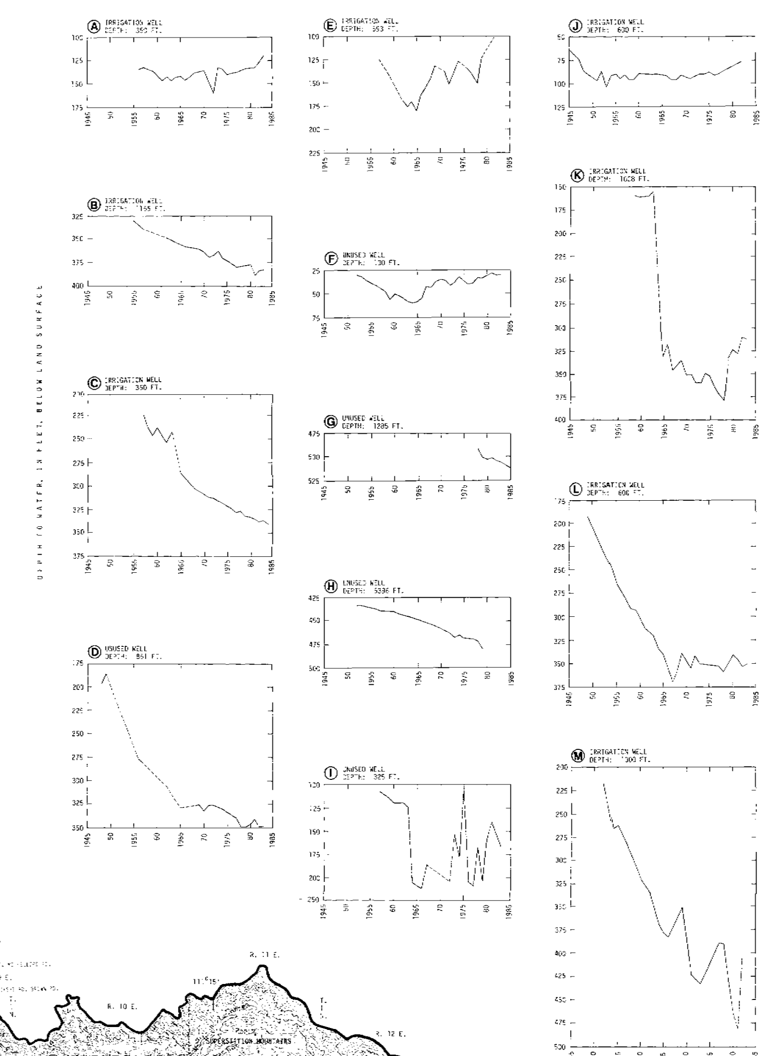


INDEX MAP SHOWING AREA OF REPORT (SHADED)
PHOENIX ACTIVE MANAGEMENT AREA (OUTLINED)



INSET
SELECTED SUB-BASINS OF THE
PHOENIX ACTIVE MANAGEMENT AREA
NO SCALE

HYDROGRAPHS OF THE WATER LEVEL IN SELECTED WELLS SHOWN ON THE MAP
(Dashed Line Indicates Inferred Water Level)



EXPLANATION

+12 ● WELL IN WHICH WATER LEVEL WAS MEASURED IN 1976 AND 1983--Number, +12, is the difference, in feet, between the 1976 and 1982 measurements

Ⓐ● WELL FOR WHICH A HYDROGRAPH DEPICTING CHANGES IN DEPTH TO WATER IS SHOWN

VALLEY-FILL DEPOSITS--Main water-bearing unit consisting of silt, sand, clay, and gravel

BEDROCK (VOLCANIC, GRANITIC, METAMORPHIC, OR SEDIMENTARY ROCK)--Water may occur in faulted or fractured zones, joint systems, or thin veneers of alluvial or fluvial sediment overlying bedrock

+25 APPROXIMATE LINE OF EQUAL CHANGE IN WATER LEVEL, 1976-1983--Contour interval 25, 50, and 100 feet

ARBITRARY BOUNDARY OF PHOENIX ACTIVE MANAGEMENT AREA (EXCLUDING HASSAYAMPA AND RAINBOW VALLEY SUB-BASINS)

For readers who prefer to use metric units rather than inch-pound units, the conversion factors for the terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
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foot	0.3048	meter
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square mile	2.590	square kilometer
acre	0.4047	square hectometer
acre-foot	0.001233	cubic hectometer
gallons per minute	0.06309	liters per second

ESTIMATED GROUNDWATER PUMPAGE IN THE
SALT RIVER VALLEY BASIN AREA

YEAR	PUMPAGE IN THOUSANDS OF ACRE-FEET	YEAR	PUMPAGE IN THOUSANDS OF ACRE-FEET	YEAR	PUMPAGE IN THOUSANDS OF ACRE-FEET	YEAR	PUMPAGE IN THOUSANDS OF ACRE-FEET
PRIOR TO 1915	57	1931	600	1949	1,644	1967	1,763
1915	15	1932	300	1950	1,852	1968	1,264
1916	15	1933	572	1951	1,910	1969	1,630
1917	15	1934	711	1952	2,020	1970	1,700
1918	40	1935	654	1953	2,330	1971	1,800
1919	63	1936	684	1954	2,330	1972	1,800
1920	95	1937	665	1955	2,240	1973	1,200
1921	100	1938	935	1956	2,330	1974	1,800
1922	200	1939	738	1957	2,330	1975	1,753
1923	400	1940	943	1958	2,300	1976	1,680
1924	500	1941	444	1959	2,206	1977	1,709
1925	500	1942	1,304	1960	2,005	1978	1,098
1926	500	1943	1,104	1961	2,178	1979	1,043
1927	500	1944	1,017	1962	1,976	1980	1,139
1928	500	1945	1,143	1963	2,134	1981	1,620
1929	600	1946	1,360	1964	1,972	1982	1,115
1930	650	1947	1,406	1965	1,500	1983	707
		1948	1,670	1966	1,350		
						TOTAL:	81,812

BASE FROM U.S. GEOLOGICAL SURVEY
PHOENIX, AZ., 1954, REV. 1969, 1:250,000
MESA, AZ., 1954, REV. 1978, 1:250,000

DEPTH TO WATER AND ALTITUDE OF THE WATER LEVEL, 1983 --

MAPS SHOWING GROUNDWATER CONDITIONS IN THE WEST SALT RIVER, EAST SALT RIVER, LAKE PLEASANT, CAREFREE AND FOUNTAIN HILLS SUB-BASINS OF THE PHOENIX ACTIVE MANAGEMENT AREA, MARICOPA, PINAL AND YAVAPAI COUNTIES, ARIZONA--1983

BY

R. W. REETER AND W. H. REMICK

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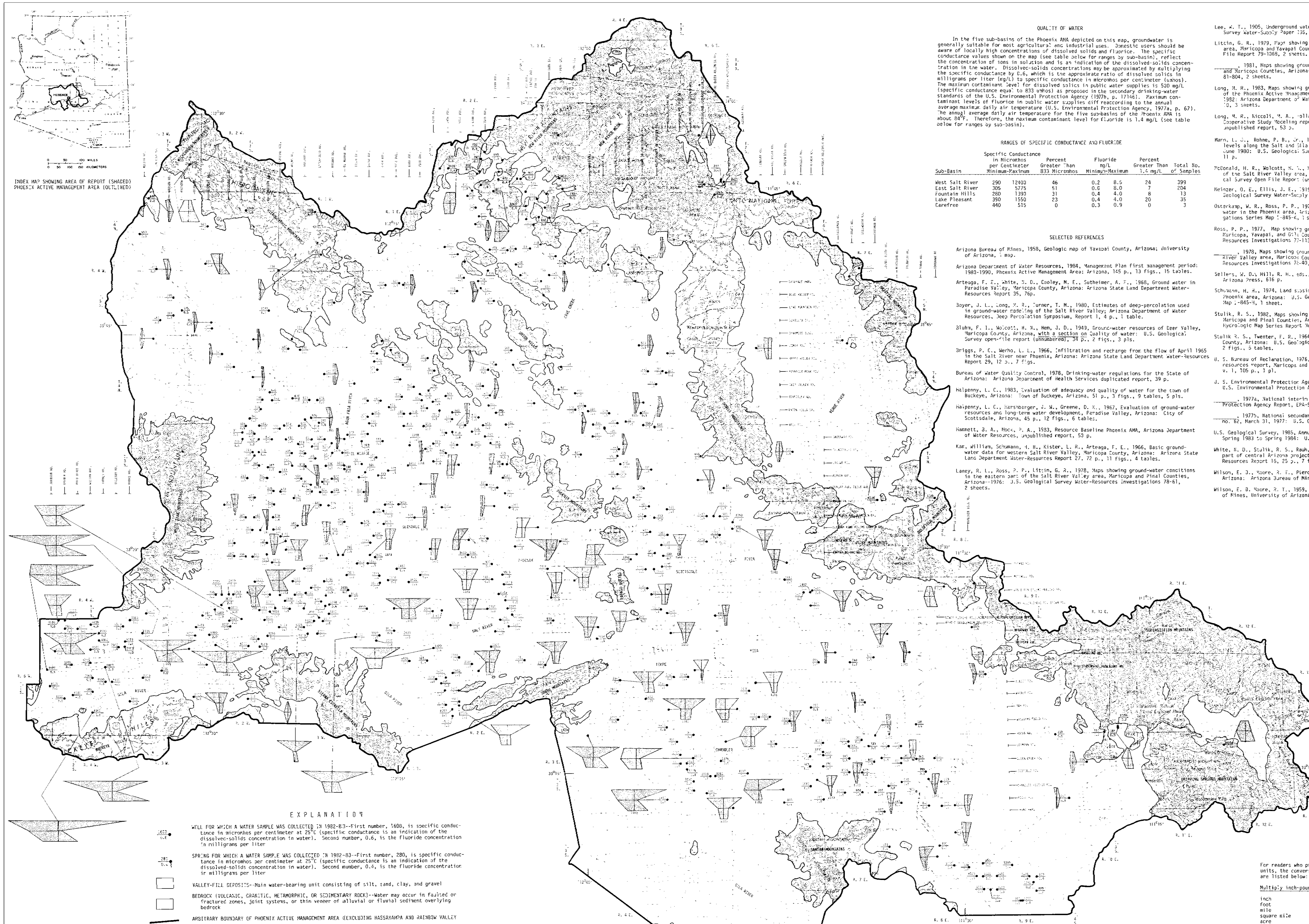

INDEX MAP SHOWING AREA OF REPORT (SHADED)
PHOENIX ACTIVE MANAGEMENT AREA (OUTLINED)

QUALITY OF WATER

In the five sub-basins of the Phoenix AMA depicted on this map, groundwater is generally suitable for most agricultural and industrial uses. Domestic users should be aware of locally high concentrations of dissolved solids and fluoride. The specific conductance values shown on the map (see table below for ranges by sub-basin), reflect the concentration of ions in solution and is an indication of the dissolved-solids concentration in the water. Dissolved-solids concentrations may be approximated by multiplying the specific conductance by 0.6, which is the approximate ratio of dissolved solids in milligrams per liter (mg/L) to specific conductance in micromhos per centimeter (umhos). The maximum contaminant level for dissolved solids in public water supplies is 500 mg/L (specific conductance equal to 833 umhos) as proposed in the secondary drinking-water standards of the U.S. Environmental Protection Agency (1977b, p. 17146). Maximum contaminant levels of fluoride in public water supplies differ according to the annual average maximum daily air temperature (U.S. Environmental Protection Agency, 1977a, p. 67). The annual average daily air temperature for the five sub-basins of the Phoenix AMA is about 84°F. Therefore, the maximum contaminant level for fluoride is 1.4 mg/L (see table below for ranges by sub-basin).

RANGES OF SPECIFIC CONDUCTANCE AND FLUORIDE

Sub-Basin	Specific Conductance in Micromhos per Centimeter Minimum-Maximum		Percent Greater Than 833 Micromhos	Fluoride mg/L Minimum-Maximum		Percent Greater Than 1.4 mg/L	Total No. of Samples
West Salt River	290	12400	46	0.2	8.5	24	399
East Salt River	305	5775	51	0.0	8.0	7	204
Fountain Hills	280	1390	31	0.4	4.0	8	13
Lake Pleasant	390	1550	23	0.4	4.0	20	35
Carefree	440	515	0	0.3	0.9	0	3

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EXPLANATION

1600 / 0.6 — WELL FOR WHICH A WATER SAMPLE WAS COLLECTED IN 1982-83--First number, 1600, is specific conductance in micromhos per centimeter at 25°C (specific conductance is an indication of the dissolved-solids concentration in water). Second number, 0.6, is the fluoride concentration in milligrams per liter

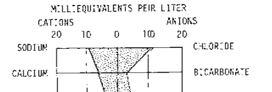
280 / 0.4 — SPRING FOR WHICH A WATER SAMPLE WAS COLLECTED IN 1982-83--First number, 280, is specific conductance in micromhos per centimeter at 25°C (specific conductance is an indication of the dissolved-solids concentration in water). Second number, 0.4, is the fluoride concentration in milligrams per liter

VALLEY-FILL DEPOSITS--Main water-bearing unit consisting of silt, sand, clay, and gravel

BEDROCK (VOLCANIC, GRANITIC, METAMORPHIC, OR SEDIMENTARY ROCK)--Water may occur in faulted or fractured zones, joint systems, or thin veneer of alluvial or fluvial sediment overlying bedrock

ARBITRARY BOUNDARY OF PHOENIX ACTIVE MANAGEMENT AREA (EXCLUDING HASSAYAMPA AND RAINBOW VALLEY

CHEMICAL QUALITY DIAGRAM--Shows major constituents in milliequivalents per liter. The diagrams are in a variety of shapes and sizes, providing a means of comparing, correlating, and characterizing similar or dissimilar types of water. Year, 1979, below diagram indicates sample collected in years other than 1982-83



For readers who prefer to use metric units rather than inch-pound units, the conversion factors for the terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
inch	25.4	millimeter
foot	0.3048	meter
mile	1.609	kilometer
square mile	2.590	square kilometer
acre	0.4047	square hectometer
acre-foot	0.001233	cubic hectometer
gallons per minute	0.06309	liters per second

5 0 5 MILES
5 0 5 10 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL
SCALE 1:125,000

BASE FROM U.S. GEOLOGICAL SURVEY
PHOENIX, AZ., 1954, REV. 1969, 1:250,000
MESA, AZ., 1954, REV. 1978, 1:250,000

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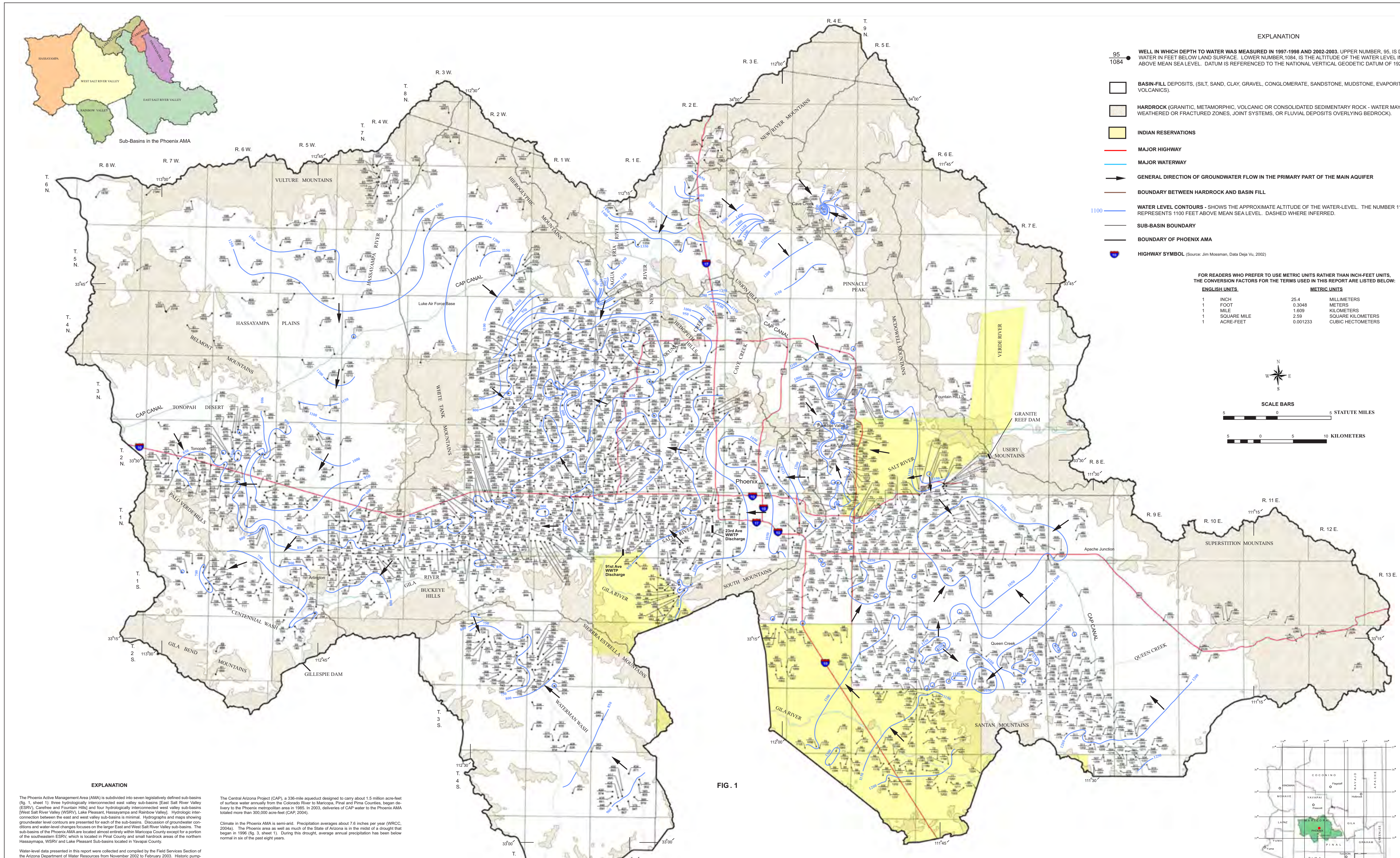


FIG. 1

EXPLANATION

95/1084 **WELL IN WHICH DEPTH TO WATER WAS MEASURED IN 1997-1998 AND 2002-2003.** UPPER NUMBER, 95, IS DEPTH TO WATER IN FEET BELOW LAND SURFACE. LOWER NUMBER,1084, IS THE ALTITUDE OF THE WATER LEVEL IN FEET ABOVE MEAN SEA LEVEL. DATUM IS REFERENCED TO THE NATIONAL VERTICAL GEODETIC DATUM OF 1929.

BASIN-FILL DEPOSITS, (SILT, SAND, CLAY, GRAVEL, CONGLOMERATE, SANDSTONE, MUDSTONE, EVAPORITES, AND VOLCANICS).

HARDROCK (GRANITIC, METAMORPHIC, VOLCANIC OR CONSOLIDATED SEDIMENTARY ROCK - WATER MAY OCCUR IN WEATHERED OR FRACTURED ZONES, JOINT SYSTEMS, OR FLUVIAL DEPOSITS OVERLYING BEDROCK).

INDIAN RESERVATIONS

MAJOR HIGHWAY

MAJOR WATERWAY

GENERAL DIRECTION OF GROUNDWATER FLOW IN THE PRIMARY PART OF THE MAIN AQUIFER

BOUNDARY BETWEEN HARDROCK AND BASIN FILL

1100 **WATER LEVEL CONTOURS -** SHOWS THE APPROXIMATE ALTITUDE OF THE WATER-LEVEL. THE NUMBER 1100 REPRESENTS 1100 FEET ABOVE MEAN SEA LEVEL. DASHED WHERE INFERRED.

SUB-BASIN BOUNDARY

BOUNDARY OF PHOENIX AMA

HIGHWAY SYMBOL (Source: Jim Mossman, Data Deja Vu, 2002)

FOR READERS WHO PREFER TO USE METRIC UNITS RATHER THAN INCH-FEET UNITS, THE CONVERSION FACTORS FOR THE TERMS USED IN THIS REPORT ARE LISTED BELOW:

ENGLISH UNITS		METRIC UNITS	
1	INCH	25.4	MILLIMETERS
1	FOOT	0.3048	METERS
1	MILE	1.609	KILOMETERS
1	SQUARE MILE	2.59	SQUARE KILOMETERS
1	ACRE-FEET	0.001233	CUBIC HECTOMETERS

EXPLANATION

The Phoenix Active Management Area (AMA) is subdivided into seven legislatively defined sub-basins (fig. 1, sheet 1): three hydrologically interconnected east valley sub-basins [East Salt River Valley (ESRV), Carefree and Fountain Hills] and four hydrologically interconnected west valley sub-basins [West Salt River Valley (WSRV), Lake Pleasant, Hassayampa and Rainbow Valley]. Hydrologic interconnection between the east and west valley sub-basins is minimal. Hydrographs and maps showing groundwater level contours are presented for each of the sub-basins. Discussion of groundwater conditions and water-level changes focuses on the larger East and West Salt River Valley sub-basins. The sub-basins of the Phoenix AMA are located almost entirely within Maricopa County except for a portion of the southeastern ESRV, which is located in Pinal County and small hardrock areas of the northern Hassaymapa, WSRV and Lake Pleasant Sub-basins located in Yavapai County.

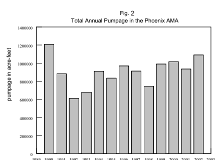
Water-level data presented in this report were collected and compiled by the Field Services Section of the Arizona Department of Water Resources from November 2002 to February 2003. Historic pumpage data were compiled by the Hydrology Division and the Phoenix AMA Office.

Land and Water Use

Land use within the Phoenix AMA has become increasingly urban with the expansion of the Phoenix metropolitan area into native desert and previously irrigated agricultural areas. The population of Maricopa County, which includes the Phoenix metropolitan area, has increased more than 50 percent since 1990 from approximately 2,122,100 to 3,194,800 in 2001 (U.S. Census Bureau, 2003). By 1995, urban land use in the Phoenix AMA (Maricopa county portion only and excluding the Gila River Indian Reservation) exceeded agricultural land use (ASU CAPLTER, 2003). Combined irrigated acreage of agricultural land in the East and West sub-basins (Maricopa county only and excluding the Gila River Indian Reservation) decreased from approximately 264,000 acres in 1995 to less than 200,000 acres in 2000 while urban land use has increased from approximately 280,000 acres to more than 420,000 over the same time period (ASU CAPLTER, 2003). Prior to the early 1990's agriculture was the dominant land use in the Phoenix AMA.

Despite the decrease in agricultural land use, groundwater withdrawn for agriculture still exceeds that withdrawn for municipal and industrial use. In 2000, agricultural use accounted for approximately 54.7% of all groundwater withdrawn in the AMA, and municipal (including domestic) and industrial (including mining and turf-related facilities) use was approximately 31.9% and 13.4%, respectively. From 1990 to 2002, the highest total groundwater pumpage in the AMA was in 1990 while the lowest was in 1992. However, since 1992 the trend has been a general increase in total annual pumpage (fig. 2, sheet 1).

Fig. 2
Total Annual Pumpage in the Phoenix AMA



Source: ADWR

Physiographical Setting

The Phoenix AMA is located primarily in south-central Arizona. This area is part of the Basin and Range physiographic province described by Fenneman (1931). It is characterized by alluvium filled basins separated by elongated fault-block mountain ranges.

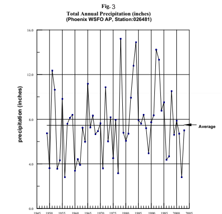
The major drainages include the Salt, Gila, Verde, Hassayampa, Agua Fria and New Rivers, Queen, Cave and Skunk Creeks and Indian Bend Wash. Upstream dams and diversions prevent all but the upper reach of Cave Creek and the Verde River from having natural perennial flow within the Phoenix AMA. The entire flow of the Salt River below Stewart Mountain Dam (except for minor overflow and during infrequent periods of extreme flooding) is diverted at Granite Reef Dam (10 miles downstream) for irrigation and municipal use in the Phoenix AMA (McCormack and others, 2003). Effluent dominated perennial flow is also present in the Salt River below the City of Phoenix 23rd and 91st Ave. wastewater treatment plants. Flows below the City of Phoenix 23rd and 91st Ave wastewater treatment plants are comprised primarily of treated effluent discharged by the plants but may also include irrigation return flows from agricultural fields and rainfall runoff from urban land.

Perennial flow in the Hassayampa River near Arlington is also dependant on effluent discharged by the City of Phoenix 91st Ave wastewater treatment plant. The effluent is mixed with groundwater in the Buckeye Canal and used to irrigate cotton and other crops. Downstream, effluent and irrigation return flows in the Buckeye Canal are discharged into the river near Arlington (Cordy and others, 2000

The Central Arizona Project (CAP), a 336-mile aqueduct designed to carry about 1.5 million acre-feet of surface water annually from the Colorado River to Maricopa, Pinal and Pima Counties, began delivery to the Phoenix metropolitan area in 1985. In 2003, deliveries of CAP water to the Phoenix AMA totaled more than 300,000 acre-feet (CAP, 2004).

Climate in the Phoenix AMA is semi-arid. Precipitation averages about 7.6 inches per year (WRCC, 2004a). The Phoenix area as well as much of the State of Arizona is in the midst of a drought that began in 1996 (fig. 3, sheet 1). During this drought, average annual precipitation has been below normal in six of the past eight years.

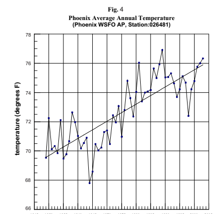
Fig. 3
Total Annual Precipitation (inches)
(Phoenix WSFO AP, Station:026481)



Source: WRRC, 2004a

The average daily temperature in the Phoenix metropolitan area has been increasing steadily during the past 50 years (fig. 4, sheet 1). The average daily temperature for 2003 was 76.3 °F, (WRCC, 2004b).

Fig. 4
Phoenix Average Annual Temperature
(Phoenix WSFO AP, Station:026481)



Source: WRRC, 2004b

Groundwater

Groundwater occurs under generally unconfined conditions throughout most of the alluvial-filled basins and local hardrock areas of the Phoenix AMA. Depths to water range from just below land surface to more than 800 feet below land surface.

The main aquifer systems of both the east and west sub-basins are composed primarily of basin-fill deposits. Previous investigations by the U.S. Bureau of Reclamation (1976) divided these deposits into three hydrogeologic units.

The units were further defined as the Upper Alluvial Unit (UAU), Middle Alluvial Unit (MAU) and the Lower Alluvial Unit (LAU) by Corkhill and others (1993) in the East and West Salt River Valley Sub-basins. Location, thickness and composition of the units are described in detail by Brown & Pool (1989) and Laney & Hahn (1986). Each of the units is characterized by distinct hydrologic properties that vary in extent and thickness throughout the Phoenix AMA. Detailed hydrologic properties of the units in the East and West Salt River Valley Sub-basins are listed by Township, Range and section in ADWR Modeling Report No. 6 (Correll and Corkhill, 1994).

Prior to extensive pumping in the AMA, groundwater flowed primarily from ESRV to the WSRV along or toward the Salt and Gila Rivers. Groundwater exited the AMA near the former Gillespie Dam (Freethey and Anderson, 1986). By1964, a large groundwater depression had formed east of the White Tank Mountains, redirecting flow from virtually all directions in the WSRV toward the depression. (ADWR, 2003a). By 1983, localized groundwater depressions caused primarily by decades of agricultural pumping had formed throughout the AMA (Reeter and Remick, 1986). As a result, a groundwater divide has formed in the southwest quarter of Township 1N, Range 4E that essentially severed the hydraulic connection between the ESRV and WSRV sub-basins (Corkhill and others, 1993).

Although groundwater levels in the ESRV have risen somewhat, the map prepared for this report (fig. 1, sheet 1) shows that most of the groundwater depressions depicted on the 1983 and 1992 maps (Reeter and Remick, 1986 and Hammett and Herther, 1995, respectively) are still evident. The groundwater divide that developed around 1983 between the East and West Salt River Valley sub-basins is still present.

West Salt River Valley Sub-basin

The sources of groundwater in the WSRV are spread almost evenly among the three alluvial units: 32 percent from the UAU, 33 percent from the MAU, and 35 percent from the LAU (ADWR, 2003a). About 6,817,500 acre-feet of groundwater was withdrawn from the WSRV from 1990 to 2002.

Major sources of groundwater recharge in the WSRV include incidental recharge of agricultural irrigation (approx. 200,000 acre-feet/year) and effluent discharged from the City of Phoenix 23rd and 91st Ave. wastewater treatment plants (approx. 40,000 acre-feet/year). An increasing amount of aquifer recharge of surface water and effluent is currently managed at 10 permitted underground storage facilities (USFs) in the WSRV. Approximately 125,950 acre-feet was stored from 1996 to 2002 via USFs in the WSRV. From 1996 to 2002, 4,220,088 acre-feet from all sources was recharged in the WSRV (ADWR, 2003a).

Withdrawal of groundwater in the WSRV from 1990 to 2002 exceeded recharge by almost 2.6 million acre-feet. This fact, along with historic overpumping in the area around Luke Air Force Base has resulted in a large groundwater depression known locally as the Luke cone of depression. Coinciding with this large groundwater depression, land subsidence of up to 18 feet has been recorded in the vicinity of Luke Air Force Base (Schuman and O'day, 1995). ADWR is currently monitoring land subsidence in the WSRV. In addition to the area around Luke Air Force Base, preliminary results have identified several areas of active land subsidence as high as 7 cm (2.75 inches) per year between 1997 and 2000. (ADWR, 2003b).

Hassayampa Sub-basin

The Hassayampa Sub-basin is further divided into the upper Hassayampa Plain and the Lower Hassayampa Area. Groundwater in the upper Hassayampa Plain occurs primarily under unconfined conditions in the basin-fill deposits (Long, 1983). The upper Hassayampa Plain is predominantly undeveloped with few existing wells scattered over a large area.

Groundwater in the Lower Hassayampa Area occurs primarily under unconfined conditions in the basin-fill deposits (Stulik, 1974), with smaller amounts under locally confined, artesian, or perched conditions (Long, 1983). Agricultural development in the Lower Hassayampa Area began in the early 1950's (Stulik, 1974) and continues to the present, particularly in the area near Tonopah.

Groundwater pumpage from the Hassyampa Sub-Basin (primarily from the Lower Hassayampa Area) was about 49,000 acre-feet in 2002. Although this is only half as much pumped throughout the 1970's and 80's, groundwater depressions are still present in both the Centennial Wash and the Tonopah areas. (fig. 1, sheet 1). Recent water-level declines are limited to the Tonopah area (sheet 2). Three newly constructed power plants have also recently begun operation in the Lower Hassayampa Area with a total projected annual water use of more than 17,000 acre-feet.

Rainbow Valley Sub-basin

Groundwater in the Rainbow Valley Sub-basin (also known as the Waterman Wash Area) occurs under unconfined conditions in the basin-fill alluvial deposits that underlie the valley (Stulik, 1982). Groundwater pumping in the sub-basin began in the 1940's with the development of agriculture in the area. By 1952, continued pumpage resulted in the development of a groundwater depression in the northwest portion of the sub-basin (Stulik, 1982). Although annual pumpage has declined from a high of 72,000 acre-feet in 1972 (Stulik, 1982) to less than 7,000 acre-feet in 2002, the groundwater depression is still evident. (fig. 1, sheet 1).

Lake Pleasant Sub-basin

The hydrogeologic units of the Lake Pleasant Sub-basin consist of unconsolidated basin fill and streambed alluvium underlain by sedimentary sandstone and conglomerate. The sedimentary layer is underlain locally by Tertiary volcanics and Precambrian schist. The unconsolidated basin fill, interbedded with volcanics, intrusives and conglomerate make up the main water-producing aquifer in the sub-basin (Clear Creek & Associates, 2003).

Annual pumpage in the Lake Pleasant Sub-basin is minimal. Since 1992, reported pumpage has averaged about 1,550 acre-feet per year and has exceeded 2,000 acre-feet in only three of the past 13 years.

East Salt River Valley Sub-basin

The primary source of groundwater in the ESRV is the LAU. Nearly half (49 percent) of the total pumpage in the ESRV is withdrawn from the LAU, 40 percent from the MAU, and only 11 percent from the UAU (ADWR, 2003a). About 4,257,500 acre-feet of groundwater was withdrawn in the ESRV from 1990 to 2002 (ADWR, 2003a).

Major sources of groundwater recharge in the ESRV include agricultural irrigation (approx. 250,000 acre-feet/year), canal leakage (approx. 22,000 acre-feet/year), and storage at USFs. Aquifer recharge of surface water and effluent is currently managed at 12 permitted USFs in the ESRV. Approximately 789,500 acre-feet was stored from 1995 to 2002 at USFs in the ESRV, and about 6,946,430 acre-feet from all sources was recharged from 1990 to 2002 (ADWR, 2003a). Recharge of groundwater in the ESRV from 1990 to 2002 exceeded withdrawals by almost 2.7 million acre-feet.

Localized pumping near Apache Junction area in the ESRV may be the cause of past earth fissuring and ongoing land subsidence of up to 2.5 cm (about 1 inch) per year (ADWR, 2003b). Other areas in the ESRV with documented earth fissures and/or land subsidence are in the vicinities of Queen Creek, North Scottsdale and Paradise Valley (ADWR, 2003b).

Carefree Sub-basin

Groundwater in the Carefree Sub-basin occurs under a variety of conditions. Water bearing units may consist of unconsolidated streambed alluvium, and various members of the Carefree Formation (HydroSystems, 2000). Local areas of fractured schist, gneiss and granite also yield water to wells (Littin, 1979).

The Carefree Formation is the major water-producing unit, with the majority of water pumped in the basin coming from its various members (HydroSystems, 2000). Pumpage in the Carefree Sub-basin is primarily for domestic use, municipal use and golf course irrigation. Reported pumpage in the sub-basin has decreased from approximately 3,700 acre-feet in 1990 to less than 2,100 acre-feet in 2002.

As a result of historic heavy pumping, cones of depression formed near the Carefree Airport in the south-central portion of the basin and in the northern part of the Town of Cave Creek. The depression near the airport reached its largest extent in 1993 (Bernier, 2001), and is currently less pronounced. However, the cone of depression centered in the southeast quarter of section 21 in Township 6N, Range 4E in the northern part of the Town of Cave Creek, is still well defined. (fig 1, sheet 1.)

Fountain Hills Sub-basin

The hydrogeology of the Fountain Hills Sub-basin is not well documented. A geologic cross-section through the Town of Fountain Hills prepared by HydroSystems (1999), indicates a confined aquifer system consisting primarily of clays and interbedded conglomerates. Separate aquifer systems occur within the recent alluvium in the streams and washes around the Town of Fountain Hills (HydroSystems 1999) and along the Verde River. In the area on the west side of the Verde River, east of Pinnacle Peak and north of the McDowell Mountains, groundwater is present in an aquifer comprised of decomposed and fractured granites (ADWR, 2001). East of this area, a clay sequence as thick as 600 feet is encountered toward the Verde River. The clay acts as a barrier to groundwater flow between the shallow alluvial aquifer along the Verde River and the decomposed and fractured granites (ADWR, 2001).

Most of the groundwater development in the Fountain Hills Sub-basin is limited to the area around the town of Fountain Hills and the area west of the retirement community of Rio Verde. Groundwater pumpage is primarily for domestic use, municipal use and golf course irrigation. Both the number of wells and the volume of groundwater pumped in the sub-basin has increased steadily since 1990. Reported pumpage in 2002 was about 4,700 acre-feet compared to 1990 when pumpage was just over 2,500 acre-feet.

Water Level Changes

Since 1997, significant changes in water levels have been recorded throughout the AMA. The area with the largest increases in water levels from 1997 to 2000 (from +25 to +75 feet) is in the southeast portion of the ESRV while the largest and most extensive area of decline (from -25 to -50 feet) is in the WSRV (sheet 2).

The areas where substantial water-level rises have occurred coincide with sizeable decreases of agriculture combined with increased use of surface water, (primarily CAP) in lieu of groundwater on the remaining agricultural land. From 1992 to 2001 more than1.3 million acre-feet of in lieu CAP water was 'stored' in the Phoenix AMA (ADWR, 2003c). Of the 1.3 million acre-feet, most (approx. 75 percent) was 'stored' in the ESRV. Other small local areas of water-level rise have resulted from artificial recharge at many of the permitted USFs located throughout the AMA

Within the large area of water-level decline in the WSRV, agricultural land use has continued to decrease due to expanding urbanization. The extent of the recent water level decline is a result of increased groundwater pumping over the past five years due in large part to the ongoing drought. Salt River Project (SRP) operates a high number of large-capacity wells in this area of water-level decline and has had to rely heavily on pumping these wells during times when surface water is not readily available. At the center of the decline in Township 2N, Range 1E, withdrawals have increased from less than 40,000 acre-feet in 1997 to more than 60,000 acre-feet in 2002. Throughout the AMA, SRP pumped over 300,000 acre-feet of groundwater in 2002 compared to only 77,000 acre-feet in 1998, when surface water was readily available and demand was lower due to above average annual rainfall.

Hydrographs for selected wells throughout the AMA are presented in Sheet 3. The Hydrographs were prepared using data from ADWR's Groundwater Site Inventory (GWSI) Database.

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BASE MAP FROM U.S. GEOLOGICAL SURVEY
PHOENIX, ARIZONA, 1954,REV.1969,1:250,000
MESA, ARIZONA, 1954, REV. 1978, 1:125,000
HOLBROOK, ARIZONA, 1954, REV. 1970, 1:250,000
AJO, ARIZONA, 1953, REV. 1969, 1:250,000

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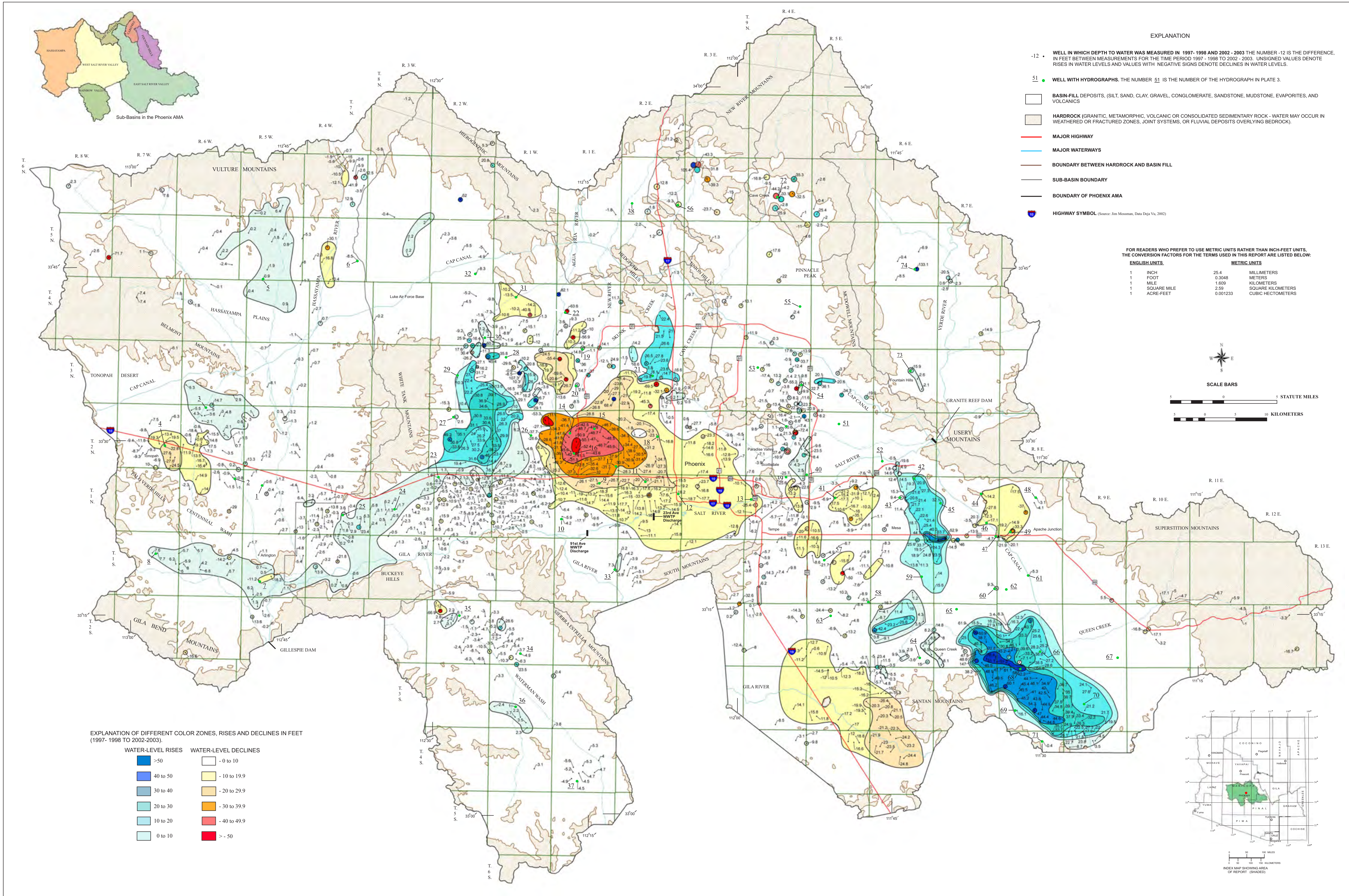
MAPS SHOWING GROUNDWATER CONDITIONS IN THE PHOENIX ACTIVE MANAGEMENT AREA MARICOPA, PINAL, AND YAVAPAI COUNTIES, ARIZONA—NOV. 2002- FEB. 2003

BY
S.J. RASCONA

THESE HYDROLOGIC MAPS ARE AVAILABLE UPON REQUEST FROM THE ARIZONA DEPARTMENT OF WATER RESOURCES, INFORMATION CENTRAL, 3550 NORTH CENTRAL AVE, PHOENIX, ARIZONA, 85012. THE HYDROLOGIC DATA ON WHICH THESE MAPS ARE BASED ARE AVAILABLE AT THE ADWR BOOKSTORE. (602) 771-8638



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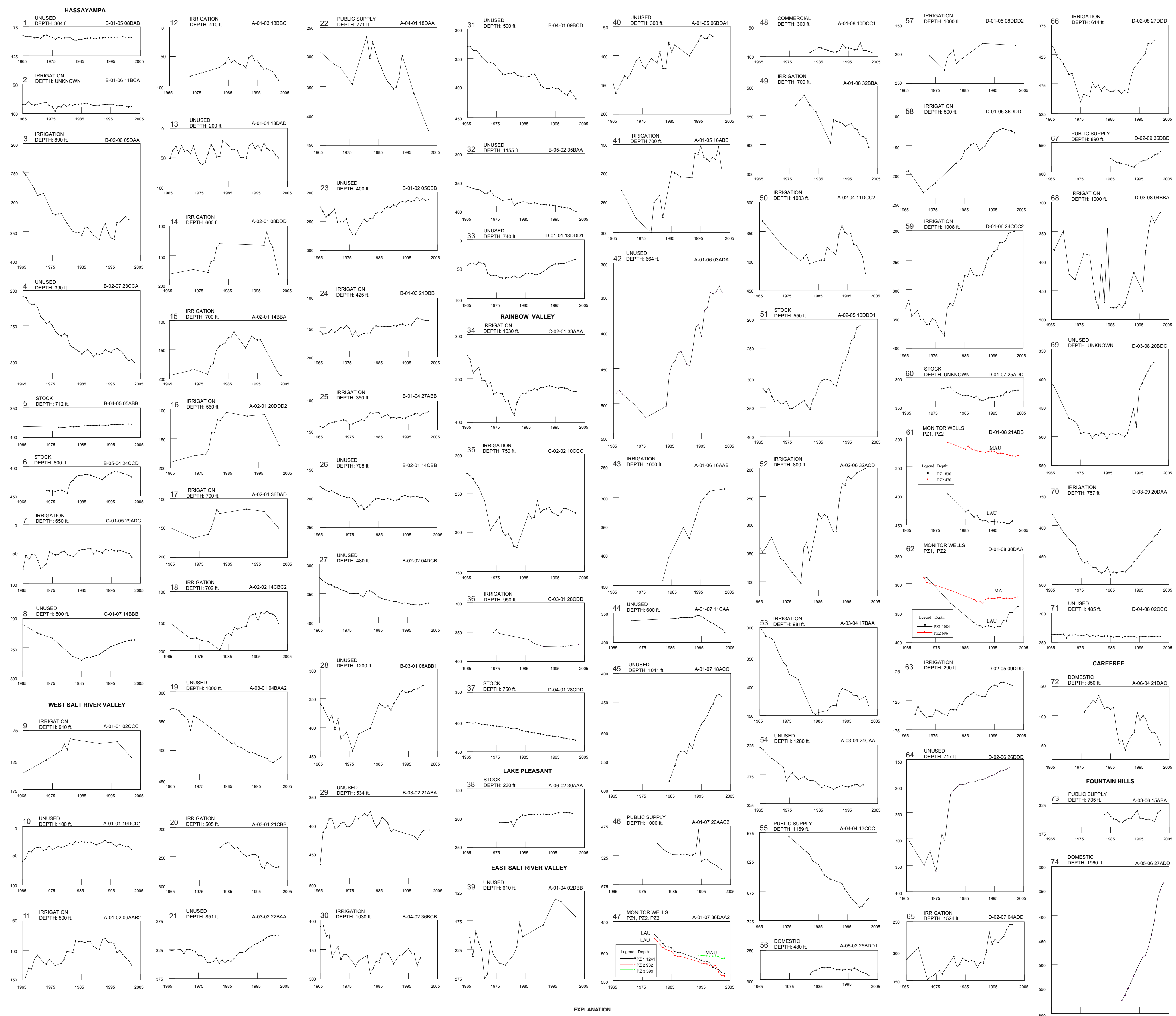

EXPLANATION

MAU-Middle Alluvial Unit of the basin-fill deposits

LAU-Lower Alluvial Unit of the basin-fill deposits

BASE MAP FROM U.S. GEOLOGICAL SURVEY
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MESA, ARIZONA, 1954, REV. 1978, 1:125,000
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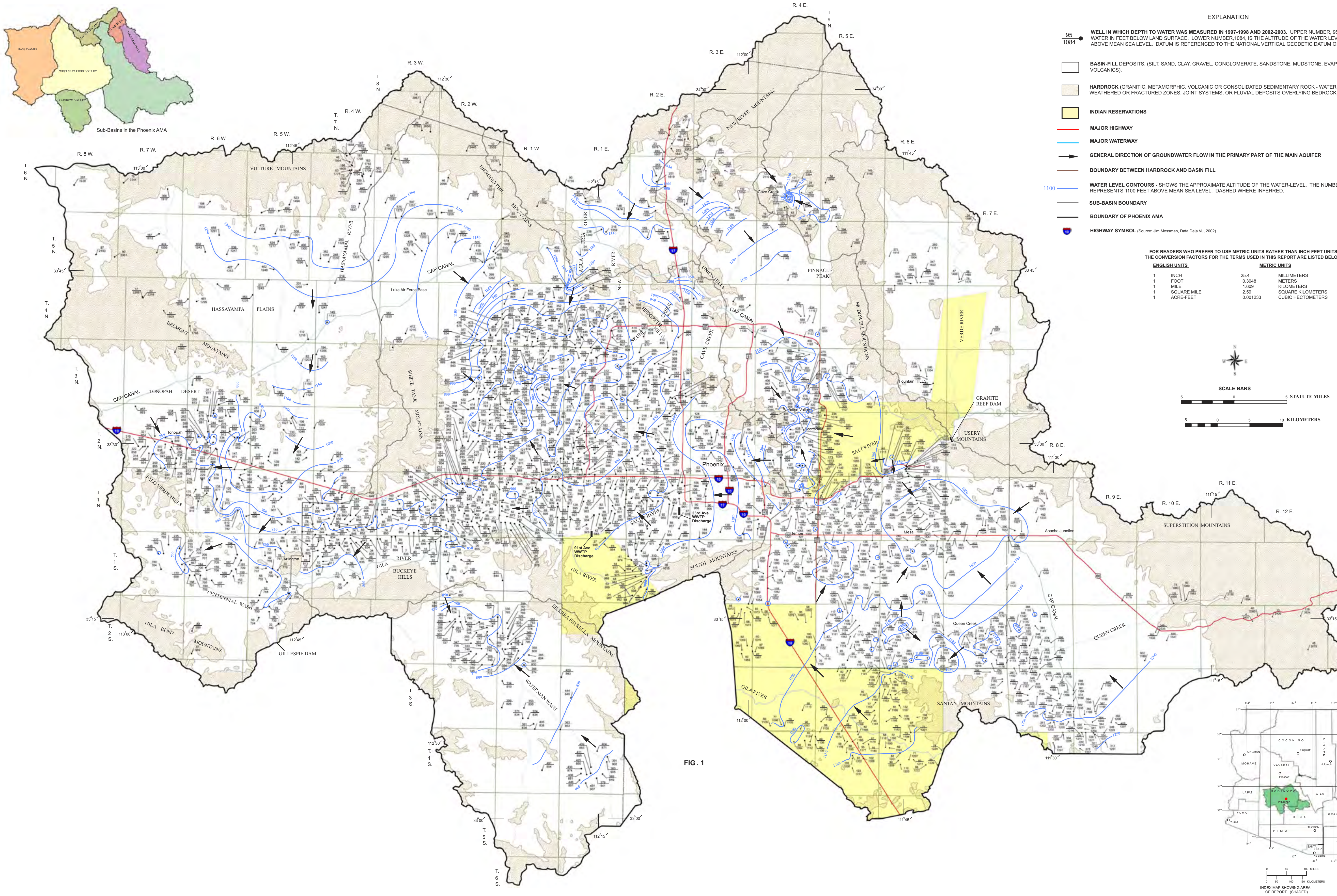

FIG. 1

EXPLANATION

95/1084 **WELL IN WHICH DEPTH TO WATER WAS MEASURED IN 1997-1998 AND 2002-2003.** UPPER NUMBER, 95, IS DEPTH TO WATER IN FEET BELOW LAND SURFACE. LOWER NUMBER,1084, IS THE ALTITUDE OF THE WATER LEVEL IN FEET ABOVE MEAN SEA LEVEL. DATUM IS REFERENCED TO THE NATIONAL VERTICAL GEODETIC DATUM OF 1929.

BASIN-FILL DEPOSITS, (SILT, SAND, CLAY, GRAVEL, CONGLOMERATE, SANDSTONE, MUDSTONE, EVAPORITES, AND VOLCANICS).

HARDROCK (GRANITIC, METAMORPHIC, VOLCANIC OR CONSOLIDATED SEDIMENTARY ROCK - WATER MAY OCCUR IN WEATHERED OR FRACTURED ZONES, JOINT SYSTEMS, OR FLUVIAL DEPOSITS OVERLYING BEDROCK).

INDIAN RESERVATIONS

MAJOR HIGHWAY

MAJOR WATERWAY

GENERAL DIRECTION OF GROUNDWATER FLOW IN THE PRIMARY PART OF THE MAIN AQUIFER

BOUNDARY BETWEEN HARDROCK AND BASIN FILL

1100 **WATER LEVEL CONTOURS -** SHOWS THE APPROXIMATE ALTITUDE OF THE WATER-LEVEL. THE NUMBER 1100 REPRESENTS 1100 FEET ABOVE MEAN SEA LEVEL. DASHED WHERE INFERRED.

SUB-BASIN BOUNDARY

BOUNDARY OF PHOENIX AMA

HIGHWAY SYMBOL (Source: Jim Mossman, Data Deja Vu, 2002)

FOR READERS WHO PREFER TO USE METRIC UNITS RATHER THAN INCH-FEET UNITS, THE CONVERSION FACTORS FOR THE TERMS USED IN THIS REPORT ARE LISTED BELOW:

ENGLISH UNITS		METRIC UNITS	
1	INCH	25.4	MILLIMETERS
1	FOOT	0.3048	METERS
1	MILE	1.609	KILOMETERS
1	SQUARE MILE	2.59	SQUARE KILOMETERS
1	ACRE-FEET	0.001233	CUBIC HECTOMETERS

SCALE BARS

5 0 5 STATUTE MILES

5 0 5 10 KILOMETERS

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PHOENIX, ARIZONA, 1954,REV.1969,1:250,000
MESA, ARIZONA, 1954, REV. 1978, 1:125,000
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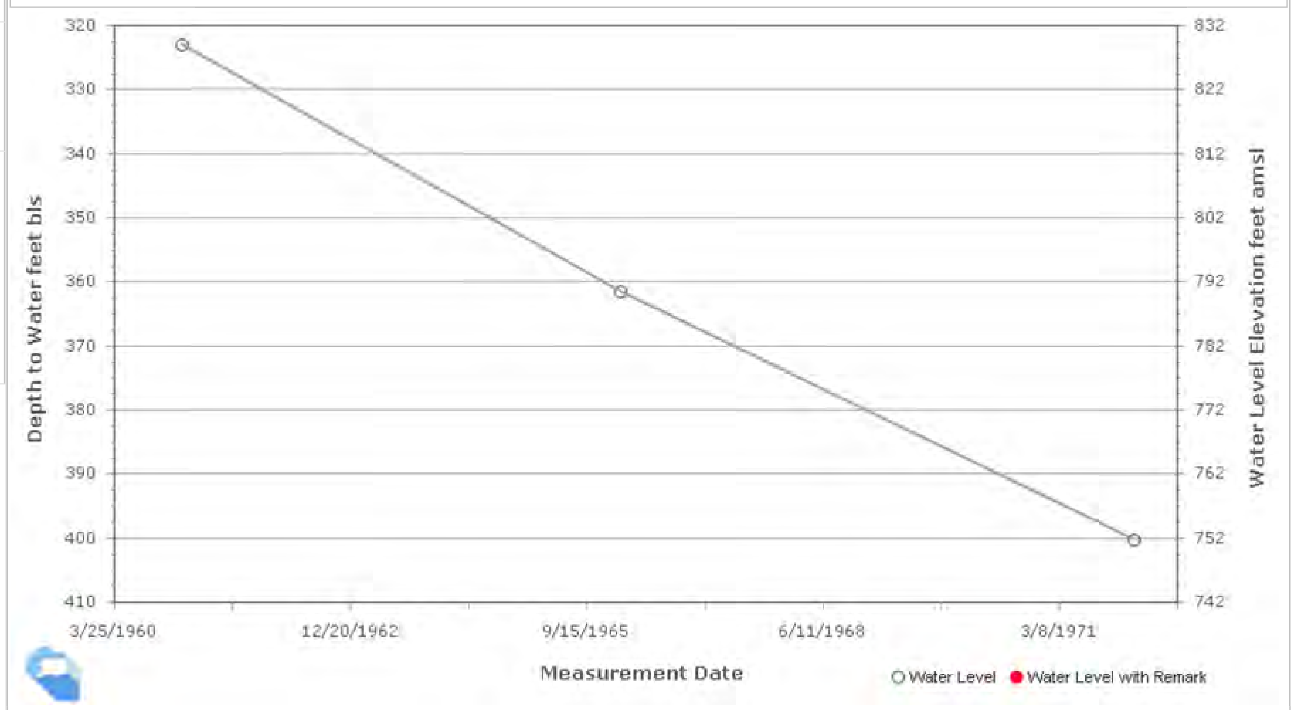
GWSI Hydrograph

Well Info Map Reset Graph Auto Site Hydrograph Email

Set x-axis Set y-axis Measurement Remarks

Arizona GroundWater Monitoring Site Hydrograph

Local ID	Site ID	Registry ID	Latitude NAD27	Longitude NAD27	Alt. (ft amsl)	Water Use	Well Depth (ft)	Case Dia. (in)	Drill Date	Latest WL Date	DTW (ft)	WL Elv. (ft)
B-03-01 28BBB	333448112223201	626942	33° 34' 48.0"	112° 22' 32.0"	1152	IRRIGATION	1090	20	4/1/1942	1/13/1972	400	752



GWSI is ADWR's technical database of well locations, construction data, and water levels. Created on 8/18/2010

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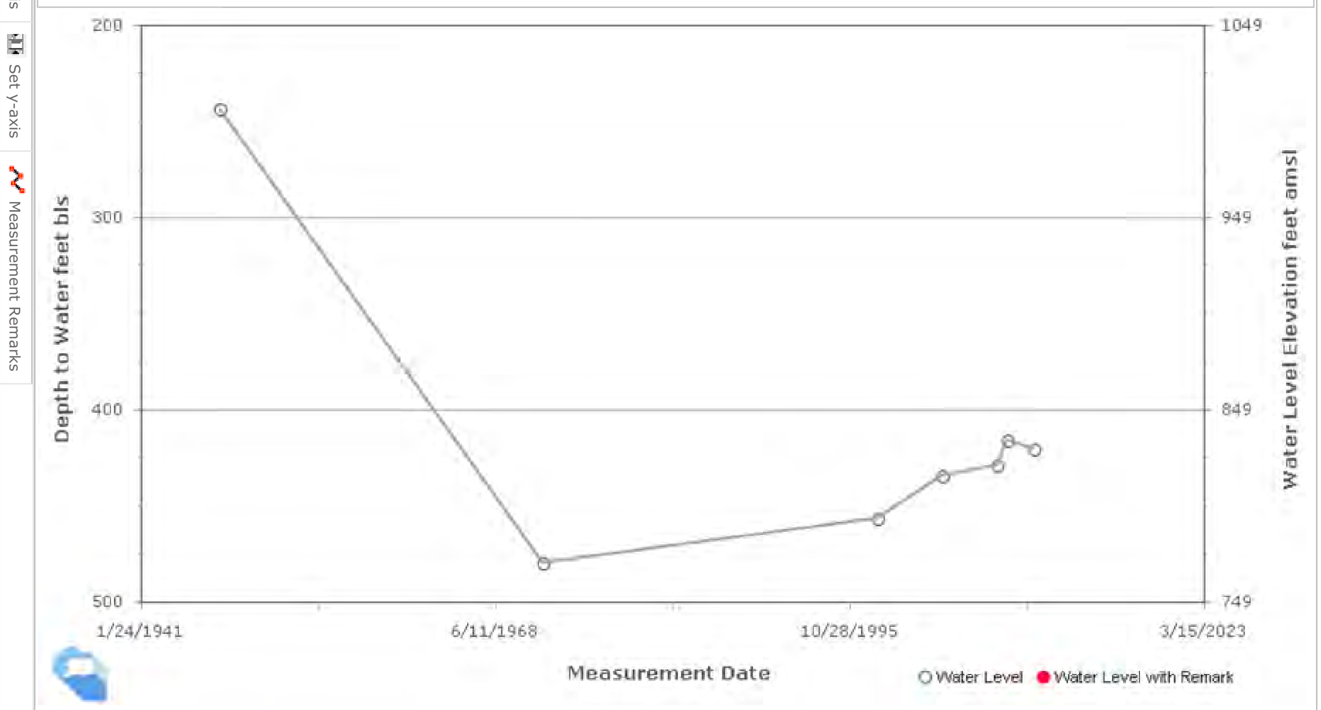
B-03-02 27AAA	333449112263801	613001	33° 34' 49.5"	112° 26' 37.2"	1249	IRRIGATION	1000	20	2/1/1947	12/29/2009	420	829



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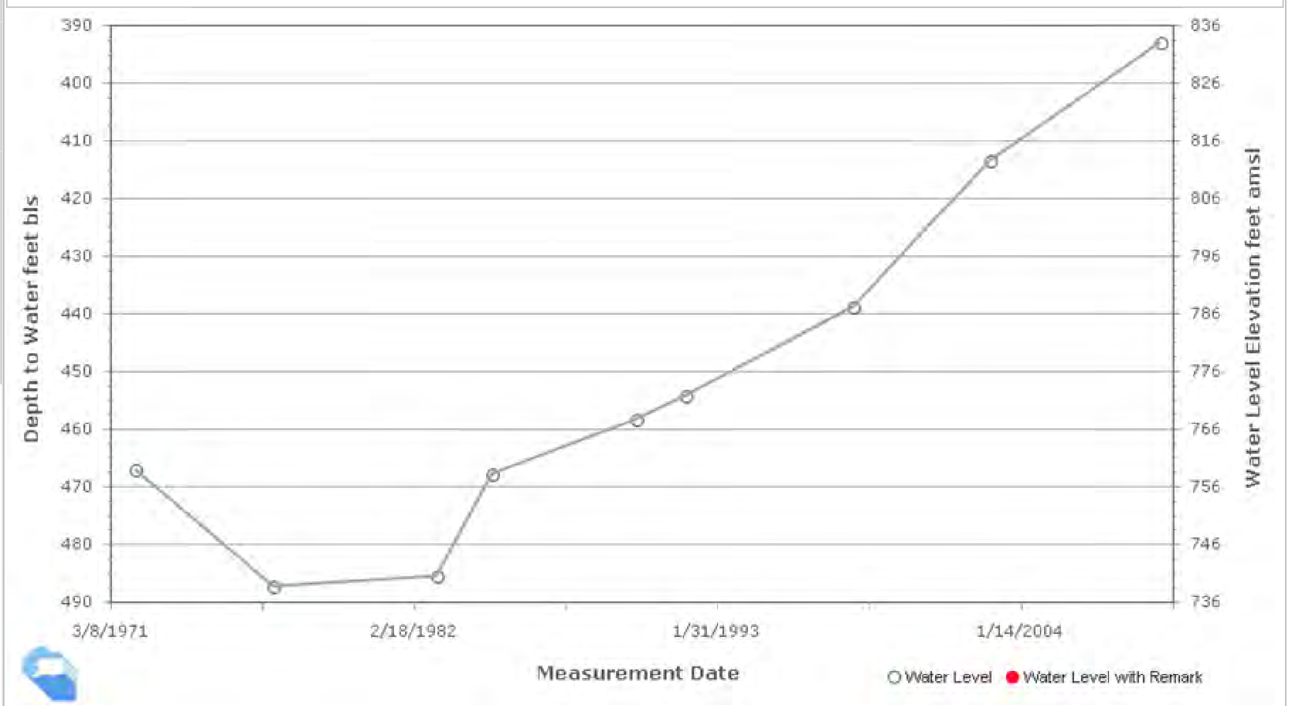
B-03-02 26BAA	333449112260601	612999	33° 34' 50.1"	112° 26' 8.2"	1226	UNUSED	1000	20	1/1/1938	1/13/2009	392.8	833.2



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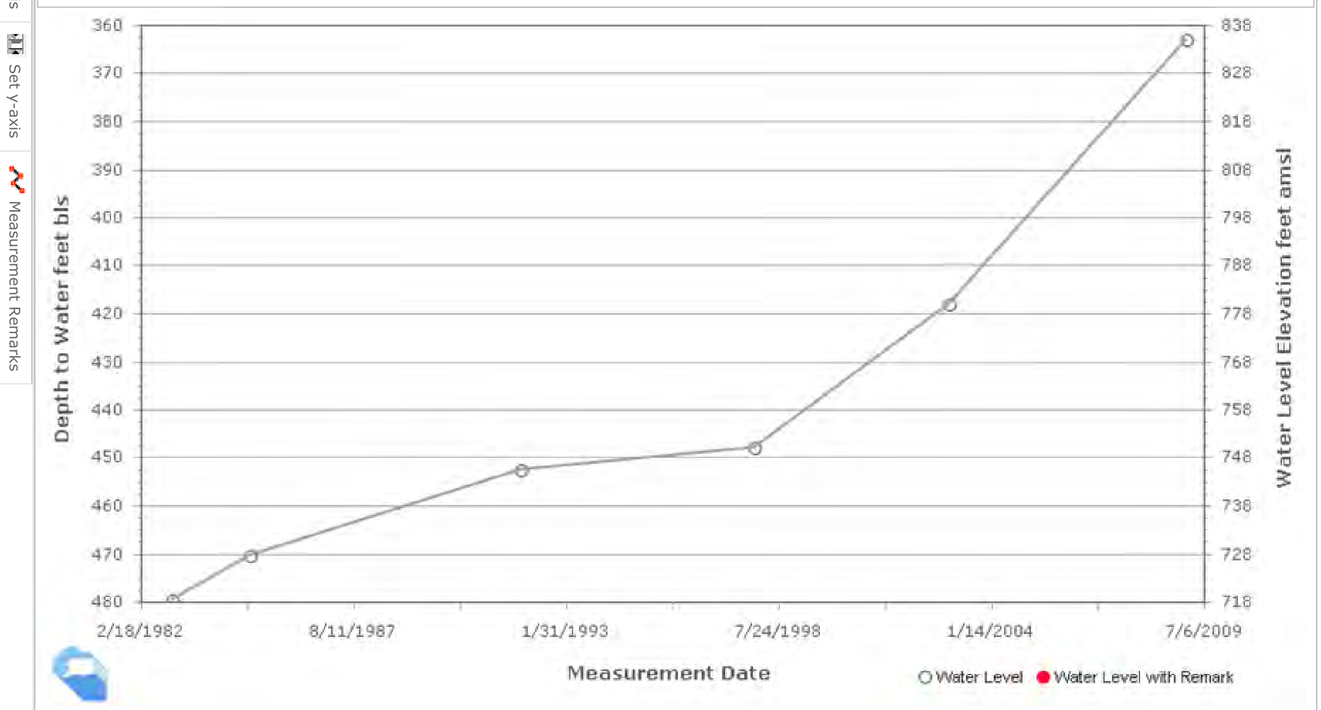
B-03-02 25BAA	333450112250501	612998	33° 34' 50.3"	112° 25' 6.3"	1198	IRRIGATION	1002	20	11/1/1939	1/13/2009	362.9	835.1



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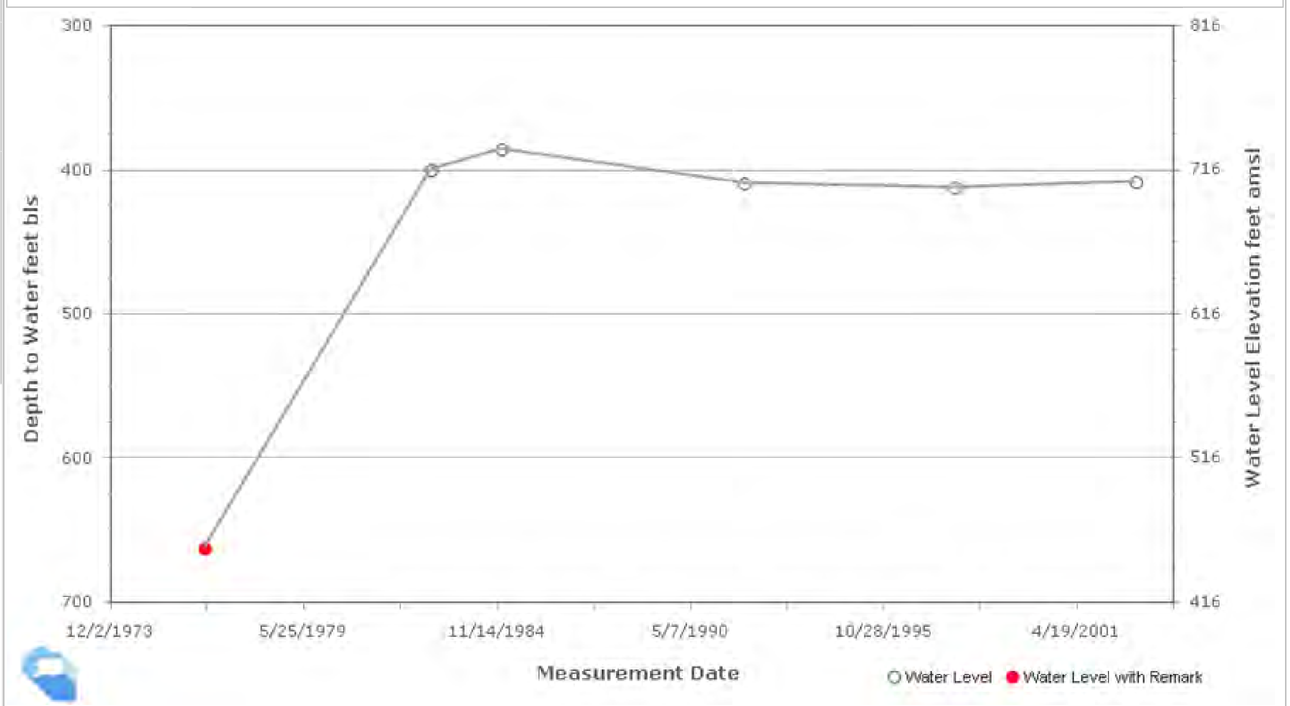
B-03-01 26BAB	333447112200701	610628	33° 34' 47.2"	112° 20' 6.7"	1116	UNUSED	1150	24		12/11/2002	407.79	708.21



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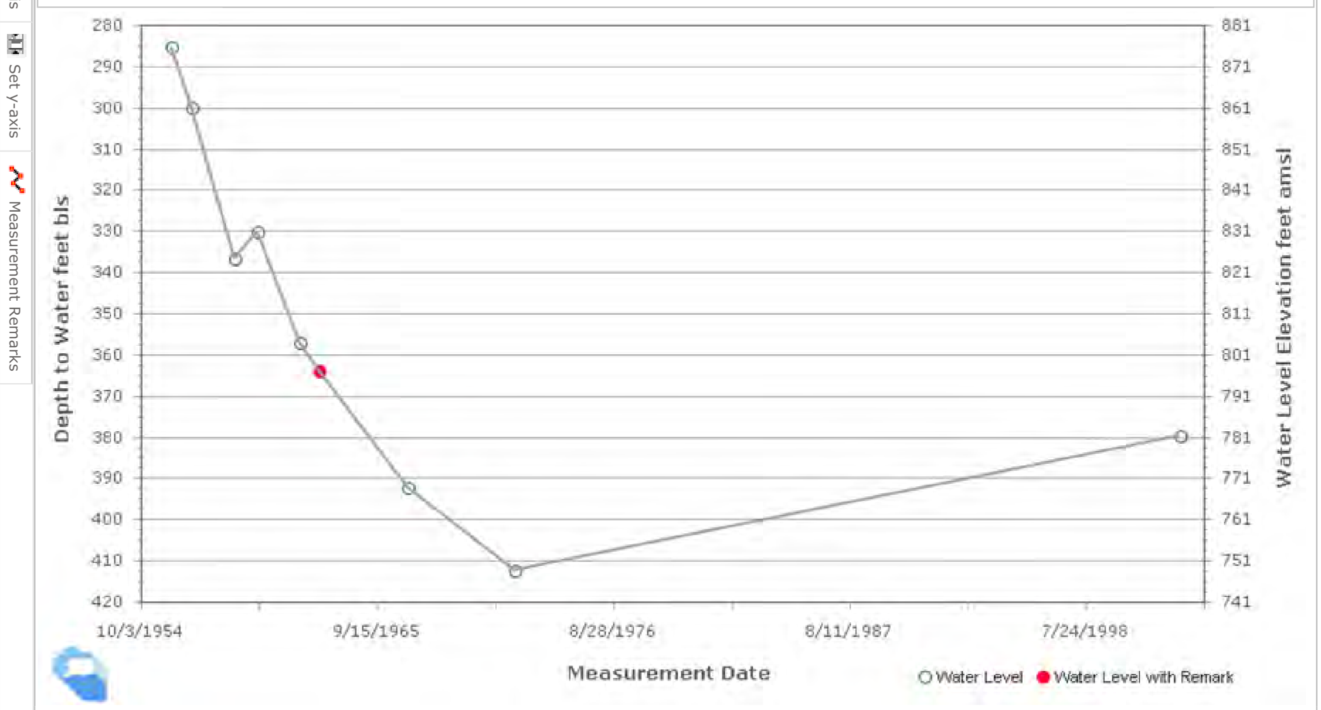
B-03-01 29BBB	333449112233401	610103	33° 34' 49.5"	112° 23' 36.7"	1161	IRRIGATION	1140	20	1/1/1944	11/21/2002	379.29	781.71



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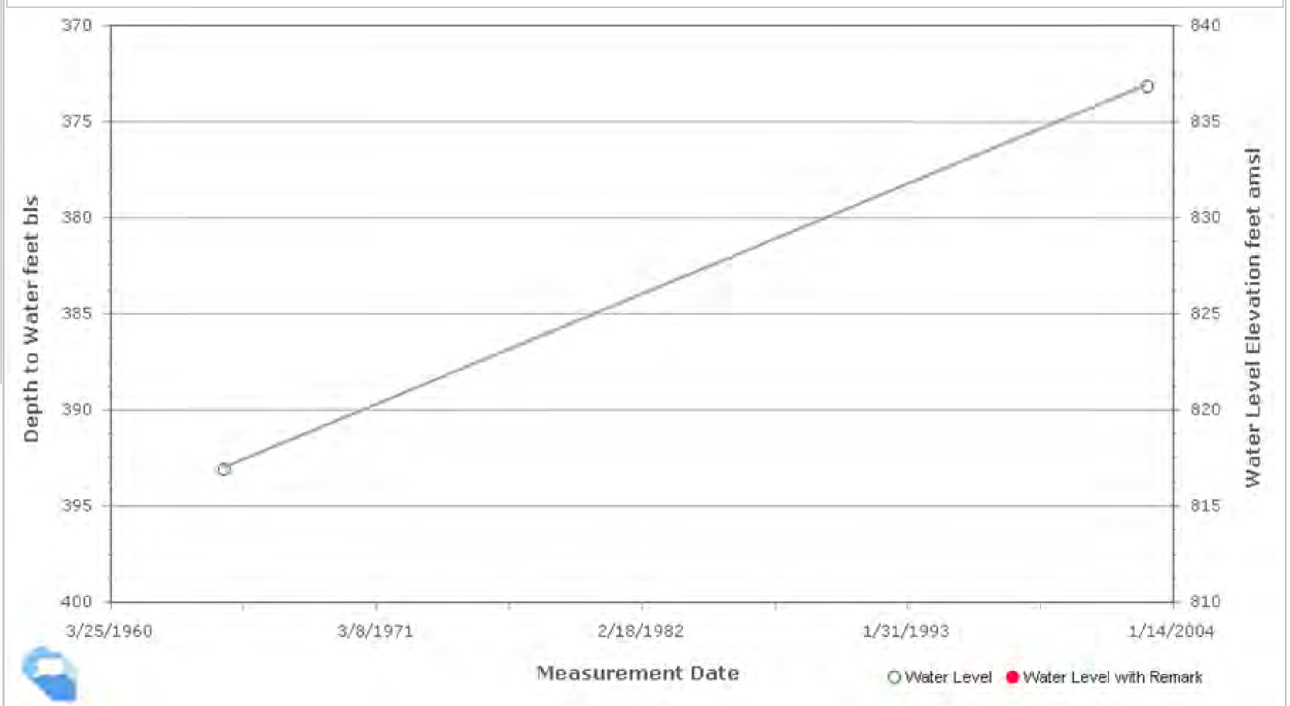
Local ID	Site ID	Registry ID	Latitude NAD27	Longitude NAD27	Alt. (ft amsl)	Water Use	Well Depth (ft)	Case Dia. (in)	Drill Date	Latest WL Date	DTW (ft)	WL Elv. (ft)
B-03-02 25BBB	333448112253001	606609	33° 34' 50.3"	112° 25' 35.0"	1210	IRRIGATION	2567	18	11/1/1964	11/22/2002	373.1	836.9

Set x-axis Set y-axis Measurement Remarks



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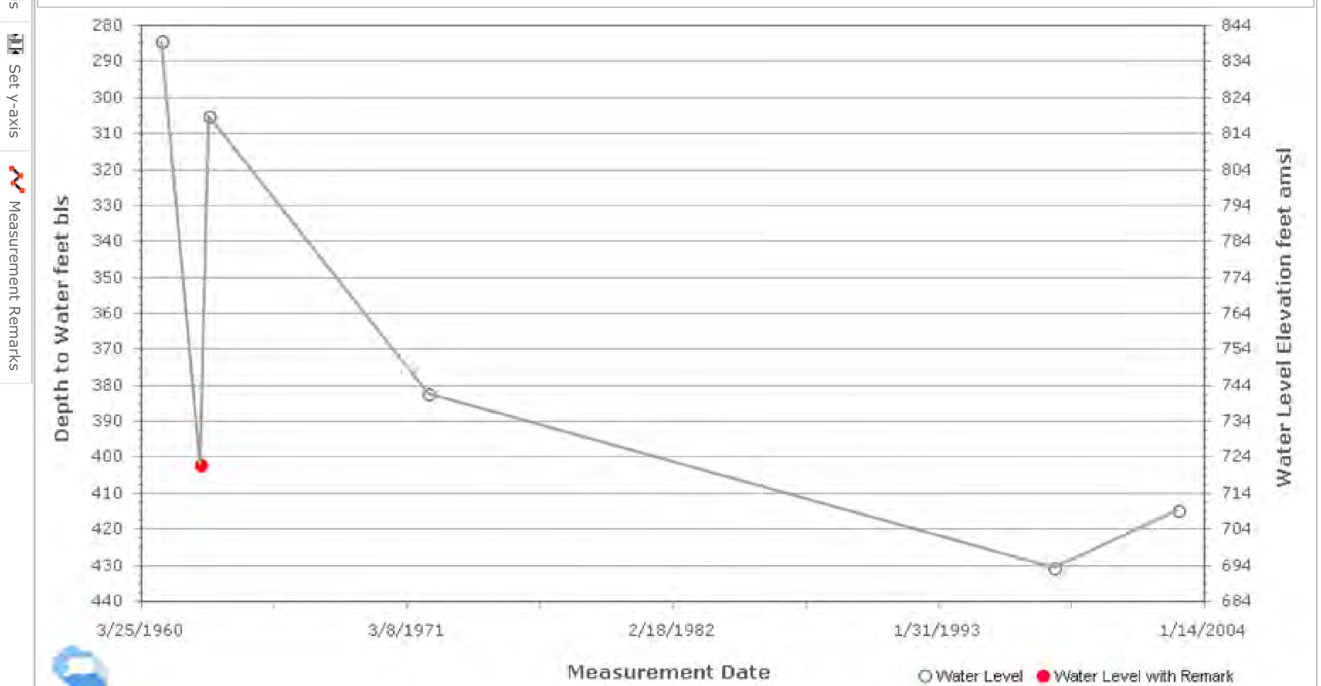
Local ID	Site ID	Registry ID	Latitude NAD27	Longitude NAD27	Alt. (ft amsl)	Water Use	Well Depth (ft)	Case Dia. (in)	Drill Date	Latest WL Date	DTW (ft)	WL Elv. (ft)
B-03-01 27ABB1	333447112205801		33° 34' 47.7"	112° 20' 58.2"	1124	UNUSED	752	20	5/1/1951	12/11/2002	414.5	709.5

Set x-axis Set y-axis Measurement Remarks



GWSI is ADWR's technical database of well locations, construction data, and water levels.

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APPENDIX V

GEOTECHNICAL INFORMATION

amec

PRELIMINARY GROUND SUBSIDENCE AND EARTH FISSURE EVALUATION REEMS ROAD CHANNEL AND BASIN MARICOPA COUNTY, ARIZONA

PRELIMINARY GROUND SUBSIDENCE AND
EARTH FISSURE EVALUATION
REEMS ROAD CHANNEL AND BASIN
MARICOPA COUNTY, ARIZONA

Submitted to:

Flood Control District of Maricopa County
Phoenix, Arizona

Submitted by:

AMEC Earth & Environmental, Inc.
Tempe, Arizona

Registered Professional Engineer (Civil)
CERTIFICATE NO. 13872
LAWRENCE A. HANSEN
Date Signed 11/30/07
ARIZONA, U.S.A.

November 30, 2007

AMEC Job No. 7-117-001074
Contract FCD 2006C020
Work Assignment 1

November 30, 2007
AMEC Job No. 7-117-001074

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399

Attn: Bobbie Ohler, P.E.

Re: Preliminary Ground Subsidence and Earth Fissure Evaluation
Reems Road Channel and Basin
Contract FCD 2006C020
Work Assignment 1
Maricopa County, Arizona

Transmitted herewith is the final version of our report for the referenced project. This report presents the findings of a preliminary assessment of the potential impact of earth fissuring and ground subsidence on the future design and operation of the, Reems Road Channel and Basin.

Please feel free to contact the undersigned should you have any questions.

Respectfully submitted,

AMEC Earth & Environmental, Inc.

Kristi Diller, G.I.T.
Staff Professional

Registered Geologist
CERTIFICATE NO. 41786
KENNETH C. FERGASON
Date Signed 11/30/07
ARIZONA, U.S.A.

Kenneth C. Fergason, P.G.
Geologist

Reviewed by:

Richard Bansberg for

Ralph E. Weeks, P.G.
Senior Geologist

Registered Professional Engineer (Civil)
CERTIFICATE NO. 13872
LAWRENCE A. HANSEN
Date Signed 11/30/07
ARIZONA, U.S.A.

Lawrence A. Hansen, Ph.D., P.E.
Principal Geotechnical Engineer

Addressee (4)

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Tempe, Arizona 85284-1016
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EXECUTIVE SUMMARY

The investigation detailed in the following report was completed to evaluate the potential impact of earth fissuring and ground subsidence on the future design and operation of the Reems Road Channel and Basin (Project). The Project, as planned by the Flood Control District of Maricopa County (District), includes a channel and basin system for storm water conveyance along Reems Road between Peoria Avenue and Falcon Dunes Golf Course, a half mile north of Northern Avenue. The investigative approach included four basic components: 1) compilation and review of existing data; 2) acquisition and analysis of synthetic aperture radar interferometry; 3) analysis of project-specific high resolution aerial digital imagery; and 4) ground reconnaissance of the project site.

Available subsidence data indicates that the Reems Road Channel and Basin are located in an area that has seen significant subsidence due to groundwater withdrawal, with approximately 19 feet of subsidence occurring since the 1950s. No known earth fissures are present along the alignment of the proposed channel or basin and the closest documented earth fissure is located approximately 1 mile to the northeast and east. No new earth fissures were documented as part of this investigation. The proposed channel and basin are located in an area where subsidence has likely created compressional stresses in the ground; therefore, the formation of earth fissures in the past or future is unlikely.

The potential for future differential subsidence to affect future grades of the proposed channel does exist and may pose a risk for the proposed structures. Subsidence profiles indicate that past subsidence north of the proposed basin declines to the north. If future subsidence were to occur, it is anticipated that this trend would continue, indicating that grades along this portion of the proposed channel would likely be steepened by future subsidence. Subsidence profiles to the south of the proposed basin show that the magnitude of past subsidence declines south of Olive Avenue. If future subsidence were to occur in the project area, it is anticipated that this trend would also continue, indicating that grades along this portion of the proposed channel would likely be lessened by future subsidence.

The groundwater history of the study area indicates that in the past 30 years, groundwater levels have increased by 50 to 150 feet. As this has occurred, subsidence rates have significantly decreased from their maximum rates of at least 0.5 ft/yr between 1957 and 1992 to about 0.03 ft/yr from 1992 to 2007. If current groundwater trends extend into the future, it is anticipated that subsidence rates will continue to decline. If groundwater trends reverse and groundwater levels begin to fall in the future, it is anticipated that subsidence rates would increase, possibly significantly if groundwater withdrawal is equally significant.

It is recommended that the District monitor groundwater trends in the area of the proposed Reems Road Basin and Channel. It is also recommended that the District directly monitor subsidence trends through the use of periodic surveys of the channel and basin profiles, and the use of InSAR. Recommendations are provided for the conceptual design of a monitoring system and design considerations for the proposed channel.

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1.0 INTRODUCTION

The investigation detailed herein was completed to evaluate the potential impact of earth fissuring and ground subsidence on the future design and operation of the Reems Road Channel and Basin (Project). The Project, as planned by the Flood Control District of Maricopa County (District), includes a channel and basin system for storm water conveyance along Reems Road between Peoria Avenue and Falcon Dunes Golf Course, a half mile north of Northern Avenue. This location is an area of known ground subsidence due to past groundwater level declines resulting from agricultural and municipal groundwater pumping. This subsidence is also responsible for the formation of earth fissures located along the fringe of the Luke Salt Body, located approximately 1 mile east and northeast of the project area.

This report contains a detailed assessment of the potential impact of earth fissuring and ground subsidence on the future design and operation of the Project components. This investigation involved research, compilation, and interpretation of existing technical data, including aerial photography and satellite-based synthetic aperture radar interferometric (InSAR) data, and a limited ground reconnaissance of the project area.

This study was authorized by the District in August of 2007 under the terms and conditions of Contract FCD 2006C0020, with the scope defined as Work Assignment No. 1. This work was performed by AMEC Earth & Environmental, Inc. (AMEC) for the sole use of the District in evaluating ground subsidence and earth fissure risks for the Reems Road Channel and Basin. AMEC is not responsible for any peripheral use of this information, or of the interpretations presented herein, by parties other than the District.

2.0 PROJECT DESCRIPTION

The extent of the study area covered in this investigation is shown on Figure 1. The local project site is presented on Figure 2. This region is located on a broad alluvial basin to the east of the White Tanks Mountains. This surface appears to be comprised of distal alluvial fan surfaces coalescing towards the Agua Fria River to the east. The terrain gently slopes to the southeast, ranging in elevation from about 1400 to 1000 feet above MSL. The Project area is immediately surrounded by agricultural farmland. Numerous residential developments are present in the region and the area immediately west of the planned basin is currently being developed.

The Project consists of the construction of a channel along Reems Road and a basin located a quarter mile north of Olive Avenue, which will convey stormwater drainage for the 100-year event to the Falcon Dunes golf course/detention basin on the northeast corner of Reems Road and Northern Avenue. The Falcon Dunes golf course/detention basin drains into the Dysart Drain, which ultimately drains into the Agua Fria River. The earthen Reems Road channel will connect with an existing channel at Peoria Avenue and then convey flows southward along the west side of Reems Road for a mile and a half, where it will connect with the Falcon Dunes

detention basin. The Reems Road basin will be located on the west side of Reems Road between Peoria Ave. and Olive Ave. The primary objective of this study is to evaluate the potential impact of earth fissuring and subsidence upon the future design and operation of the Project components.

3.0 INVESTIGATIVE APPROACH

The following discussion summarizes the investigative methods and data sets compiled for this evaluation. The approach includes four basic components: 1) compilation and review of existing data; 2) acquisition and analysis of synthetic aperture radar interferometry; 3) analysis of project-specific high resolution aerial digital imagery; and 4) ground reconnaissance of the project site.

3.1 Review of Existing Data

Existing data was compiled from a variety of sources, including published technical literature, regulatory agency databases, District files, and Maricopa County Department of Transportation (MCDOT) files. The published resources include regional geological and geohydrological studies from the U.S. Geological Survey, the Arizona Geological Survey, and the U.S. Bureau of Reclamation. The use of regulatory agency databases was restricted to Arizona Department of Water Resources (ADWR) well information, including both well construction reports for ADWR registered wells and historical water level data from the Groundwater Site Inventory (GWSI) data base. The District's library of reports was utilized to search for historical subsidence information concerning the local area, specifically the Dysart Drain project. Survey data for 1990 was extracted from the White Tanks/Agua Fria Area Drainage Master Study (WLB Group, 1992). Recent survey data, from 2003 for the project area, was obtained from the GDACS USPLSS Cadastral Corners spreadsheet available on the MCDOT Land Survey Section's website. The public records database at the MCDOT offices was searched for historical as-built drawings for roads near the project site, in order to obtain additional historical elevation information for the area.

To a large extent, the information described above has been compiled, digitized and presented in tabular form or in plan and profile. Relevant data is summarized in the following figures:

- Figure 3 – Surficial Geology
- Figure 4 – Gravity Data, Depth to Bedrock, and Depth to the Luke Salt Deposit
- Figure 5 – ADWR Well Locations
- Figure 6 – Water Level Data Trends
- Figures 7 through 11 – Subsidence Data for Reems Rd., Peoria Ave., Olive Ave., and Northern Ave.
- Appendix A – ADWR Well Report

3.2 Synthetic Aperture Radar Interferometry (InSAR)

The application of repeat-pass synthetic aperture radar interferometry (InSAR) to characterize the distribution and rate of ground subsidence in the study area is of profound significance in managing the risks associated with ground subsidence and earth fissuring. Interferometry has the capacity to detect and quantify minute changes in terrain elevation by comparing phase variances of satellite-based, side-looking radar data between orbits of a similar trajectory.

ADWR is currently applying InSAR as part of a long-range study of basin subsidence in Arizona. Recent interferograms developed by ADWR on the basis of 2000-2006 SAR data were compiled and analyzed for the project area. In addition, InSAR images previously provided by ADWR were also utilized. Five InSAR images, spanning the time from December 1996 to August 2006, are presented in Appendix B. InSAR data from 1996 to 2000 originated from the ERS-1 or ERS-2 satellites, and three interferograms are presented from this time period. An additional two interferograms from 2004 to 2006 are presented, with data from the RADARSAT or ENVISAT satellites.

InSAR is a highly processed product and represents an interpretive analysis of raw satellite data from no less than two individual data sets. It suffers from both atmospheric and terrain influences that affect the quality of the image. Procedures used in the processing of the data by ADWR reduce the impact of these atmospheric and terrain influences. The remaining constraint is decorrelation due to rapid changes in the ground surface. This phenomenon can be caused by plowing and crop changes in agricultural areas, or urban development. One complete color cycle (e.g., red to red or blue to blue) on the interferograms represents about 2.8 centimeters of elevation change between the two orbital observations. The initial pixel size is 30 meters, though processing can reduce this to 10 meters.

3.3 High Resolution Aerial Photography

High resolution color aerial photography of the entire project area was provided by the District. Aerial coverage was obtained on October 28, 2006, at a resolution of 0.32 feet. The imagery provided to AMEC had been exported as a high image quality portable document format (.PDF) file, and therefore the exact resolution of the analyzed imagery is unknown. The imagery was evaluated for the purpose of identifying features indicative of the presence of earth fissures. These features include elongated fissure gullies, alignments of potholes and other small depressions, lineations in the vegetative cover, and subtle linear ground features caused by shading. However, nearly all of the native features of the ground surface have been altered and obscured by agricultural use or residential construction. The analysis of the aerial photography yielded no features indicative of earth fissures.

3.4 Ground Reconnaissance

A ground reconnaissance site visit was performed to inspect the project alignment for subsidence or earth fissure-related features that would affect the integrity of the planned channel and basin. The farmland and graded dirt roads along the fields revealed no features indicative of earth fissures. There were no noticeable changes in grade along Reems Road, between Peoria Avenue and Northern Avenue. No earth fissures or features indicative of possible earth fissures were found at the project site.

4.0 GEOLOGICAL SETTING

4.1 Geologic Overview

The Reems Road Channel and Basin project site lies within the western portion of the Salt River Valley atop a broad, flat alluvial basin called the Luke Basin. As depicted on Figure 1, the region is bounded by the Agua Fria River to the east and the flanks of the White Tank Mountains to the west. The Western Salt River Valley (WSRV) is a typical component of the Sonoran region of the Basin and Range physiographic province. The Sonoran region contains many broad, deeply founded, alluvium-filled basins, separated by structural highlands composed of competent bedrock. The White Tank Mountains are one of these uplifted highlands, composed of both metamorphic and granitoid bedrock (Reynolds and others, 2002). The Luke sub-basin contains basin fill deposits of the Salt River Valley that can be subdivided into three units: Lower Alluvial Unit (LAU), Middle Fine-Grained Unit (MFGU) and Upper Alluvial Unit (UAU) (Prokopovich, 1983; BurRec, 1976).

As indicated by the depth to bedrock contours presented by Richard and others (2007), the Luke basin is deepest approximately 3 miles east-southeast of the south end of the Reems Road Channel. The prominent negative gravity feature shown by the Bouguer gravity data by Sweeney and Hill (2001) is in part an expression of a large salt body, containing some 15 cubic miles of halite (Eaton and others, 1972). The contours on Figure 3 showing the lateral extent and depth to the top of the Luke Salt Deposit (Rauzi, 2002) indicate that the salt body pinches out to zero near the project site. The salt body was likely formed in a non-marine environment in the center of a closed clastic sedimentary basin that was bounded by the active White Tank detachment fault along its west side (Spencer and Rauzi, 2005). The geophysical data developed by Peterson (1968) indicates that the salt may extend to a depth from 6,900 to 9,000 feet.

4.2 Regional Alluvial Stratigraphy

The Luke salt body is surrounded by unconsolidated and slightly indurated sediments composed of laterally discontinuous beds of clay, silt, sand, and gravel, with subordinate deposits of calcrete and evaporites (Stulik and Twenter, 1964). Stulik and Twenter (1964) further describe the WSRV basin fill as being of unknown maximum thickness, with 2,784 feet of sediments penetrated without reaching bedrock at a location some three miles south of the project site near Litchfield Park.

The characteristics of the WSRV basin fill and the distribution of fine-grained sediments with the basin were first evaluated by Stulik and Twenter (1964), based on well driller's logs of irrigation wells. This study revealed the presence of a predominantly fine-grained profile in several wells located near the project site, down to a datum of about 700 feet above MSL, or a depth of about 400 feet in the referenced area. Additional well logs across the Luke Basin are graphically depicted in U.S. Bureau of Reclamation (BurRec) studies for the Central Arizona Project (BurRec, 1976). These logs display the presence of fine-grained fill to depths up to 2000 feet.

As discussed by Prokopovich (1983) and the BurRec (1976), the basin fill deposits of the Salt River Valley are comprised of unconsolidated to weakly indurated sediments deposited on an irregular bedrock surface. From a geotechnical perspective, the upper basin sediments likely classify as stiff soils to soft rock, with the deep Tertiary deposits in the realm of soft to moderately indurated rock. The basin deposits are quite variable, ranging from fine-grained clay and silt deposits of lacustrine or playa origins, to coarse clastics derived from the adjacent upland. The BurRec (1976) appears to be the first to define the basin fill into three lithologic units, all of which are likely present in the alluvial profile of the regional study area. The following describes the characteristics of the three alluvial units, from oldest to youngest, largely as described by Laney and Hahn (1986) and the BurRec (1976):

- **Lower Alluvial Unit (LAU)** – These Middle to Late Tertiary deposits are in fault and erosional contact with the competent bedrock floor and buried flank of the basin, and are comprised of what is often referred to as conglomerate. The conglomerates are often interbedded with anhydrite, gypsiferous mudstone and basalt. The coarser fraction is often poorly sorted with faint bedding, consisting of sand- to cobble-sized particles in a silty to clayey matrix. Significant calcium carbonate content is common in the matrix, to the extent that the porosity of the unit is affected. The LAU may be absent where the bedrock is less than 400 feet from the surface. However, these units are not defined as time-stratigraphic divisions, and investigators commonly include the shallow, clastic deposits near the basin margins as part of the LAU. At the edges of the Luke basin, the BurRec (1976) indicates well intercepts of the LAU at depths of about 1,100 to 1,200 feet, but wells up to 2000 feet in the center of the basin did not reach the LAU.

- **Middle Fine-Grained Unit (MFGU)** – This unit is often restricted to the center of the alluvial basin of Central Arizona. Regionally, this lithology of the unit is described as intercalated playa, alluvial fan and fluvial deposits of silt, soft siltstone, and silty sand and gravel. Compared to the LAU, the MFGU likely contains a higher fraction of clay and silt, with a comparable concentration of calcium carbonate. Prokopovich (1983) notes that the MFGU contains clay and silt beds deposited in internally drained basins, resulting from damming due to tectonic movement and volcanism. The BurRec (1976) depicts a considerable thickness of the MFGU in the Luke basin, in the range of about 450 to more than 800 feet, with the top of the unit from about 700 feet deep to 1200 feet deep in the basin center.
- **Upper Alluvial Unit (UAU)** – The UAU is comprised of Late Tertiary and Quaternary clastic material, derived locally from the surrounding bedrock terrain and deposited as a mantle over the older basin fill deposits. In contrast to the MFGU, the UAU was deposited by an externally drained stream system. BurRec (1976) graphical logs of wells located in the Luke basin depict a thickness of UAU from 700 feet to 1200 feet deep in the basin center.

4.3 Surficial Geology

The local surficial geologic units (Figure 3) in the study area, as broadly described by Reynolds and Grubensky (1993), Reynolds and Skotnicki (1993), Field and Pearthree (1991) and Demsey (1988) are comprised of an assemblage of unconsolidated Quaternary alluvial fan deposits and stream deposits associated with the Agua Fria River system. Blissenback (1954) and Harvey (1992) describe alluvial fans as being composed of a complex assemblage of stream channel deposits, sheet flow deposits from larger floods (which cause avulsion of the small watercourses across the fan surface), and thick debris flow and/or mudflow deposits from large infrequent floods. The fans likely include a minor component of aeolian deposits. Alluvial terrace deposits associated with the Agua Fria River are found along the eastern margin of the study area. General descriptions of the surficial units found in the Project area are presented below and are taken from Field and Pearthree (1991), Reynolds and Grubensky (1993), and Eaton and others (1972):

- **Young Alluvium in Modern Stream Channels (Qyc)** – Deposits are dominated by clastic sediments of sand and gravel, with some cobbles and rare boulders. The age of unit Qyc is less than 3,000 years before present (ybp). Within the study area, this unit is limited to the active channels associated with the Agua Fria River drainage system.

- **Young Alluvium (Qy)** – Outside the active braided channels, this unit is locally comprised of a limited thickness of silty to clayey sand and sandy silt, overlain by a thin mantle of aeolian silty sand. Little soil development is present and Stage I carbonate cementation development is common in the lower sands, with the upper loess largely uncemented. Moderate to strong rubification (reddening) is common in this unit. Within the ephemeral channels, the upper aeolian deposits are absent, with larger amounts of gravel and cobbles present. Nearer the mountain front, the unit contains coarser sediments, including silt, sand and gravel mixtures. The age of unit Qy ranges from about 10,000 to >3,000 ybp. This unit is widespread throughout the project area.
- **Younger Middle Alluvium (Qm2)** – This unit is locally comprised of moderately cemented (Stage I to II) clayey to silty sands, occasionally interbedded with silty to sandy gravels. These deposits usually display poor soil development and some rubification. The age of unit Qm2 ranges from 10,000 to 150,000 ybp. Qm2 deposits are widespread throughout the study area, with the greatest concentrations occurring in the northwestern corner of the area.
- **Older Middle Alluvium (Qm1)** – This unit consists of a poorly sorted, angular to sub-angular mixture of silt, sand and gravel deposits. The surfaces are moderately dissected on the upper piedmont with 3 to 20 feet of relief above the active channels. Interfluvial areas are generally flat and expansive with poorly preserved bar and swale topography. Desert pavement is moderately to well developed and is found over 50 to 75 percent of the surface. Underlying soils are characterized by weakly developed argillic horizons with Stage II to III calcification. The age of unit Qm1 ranges from 300,000 to 1,000,000 ybp. Qm1 deposits are widespread throughout the study area, with the greatest concentrations occurring in the northwestern corner of the area.
- **Older Alluvium (Qo)** – Unit Qo is composed of early Pleistocene to late Pliocene alluvial fan deposits greater than 1,000,000 years in age. The unit generally consists of poorly sorted subangular gravels containing minor amounts of finer material, ranging in thickness from a thin veneer over bedrock pediments to tens of feet thick. The surfaces of unit Qo are deeply dissected up to 50 feet within interfluvial areas and have well-rounded ridges with intervening swales or ravines. Soils are generally eroded away, exposing remnants of Stage IV to VI petrocalcic horizons. Unit Qo is found as terrace deposits associated with the Agua Fria River.
- **Tertiary Alluvium (Tsy)** – This unit consists of Pliocene chiefly fluvial deposits. This unit is locally comprised of moderately cemented silt, sands, and gravels. A few low hills of Tsy deposits are located to the southeast of Luke Air Force Base, where the Luke Salt Deposit is the shallowest. These Tertiary age deposits are thought to be the result of doming of the salt body, which exhumes the older alluvial deposits.

5.0 HYDROGEOLOGICAL CONDITIONS

Groundwater in the basin fill deposits of the WSRV is a significant and highly exploited resource used for domestic, municipal, industrial, and agricultural purposes. As depicted in Figure 5, over 30 wells registered with the ADWR are present within the area directly adjacent to the Project. Within the regional study area, there are an additional 30 wells with historical water level data from the Groundwater Site Inventory (GWSI) data base. These wells range from small domestic installations of limited yield, to large irrigation wells capable of discharging several thousand gallons per minute.

Groundwater withdrawn from the basin deposits near the Project area largely originates from the UAU, with its thickness estimated by the BurRec (1976) to be locally about 800 to 1200 feet, and current groundwater levels at depths from approximately 400 to 500 feet. Figure 6 shows hydrographs for GWSI wells in the vicinity of the Project. Groundwater in the study area has declined significantly due to well withdrawals far exceeding recharge. This decline commenced in the 1940s as agricultural development began in earnest in the west valley. By the early 1980s groundwater levels had declined up to 350 feet in the region. Since the 1980s, local groundwater has recharged, and levels have increased about 50 to 150 feet.

6.0 GROUND SUBSIDENCE AND EARTH FISSURING DUE TO GROUNDWATER WITHDRAWAL

6.1 Overview of Subsidence Process

Ground subsidence due to groundwater withdrawal in alluvial basins in the Southwest is a process of differential compaction of deep sediments. Through geologic time, groundwater levels in the alluvial basin material were at or near the ground surface, or at elevations controlled by the rivers and drainage systems traversing the basins. Activities of man have changed and are continuing to affect groundwater levels in many of these basins. Damming of rivers in mountainous reaches of the upland watersheds has reduced available recharge. Groundwater pumping, primarily for agricultural, industrial and municipal use, has significantly impacted stored groundwater in many areas. In modern times, groundwater level declines of 100 feet to several hundred feet due to pumping have occurred in many basins in Arizona and throughout the Southwest.

Lowering the groundwater elevation in a column of alluvial basin material increases the effective stress. This change in effective stress is an increase in loading on the material column. If that column consists of granular materials, typically sands and gravels, compression of the material below the initial water level takes place rapidly. Until granular particle contact points are changed by compression, at least some of the compression can be recovered elastically if water levels rise and effective stress decreases. Compression that results from particle slipping or crushing will tend to have much less elastic rebound. If the material column contains a significant fraction of fine-grained materials, typically clays, consolidation of the material below the initial water level takes place slowly. The time frame of the consolidation is a function of the permeability of the material, where lower permeability increases consolidation time. Consolidation is further a function of the distance to higher permeability zones which can relieve the excess pore pressure by draining water from clay-rich materials. Greater distances to such permeable drainage zones increase consolidation time. Although consolidation increases can be modeled as an elastic phenomenon, rebound of the consolidation is typically not recoverable with a decrease in loading.

Soils are much less compressible when reloaded up to the preconsolidation pressure than when loaded above the preconsolidation pressure (Lambe and Whitman, 1969). In many basins, the ground surface has been higher (relative to the underlying bedrock) than at the present time due to erosion. The eroded alluvium preconsolidated the basin profile. Increases in effective stress less than the preconsolidation stress represented by the now eroded alluvium would result in minor subsidence. Once increases in effective stress due to a declining groundwater table exceed the preconsolidation stress, further subsidence will occur at a much greater rate, representing normal consolidation of the alluvial basin materials.

Where differential rates and magnitudes of subsidence occur over relatively short distances, horizontal strains can become sufficient to cause earth fissuring. Jachens and Holzer (1979, 1982) evaluated the threshold tensile strains for fissuring based on studies of the Eloy-Casa Grande area of central Arizona. These studies included precise leveling and geophysical surveys, and comparisons with other cases of fissuring due to groundwater withdrawal. Jachens and Holzer (1982) concluded that most fissuring occurred at horizontal tensile strains in the range of 0.02 to 0.06 percent. This compares with the threshold strains for cracking of compacted clays zones in dam embankments (or compacted clay liners) of about 0.1 to 0.3 percent (Leonards and Narain, 1963; Covarrubais, 1969).

6.2 Overview of Earth Fissure Development

The first recorded observance of earth fissuring in Arizona was in 1927 near the town of Picacho, well southeast of the study area (Leonard, 1929). Since that time, eleven subsiding Central Arizona regions within the Basin and Range province have been identified, all with suspected or verified earth fissures (Fellows, 1999; Poland 1981; Holzer and Davis, 1981). Subsequent benchmark studies were undertaken to evaluate the distribution and mechanisms of fissuring (Holzer, 1978 and 1980; Jachens and Holzer, 1979; Laney, Raymond and Winikkar, 1978; Larson and Péwé, 1986).

Earth fissures in areas of large groundwater decline in alluvial aquifers are likely associated with a process termed generalized differential compaction by Carpenter (1994). Three mechanisms are likely at play to ultimately form fissures, including bending of a plate above a horizontal discontinuity in compressibility (Lee and Shen, 1969), dislocation theory representing a tensile crack (Carpenter, 1994), and vertical propagation of tensile strain caused by draping of the alluvium over a horizontal discontinuity in compressibility (Haneberg, 1992). Due to these probable mechanisms, fissures commonly develop along the perimeter of subsiding basins,

often in apparent association with buried or protruding bedrock highs, suspected mountain-front faults, or distinct facies changes in the alluvial section.

Fissures often first manifest at the surface as subtle hairline cracks, or as alignments of small potholes, modified by burrowing animals. Overland flow is then intercepted, and the surface manifestation of the fissure grows as piping and caving occur during runoff events.

6.3 Subsidence and Earth Fissuring History of Study Area

The Project area has undergone significant subsidence due to groundwater withdrawal since significant groundwater mining commenced in the West Salt River Valley. Figures 7 through 10 show a series of profiles showing known subsidence from 1957 to 2003. Figure 11 shows groundwater trends and subsidence at the corner of Reems Road and Peoria Avenue and the corner of Reems Road and Olive Avenue.

'Earth cracks' mapped to the southeast of Luke Air Force Base and east of Dysart Road above Glendale Avenue by Stulik and Twenter (1964) provided early documentation of earth fissuring in the project vicinity (Figure 3). By 1973, the US Army Corps of Engineers had documented an earth fissure in the vicinity of Cottonwood Lane and Olive Avenue that trended generally to the northeast (SHB, 1982) that was also documented by Schumann (1992). Vertical displacement in this fissure zone can be observed on the Olive Avenue road surface and in a lined irrigation canal on the south side of Olive Avenue just east of the interim Loop 303 highway (AMEC, 2007). Further to the west, the Fenne Knoll Fissure system near the south end of McMicken Dam was reported by SHB (1982). Earth fissures east of Dysart Road and north of Glendale Avenue continue to show measurable movement (AMEC, 2007).

In addition to earth fissures, early indications of subsidence in the area included collapsed well casings as reported in Eaton and others (1972). Existing ground line profiles for roadway improvements to Reems Road from Northern to Peoria Avenues in 1965 had elevation discrepancies from 1957 USGS topographic quadrangle map elevations of about 2 feet at Northern Ave to about 4 feet at Peoria Avenue (MCHD, 1965). By 1990, during survey work for the White Tanks/Agua Fria Area Drainage Master Study (WLB Group, 1992), subsidence in the project area had reached about 17 to 18 feet compared to the 1957 USGS elevations (Figures 7 through 11). Furthermore, the local area encompassing the project was identified to be at the center and maximum elevation drop of a major subsidence depression. The overall depression extends from the vicinity of the White Tank Mountains to the west, to the Luke Salt Body to the southeast, and to Surprise to the north.

The reversal of flow in the Dysart Drain, which caused flooding around Luke Air Force Base in 1992 (Schumann, 1992), was further confirmation of this subsidence depression, and earth fissures in the area mark regions of maximum horizontal strain along the depression margins. Earth fissures are not expected in the center of the subsidence depression where ground strains would tend to be in compression and not tensile in nature. Given the 2003 data from the MCDOT Land Survey Section, recent continued but much reduced subsidence has been documented through the subsidence depression region. Between about 1990 and 2003, only about 0.8 to 0.9 feet of additional subsidence has been documented across the project area. InSAR results to the southeast of the Project indicate a maximum subsidence rate of about 0.3 feet over a 3 year period from 1997 to 2000 (Appendix B).

The groundwater level and limited subsidence history around the project area is summarized in Figure 11. Between the 1940's to the 1980's, groundwater levels dropped about 250 feet, and a maximum of 17 to 18 feet of subsidence occurred between about 1957 and 1990. Since the late 1980's, the groundwater level has recovered about 50 to 70 feet while another 0.8 to 0.9 feet of subsidence has occurred. Apparent differential elevation changes quantified by InSAR interferometry results for 1997 to 2000 in the vicinity are consistent with this recent subsidence trend.

BurRec (1972) data for the basin includes an electric resistivity log for a deep well (B-03-01 32dda) in the project vicinity. Electrical resistivities measured in the well below a depth of about 400 feet were less than 10 ohm-meters. Low resistivities continue through the 2,000-foot depth of the well, and became very low in the middle alluvial unit interpreted to begin at a depth of about 1,200 feet. Both the low resistivities and the apparent time-delayed consolidation of basin materials, as indicated by repeat survey and InSAR interferometry, resulting in continued but reduced subsidence are consistent with clay-rich basin materials underlying the project site.

In contrast, the considerably reduced subsidence at the western edge of the basin is consistent with a much shallower low resistivity profile at a deep well near Glendale Avenue and Cotton Lane (B-03-02 34bbb). There the lower alluvial unit, logged as conglomerate, begins at a depth of about 1,100 feet, the initial pre-development groundwater level was deeper, and the historic water level decline was less than at the project site. Similarly, older, much less compressible alluvium to the southeast of the project site was probably uplifted by the action of doming in the Luke Salt Body, so that groundwater declines in that area have not resulted in significant subsidence.

7.0 DISCUSSION

Available subsidence data indicates that the Reems Road Channel and Basin are located in an area that has seen significant subsidence due to groundwater withdrawal. No known earth fissures are present along the alignment of the proposed channel or basin and the closest documented earth fissure is located approximately 1 mile to the northeast and east. No new earth fissures were documented as part of this investigation. The proposed channel and basin are located in an area where subsidence has likely created compressional stresses in the ground, therefore, the formation of earth fissures in the past or future is unlikely.

The potential for future differential subsidence to affect future grades of the proposed channel does exist and may pose a risk for the proposed structures. Subsidence profiles (Figures 7 through 10) indicate that past subsidence north of the proposed basin declines to the

north. If future subsidence were to occur, it is anticipated that this trend would continue, indicating that grades along this portion of the proposed channel would likely be steepened by future subsidence.

Subsidence profiles (Figures 7 through 10) to the south of the proposed basin show that past subsidence declines to the south of Olive Avenue. If future subsidence were to occur, it is anticipated that this trend would also continue, indicating that grades along this portion of the proposed channel would likely be lessened by future subsidence. The planned basin drains to the south along this segment of the channel. If future subsidence were to occur, it could impact the ability of the basin to drain as designed. It is unlikely that future subsidence would impact the capacity of the basin itself; however increased grade in an unlined channel above could increase the sediment load reaching the basin.

The occurrence of subsidence is intimately connected to groundwater withdrawal. The groundwater history of the study area (Figures 6 and 11) indicates that in the past 30 years, groundwater levels have increased by 50 to 150 feet. As this has occurred, subsidence rates have significantly decreased from their maximum rates of at least 0.5 ft/yr between 1957 and 1992 to about 0.03 ft/yr from 1992 to 2007. Since 1992, about 0.5 feet of subsidence has been observed. If current groundwater trends extend into the future, in is anticipated that subsidence rates will continue to decline. If groundwater trends reverse and groundwater levels begin to fall in the future, it is anticipated that subsidence rates would increase, possibly significantly if groundwater withdrawal is equally significant.

InSAR results in the study area were variable due to significant decorrelation from agricultural activity. Useful data in the vicinity of Luke Air Force Base was utilized for general subsidence trends. As agricultural land in the study area is converted to residential or other municipal uses, decorrelation is decreasing with time. The most recent scene dated from July 2005 to August 2006 provides some useful date near the north end of Project and it is anticipated that future development will reduce decorrelation.

8.0 RECOMMENDATIONS

It is recommended that the District monitor groundwater trends of key wells in the area of the proposed Reems Road Basin and Channel for a radius extending five miles from the proposed basin location. The groundwater monitoring can be achieved through the use of on-line resources provided by ADWR. Well B-03-01 29BCC (Figure 5) is located in the vicinity of the planned basin and the District should develop and evaluate groundwater trends annually for the life of the project as well as other wells within the 5-mile radius.

In addition to monitoring groundwater elevations, it is recommended that the District directly monitor subsidence trends through the use of periodic surveys of the channel and basin profiles, and the use of InSAR. As discussed in Section 7.0, it is anticipated that as development in the study area continues decorrelation issues with the InSAR data will be reduced.

Subsidence monitoring through surveying techniques can be achieved through the use of dedicated Global Positioning System (GPS) monuments installed at half-mile centers along the profile of the channel and basin. The GPS monuments should be designed to be permanent and vandal-resistant. Initially, a baseline for the data should be established by monitoring annually for three years. After the initial baseline is established the frequency of monitoring can be adjusted to best match the data trends.

Consideration of ability of the planned channel to accommodate future subsidence should be given. Generally, earthen channels are more easily adjusted in the event that the channel grade changes due to subsidence, though drop structures could be added as needed for a lined channel. If channel grade is increased, the resulting increase in flow velocity may indicate that a lined channel will function better. In areas where channel grade could decrease, consideration of additional freeboard should be given to accommodate any reduction in capacity of the channel and the ability of the basin to drain.

FIGURES

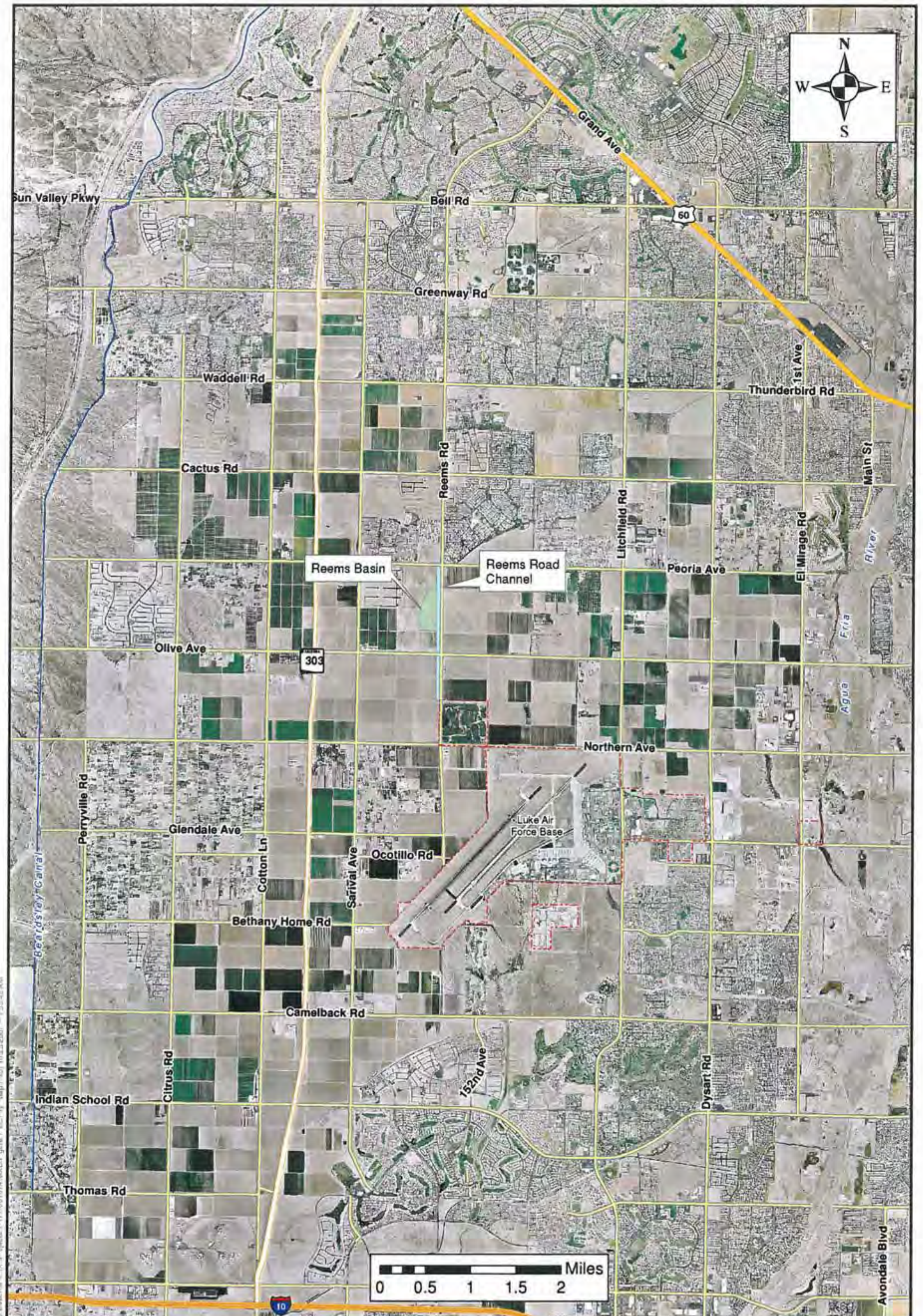

Image source: Air Photo USA June, 2006	JOB NO.: 7-117-001074 DESIGN: KED DRAWN: PWB DATE: 10/9/2007 SCALE: 1" = 1 mile	Preliminary Ground Subsidence and Earth Fissure Evaluation Flood Control District of Maricopa County Reems Road Channel and Basin Contract FCD 2006C020, Work Assignment No. 2 VICINITY MAP	FIGURE 1

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Map Document: (X:\Projects\7-117-001074\MXD\Figure 2 Project Location_Map.mxd) 10/9/2007 -- 3:50:26 PM

JOB NO.: 7-117-001074 DESIGN: KED DRAWN: PWB DATE: 10/9/2007 SCALE: 1" = 1200'	Preliminary Ground Subsidence and Earth Fissure Evaluation Flood Control District of Maricopa County Reems Road Channel and Basin Contract FCD 2006C020, Work Assignment No. 2 Project Location	FIGURE 2

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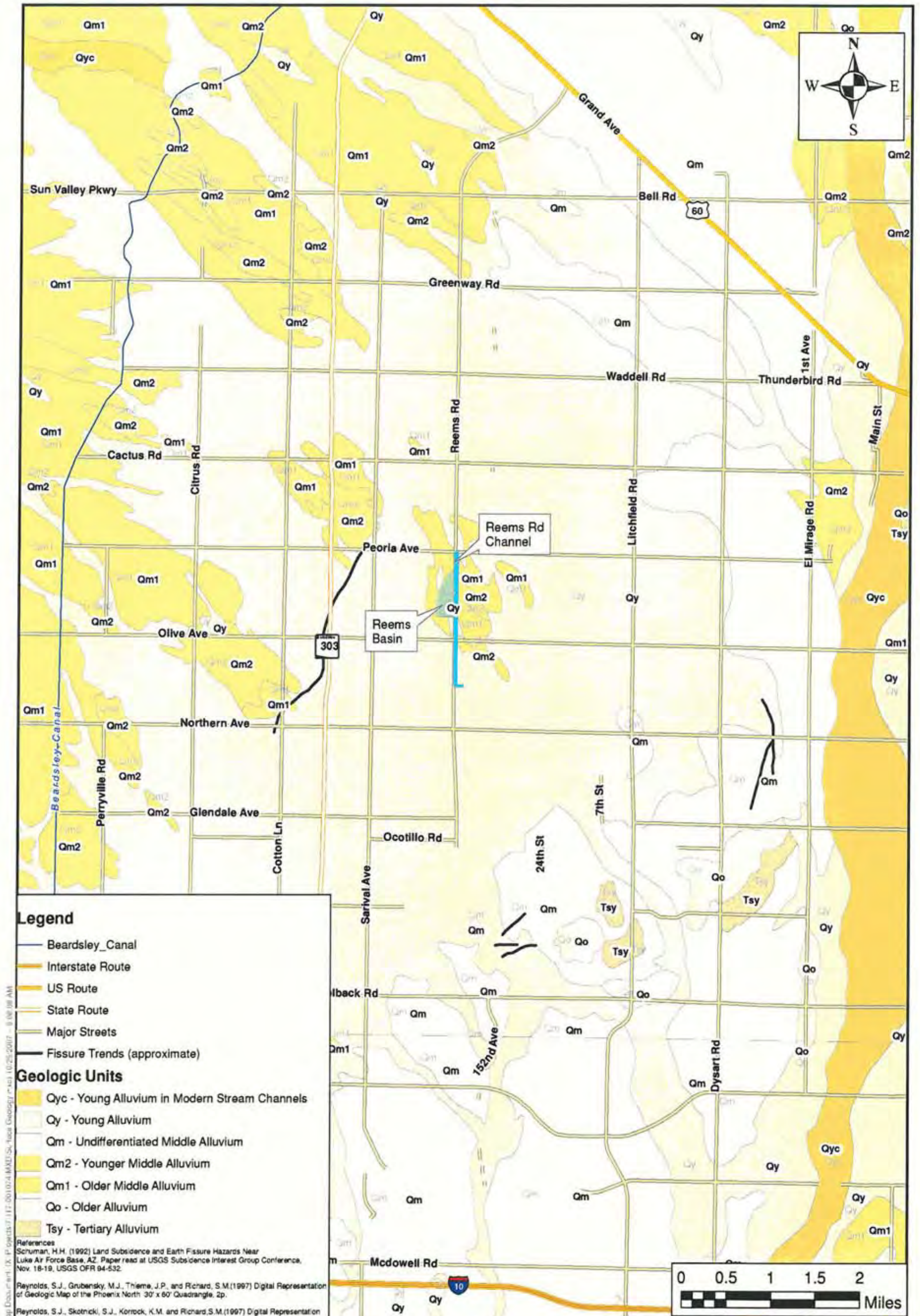

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DATE:	10/11/2007
SCALE:	1" = 1 mile

Preliminary Ground Subsidence and Earth Fissure Evaluation
Flood Control District of Maricopa County
Reems Road Channel and Basin
Contract FCD 2006C020, Work Assignment No. 2

SURFICIAL GEOLOGY

FIGURE 3

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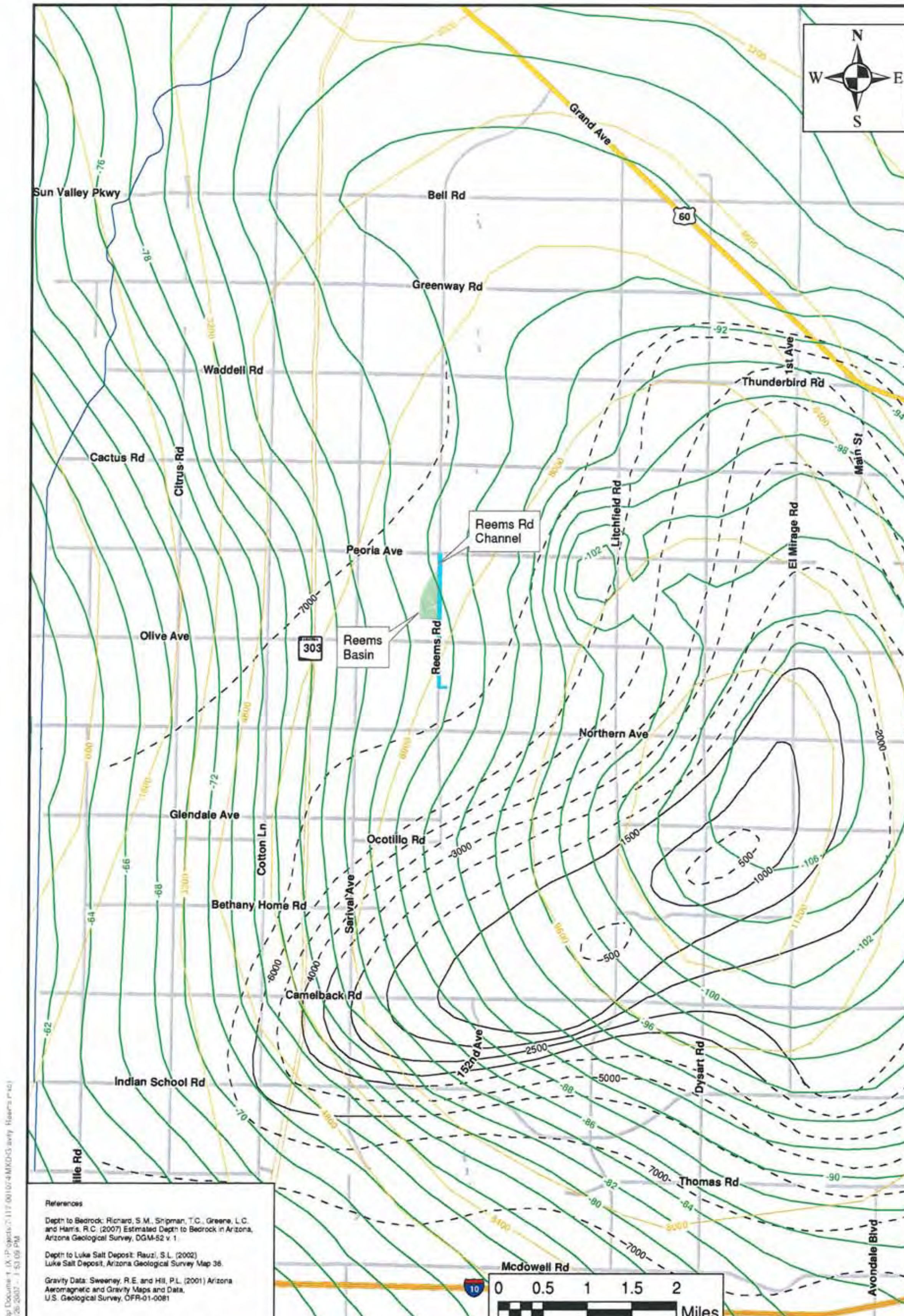

Legend
- Beardsley_Canal
- Depth to Bedrock (feet)
- Bouguer Gravity Contours (milligals)

Depth to Luke Salt Deposit (feet)
- Approximate
- Actual

JOB NO.:	7-117-001074
DESIGN:	KED
DRAWN:	PWB
DATE:	10/19/2007
SCALE:	1" = 1 mile

Preliminary Ground Subsidence and Earth Fissure Evaluation
Flood Control District of Maricopa County
Reems Road Channel and Basin
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Gravity Data, Depth to Bedrock, and Depth to Luke Salt Deposit

FIGURE 4

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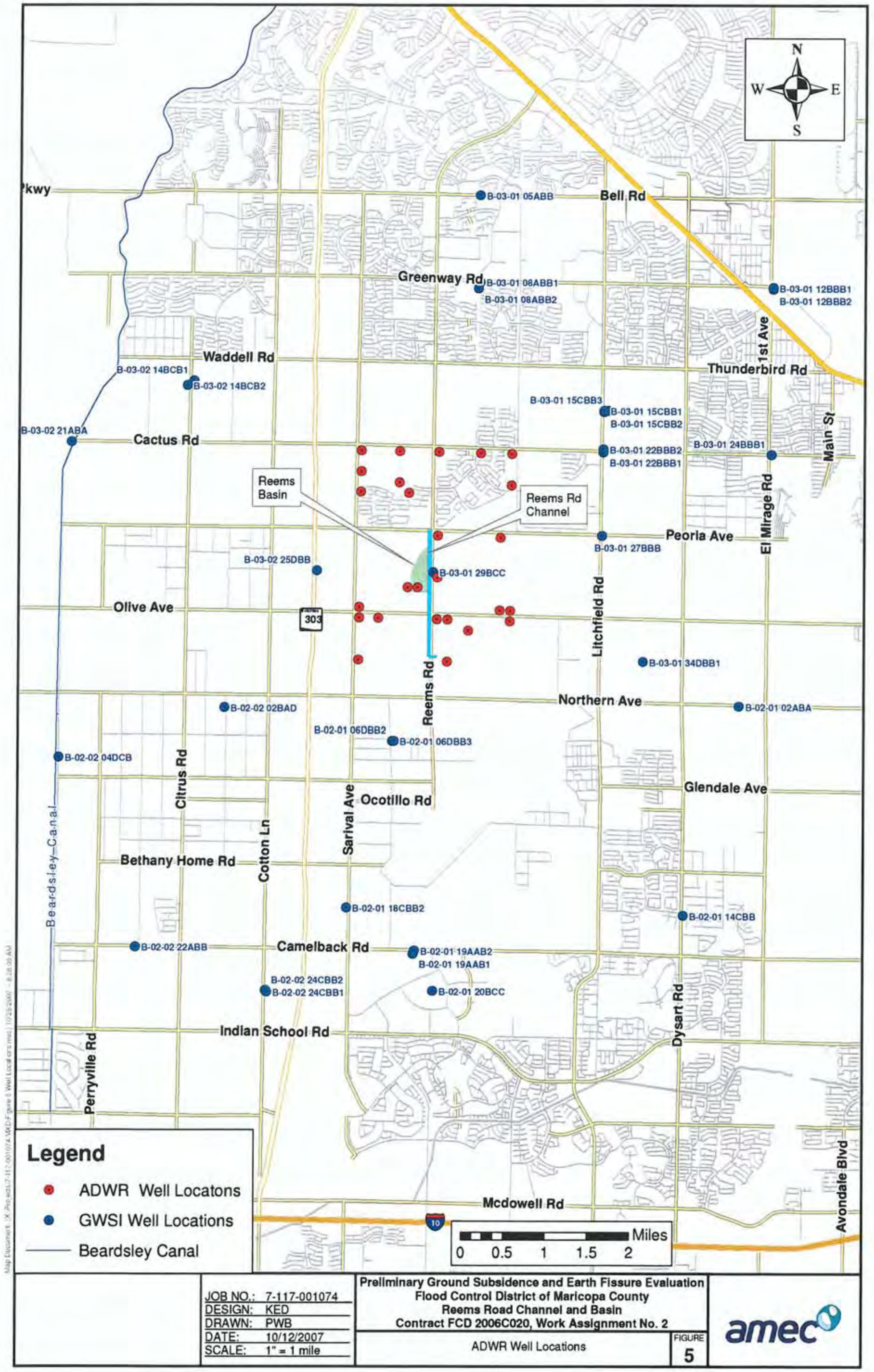
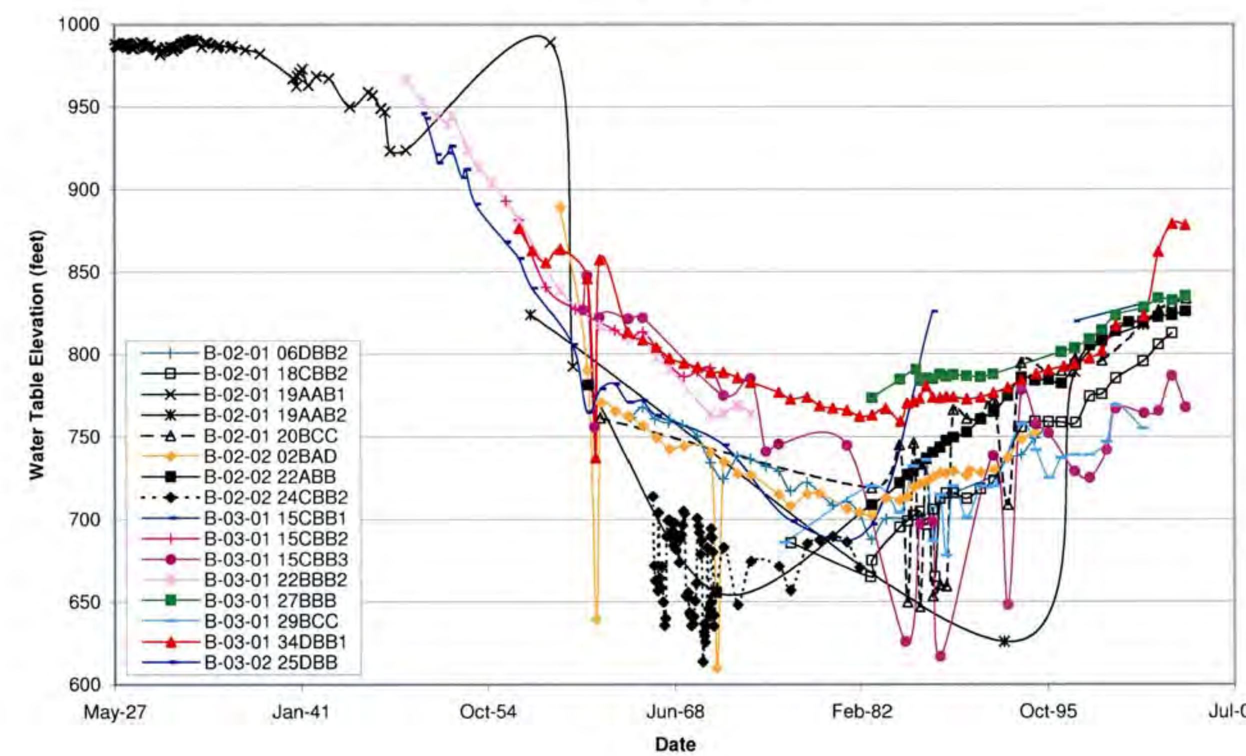


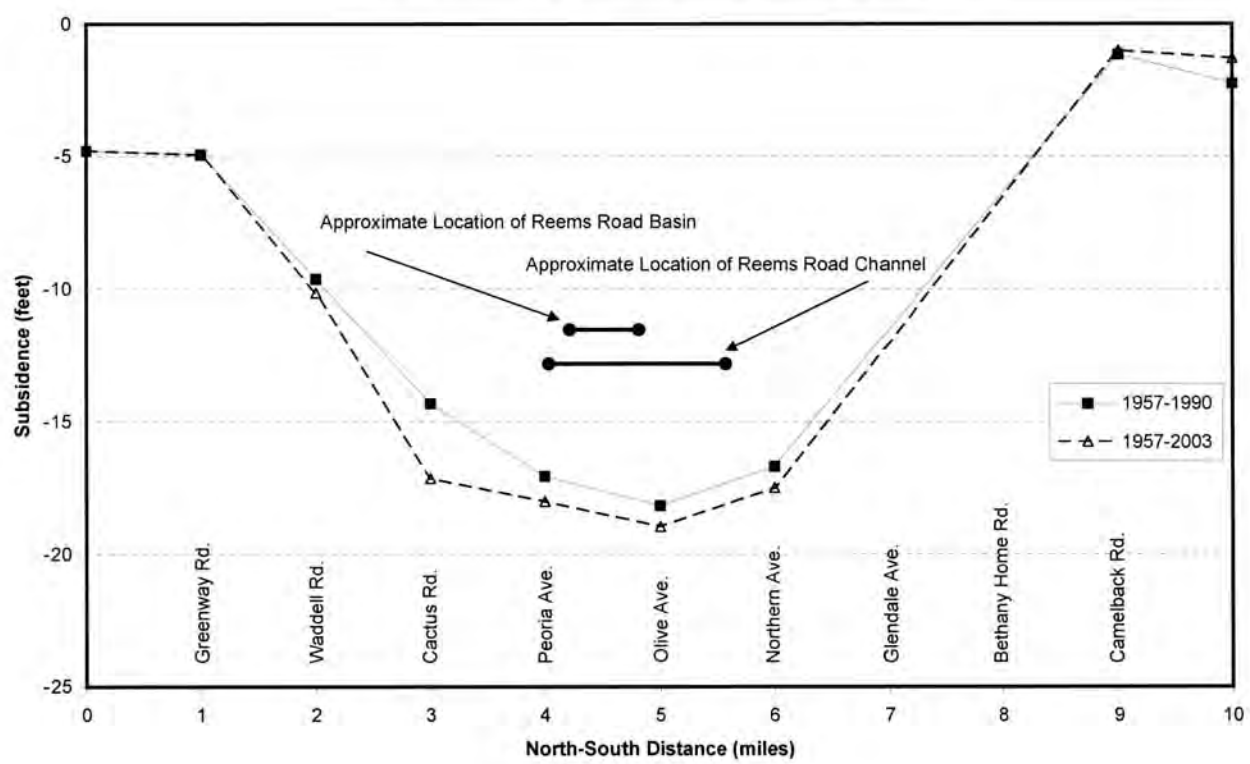
Flood Control District of Maricopa County
Preliminary Ground Subsidence and Earth Fissure Evaluation
Reems Road Channel and Basin
Maricopa County, Arizona
AMEC Job No. 7-117-001074

Figure 6
Water Level Data Trends



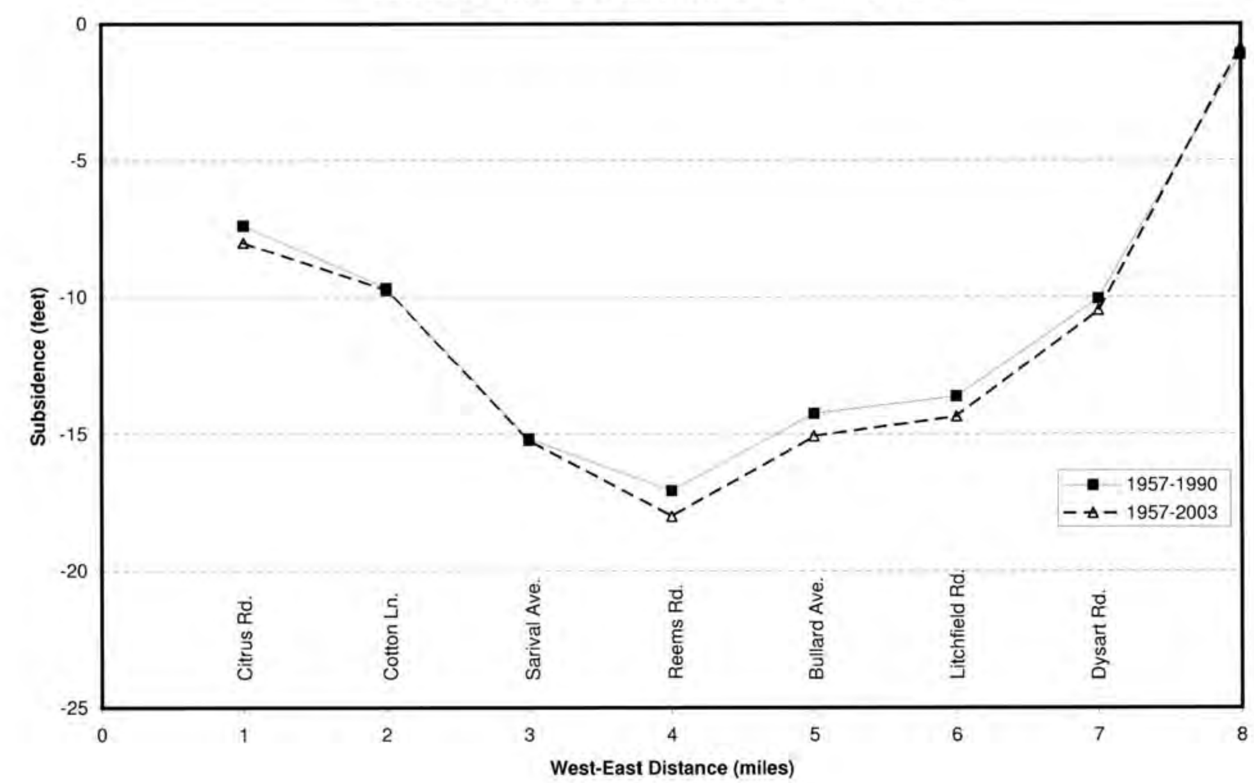
Flood Control District of Maricopa County
Preliminary Ground Subsidence and Earth Fissure Evaluation
Reems Road Channel and Basin
Maricopa County, Arizona
AMEC Job No. 7-117-001074

Figure 7
Subsidence Data for Reems Road for 1957 to 2003



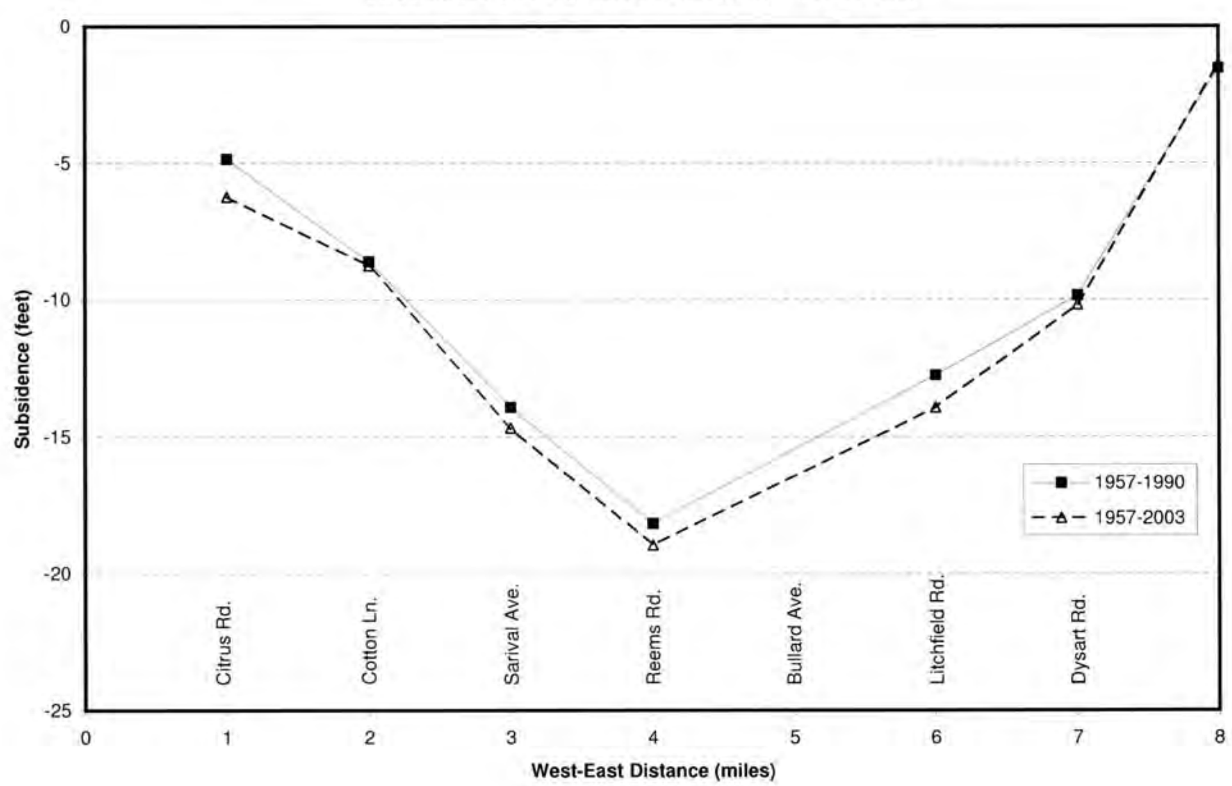
Flood Control District of Maricopa County
Preliminary Ground Subsidence and Earth Fissure Evaluation
Reems Road Channel and Basin
Maricopa County, Arizona
AMEC Job No. 7-117-001074

Figure 8
Subsidence Data for Peoria Avenue for 1957 to 2003



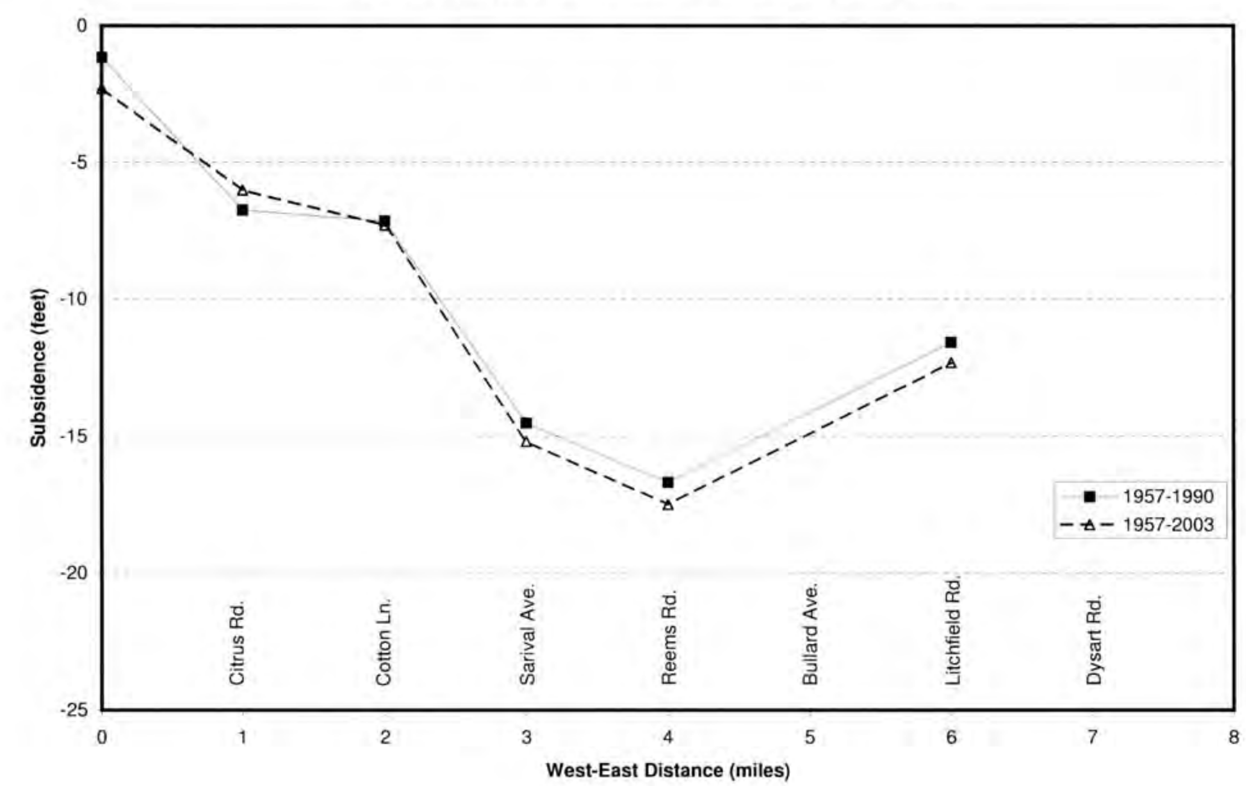
Flood Control District of Maricopa County
Preliminary Ground Subsidence and Earth Fissure Evaluation
Reems Road Channel and Basin
Maricopa County, Arizona
AMEC Job No. 7-117-001074

Figure 9
Subsidence Data for Olive Avenue for 1957 to 2003



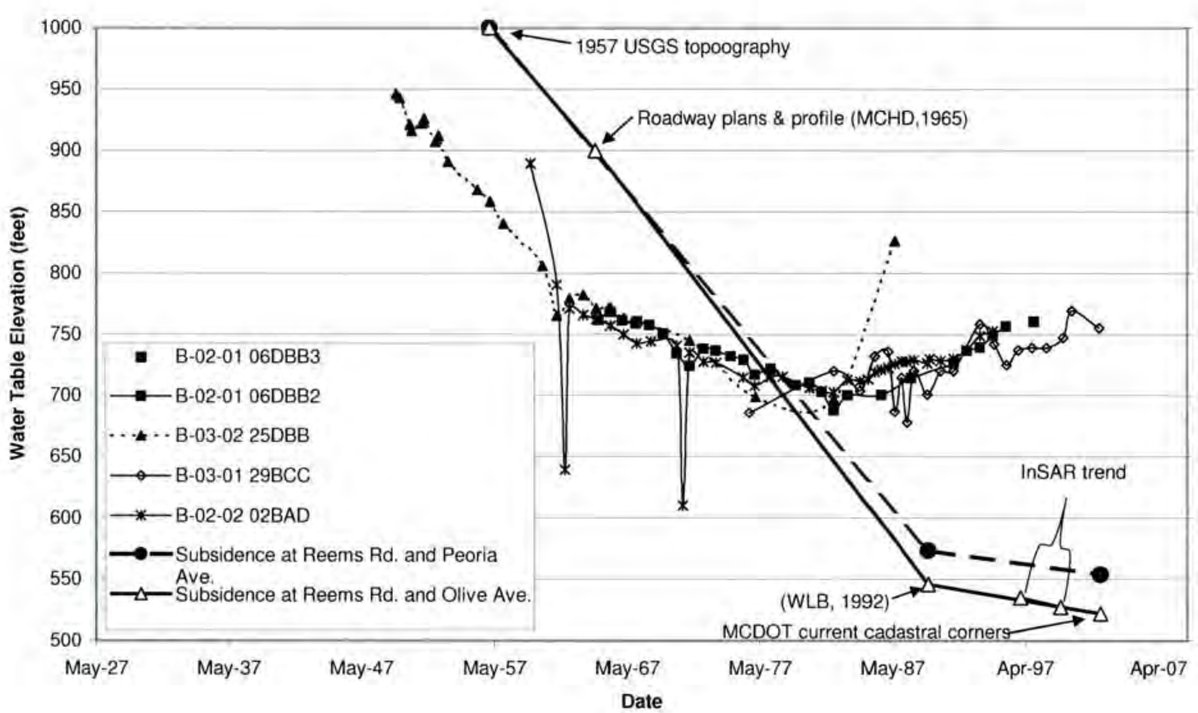
Flood Control District of Maricopa County
Preliminary Ground Subsidence and Earth Fissure Evaluation
Reems Road Channel and Basin
Maricopa County, Arizona
AMEC Job No. 7-117-001074

Figure 10
Subsidence Data for Northern Avenue for 1957 to 2003



Flood Control District of Maricopa County
Preliminary Ground Subsidence and Earth Fissure Evaluation
Reems Road Channel and Basin
Maricopa County, Arizona
AMEC Job No. 7-117-001074

Figure 11
Water Level Data Trends near Sarival Ave. and Northern Ave.
With Measured Subsidence along Reems Road at Peoria Ave. and Olive Ave.



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EARTH FISSURE INVESTIGATION REPORT
MCMICKEN DAM
WORK ASSIGNMENT NOS. 4 & 5
CONTRACT FCD 2000C006
MARICOPA COUNTY, ARIZONA

SUBMITTED TO:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
MARICOPA COUNTY, ARIZONA

SUBMITTED BY:

AMEC EARTH & ENVIRONMENTAL, INC.
PHOENIX, ARIZONA

11 APRIL, 2003

AMEC JOB NO. 0-117-001122

Earth Fissure Investigation Report
McMicken Dam
Work Assignment Nos. 4 & 5
Contract FCD 2000C006
Maricopa County, Arizona

Submitted to:

Flood Control District of Maricopa County
Maricopa County, Arizona

Submitted by:

AMEC Earth & Environmental, Inc.
Phoenix, Arizona

11 April, 2003

AMEC Job No. 0-117-001122

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1.0 INTRODUCTION

This report presents the findings of an investigation designed to detect and characterize the distribution and nature of earth fissures located in the vicinity of the southernmost six-mile portion of McMicken Dam. McMicken Dam is operated and maintained by the Flood Control District of Maricopa Count, herein referred to as the District. The District has implemented a Structures Assessment Program as a means of evaluating and subsequently managing the various risks associated with the operation of flood control facilities under their jurisdiction. Phase II of this process is an outgrowth of an initial stage involving both problem identification and risk assessment. The overall goal of Phase II, of which this investigation is a part, is to gain a further understanding of those site conditions that could influence facility performance, and subsequently formulate corrective actions through focused analysis and design development.

Earlier studies at McMicken Dam in 1982 detected the presence of earth fissures about 600 feet east of Station 63+50 (SHB, 1982)[1]. As indicated by the subsidence history of the McMicken embankment crest and other lines of evidence, these fissures are the result of horizontal strains in the alluvial basin sediments induced by the large-scale ground subsidence caused by the consolidation of the alluvial groundwater aquifer upon dewatering. This mining of the alluvial aquifer began in the early 20th century with agricultural development of the West Valley. This development included the installation and use of many high-capacity irrigation wells. These fissures, named the Fenne Knoll Fissures in 1982, are typical of many earth fissures known to occur in several locations throughout south-central Arizona. They are at the fringe of the basin and associated with nearby protrusions of competent bedrock extending through what is likely a relatively thin mantle of unconsolidated sediments.

This evaluation was designed to supplement and update previous investigations performed by the District regarding the risk of earth fissures affecting the integrity of McMicken Dam. The work occurred in three phases. The initial phase synthesized pertinent remote sensing, geodetic, geological, geophysical and geohydrological data related to ground subsidence and earth fissuring in the vicinity of the Fenne Knoll Fissures. This information then became the basis for acquiring additional field data related to the nature and extent of the fissure complex. The first phase culminated with the acquisition and interpretation of newly acquired low-sun-angle (LSA) aerial photography, ground mapping of the fissure traces, and the excavation of test pits across the identified features. After confirming the near proximity of earth fissures to the McMicken Dam embankment, the investigation was extended to include the use of shallow seismic refraction surveys to search for hidden discontinuities, and trenching to expose and

[1] References are listed at the end of this report.

Flood Control District of Maricopa County
Earth Fissure Investigation Report
McMicken Dam
Work Assignment Nos. 4 & 5
Contract FCD 2000C006
Maricopa County, Arizona
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11 April, 2003

characterize suspected fissures approaching the embankment. The first two phases of this investigation were initiated on August 20, 2001 after receipt of authorization from the District to proceed on Work Assignment 4 of Contract No. 2000C006.

It was recognized at the completion of the first two tasks summarized above that the investigation would benefit significantly from the acquisition of additional remote sensing and subsurface data. A surface geophysical approach was selected as an efficient means of acquiring data regarding the variable thickness of the underlying alluvial materials, and the general properties of these unconsolidated deposits. In addition, a review of remote sensing data (interferograms) indicated the occurrence of significant differential subsidence, and in turn a possible fissuring risk, in the vicinity of Station 290+00. This region was included as the North Study Area in the surface geophysical field program, which included micro-gravity surveys, one-dimensional shear wave profiling (refraction microtremor), and resistivity soundings. Additional LSA aerial photography of the North Study Area also was acquired and analyzed. This final phase of the evaluation was authorized by the District on October 1, 2002 as Assignment 5 of the contract.

2.0 REGIONS OF INVESTIGATION AND PROJECT COMPONENTS

2.1 Study Areas

Regarding the issue of ground subsidence, dam safety concerns relate to the potential for detrimental changes in reservoir capacity and dam freeboard. Earth fissures through the dam cross sections and dam foundation soil profiles create the risk of piping failures of the embankment. Coupled with the hydrogeological characteristics of the region, these issues dictated the extent of the study areas, the types of data deemed relevant, and the nature of supporting site-specific investigations.

In consideration of the contrast between the scale of available regional information and the extent of project-specific investigative activities completed for this evaluation, three study areas were delineated. The first of these areas is regional in scale, encompassing the entire alignment of McMicken Dam, and covering about 50 square miles east and northeast of the White Tank Mountains (Figure 1). Small-scale data, such as the location of registered wells and Bouger gravity data, were acquired and synthesized within this regional study area. A second, smaller study area was established for the site-specific investigations that followed the initial compilation of available data. The South Study Area is approximately one mile wide, straddling the McMicken Dam embankment, and extending from the dam's southern terminus north to Station 120+00. A vast majority of the geophysical and subsurface exploration completed for this study occurred within this smaller study area. The third study area (North Study Area)

- **Alluvial Unit A-2: Latest to Late Pleistocene Alluvial Deposits (M2)** – This unit is locally comprised of moderately cemented (Stage II) clayey to silty sands, interbedded with silty to sandy gravels. These deposits usually display poor soil development and some rubification, with a granular texture. In trench exposures, the unit extended to the full depth of investigation (10 feet) at three locations.

- **Alluvial Unit A-1: Mid Pleistocene Alluvial Deposits (M1b)** – A vast majority of shallow exposures of this unit are comprised of strongly cemented (Stage II+ to IV) clastic deposits of sand, gravel and cobbles, often containing boulders of considerable size. Paleo-soil horizons can be observed at the top of the unit, and excavated exposures often reveal horizons that are most appropriately described as soft rock. In contrast, unconsolidated sandy beds are present, some with relatively high concentrations of calcium carbonate, but poor cementation. The coarser deposits of the unit are generally clast-supported and slightly imbricated.

5.0 GEOHYDROLOGICAL CHARACTERISTICS

Groundwater contained within the basin fill deposits east and north of McMicken Dam is a significant and highly exploited resource, used for domestic, municipal, industrial and agricultural purposes. As depicted in Figure 4, over 350 wells registered with the ADWR are present within the regional study area. These wells range from small domestic installations of limited yield, to large irrigation wells capable of discharging several thousand gallons per minute. Of 40 registered wells in the vicinity of the southern half of McMicken Dam (Figure 5), 30 have reported depths between 534 and 1,533 feet, with an average penetration about 995 feet (Table 1).

Groundwater withdrawn from the basin deposits near McMicken Dam largely originates from the UAU, with its thickness estimated by the BurRec (1976) to be locally about 600 to 650 feet, and current groundwater levels at depths from approximately 400 to 500 feet. Prior to development in 1923, nearby groundwater levels were likely at elevations of about 1060 to 1100 feet above MSL, translating to depths of about 200 to 250 feet (BurRec, 1976). This decay in groundwater levels has prompted the deepening of many wells to depths in excess of 1000 feet to tap the resources of the LAU. As with most of the WSRV, the LAU appears to be separated from the UAU by fine-grained, low-permeability deposits within the MFU, although the BurRec (1976) maps the westward, lateral limit of the MFU in the near vicinity of McMicken Dam.

As depicted in Figures 6 and 7, recorded groundwater levels in the vicinity of McMicken Dam have significantly declined since the late 1930's. Of the 10 records selected, water levels in five have been measured since the 1940's or earlier. Within these five wells, the average rate of groundwater decline is about 4.5 feet per year. However, a large portion of this decline occurred before the mid-1960's, with most levels currently static or in slight recovery.

As discussed in more detail in Section 6.0, a significant influence upon the distribution and magnitude of ground subsidence along the western fringe of the WSRV is the lithology of the basin sediments. Both the geohydrological and compaction responses to dewatering are largely controlled by the particle-size distribution of the sediments, which in turn dictates the permeability and consolidation characteristics of the material. Stulik and Twenter (1964) identified the existence of fine-grained sediments in the basin profile about 1 to 1½ miles east of the southern three miles of the McMicken embankment. Their interpretation was based on well logs to a datum of about 700 feet above MSL, or about 600 feet below ground in the local area. This region is offset about 1 mile to the east of an area of pronounced subsidence, as indicated by recent interferometric coverage.

6.0 GROUND SUBSIDENCE DUE TO GROUNDWATER WITHDRAWAL

6.1 Overview of Subsidence Process

Ground subsidence due to groundwater withdrawal in alluvial basins of the Southwest is a process of compression and consolidation of the deep sediments. Through geologic time, groundwater levels in the alluvial basin aquifer were at or near the ground surface, often at elevations controlled by the drainages traversing the valley floors. Activities of man have changed and are continuing to affect groundwater levels in many of these basins. Damming of rivers in mountainous portions of watersheds has reduced available recharge. Groundwater pumping, primarily for agricultural, industrial and municipal use, has significantly mined groundwater in many areas. In modern times, groundwater level declines up to several hundred feet due to pumping have occurred in many basins in Arizona and the Southwest.

Lowering the groundwater elevation in alluvial basin sediments results in an increase in effective stress. This change in effective stress is an increase in loading on the material column. If that column consists of granular materials, typically sands and gravels, compression of the material below the initial water level takes place rapidly. Until granular particle contact points are changed by the compression, at least some of the compression can be recovered elastically if water levels rise and effective stresses fall. Compression that results from particle slipping or crushing will have much less elastic rebound. If the material column contains a significant fraction of fine-grained materials, typically clays, consolidation of the material below the initial water level takes place slowly. The time frame of the consolidation is a function of the permeability of the material, with lower permeability increasing consolidation time. Consolidation rate is also a function of the distance to higher permeability zones that can relieve the excess pore pressure by draining water from the clayey materials. Greater distances to such permeable drainage zones increase consolidation time.

Soils are much less compressible when reloaded up to the preconsolidation pressure than when loaded above the preconsolidation pressure (Lambe and Whitman, 1969). In many basins, the ground surface has been higher (relative to underlying bedrock) than at the present time due to erosion. The eroded alluvium preconsolidated the basin profile. Increases in effective stress less than the preconsolidation stress represented by the now eroded alluvium would result in minor subsidence. Once increases in effective stress due to a declining groundwater table exceed the preconsolidation stress, further subsidence will occur at a much greater rate, representing normal consolidation of the alluvial basin materials.

Where differential rates and magnitudes of subsidence occur over relatively short distances, horizontal strains can become sufficient to cause earth fissuring. Jachens and Holzer (1979, 1982) evaluated the threshold tensile strains for fissuring based on studies of the Eloy-Casa Grande area of central Arizona. These studies included precise leveling and geophysical surveys, and comparison with other cases of fissuring due to groundwater withdrawal. Jachens and Holzer (1982) concluded that most fissuring occurred at horizontal tensile strains in the range of 0.02 to 0.06 percent. This compares with the threshold strains for cracking of compacted clay zones in dam embankments (or compacted clay liners) of about 0.1 to 0.3 percent (Leonards and Narain, 1963; Covarrubais, 1969).

Case studies of other areas of the Southwest can provide insight into the issues of subsidence and earth fissuring relevant to McMicken Dam. Holzer (1981) calculated values of subsidence per unit water level decline for six areas, including the Eloy-Picacho area in Arizona. He found subsidence per unit water level declines of 0.037 to 0.053 for groundwater declines that exceeded the preconsolidation stress of the aquifer formation. Some of these areas involve alluvium of great depth.

Subsidence in the WSRV in the vicinity of Luke Air Force Base has been as great as 15 feet or more in response to overpumping of groundwater and lowering of the groundwater table several hundred feet where the alluvial basin is thousands of feet deep (Schumann, 1992). Subsidence up to 7 feet has been documented in Paradise Valley, Arizona in response to groundwater pumping in that area. An earth fissure associated with that subsidence and the presence of relatively shallow bedrock (depth less than 1,000 feet) buried within the alluvium has been identified (Larson and Péwé, 1986).

An earth fissure and subsidence monitoring program is in place at the Apache Generating Station near Cochise, Arizona (AMEC, 2001). Subsidence typically ranging to in excess of 2 to 3 feet at the facility in the last 25 years has been documented (AGRA, 1999). An earth fissure was discovered on facility property in 1993, and has been subsequently monitored using tape extensometer, optical leveling and precise geodetic measurements. The generating station is located near the southwest margin of the Willcox Playa. It is a closed alluvial basin with no through-flowing drainages and no significant erosion of the basin alluvial material thickness. Groundwater elevations have dropped more than 100 feet, and are presently dropping at a rate of about 4 to 5 feet per year. Depth to bedrock under the facility is about 1,000 to 1,100 feet as verified by geophysical logs of deep exploration wells for water production (SHB AGRA, 1993).

Helm (1984) presents a simplified computational technique applicable to estimation of settlement due to groundwater withdrawal. The method considers the depth of compressible alluvium over bedrock, amount of groundwater decline and consequent increases in effective stress, and the average Young's modulus (E) of the compressible layers. The E value represents both the short-term, essentially elastic component of settlement and the long-term component of settlement due to slow drainage and consolidation of the more plastic clays. Data on evaluation of case histories of subsidence in similar basins is available to assist in estimating E values (Bell, 1981; Holzer, 1981; Helm, 1984).

The Helm method was used to analyze subsidence at the Apache Generating Station (SHB AGRA, 1993). In estimating average values, a value of E of 6 kips per square inch (ksi) was estimated for clay layers based on data for settlement of upper lakebed clays in the Las Vegas Basin (Bell, 1981). A value of E of 24 ksi was estimated for granular layers. The relative amount of silt and clay, and sand and gravel, in each area around the generating station was estimated, with average E values of about 20 ksi in the more coarser grained alluvium, and average E values of about 10 ksi in the more clayey part of the alluvium. This method was then applied for the approximate depth to bedrock of 1,000 feet. The analysis indicated settlement of 2 feet for an approximate E value of 10 ksi and a total groundwater decline of 120 feet. Consolidation testing of shallow clays at the site indicated that the alluvium was normally consolidated.

6.2 Subsidence History in Study Area

Survey elevation data sets documenting subsidence in the study area include NGS data along the roughly north-south oriented Beardsley Canal and along the crest of McMicken Dam. NGS leveling data were collected in 1947-48, 1967 and 1981. Some points have been reoccupied more recently, including elevation measurements in autumn 2002. Elevation surveys of the crest of McMicken Dam were performed in 1955 following construction, in 1981 before reconstruction, and in 1985, 1998 and 2001. InSAR interferometry imagery has also documented relative elevation changes throughout the study area for several recent time periods. The InSAR interferogram for the period December 1996 through December 1999 (Figure 13) is especially useful.

Subsidence and annual subsidence rates on a south to north profile from Camelback Road to about Union Hills Road along the Beardsley Canal are summarized in Figures 8 and 9. NGS survey monuments are present at typical 1-mile intervals along the canal alignment. Comparison of elevation measurements in 1947-48, 1967 and 1981 indicates that the total subsidence between 1947-48 and 1981 ranged from about 2 to 3 feet from Camelback Road to Olive Avenue, and about 3 to 4 feet from Peoria Avenue to Bell Road. Where McMicken Dam parallels the Beardsley Canal from Cactus Road to Bell Road, total subsidence between 1955 and 1982 ranged from about 2.5 to 4 feet, and was typically about 3 to 3.5 feet. Elevations of three of the NGS points resurveyed by ADWR in 2002 indicate that less than 1 foot of subsidence has occurred at those points since 1981.

Subsidence rates between 1947 and 1967 ranged from about 1.5 to 3 cm per year (cm/yr), and were greatest at Camelback Road (about 2.9 cm/yr) and Glendale Avenue (about 2.7 cm/yr). Subsidence rates between 1967 to 1981 were significantly reduced to less than 1.3 cm/yr or less along the southern portion of the profile. Between Peoria Avenue and Bell Road, subsidence rates were about 1.3 to 2.0 cm/yr. From 1981 to 2002, subsidence rates at measured monuments north of Olive Avenue varied from about 0.5 to 1 cm/yr. InSAR interferometry between 1996 and 1999 indicates that subsidence during that time may have largely ceased south of Bethany Home Road, and was about 0.5 cm/yr at Glendale Avenue, and about 0.8 cm/yr at Peoria Avenue. Subsidence rates along other parts of the profile were about 0.3 to 0.5 cm/yr.

Subsidence and annual subsidence rates, based on District surveys along the McMicken Dam crest between Stations 40+00 and 240+00 are summarized in Figures 10 and 11. Crest elevations were measured in 1955, in 1981 before reconstruction, and in 1985, 1998 and 2001. Comparison of elevation measurements between 1955 and 1982 indicates settlements of about 2.5 to 3.5 feet north of Station 100+00, with a maximum 4.0 feet of settlement at about Station 118+00. Settlement decreased south of Station 100+00, and became about zero at Station 70+00. The rise of the crest by about 1 foot at Station 60+00 is unlikely and may be related to a survey error or placement of aggregate base along the crest of the dam by District maintenance personnel. Settlement between 1985 and 2001 ranged from about 0.4 feet at the southern end of the dam, to 0.9 feet at about Station 110+00.

Settlement rates between 1955 and 1982 ranged from about 0 cm/yr to about 3 to 4 cm/yr north of Station 100+00. Subsidence rates had substantially decreased by the 1980's. Between 1985 and 1991, the relative subsidence rate across the dam ranged from about 0 cm/yr at Station 40+00 up to about 1.2 cm/yr at Station 105+00. North of Station 105+00, the subsidence rate ranged from about 0.8 to 1.1 cm/yr. The subsidence rate between 1991 and 1998 dropped to about half of the 1985 to 1991 rate. InSAR interferometry results for 1996 to 1999 were slightly smaller but closely matched the 1991 to 1998 subsidence rates. Recent subsidence rates between 1998 and 2001 are generally similar to the 1990's rates but appear erratic.

Several observations can be made from the available subsidence survey and groundwater elevation data. Groundwater withdrawal and falling water levels in the study area are believed to be the cause of the documented subsidence. Groundwater declines in the study area between about 1940 and 1982 were typically in excess of 200 feet. Subsidence rates in the study were at a maximum at that time. Water levels have been generally stable since the 1980's. Subsidence rates have decayed in that time, and in some areas, appear to have nearly stopped. Reliable subsidence data has not been identified for time periods before the NGS surveys beginning in the 1940's. It does appear that groundwater elevations dropped significantly before that time.

Preconsolidation conditions, if they existed within the basin alluvium along the mountain front, would have minimized subsidence in the early years of groundwater withdrawal. The current largest magnitude subsidence activity indicated by InSAR interferometry appears to occur in fairly narrow zones or cones. These zones are consistent with the larger subsidence rates documented at Monuments H265 at Glendale Avenue and L265 at Peoria Avenue along the Beardsley Canal. The subsidence in these locales does not appear to be related to pumping wells in the area. Furthermore, based on the available interferometry subsidence data, the zones of enhanced subsidence appear to have typical radiuses of about one-half mile.

Characterization of the deeper alluvium in which compression and consolidation induced subsidence occurs is limited primarily to regional gravity surveys and (questionable quality) well driller's logs at some wells in the area. Results from gravity surveys, along with the limited number of deep exploration wells, have been used to characterize general bedrock elevations in the alluvial basin (Cooley, 1973; Oppenheimer and Sumner, 1980). This generalized mapping indicates that alluvium is greater than 1,200 feet thick along the Beardsley Canal, may be about 400 to 800 feet deep at the southern terminus of McMicken Dam, and rapidly increases in thickness to the south. It does not provide interpreted detail of probable bedrock profiles along McMicken Dam relatively close to the mountain front.

7.0 SUBSIDENCE-INDUCED EARTH FISSURING

7.1 Overview of Fissuring Phenomenon

The first recorded observance of earth fissuring in Arizona was in 1927 near the town of Picacho well south of the study area (Leonard, 1929). Since that time, eleven subsiding Central Arizona regions within the Basin and Range province have been identified, all with suspected or verified earth fissures (Fellows, 1999; Poland 1981; Holzer and Davis, 1981). Subsequent benchmark studies were undertaken to evaluate the distribution and mechanisms of fissuring (Holzer, 1978 and 1980; Jachens and Holzer, 1979; Laney, Raymond and Winikkar, 1978; Larson and Péwé, 1986).

Earth fissures in areas of large groundwater decline in alluvial aquifers are probably associated with a process termed generalized differential compaction by Carpenter (1993). Three mechanisms are likely at play to ultimately form fissures. These mechanisims include bending of a plate above a horizontal discontinuity in compressibility (Lee and Shen, 1969), dislocation theory representing a tensile crack (Carpenter, 1993), and vertical propagation of tensile strain caused by draping of the alluvium over a horizontal discontinuity in compressibility (Haneberg, 1992). Due to these probable mechanisms, fissures commonly develop along the perimeter of subsiding basins, often in apparent association with buried or protruding bedrock highs, suspected mountain-front faults, or distinct facies changes in the alluvial section.

Fissures often manifest at the surface as subtle hairline cracks, or as alignments of small potholes, modified by burrowing animals. Overland flow is then intercepted, and the surface manifestation of the fissure grows as piping and caving occur during runoff events. The shallow, weakly cemented Holocene surface soils often erode quickly, providing ample sediments to the fissure during precipitation events and ensuing runoff capture. The underlying Late Pleistocene soils are often more cemented and resistant to erosion, with ledges formed at the Holocene/Late Pleistocene contact.

Due to the potential detrimental effects of fissuring upon safe operation of the Central Arizona Project (CAP), several studies of the fissuring process were performed as a joint effort by the U.S. Bureau of Reclamation and the U.S. Geological Survey (USGS). The results of these investigations are largely presented in a series of unpublished, draft documents retrieved from CAP archives. The Hawk Rock area near Apache Junction was the focus of considerable study during the CAP program. The effort included mapping of the fissure traces present, a ponding test to measure inflows and fissure erosion, surface and borehole geophysics, exploratory drilling of the basin alluvium and a two-year geodetic monitoring program (Raymond, 1985). The CAP also conducted fissure inflow testing adjacent to the Picacho Pumping Plant near

Eloy, Arizona during April of 1988. Detailed summaries of the findings of these field programs are presented in a recent report prepared as part of the District's ongoing Structures Assessment Program (AMEC, 2002).

7.2 Earth Fissures in Western Salt River Valley

Robinson and Peterson (1962) were the first to publish any reference to earth cracks within the WSRV. They conjectured that the cracks found around what was later identified as the Luke salt body may have been caused by dewatering and subsequent compaction of the basin deposits. They further associated the resulting subsidence as the probable cause for the collapse of casings in nearby wells. Eaton and others (1972) identified more fissures around the salt body, and presented an alternate concept in regards to their origin. They postulated that the buoyant rise of the salt body could have also contributed to development of fissures. The occurrence of fissures in the vicinity of Luke Air Force Base was further documented by Laney and others (1978), and by Schumann (1992). These fissures around the flank and northwest of the salt body are well removed from McMicken Dam, being some 4 to 8 miles southeast of the southern terminus of the structure.

7.3 Discovery of the Fenne Knoll Fissures

For the purpose of evaluating the cause of embankment cracking, the District performed extensive geotechnical evaluations of McMicken Dam in 1981-82. These investigations culminated in a July 28, 1982 report by Sergent, Hauskins and Beckwith Consulting Geotechnical Engineers (SHB, 1982). This report summarizes the original methods employed to search for earth fissures in the vicinity of McMicken Dam, and characterizes fissures discovered near the southern terminus of the McMicken embankment. These fissures were named the Fenne Knoll Fissures by the authors of the SHB report.

The initial earth fissure studies at McMicken Dam employed both low-sun-angle aerial reconnaissance and photography to search for fissures. Subsequent to a photogeologic interpretation of the imagery, trenching of several features was performed. What is now known as the Fenne Knoll Fissures were confirmed by this trenching. As depicted on Sheet 1 (Appendix A), two fissure segments were defined, each segment being about 750 feet long. The closest distance between the surficial expression of the fissures and the downstream toe of McMicken Dam in 1982 was about 650 feet, due east of Station 63+50.

The original trenching of the Fenne Knoll Fissures revealed near-vertical discontinuities with an uneroded width of about ¼ to ½ inch. Some of these trenches extended to a depth of 20 feet, with the fissures often observable throughout the excavated interval. Considerable fissure erosion, rodent effects and infilling with dark soil were also observed.

7.4 Surface Observations

The recent year-2001 LSA photography revealed the presence of surface features indicative of earth fissuring at locations north and west of the old traces of the Fenne Knoll Fissures. The closest approach of these features (aligned potholes and small depressions) to the embankment was about 125 feet, east of Station 58+00 near Test Pit TP-1. The pattern of the recent features indicates the presence of three newly discovered, near-parallel fissures, spaced about 200 to 250 feet apart and west of the fissures discovered in 1981-82.

In observing the erosional features of the Fenne Knoll Fissures in comparison with their appearance 20 years ago, the lack of large fissure gullies is pronounced. Segments of the old fissures clearly visible both on the original LSA photography, and previously on the ground are currently concealed, with almost no surficial evidence of the fissure now present. Other portions of the fissure complex that contained small gullies have changed little over the 20-year period (see photos in Appendix B). McMicken Dam intercepts all the small arroyos that cross the fissure complex. The lack of appreciable runoff may be responsible for the slow erosional development of the fissures.

In addition to the distinctive alignment of features in the LSA imagery indicative of earth fissures at the surface, other more subtle lineaments are discernable in the aerial photography. As depicted on Sheets 1 through 3, these linear features are caused by the alignment and contrasting health of the desert vegetation, tonal contrasts in the desert floor likely due to the effects of burrowing animals, and the orientation of tributary arroyos. The drainage alignments are discordant to the dendritic pattern in the alluvial fan surface. All these features are probable indicators of discontinuities in the subsurface, and many have been observed extending along the projection of known fissures. It is possible that the discordant drainages are expressions of prehistoric fissures, previously eroded into fissure gullies and subsequently plugged, with the external drainage then reestablished.

As depicted on Sheet 4, the orientations of the vegetation lineaments appear to be related to the configuration of local ground subsidence, and the distribution of known earth fissures. As discussed in more detail in the report sections to follow, these lineaments may be an expression of subtle discontinuities in the shallow cemented soil profile. The genesis of these discontinuities is not fully understood, but the apparent relationship between their distribution and that of ground subsidence offers some insight into their origin. Whether tectonically induced or the result of prehistoric differential consolidation of the basin alluvium, it appears that the lineaments are an expression of ancient horizontal strain of sufficient magnitude to produce brittle fracture in the cemented soil horizon. These discontinuities likely enhance root

The interpreted underlying horizon throughout the seismic profile consists of materials with p-wave velocities greater than 2,500 f/s, and more typically in the range of 3,000 to 4,600 f/s. Material p-wave velocities in this range are consistent with strongly cemented Mid-Pleistocene alluvial deposits (Alluvial Unit A-1). The interpreted top of this horizon ranges in depth from a few feet, such as in parts of Lines 25, 36, 39, 47 and 56, up to about 15 to 20 feet in parts of Lines 37 and 44.

10.0 EARTH FISSURING HAZARD AND RISK

Based on the findings of this investigation, there exists a high probability that earth fissures are present within the shallow foundation soils under McMicken Dam between Stations 58+00 and 65+00. Two fissures zones are well defined, one encountered in Test Trench TT-102 and Test Pits TP-6, -9 and -10, and one in Test Trench TT-102 and Test Pits TP-1, -2 and 3. Additional surface indications of more fissuring have recently been detected near the downstream toe of the dam on the north-south projection of the fissure encountered in Test Pits TP-4 and -5, between the two aforementioned fissure trends.

For purposes of this discussion, the following are offered as definitions of the hazard classifications applied below:

High Hazard – Distinct possibility that earth fissures are present in the alluvial foundation soils under the dam. Multiple lines of evidence are present, including close proximity of documented fissures trending towards the embankment. Indications also include significant density of seismic refraction anomalies and photo-lineaments, some of which are coincidental or parallel to trends of known fissures. The occurrence of fissures also correlates with the suspected region of considerable horizontal strain, as indicated by the settlement profile along the dam crest and interferometry. The region of high hazard is further defined by subsurface conditions that are conducive to the development of fissures, including shallow and variable alluvial thickness and proximity to the suspected boundary between more rigid clastic sediments to the west, and fine-grained, more compressible deposits to the east.

Moderate Hazard - Region where moderate density of photo-lineaments and reduced number of seismic anomalies have been detected. Settlement profiles and interferometry indicate the possibility of tensile strains. The probability of open fissures present in close proximity to the base of the embankment is low, but continued strain could produce future fissuring to the surface along photo-lineaments.

Low Hazard - Portion of dam alignment lacking in significant numbers of intersecting photo-lineaments and seismic anomalies, coupled with interferometric and crest settlement profile data indicating the lack of appreciable horizontal strain.

In view of the photo lineaments present, the frequency and pattern of seismic anomalies, direct field evidence regarding the location of known fissures, and the geodetic, geophysical and interferometric data, the earth fissuring risk for that portion of the embankment corridor under study can be zoned. The following summarizes a recommended hazard zonation for the study region, with that portion within the South Study Area depicted on Figure 29:

South Study Area

- **40+00 – 56+00 (hazard – low)**

1. Short segments of arroyos located east and south of dam are skewed to normal dendritic pattern, indicating presence of ancient fissures.
2. Low density of photo lineaments.
3. Could be region now dormant, in closer proximity to exposed bedrock to the west, with dewatered, shallow sediments in the alluvial profile.
4. Occurrence of seismic anomalies limited, with 4 detected within a distance of 800 feet along the downstream toe of the dam.
5. No interferometric indication of local differential profile of ground subsidence.

- **56+00 – 75+00 (hazard – high)**

1. Close proximity of known fissures.
2. High density of photo-lineaments and seismic anomalies
3. Dam alignment curves to north, creating additional uncertainty between Stations 63+00 and 66+00.
4. Region of contrasting differential subsidence, with subsidence bowl to the east and south of known fissures, likely created by consolidation of fine-grained sediments in the alluvial profile.
5. Probable shallow buried bedrock ridge immediately west of zone

- **75+00 – 105+00 (hazard – moderate)**

1. Transition of alignment towards region of pronounced subsidence to north, as indicated by interferogram.
2. Geophysical indications regarding the presence of basin-bounding fault crossing under the embankment in the vicinity of Station 85+00, creating possible rapid contrast in alluvial thickness.
3. Increased density of photo-lineaments, with some weak seismic anomalies detected.

4. Region between Stations 90+00 and 100+00 contains several strong lineaments whose trend is largely transverse to dam and coincident with other lineaments upstream above the retention pool.

- **105+00 – 125+00 (hazard – low)**

1. Pattern of photo-lineaments and interferometry indicates presence of stable ground.
2. Crest settlement history indicates transition to region of long-term lateral compression.

North Study Area

The diffuse zone of photo-lineaments detected within the North Study Area (Figure 26) may represent a focus of past strain, with some differential subsidence now occurring in the region due to modern declines in the groundwater table. The recent geophysical surveys do not identify a possible cause for the subtle contrast in subsidence rates detectable in the interferometry of this area. Although largely conjectural, it is possible that lateral and vertical variations in the distribution of fine-grained sediments within the deep alluvium may be responsible for the subsidence contrast.

Due to the limited nature of the investigation within the North Study Area, it is conservatively recommended that the McMicken embankment between Stations 275+00 and 285+00 receive special consideration during the development of protracted surveillance, monitoring and characterization strategies. This region is not considered to be comparable to the 75+00/105+00 moderate hazard zone of the South Study Area, considering the lack of shallow, variable depth to bedrock and distinct, linear contrasts in the rate of subsidence.

11.0 CONCLUSIONS AND RECOMMENDATIONS

Due to the limited displacements observed, it is unlikely that the earth fissures detected upstream of the embankment currently pose a risk of a piping failure of the embankment during periods of floodwater detention. Upon experiencing further horizontal strain, these fissures will likely widen, thereby creating a future hazard to the safe operation of the facility. Additional strain in segments of the embankment between Station 56+00 and 105+00 may also cause other fissures to develop.

11.1 Monitoring

In light of the current understanding of fissure development near McMicken Dam, monitoring should play a pivotal role in the District's ability to anticipate and detect fissuring. Such monitoring could reduce the extent of initial corrective actions, while assuring adequate dam safety and directing future protective efforts. It may be possible to tailor future corrective efforts on those areas experiencing strain to a degree deemed sufficient to produce horizontal fissure displacements of a magnitude necessary to produce a piping threat to the embankment.

Options exist regarding the technologies capable of detecting damaging subsidence and fissures, and measuring horizontal strain as a precursor and alert mechanism to fissure formation across the McMicken Dam embankment. A monitoring design should be formulated upon completion of the recommended geophysical data collection and interpretation, and land subsidence/strain modeling. The approach should be designed to be of sufficient accuracy and durability, while providing rapid information in a cost-effective manner. The most viable monitoring system is likely one that assimilates and processes data from several sources, some conventional and some involving rapidly evolving, advanced technologies. The District should evaluate a spectrum of monitoring technologies, then develop, cost and construct a prototype system.

There are at three evolving technological categories with the capacity to monitor ground movements: 1) terrestrial time-domain reflectometry (TDR), 2) remote sensing techniques, and 3) global positioning. These technologies are in rapid change, with improvements in instrumentation, technique and data reduction a common occurrence. Each technology may have an application. It is imperative that each be assessed for its potential to augment or eliminate more conventional methods of measuring strain and geodetic position.

TDR is a technology that has a proven track record as applied to the measurement of minute strains in rigid structures, such as bridges and buildings. Recent developments in instrumentation, detection capacity and data reduction are making the technology a cost-effective approach to monitoring movements in earthen fills and natural ground. The most revolutionary development in TDR technology is in the use of a single optical fiber as a sensor capable of measuring strain at high accuracy. Costs for the instrumentation are moderating, and manufacturers are developing complete systems, with integrated sensors and detectors. Recent optical fiber systems employ Brillouin scattered light, with vendor claims of high accuracy, and lower cost.

The application of aircraft-based remote sensing as a means of detecting earth fissures is greatly enhanced by acquiring project-specific data. Once the terrain and geologic setting are appraised, flight mission altitude and related mission criteria can be selected to optimize the sensitivity of the imagery in the detection of fissures. As applied during this study, the preferred method is the use of low-sun-angle, vertical, black-and-white photography. This approach has proven highly successful in detecting surface discontinuities in the semiarid terrain surrounding McMicken Dam. Periodic acquisition of remote sensing data of the risk zone should be part of a long-term monitoring program for McMicken Dam.

Certain attributes of the McMicken fissure risk zone make the continued application of InSAR attractive. The rate of subsidence is compatible with the ability of the INSAR data to detect change. InSAR is currently fraught with the problem of decorrelation caused by rapid surface variations, such as agricultural crops. The south end of McMicken Dam is removed from areas of potential decorrelation. Data processing techniques are currently under study by the US Geological Survey and the Center for Space Research to make interferometry useful in previously decorrelated terrain. Use of dedicated radar reflectors is also being studied, and prototype testing is underway. All these factors need consideration in evaluating the usefulness of the technology.

The US Department of Defense (DOD) Global Positioning System (GPS) has revolutionized the acquisition of geodetic data. Its application has and will continue to replace more conventional means of acquiring horizontal and vertical position. GPS has application to the monitoring of local quadrilaterals positioned to straddle earth fissures, and periodic elevation sweeps of more regional extent along embankment corridors and crests.

Development of an effective monitoring strategy should give equal consideration to more conventional means of measuring elevation change and horizontal strain, and detecting earth fissures. These techniques include the use of tape extensometers, shallow seismic refraction to detect fissures, trenching and pit logging to verify the presence of fissures, and groundwater level recordings. Some of these applications bridge the gap between investigation and operational monitoring, providing the basis for designing a site-specific system.

11.2 Characterization of North Study Area

Further investigation of the characteristics of a diffuse zone of northwest-trending photo-lineaments within the North Study Area should be considered. The three basic methods of investigation proven to be highly effective in detecting earth fissures in the South Study Area should be applied. The first of these methods is shallow seismic refraction profiling. Approximately four, 900-foot long, northeast-trending coupled traverses should be completed, one in each of the quadrants formed by the intersection of the McMicken embankment and Bell Road. In conjunction with the geophysics, additional ground reconnaissance should be performed, utilizing the recent 2002 LSA aerial photography to ground truth all lineaments within the zone of interest. Once the reconnaissance and the seismic investigation is complete, shallow trenching should be performed to expose the subsurface profile at anomalies detected in the refraction signals, and across lineament trends. Although subject to adjustment as the field program proceeds, about 400 linear feet of trenching, in the same configuration completed for the "TT" series trenches in the South Study Area, will likely be required to characterize discontinuities in the shallow soil profile.

11.3 Geotechnical Considerations

It is understood that the District will rapidly commence an evaluation to select a remedial approach to mitigate the earth fissure risk. Under consideration will be structural modifications to the embankment, with the goal of preventing piping failure should an earth fissure widen sufficiently to provide a seepage conduit through the foundation soils and the embankment. The dominant influence upon selecting the physical attributes, cross-sectional geometry and lateral extent of these modification options will be the local geotechnical conditions. Some of these conditions have been sufficiently characterized, where some should be further investigated to refine the design of a selected alternative.

Of significance in regards to properly designing and constructing any physical intercept to prevent piping is the nature of the shallow alluvial fan deposits under the dam. These recent investigations have revealed a highly erratic distribution of relatively permeable sand/gravel/cobble deposits, some of which extend beyond the depth of the test trenches. The hollow-stem auger borings completed by SHB (1982) in the general area indicate the presence of similar materials at depths to at least 30 feet. These units contain permeable lenses of coarse sand and fine gravel, with the bulk of the unit containing coarser, clast-supported and imbricated alluvial channel deposits.

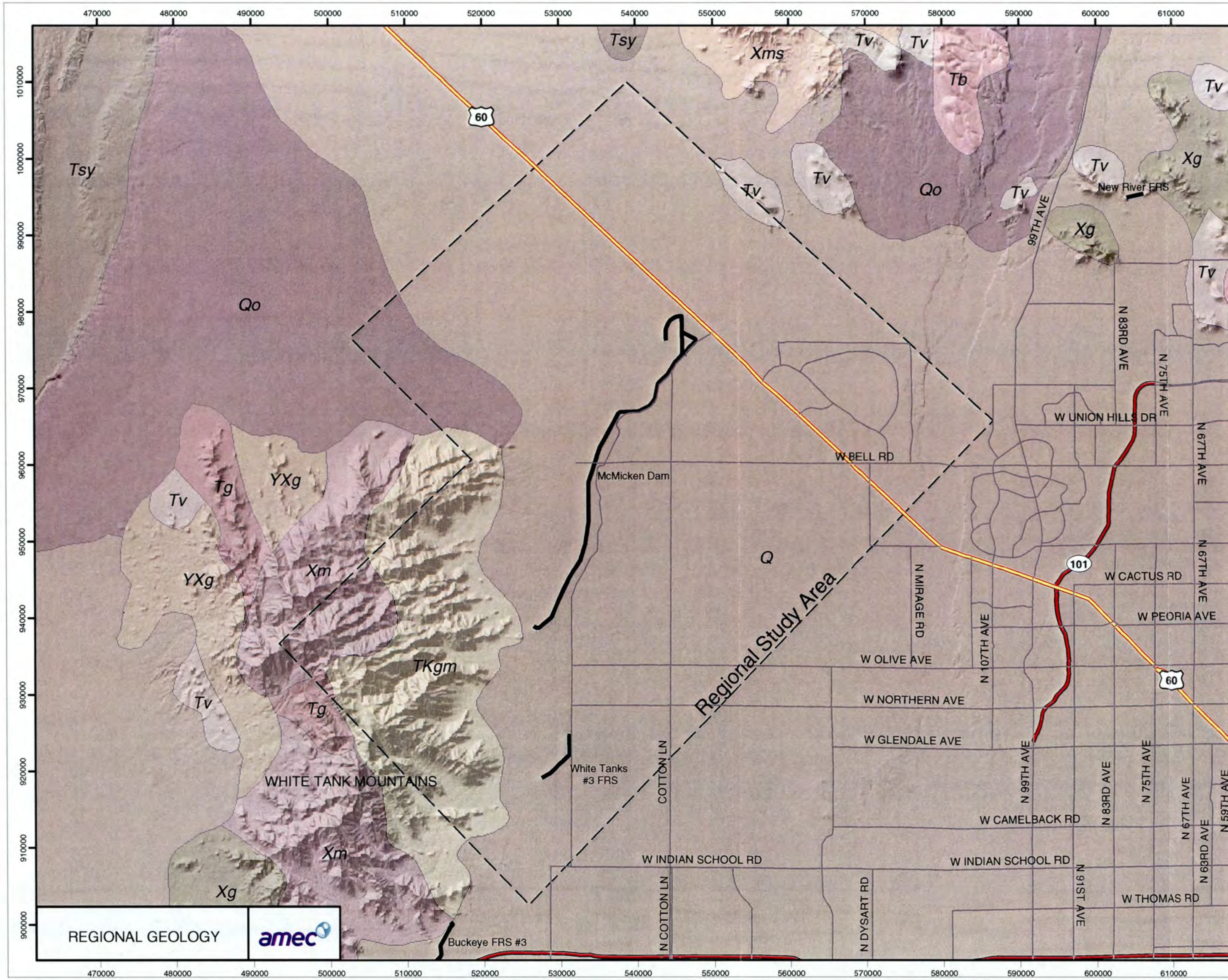
In most locations the permeable, caving deposits described above are underlain by Mid-Pleistocene alluvium, often with mature soil development. The upper calcrete of these deposits is rock-like, with the capacity to resist the seepage-induced erosion along an earth fissure. These calcretes are often underlain by more friable sand/gravel/cobble deposits, some with boulders to 24 inches. The calcretes are often truncated laterally, likely due to subsequent episodes of channel cutting across the ancient alluvial fan surface. Should the District select a modification to the dam to prevent piping as the preferred defensive strategy, the shallow foundation soils need subsequent detailed study, so as to assure proper vertical barrier penetration or extent of other preventative configurations.

11.4 Protective Land Use Strategy

Consideration should be given to the possibility of establishing a zone of no further development for the region within 1,500 to 2,000 feet of the McMicken Dam embankment south of Station 115+00. Having this zone would prevent the obscuring of present and future fissures by further development, thereby enhancing the effectiveness of photogeologic and ground monitoring efforts.

Although not quantified, one factor revealed by regional interferometry is the extent of the bowls of ground subsidence surrounding large-capacity groundwater wells. Distinct subsidence often radiates out from these pumping centers for a distance of ¾ to 1 mile. Whether such centers will grow in lateral extent through time is an open question. However, this discovery reveals the possibility of preventing or lessening the occurrence of earth fissures by restricting the siting of new wells in regions of distinct fissuring risk. Consideration should be given to limiting the future siting and operation of large-capacity wells within a protective fringe near the southern portion of McMicken Dam. The extent of this buffer zone should be determined by further study of the hydrogeologic conditions of the local area and the proposed location, yield, depth and anticipated drawdown of any well(s) proposed.

FIGURES



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Earth Fissure Investigation
McMicken Dam
Work Assignment Nos. 4 & 5
Contract FCD 2000C006
Maricopa County, Arizona

LEGEND

- Q-Surficial Deposits
- Qo-older surficial deposits
- TKgm-granitic rocks
- Tb-basaltic rocks
- Tg-granitoid rocks
- Tsy-Sedimentary rocks
- Tv-Volcanic rocks
- Xg-granitoid rocks
- Xm-metamorphic rocks
- Xms-metasedimentary rocks
- YXg-granitoid rocks

NOTES

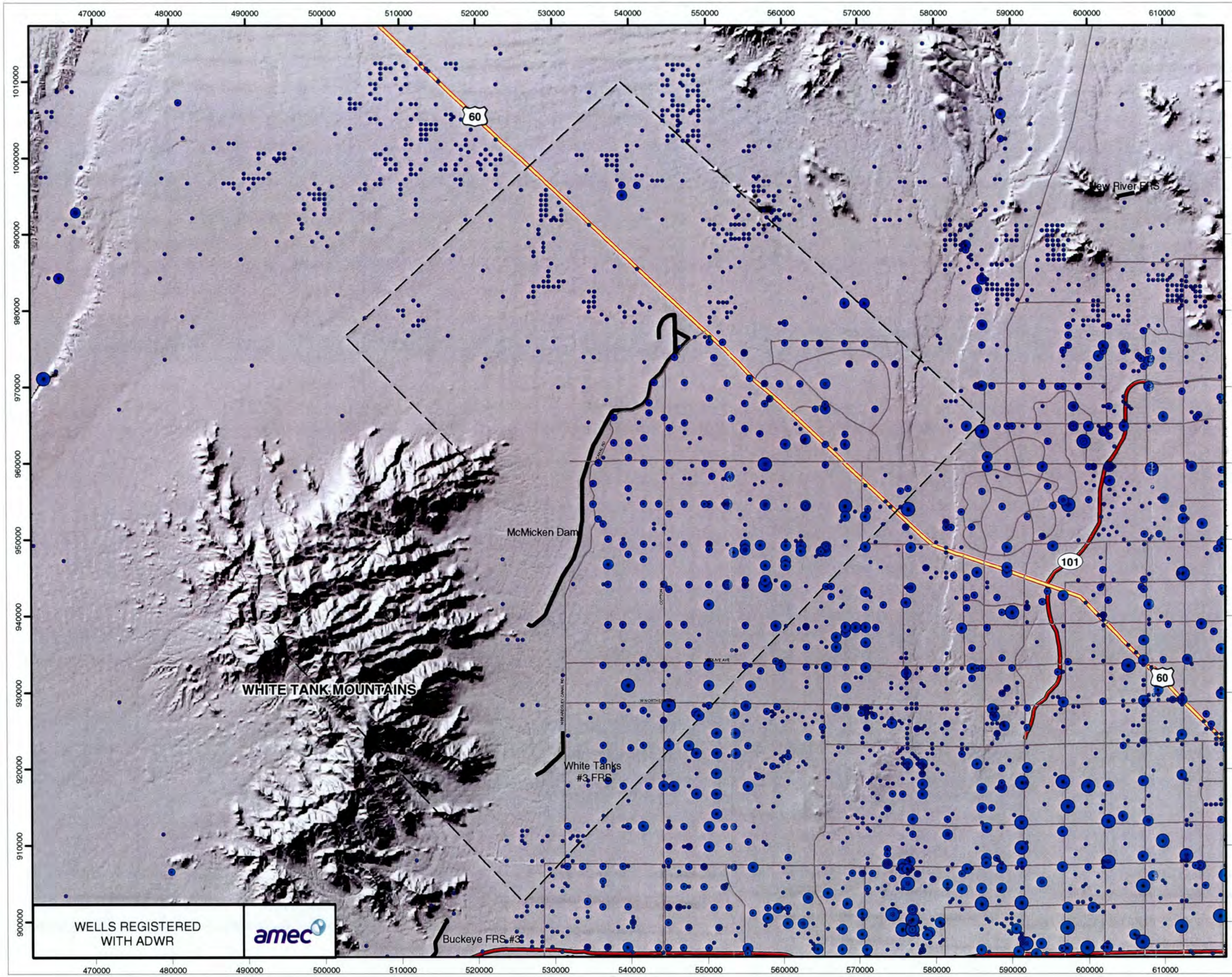
Geology Data from Arizona Geological Survey DI-8, v.2, 2000

Road Data derived from U.S. Department of Commerce, Bureau of the Census, Geography Division, 2001TIGER/Line Files

Data is in State Plane Coordinates (international feet) for the Arizona Central zone using the North American Datum of 1983.

AMEC Job No. 0-117-001122

	By	Date	
DESIGN	EMP	1/24/03	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.			RECOMMENDED BY Date:
PLANS			APPROVED BY Date:
PLANS CHK.			CHIEF ENGINEER AND GENERAL MANAGER
SUBMITTED BY: Date:			FIGURE 2



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
Earth Fissure Investigation
McMicken Dam
Work Assignment Nos. 4 & 5
Contract FCD 2000C006
Maricopa County, Arizona

LEGEND

PUMPRATE (gpm)

- 0 - 450
- 451 - 1500
- 1501 - 2500
- 2501 - 4500
- 4501 - 7000

NOTES

Well Data from
Arizona Department of Water Resources
Arizona Well Registry Distribution Database
March 2002

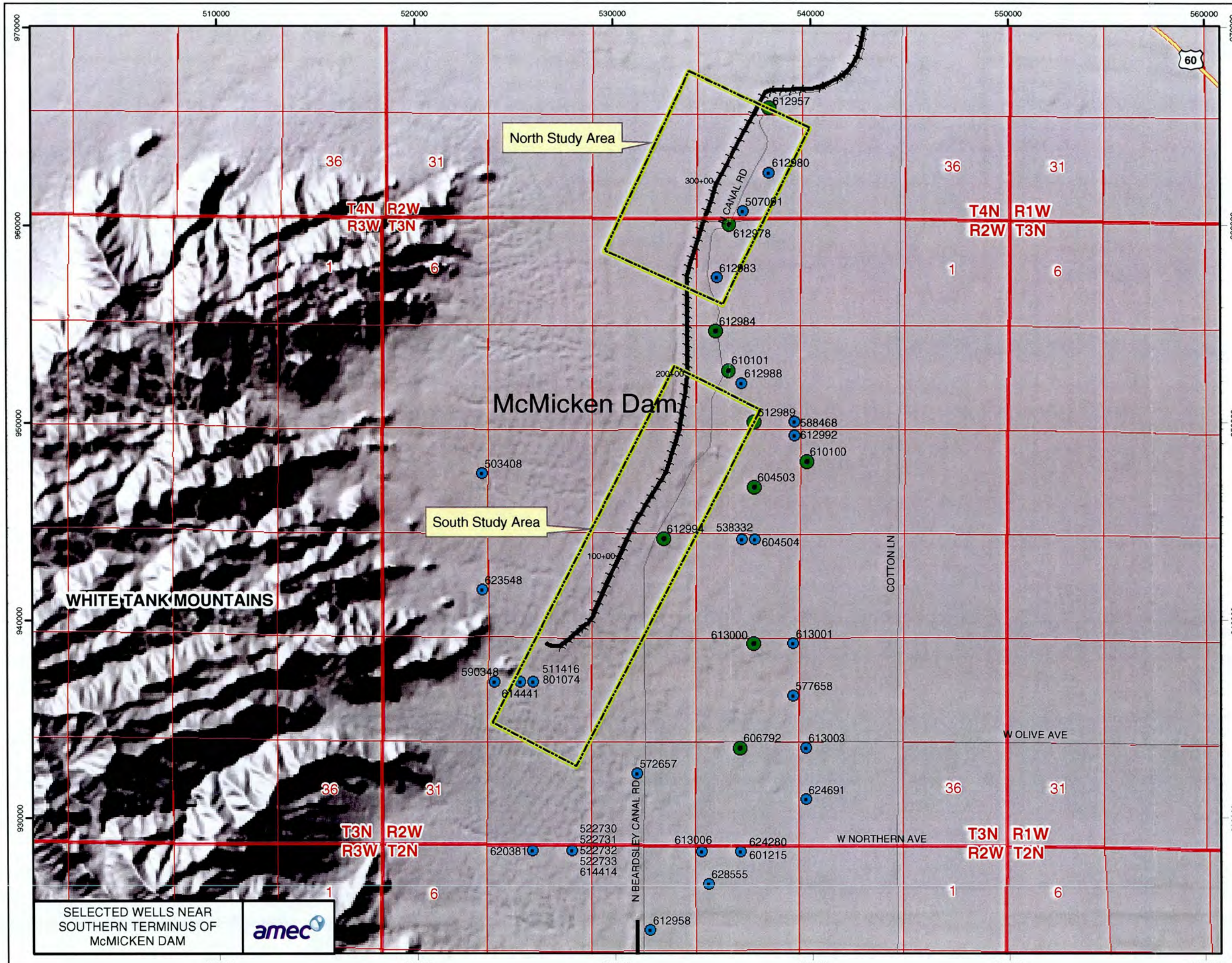
Road Data derived from U.S. Department of Commerce, Bureau of the Census, Geography Division, 2001TIGER/Line Files

Data is in State Plane Coordinates (international feet) for the Arizona Central zone using the North American Datum of 1983.

N S W E
1 0.5 0 1 2 Miles

AMEC Job No. 0-117-001122

	By	Date	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN	EMP	1/24/03	
DESIGN CHK.			RECOMMENDED BY Date:
PLANS			APPROVED BY Date:
PLANS CHK.			CHIEF ENGINEER AND GENERAL MANAGER
SUBMITTED BY: Date:			FIGURE 4



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

Earth Fissure Investigation
McMicken Dam

Work Assignment Nos. 4 & 5
Contract FCD 2000C006
Maricopa County, Arizona

LEGEND

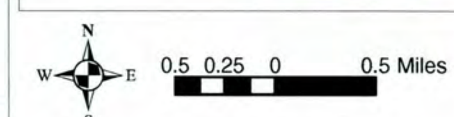
- Water Wells
- 621000 ADWR Registration Number
- Water Wells with Hydrograph

NOTES

Well Data from
Arizona Department of Water Resources
Arizona Well Registry Distribution Database
March 2002

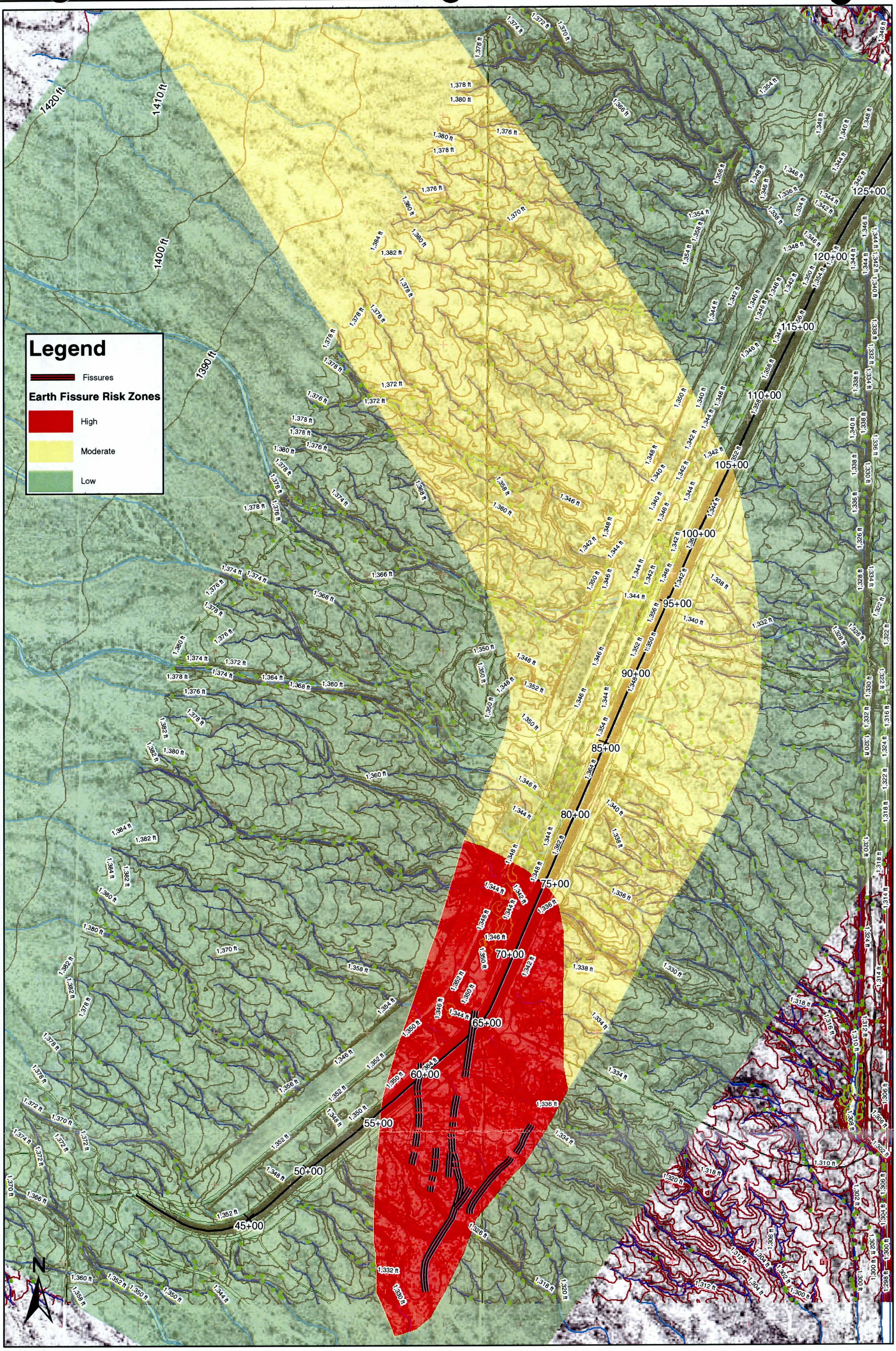
Road Data derived from U.S. Department of Commerce, Bureau of the Census, Geography Division, 2001TIGER/Line Files

Data is in State Plane Coordinates (international feet) for the Arizona Central zone using the North American Datum of 1983.



AMEC Job No. 0-117-001122

	By	Date	
DESIGN	EMP	1/24/03	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.			RECOMMENDED BY Date:
PLANS			APPROVED BY Date:
PLANS CHK.			CHIEF ENGINEER AND GENERAL MANAGER
SUBMITTED BY: Date:			FIGURE 5



JOB NO.: 0-117-001122 DESIGN: REW DRAWN: EMP DATE: 12/19/02 SCALE: 1 " = 600 '	Earth Fissure Investigation - McMicken Dam Work Assignment Nos. 4 & 5 Contract FCD 2000C006 Maricopa County, Arizona		amec
	Earth Fissure Risk Zones	FIGURE 29	

APPENDIX VI

DEVELOPER DRAINAGE REPORTS (EXCERPTS)

CMX

PRELIMINARY DRAINAGE REPORT

FOR

PHASE 2 OF ZANJERO TRAILS

SURPRISE, ARIZONA

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Phone: (602) 567-1900
Fax: (602) 567-1901

Registered Professional Engineer (Civil)
CERTIFICATE NO.
36390
MICHAEL
WEINBERG
Date Signed 2-28-08
ARIZONA, U.S.A.

February 2008
Project No. 6714.06

1.0 INTRODUCTION

1.1 PURPOSE

This report has been submitted in support of the preliminary plat for the second phase of the overall Zanjero Trails development. The preliminary drainage report described herein has been prepared to meet the standards for storm water management as described in the City of Surprise Drainage Standards, and the Drainage Design Manuals for Maricopa County, Volume I, Hydrology and Volume II, Hydraulics, January 1996.

1.1.1 Project Name, Location and Topography

Phase 2 of Zanjero Trails is located in Maricopa County and consists of approximately 411 acres in portions of Sections 21 and 22 of Township 3 North, Range 2 West. The property is generally bound by Cactus Road on the north and Peoria Avenue on the south, the mid-section line of Section 22 on the east and the Beardsley Canal on the west. The property is located within the planning area for the City of Surprise. The site, as well as the surrounding area, generally slopes to the southeast at approximately 0.7 percent.

1.1.2 Existing and Ongoing Studies

Drainage related facilities for Phase 2 of Zanjero Trails will be designed in accordance with the Master Drainage Study for Phase 2 of Zanjero Trails submitted to the City of Surprise in May 2007. Drainage related facilities for Parcel SC1 will be designed in accordance with the Final Drainage Report for 'Dysart High School', submitted to Maricopa County Planning and Development Department in November 2007.

1.1.3 Regional Drainage Plan

The baseline hydrologic data for evaluation of drainage facilities in this region of Maricopa County is the Loop 303 Corridor / White Tanks Area Drainage Master Plan (WT ADMP, URS, June 2001).

1.1.4 Site Location Relative to Known FEMA Flood Hazard Zones

The property is located entirely within Flood Hazard Zone X (Other Flood Areas) as delineated on FEMA Flood Insurance Rate Map (FIRM) number 04013C1580H revised September 30, 2005 (Figure 3).

Zone X (Other Flood Areas) is defined as follows:

> "The flood insurance rate zone that corresponds to areas outside the 100-year floodplains, areas of 100-year sheet flow flooding where average depths are less than 1 foot, areas of 100-year stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone."

2.0 HYDROLOGIC ANALYSIS

2.1 OFF-SITE HYDROLOGY AND IMPACTS TO PROPOSED PROJECT SITE

In general, historic offsite drainage areas for Phase 2 of Zanjero Trails originated from the White Tanks Mountains west of the project. Today, the McMicken Dam and Beardsley Canal obstruct these flows from discharging to Phase 2. Flows generated in the small sub-basin located immediately north of Phase 2 of Zanjero Trails, and east of the Beardsley Canal, are directed east along Cactus Road. Areas east and south of Phase 2 drain away from the study area. Figure 4 in Appendix A, gives an overview of the regional drainage patterns surrounding the site.

2.1.1 Existing Landuse

The site as well as the surrounding area is currently undeveloped with native desert vegetation.

2.2 ON-SITE HYDROLOGY

2.2.1 Methodology and Criteria

Under existing conditions, flows produced by the Phase 2 site have been directed in a southeastward direction. As shown in the Figure 4 in Appendix A, runoff generated by the site (ADMP Sub-basins 159 and 160) is directed to a point roughly 0.5 miles east of the intersection of Peoria Avenue and Perryville Road.

The proposed conditions for Phase 2 of Zanjero Trails will largely mimic the existing conditions outlined in the ADMP. Flows generated west of Perryville will be conveyed to the intersection of Peoria and Perryville. This flow will be conveyed beneath the roadway intersection via a pipe culvert. A proposed channel, to be constructed parallel to Peoria Avenue, will route the flow eastward toward the historic outfall. Flows produced by Phase 2 development east of Perryville Road will also be collected in the channel and routed to the east.

On-site rainfall runoff will be routed to retention ponds via in-street flow and, when necessary, storm drain pipe. The Preliminary Drainage Exhibit (Figure 5) shows proposed street routings through onsite drainage sub-basin network. The specific locations or sizes of storm drain pipe within the local roadways of Zanjero Trails are not shown in this report. These lines will be designed at the time of improvement plan preparation for each of the parcels, according to the standards provided by Maricopa County for such facilities where roadway elevations and slopes are defined.

Parcels 11D, 12D, 14 and 15 will be developed as commercial parcels in future. Developed condition hydrologic analysis for Phase 2 of Zanjero Trails takes into account future development of these parcels and depicts full 100-year, 2-hour retention volumes provided for these parcels.

Retention basins for Zanjero Trails have been designed with storage volume for the entire developed-conditions runoff produced by the 100-year, 2-hour rainfall event. The retention basins will be drained within 36 hours, either through natural infiltration, controlled bleed-off to adjacent channels or washes, or via percolation through drywells.

Retention basin bleed-off, major roadway runoff, and retention basin overflow will be conveyed through Zanjero Trails within local and collector streets, and landscaped open channels. The proposed locations of the landscaped open channels are represented as routing channels in the Preliminary Drainage Exhibit (Figure 5). These drainage ways will discharge storm water to the south into a proposed drainage channel along Perryville Avenue and then towards the east in a proposed channel along Peoria Avenue. This system maintains the historic drainage patterns documented in the ADMP.

Developed conditions HEC-1 models, which include provision of retention basins, have been produced for 100-year, 24-hour and 100-year, 6-hour storm events. Comparison of peak flow rates from both the models shows that 100-year, 6-hour storm event is the controlling storm event for this site. Output of these models can be found in Appendix C. The post development flow rates at discharge points are lower than their respective existing conditions discharge listed in the ADMP.

3.0 PROPOSED DRAINAGE INFRASTRUCTURE

3.1 CONVEYANCE OF RUNOFF THROUGH PROJECT SITE

As stated above, the on-site rainfall runoff from Phase 2 of Zanjero Trails will be routed via in-street flow and, where necessary, storm drain pipes to retention basins. The volume of runoff created by the 100-year, 2-hour storm will be retained. Although full 100-year, 2-hour retention volume requirement will be satisfied for entire site at individual Parcel level, some intra-parcel retention basins do not have enough retention volume. Overflow from these retention basins will be routed via in-street flow, and where necessary storm drain pipes, to another retention basin with excess volume available.

3.2 ONSITE RETENTION REQUIREMENTS

Under developed conditions, imperviousness of onsite watersheds is increased, which in turn increases the amount of runoff generated from the same drainage sub-basins in existing conditions. Developed areas within Maricopa County are required to regulate stormwater discharge such that net flow rates discharged from the site are equal to or less than the pre-development rate. This is often controlled through the construction of retention basins. Provision of full 100-year, 2-hour onsite retention volume, demonstrated developed conditions flow rates to be less than pre-development flow rates.

3.2.1 Required Retention Volume

The runoff analyses for the on-site drainage areas has been performed according to the Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics, January 1996, using the rational method. The total runoff volumes have been calculated according to the following equation:

$$V = C\,(P/12)\,A$$

Where:
- V is the total runoff volume (acre-ft)
- C is the runoff coefficient
- P is the 100-year, 2-hour rainfall depth (2.8 inches)
- A is the drainage area (acres).

For calculating runoff volume, Maricopa County uses Figure 8-1, the 100-year, 2-hour Precipitation Isopluvial Map. The runoff coefficients for the sub-basins has been taken from Table 3.2 in the Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology, January 1995. For the developed conditions calculations, the C value corresponds to the weighted average for appropriate land use in Table 3.2 of the Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology, January 1995.

The base values used to compute weighted runoff coefficients were as follows:

Asphalt - 0.95
Landscaping - 0.31
Single Family Residential - 0.69
Commercial - 0.88
Multi-Family Residential - 0.75

Table 2.1 in Appendix B shows computation of Weighted Runoff Coefficient for 100-year storm event. Table 2.2 in Appendix B shows the required retention volumes.

Parcel SC1 is a proposed high school site for Dysart High School. Required retention volume for this parcel was calculated as 9.90 ac-ft. Drainage related facilities for Dysart High School will be designed in accordance with the Final Drainage Report, submitted to Maricopa County Planning and Development Department (December 2007). Based on this report, full 100-year, 2-hour provided retention volume for the entire site is 10.182 ac-ft. This volume was used for Parcel SC1 while computing 100-year, 6-hour and 100-year, 24-hour peak flow rates using HEC-1 analysis (Appendix C).

Parcels 11D and 12D will be developed as multi-family parcels in future. Parcels 14 and 15 will be developed as commercial parcels in future. In the interim conditions, retention volume will be provided for these parcels using a runoff coefficient of 0.50 for "Undeveloped Desert". Table 2.3 in Appendix B shows minimum retention volumes provided for parcels 11D, 12D, 14 and 15. When these parcels are developed in future, the full 100-year, 2-hour retention volume listed in Table 2.2 will be provided for these parcels.

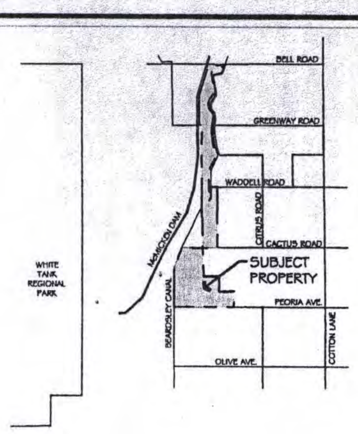
3.2.2 Ultimate Retention Basin Outfall

Retention basin outlet facilities will generally consist of 6-inch pipes or larger with throttling devices for controlled bleed-off of retained water and low-water discharge. For high-water discharge, riprap-lined overflow structures or other types of structures may be used to discharge water downstream. Where retention basins cannot be bled off through discharge pipes, drywells will be utilized for percolation. Dry well percolation test results will be provided with the Final Parcel Drainage Report to support dewatering calculations. Basins will be designed such that retained water is bled off or drained within 36 hours of each storm event by these methods.

The bleed-off pipes will be designed using Haestad Methods CulvertMaster, Version 3.0. The maximum discharge rate for the bleed-off pipes is 1 cfs. Riprap aprons, or other means of erosion control, will be placed downstream of all storm drain pipe outlets to protect against scour around the outlets, provide uniform spreading of the flows, and decrease the flow velocities. These structures will be designed in accordance with riprap nomographs contained in the *Municipal Stormwater Management Manual* 2nd Edition by Debo and Reese, as part of final parcel grading and drainage reports. The high-water outlet structures for the retention basins will also be designed as part of final parcel grading and drainage reports.

For storm events greater than the 100-year 2-hour, flows will convey through the site remaining a minimum of 1-foot below finish floors and will meet street capacity requirements.

Keymap



Legend

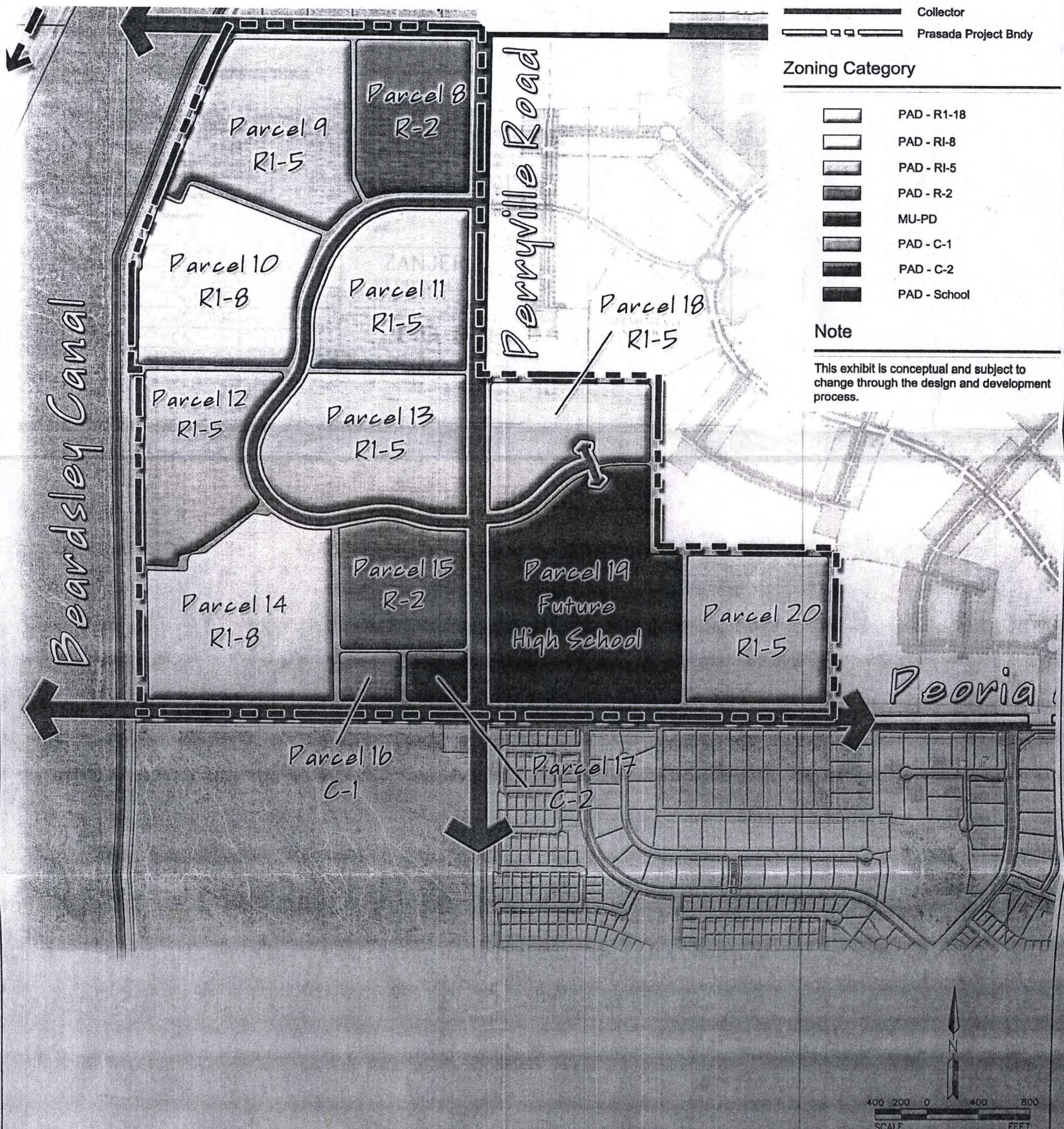
- Zanjero Trails Project Bndy
- Beardsley Canal
- McMicken Dam
- Arterial
- Collector
- Prasada Project Bndy

Zoning Category

- PAD - R1-18
- PAD - RI-8
- PAD - RI-5
- PAD - R-2
- MU-PD
- PAD - C-1
- PAD - C-2
- PAD - School

Note

This exhibit is conceptual and subject to change through the design and development process.



CMX PROJ.	6714.06
DATE:	FEB. 2008
SCALE:	1"=800'
DRAWN BY:	JAR/AMS
CHECKED BY:	AP

ZANJERO TRAILS-PHASE 2
PERRYVILLE ROAD & PEORIA AVENUE
SURPRISE, ARIZONA

FIG 2: LAND USE PLAN

CMX
PHOENIX OFFICE
7740 N. 16TH ST. STE 100, PHOENIX, AZ
PH (602) 567-1900 FAX (602) 567-1901

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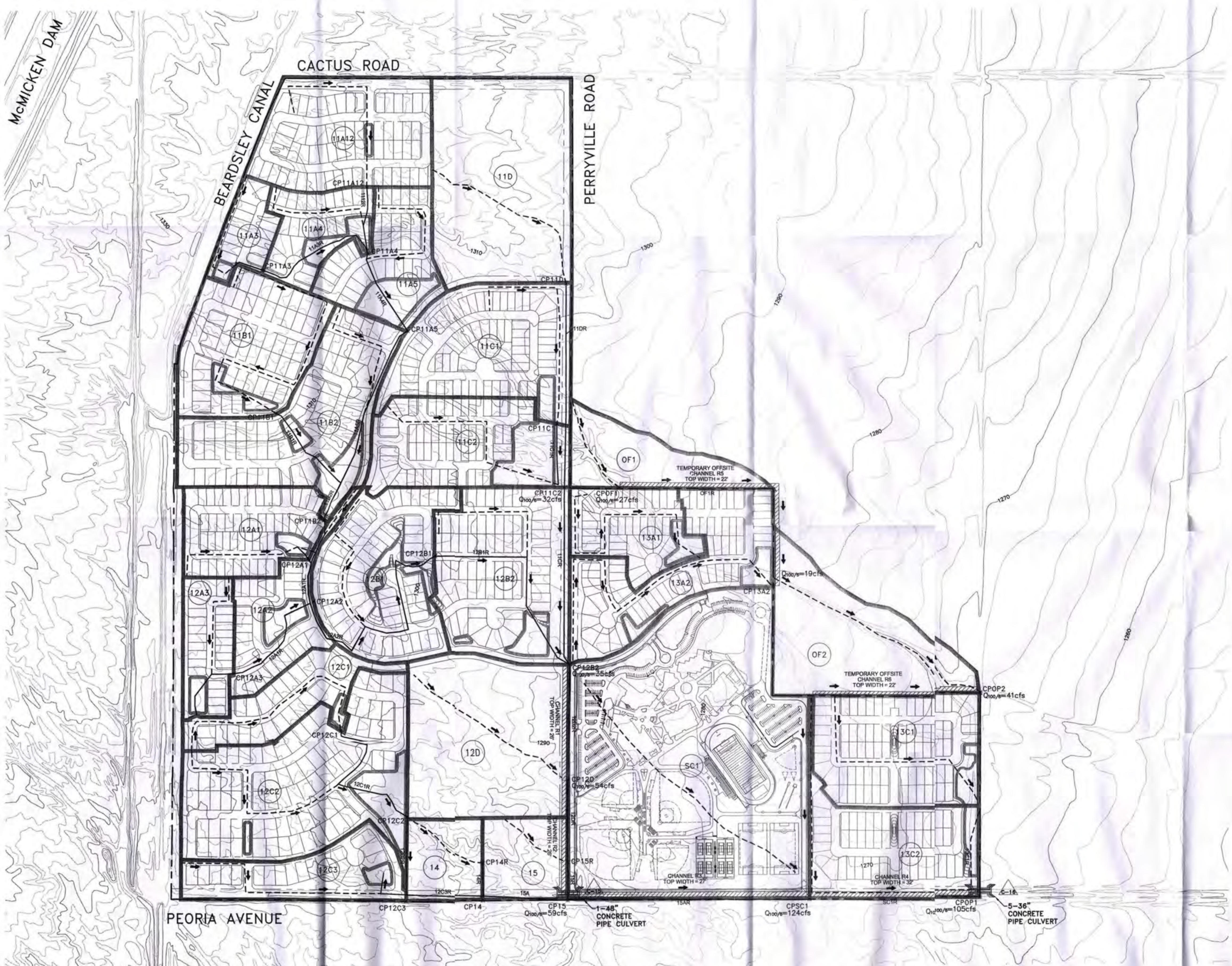

LEGEND

PROJECT BOUNDARY	
DRAINAGE AREA LABEL	11D
DRAINAGE AREA BOUNDARY	
FLOW ROUTING & LABEL	11CR
FLOWLINE	
CHANNEL CORRIDOR AND DIMENSION	CHANNEL R4 TOP WIDTH = 35'
CONCENTRATION POINT & LABEL	CP11A
FLOW ARROW	
RETENTION BASIN	

Comparison of Provided and Required Retention Volumes		
Parcel	$V_{Required}$ (acre-ft)	$V_{Provided}$ (acre-ft) [1]
11A	6.780	11.790
11B	6.350	8.820
12C	7.950	10.150
12A	4.340	6.050
12B	6.570	6.790
11C	5.720	10.390
11D	3.211 (1)	3.330
12D	2.837 (1)	2.910
14	0.672 (1)	0.730
15	0.747 (1)	0.830
SC1	9.900	10.182
13A	1.430	5.740
13C	5.400	5.890

NOTE:

[1] PROVIDED RETENTION VOLUMES ARE PRELIMINARY AND MAY CHANGE AT FINAL DESIGN STAGE.

(1) INTERIM VOLUMES TAKEN FROM TABLE 2.3. UPON BUILD-OUT, DEVELOPED RETENTION VOLUMES LISTED IN TABLE 2.2 WILL BE PROVIDED.

N

300 150 0 300 600

SCALE FEET

ZANJERO TRAILS-PHASE 2

PERRYVILLE ROAD & PEORIA AVENUE
SURPRISE, ARIZONA

FIG 5: PRELIMINARY DRAINAGE EXHIBIT

CMX PROJ. 6714.06
DATE: FEB. 2008
SCALE: 1"=300'
CMX
DESIGNED: MAN | DRAWN: JAR/BC | APPROVED: KCK
REV.
DWG. NO. 1
SHT. 1 OF 1

FINAL DRAINAGE REPORT

FOR

DYSART HIGH SCHOOL #4

NEC PERRYVILLE ROAD AND PEORIA AVENUE
MARICOPA COUNTY

Prepared for:
DYSART UNIFIED SCHOOL DISTRICT NO. 89
11405 N Dysart Road
EL MIRAGE, AZ 85335
Phone: (623) 876-7028
Fax: (623) 876-7036

Prepared by:
CMX, L.L.C.
7740 North 16th Street, Suite 100
Phoenix, Arizona 85020
602-567-1900

Registered Professional Engineer (Civil)
CERTIFICATE NO.
31694
STEPHANIE K.
KINSEY
Date Signed 12-2007
ARIZONA, U.S.A.

December, 2007
CMX Project No. 7436

3.0 OFFSITE DRAINAGE

Under existing conditions offsite flows approach the site from the north and west. Contributing sub-basins originate below the McMicken Dam and Beardsley Canal and extend in a southeasternly direction toward Perryville Road. These flows overtop Perryville Road at two primary locations. The first crossing, situated just north of Peoria Avenue, has historically conveyed flows directly into the site in essentially a shallow sheet-flow condition. The second crossing, located roughly ½ mile north of Peoria Avenue, conveys flow across the roadway and into a shallow wash corridor herein referred to as the *North Wash*. The North Wash, which is the only wash that crosses the site, continues beyond Perryville Road in a southeastern direction and passes across the extreme northeastern portion of the site which for this project will remain undeveloped.

An offsite drainage management system has been designed for the site. A HEC-1 model was created to represent this system. The model combines undeveloped offsite drainage areas with the developed onsite area. The aforementioned HEC-1 model and corresponding hydrology exhibit can be found in Appendices B3 and C.

The following describes how offsite drainage will be handled based on existing conditions:

Flows approaching the site from the northwest will continue to do so. In this manner the estimated 100-year peak flow of 261 cfs will flow across Perryville at the historic crossing location and enter the North Wash. An offsite channel will be constructed north of the site to capture any offsite flows from the northwest and route them to the North Wash. A HEC-RAS analysis was performed in order to delineate the floodplain and floodway limits of the North Wash (See Appendix C for the results of this analysis). As shown on Figure 5, the floodplain limits of the North Wash do extend into the northeastern corner of the site within an area that will remain undeveloped for this project. All finished floor locations adjacent to the North Wash have been set a minimum 12 inches above the corresponding high water surface elevation.

The second provision of the offsite drainage management system will be the construction of a collector channel along the west side of Perryville Road between the southern boundary of the North Wash watershed and Peoria Avenue. This channel will collect those offsite flows approaching the site from the west and route them south to the intersection of Perryville Road and Peoria Avenue (See Appendix C5 for channel calculations). These flows (a 100-year peak flow of 309 cfs) will enter an offsite detention basin that will be constructed at the northwest corner of the intersection of Perryville Road and Peoria Avenue. This detention basin will be used to attenuate the peak flow crossing Perryville Avenue and entering the onsite drainage channel just north of Peoria Avenue to 180 cfs. See Appendix B2 for detention basin calculations.

Those flows contained in the offsite detention basin will be metered out under Perryville Road via a single 48-inch pipe culvert. This culvert will discharge to a triangular, grass-lined channel that will be constructed along the southern boundary of the site just north of Peoria Avenue. This channel serves as a means of conveying these offsite flows to the historic outfall, an emergency outfall for onsite retention basins, and a discharge point for Peoria Avenue storm drain (See Appendix C5 for channel calculations). The onsite channel will continue along the southern boundary of the site and will exit under the southeast roadway entrance via 5 -36" pipe culverts (See Appendix C6 for culvert calculations). As the downstream invert of these culverts is substantially below the natural grade east of the site, an offsite channel will continue to route flows east of the site until the channel is able to daylight to existing approximately 1,100 feet east of the site where the flows will outlet and continue on their historical path.

The methodology employed for the hydrologic and hydraulic design used to manage the offsite flows impacting the site is in accordance with the Flood Control District of Maricopa County design standards. The drainage patterns maintained through this management mirror those provided in the Zanjero Trails Master Drainage Study (see Reference #4), and the *Loop 303 Corridor White Tanks Area Drainage Master Plan Update* (See reference #5).

4.0 ONSITE DRAINAGE

INFRASTRUCTURE:

<u>Desert Cove Road</u>

Desert Cove Road has been designed so that the majority of the runoff generated by the half street improvements adjacent to the site will be conveyed to the northeast end, where a catch basin located on a sump condition has been placed. The 100-yr 2-hr runoff volume for this street will be retained by onsite basin B1.

<u>Perryville Road</u>

A small portion of runoff generated by Desert Cove Road will discharge to Perryville Road half street improvements. Perryville Rd has been designed to convey flows to the south, where two 24-feet wide scuppers, on a flow by condition, have been placed to remove most of the flow generated by the half street. The first scupper will capture 6.5 cfs, generated by a 100-yr storm, and will convey such runoff to the onsite retention basin E9. The second supper will capture 3.9 cfs and will convey the corresponding runoff volume to the onsite retention basin E11.

LEGEND

48	DRAINAGE LABEL		PROJECT BOUNDARY
⁎CP-48	CONCENTRATION POINT		ROUTING
R47	ROUTING LABEL		DRAINAGE BOUNDARY
2 ——	HEC-RAS SECTION		FLOW ARROW

N

DWG. NO.	CMX PROJ: 7436	DATE: DEC., 07	SCALE: N.T.S.	DYSART HIGH SCHOOL PERRYVILLE ROAD AND PEORIA AVENUE MARICOPA COUNTY, ARIZONA
1	DESIGNED: AT/FJC	DRAWN: ALM	APPROVED: KCK	
	REV.			
SHT. 1 OF 1				FIG 3: OFFSITE HYDROLOGY EXHIBIT

CMX
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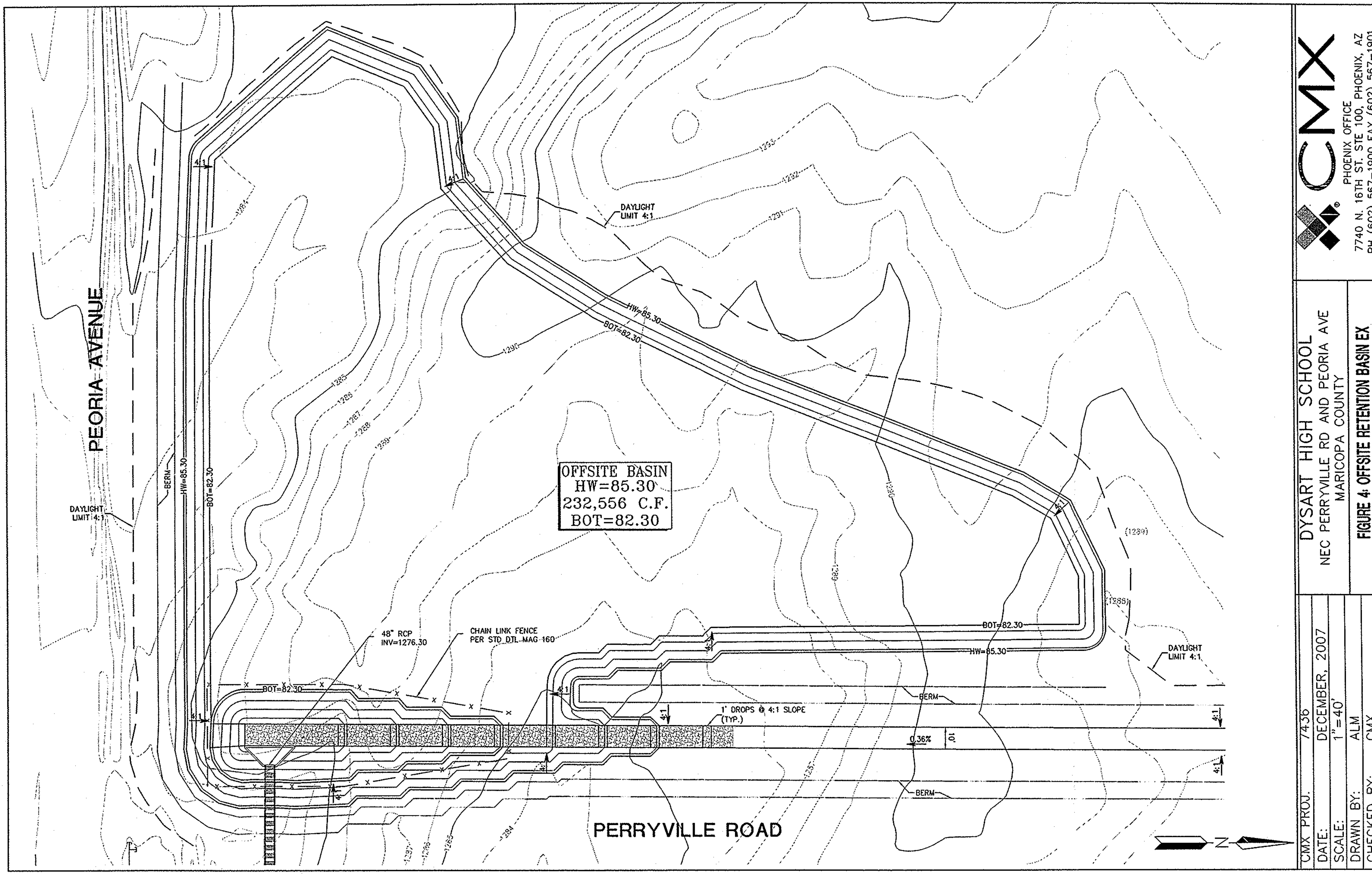
PEORIA AVENUE
PERRYVILLE ROAD
OFFSITE BASIN
HW=85.30
232,556 C.F.
BOT=82.30
DAYLIGHT LIMIT 4:1
BERM
HW=85.30
BOT=82.30
48" RCP
INV=1276.30
CHAIN LINK FENCE
PER STD DTL MAG 160
1' DROPS @ 4:1 SLOPE (TYP.)
0.36%
Z
CMX
PHOENIX OFFICE
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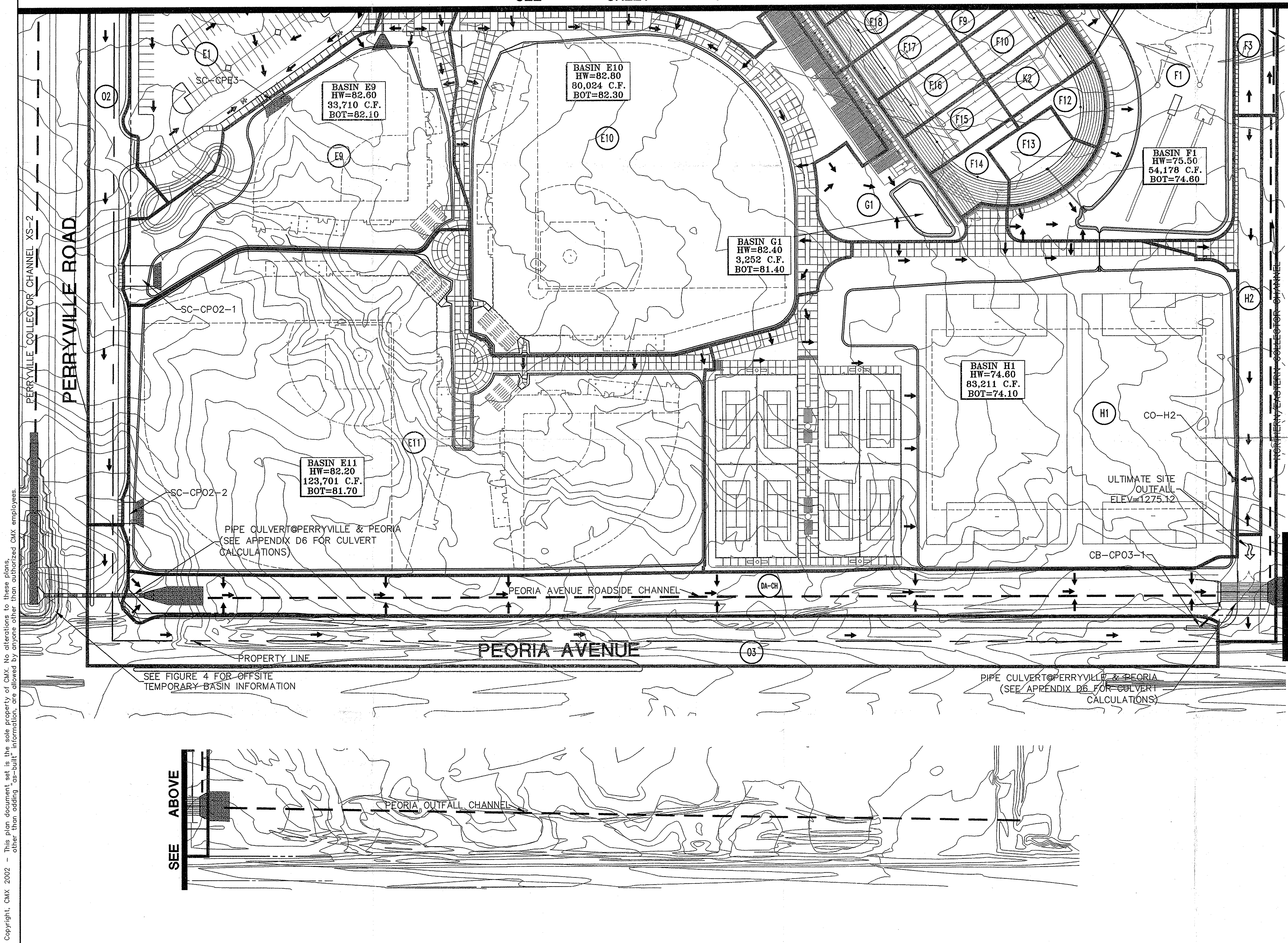
PH (602) 567-1900 FAX (602) 567-1901
DYSART HIGH SCHOOL
NEC PERRYVILLE RD AND PEORIA AVE
MARICOPA COUNTY
FIGURE 4: OFFSITE RETENTION BASIN EX
CMX PROJ. 7436
DATE: DECEMBER, 2007
SCALE: 1"=40'
DRAWN BY: ALM
CHECKED BY: CMX



LEGEND

- DRAINAGE AREA BOUNDARY
- DRAINAGE AREA LABELS — A-33
- FLOW ARROW
- STORM DRAIN PIPE
- RIP RAP APRON
- PEAK 100-YEAR DISCHARGE — Q_{100}=41.1 CFS
- CATCH BASIN
- CURB OPENING LABEL — CO-A2
- DRAINAGE CHANNEL

DYSART HIGH SCHOOL
PERRYVILLE RD AND PEORIA AVE
MARICOPA COUNTY

FIG 5: DRAINAGE PLAN

CMX PROJ. 7436	
DATE:	DECEMBER, 2007
SCALE:	1" = 60'
DESIGNED: JW	DRAWN: ALM
APPROVED: JDK	
REV.	DWG. NO. 2
	SHT. 2 OF 2

CMX

MASTER DRAINAGE REPORT

FOR

PRASADA

Peoria Avenue and Cotton Lane
Surprise, AZ

Prepared For:
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c/o Norm Nichols
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Phone: (602) 753-7506

Prepared By:
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7740 North 16th Street, Suite 100
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Phone: (602) 567-1900

Registered Professional Engineer (Civil)
CERTIFICATE NO.
35050
KEVIN C.
KAMMERZELL
Date Signed
ARIZONA, U.S.A.

Third Submittal: June 2006
Second Submittal: May 2006
First Submittal: December 2005
Project No. 6889

the Salt/Gila Rivers to the south. This report was an update to an Area Drainage Master Plan prepared for the Flood Control District of Maricopa County by the WLB Group, Inc. (WLB, 1995). Figure 4 in Appendix A shows the entire ADMP watershed with the Prasada project boundary overlay.

Data from the model developed by URS to predict 100-year 24-hour flow rates for the region were used in the evaluation of offsite stormwater flows to the project area. Figure 5 (Appendix A) shows the local sub-watershed boundary areas, flow routing directions and location of peak flows for the HEC-1 Model at the critical confluence points. The watershed up-gradient of the Prasada project area extends north of Union Hills Drive and northwest through a portion of the White Tank Mountains. The east-west arterial roadways convey storm runoff to the Agua Fria River. The specific east-west roadways relative to the project area are Greenway Road, Waddell Road, Cactus Road, Peoria Avenue and Olive Avenue. Flow splits or diversions occur at some of the arterial roadway intersections within the project watershed. This will not occur in the drainage area for developed or future conditions. The Existing Conditions HEC-1 Model (with projects such as regional channel systems in place) is located in Appendix C on a CD ROM.

3.0 DEVELOPED DRAINAGE CONDITIONS

The site does not contain any US Army Corps of Engineers (USACE) Section 404 washes or Section 401 wetlands.

Drainage reports for each parcel will provide detailed information regarding compliance by that parcel with the National Pollutant Discharge Elimination System (NPDES) for construction and post-construction conditions. Prior to construction, the developer or contractor will provide the City with a site-specific Storm Water Pollution Prevention Plan (SWPPP).

3.1 Off-Site Drainage

The Draft, Volume IV, Level III ADMP Update Report (URS, August 2004) provides alternative drainage solutions, and recommends the alternative that incorporates regional drainage solutions to control storm flow under post-development conditions. The selected alternative includes drainage channels and regional detention basins that are designed to mitigate flooding in the area. This drainage report utilized the post-development HEC-1 model with ultimate drainage control systems in place, including modifications to the off-line detention basin and the channels in the Loop 303 flood control system. Within this hydrologic model, the surrounding sub-basins have been modified to reflect post-developed conditions. 100-year, 2-hour retention volume was used, but the retention systems were assumed to be 80% effective to account for several hydrologic factors, including poor basin design and construction, sedimentation, poor maintenance, retention volume reduction variances in the overall watershed, and as a safety factor.

The future primary drainage system that will reroute existing condition flows upstream of the Prasada development is associated with the Loop 303 Freeway. Part of this freeway includes a parallel drainage channel system, which will divert all flows generated west of the Loop 303 south to the Camelback channel, then east to the Bullard Wash channel, and finally to the Gila River. Figure 5 in Appendix A illustrates flows from both models (existing and developed). The November 2004 election resulted in the passage of Proposition 400, which provides funding for the Loop 303 freeway and drainage improvements. This study therefore assumes that the freeway drainage improvements will be in place. This assumption reduces the sizes of drainage structures required for Prasada.

The FCDMC draft Level III Conceptual Design Plans (URS, November 2004) placed a regional detention basin at the corner of Cactus Road and the Loop 303 Freeway. This location is impractical for the proposed development of the northeastern portion of the Prasada project. The value of the proposed commercial land adjacent to this portion of the freeway necessitated formulation of an alternate plan. Therefore, this Drainage Master Report proposes to modify this detention basin and channel system for the 4-mile reach of the Loop 303 contained between the northern and southern boundaries of the project between Greenway Road and Olive Avenue. The intent is to replace the proposed single detention basin at Cactus Road with two detention basins: one basin ½ mile north of Waddell Road, and the other ½ mile south of Peoria Avenue. The future conditions HEC-1 model was modified to incorporate the changes to the regional channel system. The goal of this model is to maintain the current design flow rates at the exit point along Olive Avenue, which in turn will not place any additional burden on the downstream landowners. Appendix C contains the detailed description of the revision to the hydrologic model, and the results of the revisions.

CMX and the Prasada development team met with representatives from FCDMC, ADOT, MCDOT, and the City of Surprise on Wednesday, the 29th of June of 2005, to present the plans to rearrange the regional detention basin location(s), modify the supporting channel geometric configurations, and incorporate first flush basin methodology for the parcels west of the regional detention basins. These modifications to the existing regional FCDMC plan are addressed in detail in hydrology appendix (Appendix C) of this report. The general outcome from this meeting was that moving the singular regional detention basin, from the intersection of Cactus Road and the Loop 303, into two regional basins, one in Sections 12 and the other in Section 25, is an acceptable alternative to the present plan proposed by the FCDMC. Further coordination and planning between the regulatory agencies and the development team was agreed upon to create the final designs of the Loop 303 Channel System that meet the needs of all the concerned parties. Pursuant to these discussions, it was agreed that the ultimate configuration for the Loop 303 basin locations and supporting drainage infrastructure would need to be reviewed and approved by ADOT and FCDMC.

The ADMP also proposes the future Cotton Lane Wash improvements. The Cotton Lane Wash is primarily created by the elevation difference between Cotton Lane and the intercepted stormwater runoff. The FIRM illustration of the Cotton Lane Wash Zone A Flood Hazard (Figure 3 Appendix A) is presented primarily west of the section line for the portions of the wash adjacent and in the Prasada project. This concept is planned to be maintained for the sections of Cotton Lane Wash that are adjacent to, but not through, the project area (Sections 12, 13, and 25). The eastern half-street improvements will be designed with the elevation necessary to prevent overtopping of the roadway centerline. A temporary channel may be constructed in the western half-street right-of-way. This channel would not convey the entire flow from the Cotton Lane Wash, but would provide additional protection to the new street improvements. The remainder of the flows would be conveyed on the property west of the western half-street right-of-way, similar to the present conditions. For the section of the Cotton Lane Wash internal to the Prasada project (the area where Prasada is west of the centerline of Cotton Lane), it is intended to place the wash into a drainage corridor by channelization. These future proposed modifications to Cotton Lane Wash would require approval by the City and the FCDMC, and would have to be addressed through the CLOMR/LOMR process with FEMA.

The ADMP also proposes a drainage system at the eastern edge of the site near Section 18, to alleviate the existing FEMA floodplain of the Reems Road Wash. The FCDMC has an ongoing project that is channelizing this floodplain on the west side of Reems Road. The extension of this channel has been accounted for in the preliminary design presented in this Master Drainage Study. The primary difference between the Loop 303 Channel and the Reems Road Wash is that the latter is an earthen/grass lined channel corridor, and the Loop 303 Channel is concrete. Appendix D contains the proposed channel design for the Reems Road Channel. This portion of the Prasada will also require approval by the City and the FCDMC, and would have to be addressed through the CLOMR/LOMR process with FEMA.

The basis of this off-site drainage plan, as well as others in this region of the County is that the east-west and north-south roadways direct flows from the surrounding drainage areas. In their existing configuration, these roadways are typically elevated with a swale on both sides of the road. For the developed or future conditions it is assumed that the flows from rainfall events up to, but not exceeding the 100-year storm event, will be contained on the north side of the half-street of east-west roadways, and on the west side of the half-street of the north-south roadways. This assumption is based on the desire to avoid upstream sheet flows from having to cross arterial roads, which would require multiple culvert crossings and/ or allowing flows to overtop the roads. Neither option is favorable from a public safety or cost standpoint. Additionally, the flows from the 10-year storm will not overtop the channel and enter the roadway. CMX has presented this concept to the FCDMC and the Maricopa County Department of Transportation (MCDOT) for other projects in the region. The consensus was that this was a feasible approach as long as significant impacts on the adjacent property owners are not created, and that the finished floor elevations are protected from the 100-year storm water elevation without the Loop 303 channel system in place.

Existing or future developments north and west of Prasada that have roadways on their south or east side of their project with arterial roadway improvements, and have not incorporated roadside channels for the flows presented in FCDMC AMDP, could force runoff onto the Prasada project. This potential exists at multiple locations on four arterial roadways. The first roadway is Waddell Road, and the impacted area is from Perryville Road to Citrus Road and Sarival Avenue to Reems Road. The second roadway is Cactus Road, from Citrus Road to Cotton Lane. The third roadway is Peoria Avenue, from Cotton Lane to ½ mile east of Sarival Avenue. The last roadway is Cotton Lane, and the impacted area is approximately ½ mile south of Greenway Road to Cactus Road, and from Peoria Avenue to Olive Ave. To prevent this from occurring, and placing a burden on Prasada, the adjacent portions of the Prasada development will be elevated to prevent flows from entering the site from the north and/or the west.

This Drainage Master Study was prepared in support of the proposed Development Master Plan for Prasada. Assumptions for developed conditions were made based on the associated unit densities for each parcel. As land-planning progresses for the project, revisions to this study may be appropriate to represent modifications in flow rates, internal and external flow paths (channels, swales, overland flow, etc.), offsite drainage conditions, and retention basin location and volumes. In addition, as individual parcels are developed (i.e. preliminary plat or site plans are prepared), each parcel will be required to submit individual drainage plans and studies, as necessary, to indicate conformance with the assumptions and guidelines reflected in this Study. The concepts and design guidelines provided within this Study may be amended in the future with the approval of the City of Surprise and the FCDMC when the improvements are within their jurisdiction.

3.2 On-Site Drainage

The on-site drainage systems for the Prasada project, including retention/detention/first-flush basins, dry wells, channels, culverts and storm drain pipe systems are effective only if properly maintained. If debris and sediment are not regularly removed, these drainage systems may not operate as designed. The end user/owner of the on-site drainage systems is responsible to create a maintenance plan for these systems. This plan must be reviewed and approved by the City.

3.2.1 Storm Water Control

As required by the City of Surprise and Maricopa County Standards, peak storm water flow resulting from a 100-year storm shall be safely conveyed through the development for both offsite and onsite flows. The

5.3.4.3 of the Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics, January 28, 1996, as part of final subdivision grading and drainage reports. The high-water outlet structures for the retention basins will also be designed as part of final subdivision grading and drainage reports.

3.2.7 Maintenance Requirements

Drainage infrastructure provided for interim and completed design shall be maintained by the Developer during construction and the Home Owners Association once construction is completed. Annual inspections shall be performed to identify excessive sedimentation of drainage ways, basins and culverts. Additional inspections shall be administered following significant storm events (greater than 1-inch rainfall in a 24-hour period). Inspections shall also document blockages as a result of debris (tree limbs, excessive trash, etc.) to the drainage courses through the property under interim and developed conditions. Blockages shall be removed within 36 hours of identification of maintenance condition.

Guidelines shall be prepared and approved by the City of Surprise to characterize the extent of sediment removal required for the property. Guidelines shall be submitted with the SWPPP prior to construction of the property.

4.0 DRAINAGE IMPACTS ON PROPOSED DEVELOPMENT

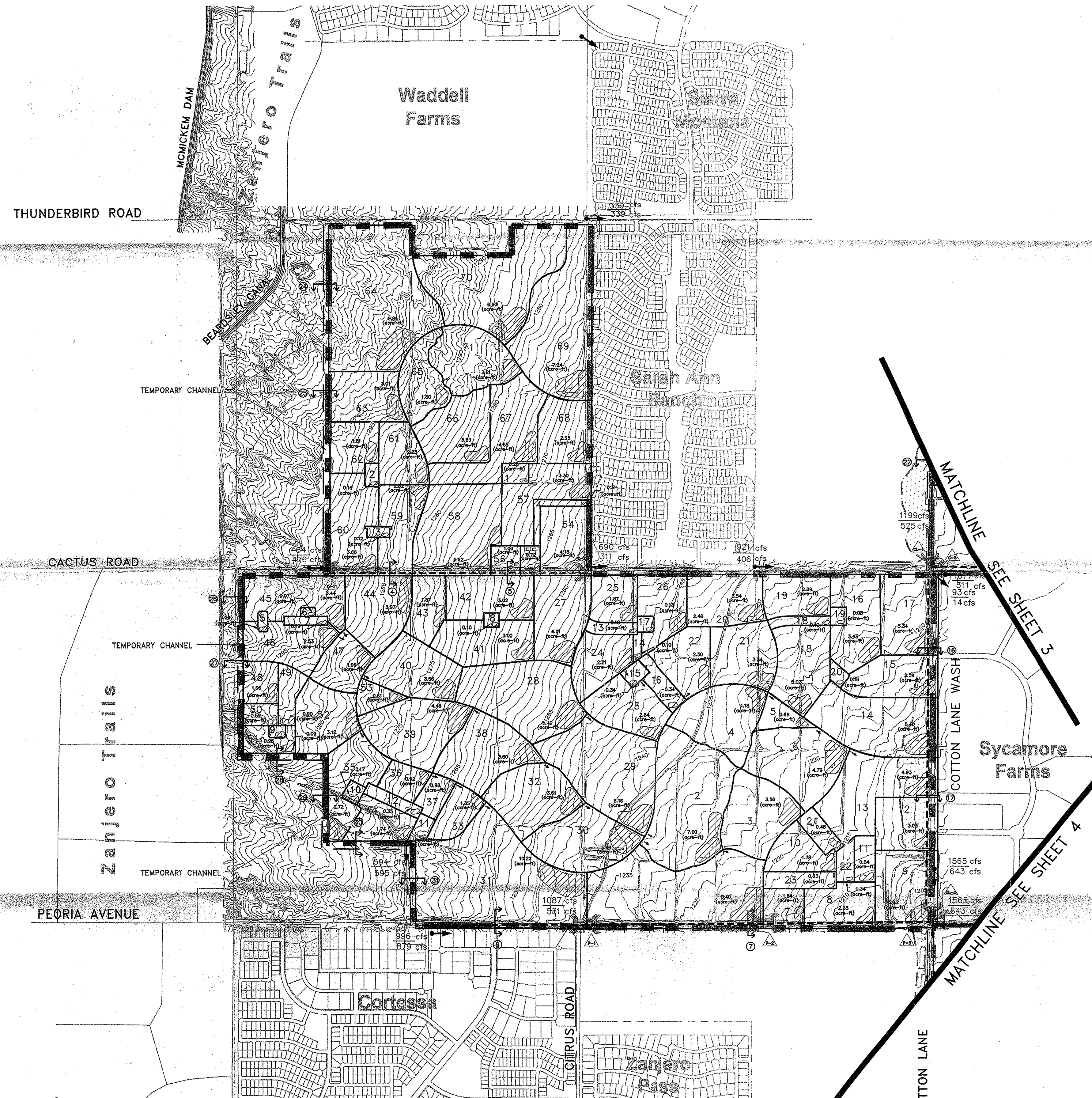
The most significant drainage constraint for this project area is the peak flows from the 100-year, 24-hour rainfall event. These flows are routed along the site boundaries and are adjacent to the arterial roadways. The drainage channels needed to convey the off-site flows will be located in the area between the road right-of-way (ROW) and the development. To maintain the historic flow patterns that are presented in the Loop 303 Corridor/White Tanks ADMP Update (URS, 2001), flows will follow the same patterns. Entrances to the site will cross the channels, and will require culvert crossings. These hydraulic structures will have to convey peak flows from the 100-year storm. The previous section addresses the design parameters associated with these channels and culverts. The tables presented below identify the approximate width of the channel corridors and culvert sizes.

TABLE D PRELIMINARY CHANNEL WIDTHS	
Channel Label	**Approximate Channel Top Width (ft)**
Loop 303 North/South Channels	
!LP (Loop 303 @ Greenway)	32
!LP1 (Loop 303 @ Waddell)	34
!LP@ (Loop 303 @ Cactus)	45
!LP3 (Loop 303 @ Peoria)	57
!LP4 (Loop 303 @ Olive)	49
East/West Channels	
Waddell - 1	50
Cactus - 1	49
Cactus - 2	52
Cactus – 3A	35
Cactus – 3B	55
Peoria - 1	80
Peoria - 2	83
Olive - 1	35
Olive – 2A	28
Olive – 2B	35
Olive – 3A	35
Olive – 3B	44
North/South Channels	
Reems -1	78
Sarival – 1A	39
Sarival – 2A	39
Cotton – 1A	28
Cotton – 1B	33
Roadside Temporary Channels	
P/O Collector - 1	22
P/O Collector - 2	30
Cotton-1*	107
Cotton-2A*	78
Cotton-2B*	99
Cotton-3*	110
Offsite Boundary Temporary Channels	
Perryville-1	32
Perryville-2	65
Perryville-3	30
Perryville-4	52
Perryville-5	54
Perryville-6	57
Perryville-7	55
Perryville-8	66
* NOTE: Temporary channels with V-ditch configurations (side slopes are 4:1 roadside & 20:1 west side of roadway). Additionally, the Existing Conditions are the control flows for temporary channel calculations for Channel Top Widths.	

TABLE E PRELIMINARY CULVERT SIZES				
Culvert Label	**Culvert Location**	**Channel Label**	**Culvert Size**	**Quantity**
W - 1	Waddell & Cotton	Waddell - 1	8 x 4	3
W - 2	Waddell – West Entry to Prasada	Waddell - 1	8 x 4	3
W - 3	Waddell – East Entry to Prasada	Waddell - 2	8 x 4	2
W - 4	Waddell & Sarival	Waddell - 2	8 x 4	2
C - 1	Cactus – West Entry to CLR	Cactus - 1	10 x 4	2
C - 2	Cactus & Citrus	Cactus - 2	10 x 4	2
C - 3	Cactus & Cotton	Cactus - 3	10 x 4	3
C - 4	Cactus – West Entry to Prasada	Cactus - 3	10 x 4	3
C - 5	Cactus – East Entry to Prasada	Cactus - 4	6 x 4	2
C - 6	Cactus & Sarival	Cactus - 4	6 x 4	2
P - 1	Peoria & Citrus	Peoria - 1	12 x 4	3
P - 2	Peoria & Collector	Peoria - 2	10 x 4	3
P - 3	Peoria & Cotton	Peoria - 2	10 x 4	3
O - 1	Olive & Cotton	Olive - 1	6 x 4	2
O - 2	Olive & Collector-1	Olive - 1	6 x 4	2
O - 3	Olive & Sarival	Olive - 2	8 x 4	2
O - 4	Olive & Collector-2	Olive - 3	8 x 4	3
R - 1	Reems & Waddell	Reems - 1	12 x 4	3
CL-1	Cotton Lane & Cactus	Cotton-1	10 x 4	4
CL-2	Cotton Lane & Peoria	Cotton-1	8 x 4	4
R - 2	Reems & Collector	Reems - 1	12 x 4	3
R - 3	Reems & Cactus	Reems - 1	12 x 4	3
S – 1	Sarival & Collector	Sarival - 1	8 x 4	2

The designs of the channel geometry and culvert sizes are related. The channel headwater and tailwater conditions are directly impacted by the culvert sizes, and the culvert is impacted by the channel slope. The options presented here are preliminary, and will be revisited in final drainage reports for the adjacent parcels and roadways.

Another significant drainage constraint is the location and size of the proposed regional detention basins for the Loop 303 Channel. These regional off-line detention basins are located on the west side of the channel and divert large volumes of storm water runoff into the basin to attenuate the peak flows from the 100-year, 24-hour storm event. Table 5 presents the approximate size of these basins for Alternatives 1 and 2.



Preliminary Channel Widths		
Cross Section Number	Channel Label	Approximate Channel Top Width (ft)
	Loop 303 North/South Channels	
A	Loop 303(@ Greenway)	32
B	Loop 303 (@ Waddell)	34
C	Loop 303 (@ Cactus)	45
D	Loop 303 (@ Peoria)	57
E	Loop 303 (@ Olive)	49
	East/West Channels	
1	Waddell – 1	50
2	Cactus – 1	49
3	Cactus – 2	54
4	Cactus – 3A	35
5	Cactus – 3B	55
6	Peoria – 1	80
7	Peoria – 2	83
8	Olive – 1	35
9	Olive – 2A	28
10	Olive – 2B	35
11	Olive – 3A	35
12	Olive – 3B	44
	North/South Channels	
13	Reems –1	62
14	Sarival – 1A	39
15	Sarival – 2A	39
16	Cotton – 1A	28
17	Cotton – 1B	33
	Roadside Temporary Channels	
18	P/O Collector – 1	22
19	P/O Collector – 2	32
20	Cotton–1	119
21	Cotton–2A	82
22	Cotton–2B	108
23	Cotton–3	123
	Offsite Boundary Temporary Channels	
24	ZT–1A	32
25	ZT–1B	65
26	ZT–2A	30
27	ZT–2B	52
28	ZT–3	54
29	ZT–4	57
30	ZT–5	55
31	ZT–6	66

LEGEND

PROJECT BOUNDARY

PARCEL BOUNDARY

CHANNEL & LABEL — OLIVE–2

TEMPORARY CHANNEL

FEMA FLOODPLAIN

INTERNAL PROJECT FLOW ARROW

FCDMC ADMP SUB–BASIN FLOW DIR. ARROW

CULVERT LABEL

CULVERT

APPROX. RETENTION BASIN LOCATION & LABEL — 3.02 (acre–ft)

PARCEL LABEL — 68

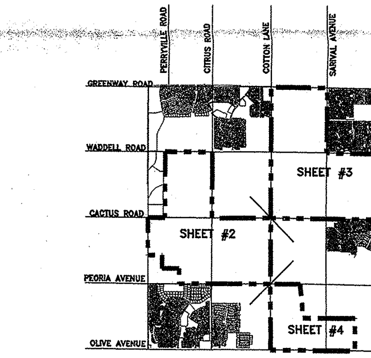
FCDMC Q100/24 EXISTING CONDITIONS FLOWRATE — 493 cfs

FCDMC Q100/24 DEVELOPED CONDITIONS FLOWRATE — 230 cfs

PROPOSED CROSS SECTION IDENTIFIER — 16

NOTES:

1. RETENTION BASIN LOCATIONS AND SIZES ARE PRELIMINARY AND ARE SUBJECT TO CHANGE.
2. RETENTION VOLUMES SHOWN ESTIMATE THE 100–YEAR 2–HOUR STORM RETENTION FOR EACH INDIVIDUAL PARCEL AND CALCULATED BY LAND USE TYPE.
3. WATERSHED LIMITS AND FLOW RATES PRESENT HERE IN INDICATE THE REGIONAL AREA DRAINAGE MASTER PLAN FLOW RATES FOR EXISTING CONDITIONS AND DEVELOPED CONDITIONS BASED ON DESIGN PARAMETERS ESTABLISHED BY THE FCDMC AND CITY OF SURPRISE. PURSUANT TO MASTER PLANNING OF THE PRASADA DEVELOPMENT AND COMMUNICATION WITH THE FCDMC AND CITY OF SURPRISE, THE REGIONAL RETENTION ASSUMED IN THE ADMP HAS BEEN MODIFIED TO FIT WITHIN THE PRASADA LAND PLAN. FLOW RATES SHOWN HEREIN MAY DIFFER SLIGHTLY FROM THE 2004 ADMP. HOWEVER, REGIONAL STORM WATER MANAGEMENT GOAL IS ACHIEVED.
4. FLOW ON WEST SIDE OF COTTON LANE WILL BE CONTROLLED IN A DRAINAGE CORRIDOR/ CHANNEL. CLOMR/LOMR WILL BE OBTAINED TO REMOVE INDIVIDUAL LOTS FROM THE HAZARD ONCE PRELIMINARY PLAT AND FINAL PLAT HAVE BEEN ESTABLISHED.



VICINITY MAP
SCALE: N.T.S.

N

800 400 0 800 1600
SCALE FEET

PRASADA
CACTUS ROAD & COTTON LANE
SURPRISE, ARIZONA

FIGURE 5: DRAINAGE MASTER PLAN

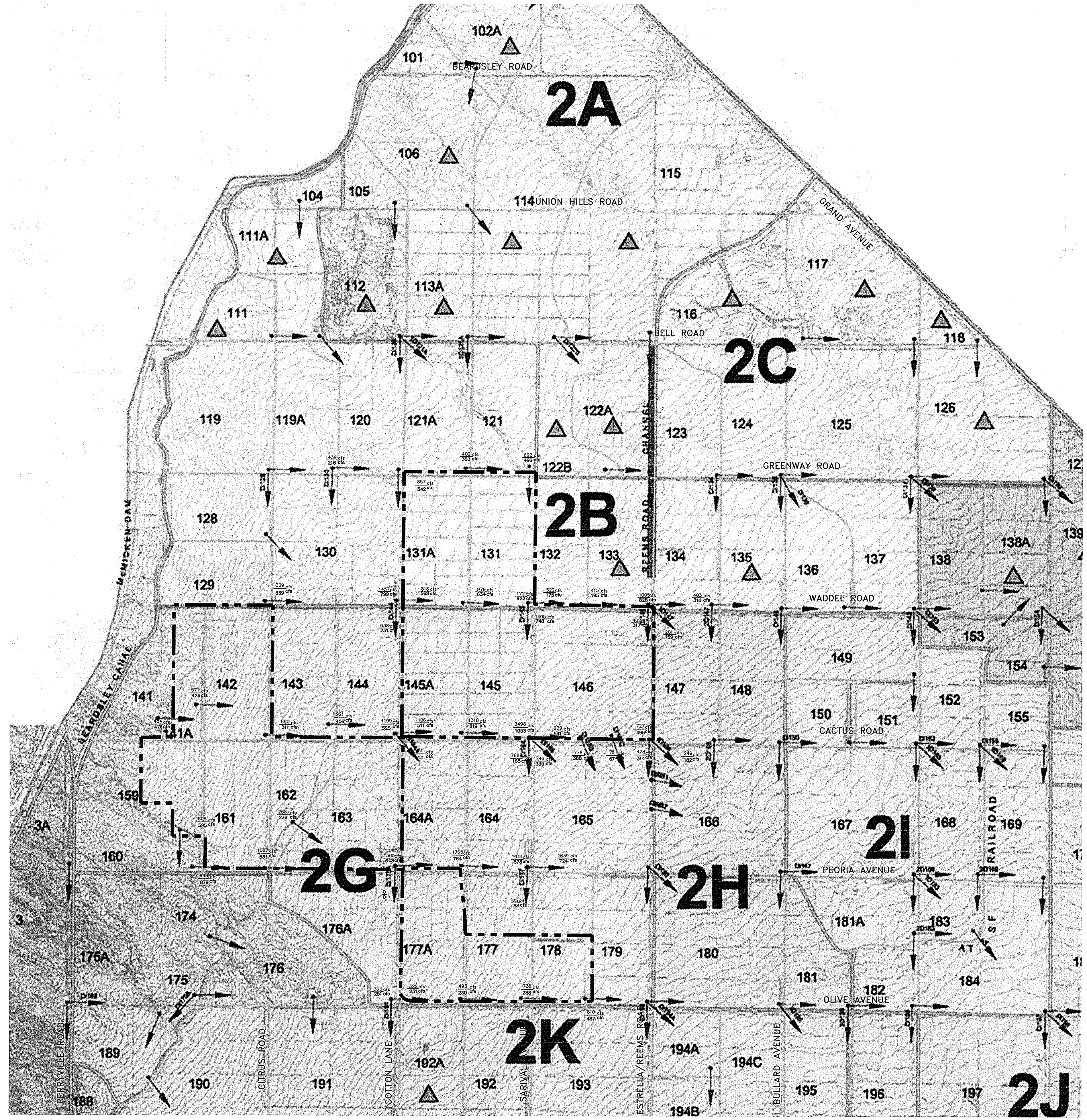
CMX PROJ.	6889
DATE:	JUNE 2006
SCALE:	1"=800'

CMX

DESIGNED: PLG | DRAWN: ZDW | APPROVED: KCK

REV. | DWG. NO.

SHT. 2 OF 4



LEGEND

PROJECT BOUNDARY

Q100/24 EXISTING CONDITIONS FLOWRATE

Q100/24 DEVELOPED CONDITIONS FLOWRATE

857 cfs / 542 cfs

NOTES:

1. THIS EXHIBIT IS A BLOW UP OF THE ORIGINAL LOOP 303 CHANNEL/WHITE TANK ADMP HEC-1 EXHIBIT BY URS, BUT INCLUDES THE REVISED FLOW RATES (URS JAN. 2004), WITH THE PRASADA PROJECT AREA BOUNDARY.
2. THE FLOWRATES ARE FROM THE WHITE TANKS LOOP 303 ADMP AND REPRESENT THE 100 YEAR-24 HOUR EXISTING CONDITION FLOWS AND FUTURE CONDITION FLOWS WITH OUT "PROJECTS IN PLACE," MEANING THE REGIONAL CHANNEL SYSTEMS, WITH THEIR DIVERSIONS, ARE NOT INCLUDED.
3. THIS EXHIBIT IS INCLUDED FOR COMPARISON PURPOSES TO THE HEC-1 MODELS WITH "PROJECTS IN PLACE."
4. THE ADMP HEC-1 FILES USED ARE:
   EXISTING CONDITIONS: L303M1L.OH1
   FUTURE CONDITIONS: L303F8B.OH1

PRASADA

CACTUS ROAD & COTTON LANE
SURPRISE, AROZONA

FIGURE 4: FCDMC ADMP HEC-1 EXHIBIT

CMX PROJ.	6889	CMX	
DATE:	JUNE 2006		
SCALE:	N.T.S.		
DESIGNED: PLG	DRAWN: ZDW	APPROVED: KCK	
REV.		DWG. NO. 1	
		SHT. 1 OF 1	

U:\6800\6889\Water Resources\W-Exhibits\Master Report\Drainage\Sub3\F4-6889-ADMP\F4-6889-ADMP.dwg 1-04-2007 - 9:32am

FINAL DRAINAGE REPORT
FOR
SYCAMORE FARMS PARCEL 13
SURPRISE, ARIZONA

February 25, 2005
1st Revision: May 25, 2005
2nd Revision: June 28, 2005

Prepared for:

Taylor Woodrow/Arizona Inc.
6720 N. Scottsdale Road, Suite #390
Scottsdale, AZ 85253
(480) 314-5700

Prepared by:

Coe & Van Loo Consultants, Inc.
4550 North 12th Street
Phoenix, AZ 85014
(602) 264-6831

CVL Project No.: 04-0032-08-08

CVL

3.0 MANAGEMENT OF OFF-SITE RUNOFF

3.1. Off-Site Hydrology

As stated in Section 2.0 the off-site hydrology impacting Sycamore Farms Parcel 13 has been updated in the URS, Loop 303 Corridor/White Tanks Area Drainage Master Plan (ADMP) Update (Reference 6). The existing condition HEC-1model for the 100-year, 24-hour storm, latest revision dated January 14, 2004, was received via email from the FCD on April 26, 2005. CVL developed a 100-year, 6-hour storm using a 6-hour distribution, rainfall depth and corresponding depth-area records as outlined in Reference 2. The two models were compared to determine the controlling storm that impacts the site. For all calculations the storm that produced higher peak flows and was used as the basis for the off-site determination. Refer to Appendix A for the 100-year, 24-hour model and Appendix B for the 100-year, 6-hour model.

As shown on the ADMP schematic (Appendix A) the site is impacted by flows from the north and east. Diversion DI164A routes flow from the intersection of Cactus Road and Sarival Avenue south on the west side of Sarival Avenue. The site is also impacted by flow generated within sub-basin 164. Areas directing off-site flows toward the site within sub-basin 164 were prorated to determine peak flows impacting the site along the northern and eastern boundaries. To ensure that flows generated in sub-basin 164A do not impact the site, a cross section of Loop 303 was developed using Manning equation. Based on the calculation, flows within sub-basin 164A do not overtop Loop 303 and is routed to CP164A as specified in the ADMP. Refer to Appendix C for off-site exhibits and calculations.

3.2. Off-Site Storm Water Management Plan

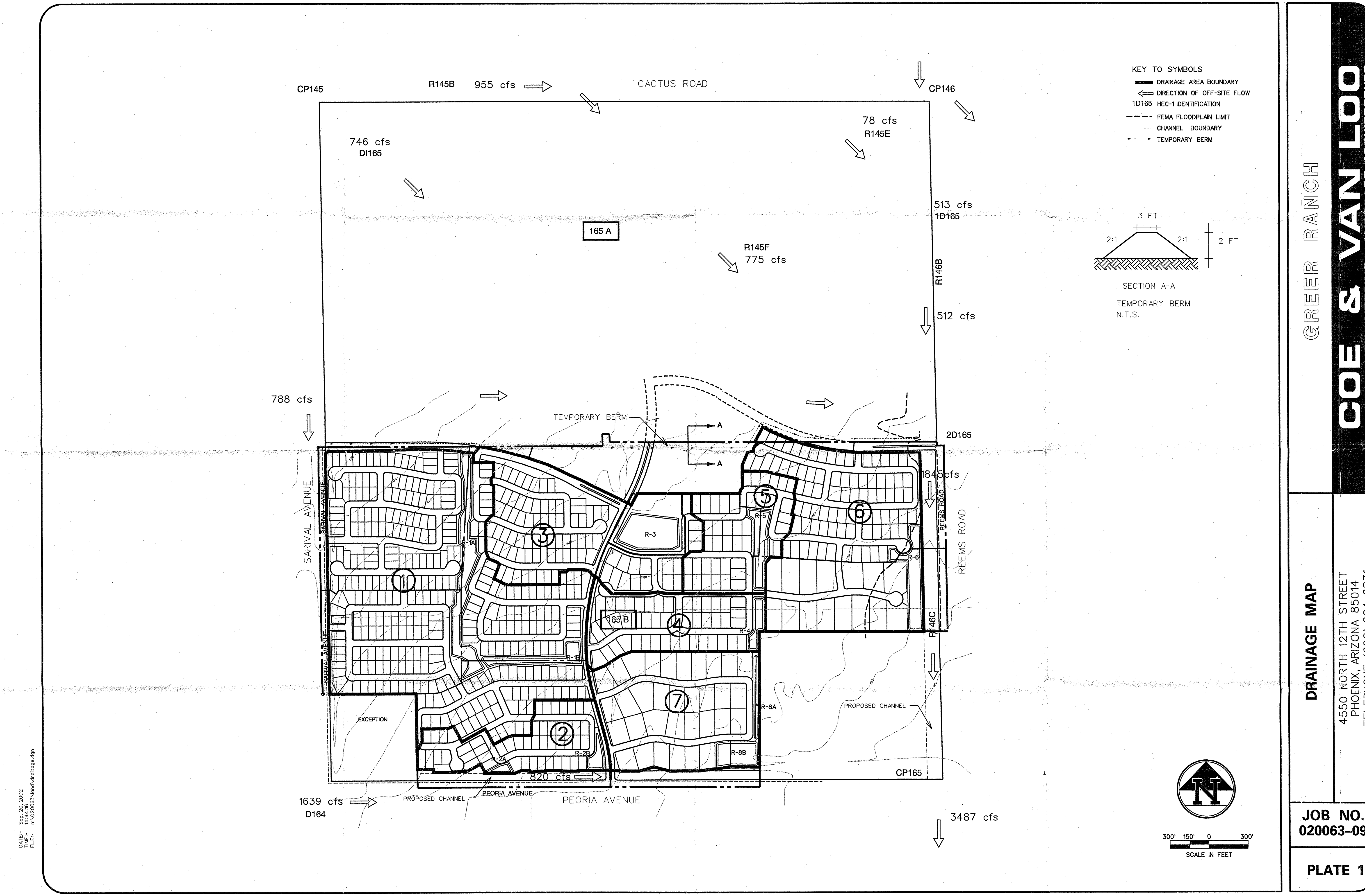
The proposed drainage concept for intercepting and conveying offsite runoff through the project site includes an open channel and temporary earthen berms. The channel has been designed adjacent to Sarival Avenue to intercept the 100-year, 6-hour flow of 862cfs (DI164) routed south on the west side of Sarival Avenue. In addition, the channel will intercept flows directed east by the temporary earthen berm along the north side of Poinsettia Drive. A proposed HEC-RAS

CVL

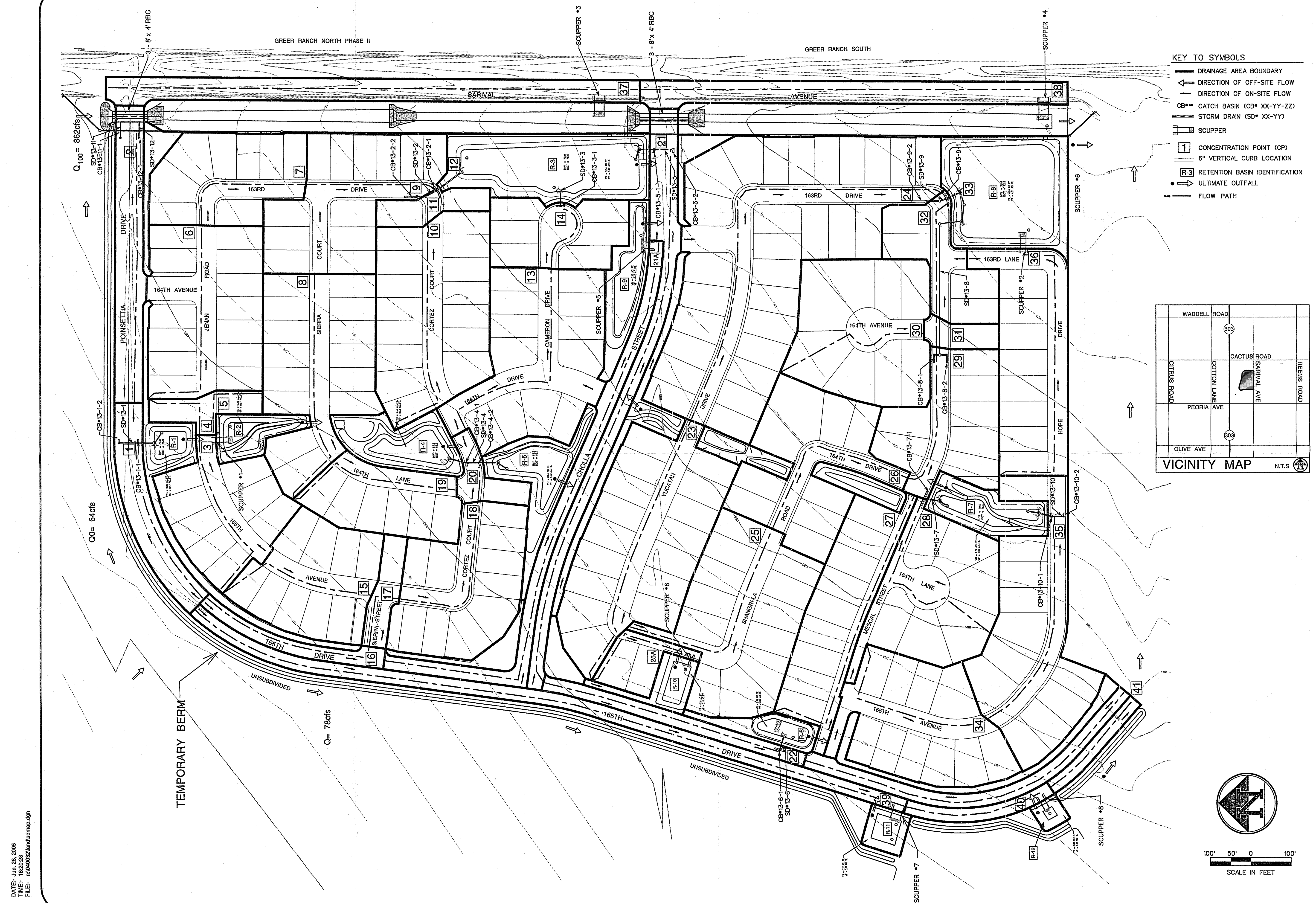
model was developed to determine the conveyance capacity of the channel and culverts. The flow is subcritical with varying velocities. The channel is lined with decomposed granite per the landscape plans. The FCDMC manual states the maximum permissible velocity for fine gravel is 5-feet per second. Erosion protection has been provided at the downstream ends of culverts and drop structure where velocities exceed 5-feet per second. 1-foot of freeboard has been provided for the 100-year storm event within the channel to ensure that adjacent finish floors are at least 18" above the water surface elevation. Refer to Appendix G for the proposed condition HEC-RAS model and station exhibit.

The channel will discharge flow south within the inundation limits. An existing conditions HEC-RAS model was created to determine the natural boundaries of flooding within Sarival Avenue using 862cfs specified in the 100-year, 6-hour ADMP model. Results from the existing conditions HEC-RAS model were plotted to ensure the proposed drainage improvements did not increase the natural floodplain limits. Refer to Appendix H for the existing conditions HEC-RAS model and exhibit.

Temporary earthen berms have been designed to protect the site from off-site sheet flows that approach the site from north and west. The berm on the north will direct flows east to the Sarival channel. The berm on the west will direct flow south and ultimately discharge the flow to the east where flow is returned to the natural drainage path. A letter of agreement between adjacent land owners will be presented to the City of Surprise that addresses the temporary berm and possible upstream flooding.



CACTUS ROAD
CP145
R145B
955 cfs
CP146
78 cfs
R145E
746 cfs
DI165
513 cfs
1D165
165 A
R145F
775 cfs
R146B
512 cfs
788 cfs
TEMPORARY BERM
A
A
2D165
1845 cfs
SARIVAL AVENUE
REEMS ROAD
R-3
165 B
R-4
R-5
R-6
R-1A
R-1B
R-2A
R-2B
R-8A
R-8B
R146C
EXCEPTION
PROPOSED CHANNEL
820 cfs
PEORIA AVENUE
CP165
1639 cfs
D164
3487 cfs
KEY TO SYMBOLS
DRAINAGE AREA BOUNDARY
DIRECTION OF OFF-SITE FLOW
1D165 HEC-1 IDENTIFICATION
FEMA FLOODPLAIN LIMIT
CHANNEL BOUNDARY
TEMPORARY BERM
3 FT
2:1
2:1
2 FT
SECTION A-A
TEMPORARY BERM
N.T.S.
N
300' 150' 0 300'
SCALE IN FEET
DATE- Sep. 20, 2002
TIME- 14:44:16
FILE- n:\020063\land\drainage.dgn
GREER RANCH
COE & VAN LOO
PLANNING•ENGINEERING•LANDSCAPE ARCHITECTURE
DRAINAGE MAP
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831
JOB NO.
020063-09
PLATE 1



SYCAMORE FARMS PARCEL 13

COE & VAN LOO

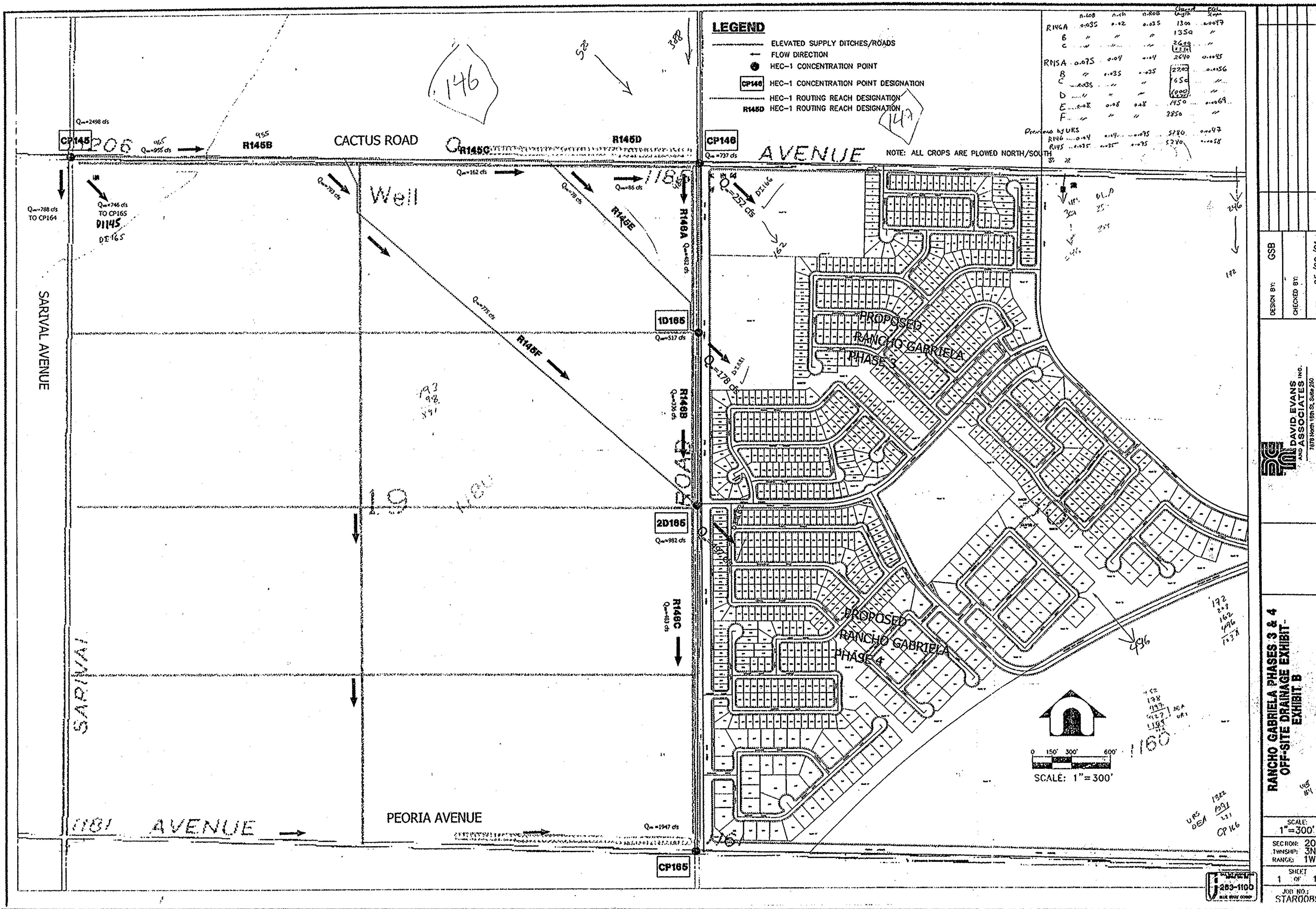
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

DRAINAGE MAP

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

JOB NO.
040032-08

PLATE
1


LEGEND
ELEVATED SUPPLY DITCHES/ROADS
FLOW DIRECTION
HEC-1 CONCENTRATION POINT
CP146 HEC-1 CONCENTRATION POINT DESIGNATION
HEC-1 ROUTING REACH DESIGNATION
R145D HEC-1 ROUTING REACH DESIGNATION
NOTE: ALL CROPS ARE PLOWED NORTH/SOUTH
CACTUS ROAD
PEORIA AVENUE
SARIVAL AVENUE
CP145
CP146
CP165
1D165
2D165
R145B
R145C
R145D
R145E
R145F
R146A
R146B
R146C
PROPOSED RANCHO GABRIELA PHASE 3
PROPOSED RANCHO GABRIELA PHASE 4
SCALE: 1"=300'
DAVID EVANS AND ASSOCIATES INC.
DESIGN BY: GSB
DATE: 05/29/01
REVISION
RANCHO GABRIELA PHASES 3 & 4 OFF-SITE DRAINAGE EXHIBIT EXHIBIT B
SCALE: 1"=300'
SECTION: 20
TWNSHIP: 3N
RANGE: 1W
SHEET 1 OF 1
JOB NO.: STAR0089

FINAL DRAINAGE REPORT
FOR

RANCHO GABRIELA PHASE 4

PREPARED FOR

BIG RED LAND INVESTMENT, INC.
6730 N. SCOTTSDALE ROAD, SUITE 230
SCOTTSDALE, ARIZONA 85253
(480) 607-5800

PREPARED BY

GEOFFREY S. BROWNELL, E.I.T.
DAVID EVANS AND ASSOCIATES, INC.
7878 NORTH 16TH STREET, SUITE 250
PHOENIX, AZ 85020
(602) 678-5151

REVISED MARCH 2002
REVISED DECEMBER 2001
AUGUST 2001
DEA PROJECT NO. STAR0000-0089

Registered Professional Engineer (Civil)
CERTIFICATE NO. 30013
TERI S. GEORGE
Date Signed 3/4/02
ARIZONA U.S.A.

Hydraulic analyses using the U.S. Army Corps of Engineer's HEC-2 computer model (Reference 3) determined that the majority of flow routed east on Cactus Road towards the intersection with Reems Road would actually weir into the field south of Cactus before reaching the intersection. Of the 955 cfs routed from Sarival along Cactus, approximately 869 cfs weirs into the field with only 86 cfs remaining in the road section. This decreases the concentrated flow at the intersection of Reems and Cactus to 727 cfs. Because of the decreased concentrated flow, only 249 cfs of the 727 cfs is now diverted to the southeast towards the proposed project site. See Exhibit B, located in the back pocket, for a graphical representation of the results of the hydraulic and hydrologic analyses performed.

Because the slope of the fields is to the south/southeast, the runoff weiring from Cactus Road does, however, impact Reems Road at several points south of Cactus Road. Based on field observations and aerial topographic information, it was determined that runoff concentrates approximately ¼ mile and a ½ mile south of Cactus Road. At these locations, flow routed through the fields west of Reems Road combines with flow routed south along Reems Road. The concentrated flow then continues south to the intersection of Reems and Peoria.

The capacity of Reems Road was analyzed based on hydraulic modeling using the HEC-2 computer program. It was determined that as the flows in Reems Road increase, some runoff may spill over the berms and flow to the southeast towards Rancho Gabriela Phase 4. The results indicate that a total of approximately 675 cfs may weir over the berms along the east side of Reems. This is in addition to the approximately 249 cfs diverted to the southeast at the intersection of Reems and Cactus.

The current FEMA Flood Insurance Rate Map (FIRM) for the Rancho Gabriela project site, map number 04013C1585 F (Effective date September 30, 1995) shows that Phase 4 of the Rancho Gabriela project site is in flood hazard Zone X. Zone X is defined as, *"Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood."* Reems Road between Cactus Road and Peoria Avenue is within flood hazard Zone A. Zone A is defined as, *"Special flood hazard areas inundated by 100-year flood. No base flood elevations determined."* A copy of the current FIRM panel is provided in Appendix B.

3.0 PROPOSED DRAINAGE CONCEPT

The proposed drainage concept is presented in three parts: on-site drainage conveyance, off-site drainage and on-site storm water retention. On-site storm water retention calculations are summarized in section 3.3. The hydrologic analyses are summarized in section 4.0 and the hydraulic analyses are summarized in section 5.0.

3.1 On-site Drainage Conveyance

On-site storm water runoff is conveyed through the site by the paved roadway sections with normal crowns and either 4-inch roll or 6-inch vertical curb. Figure 2, located in Appendix A, illustrates the proposed roadway cross-sections. The land plan provides drainage tracts to comply with the on-site drainage concept as shown on Exhibit A. Lots have been graded to drain into the roadway on which they front. The roadways convey on-site runoff towards the retention facilities. Catch basins or depressed curb and sidewalk are used to direct the flows from the streets into the retention basins.

The roadway sections are designed to convey the 10-year peak flows between the curbs and 50-year peak flows within the cross section between buildings (front yards and streets). The lowest finish floor elevation of each lot is designed to be free from inundation from the 100-year storm event.

3.2 Off-site Drainage Conveyance

It is anticipated that Rancho Gabriela Phase 3 and Phase 4A will be mass graded at one time. If this occurs, off-site flows impacting Rancho Gabriela Phase 4's northern boundary will be eliminated with the mass grading of Phase 3. If the Phase 3 site is not graded in concurrence with Phase 4A, temporary retention basins will be provided to eliminate off-site flows generated in the field north of the project from impacting the project's northern boundary.

After discussions with the City of Surprise, it was agreed that off-site runoff routed along Reems Road would be contained within the roadway section. This will be accomplished by ensuring pad elevations and entry road elevations along Reems are sufficiently above the calculated 100-year water surface elevation. This puts the pad elevations above the elevation of the existing berm along the east side of Reems Road.

The impetus for this decision is that the Flood Control District of Maricopa County and the City of Surprise are discussing regional solutions to flooding problems in the area. Currently, a regional drainage channel extends from Bell Road to approximatley ¾ miles south of Greenway Road along the west side of Reems Road. All alternatives proposed by the Flood Control District, as part of the Loop 303 Corridor/White Tanks ADMP update, extend the Reems Channel south past the project site. When and if the regional channel is built, all off-site flows impacting the Rancho Gabriela Phase 4 project site will be eliminated.

PRELIMINARY DRAINAGE REPORT
FOR
GREER RANCH
SURPRISE, ARIZONA

January 15, 2003

Prepared for:

Lennar Communities Development Inc.
2702 N. 44th Street, Suite 100A
Phoenix, AZ 85008
(602) 331-9300

34665
R. STUART
BARNEY
1/22/03

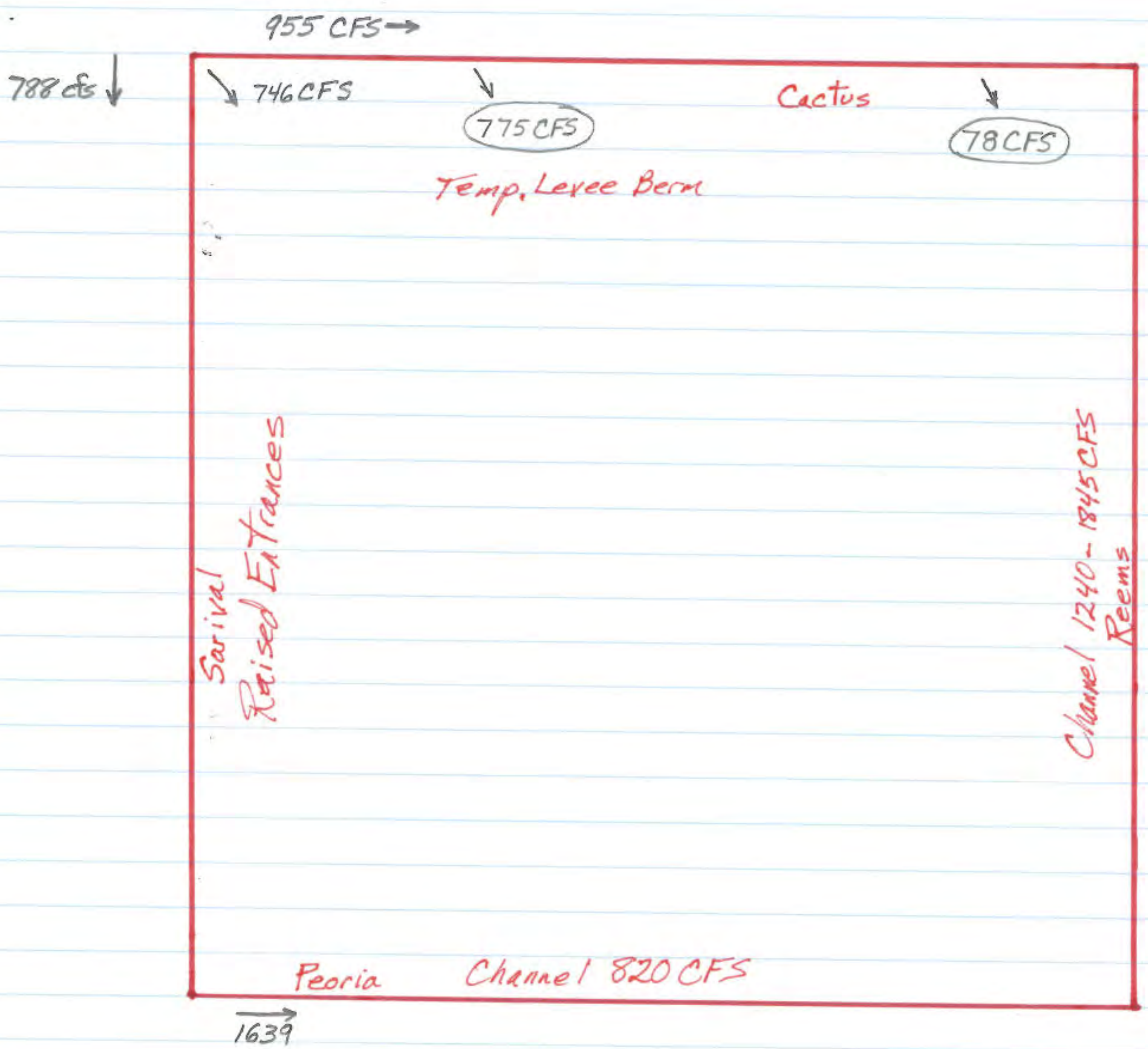
Prepared by:

Coe & Van Loo Consultants, Inc.
4550 North 12th Street
Phoenix, AZ 85014
(602) 264-6831

CVL #02-0063-02-02

CVL

- No Channel on Cactus – Temp. Levee Berm
- No Channel on Sarival – Raised Entrances
- Nothing written about Dissipation within 36 Hours
- Volume Provided Calculations



Called Brent Emmerton w/CVL Friday 1/31/03 10:00AM

3.0 MANAGEMENT OF OFF-SITE RUNOFF

3.1. Off-Site Hydrology

The site is impacted by off-site flows approaching each boundary surrounding the site. These flows are determined in the White Tanks ADMS (Appendix A) for the 100-year, 24-hour storm event. See Plate 1 for flow locations and quantities.

Under existing conditions, as determined by the White Tanks ADMS, off-site flows are split at the intersection of Cactus Road and Sarival Avenue. 788 cfs is directed southerly along the west side of Sarival Avenue to the intersection of Peoria Avenue and Sarival Avenue. 746 cfs is directed southeasterly toward the site and 955 cfs is directed easterly on the north side of Cactus Road. According to the revised ADMS study by DEA & Associates, 775 cfs weirs over Cactus Road between Sarival Road and Reems Road and is directed southeasterly through the site toward Reems Road. An additional 78 cfs weirs over Cactus Road near the intersection of Cactus Road and Reems Road and is directed southeasterly toward Reems Road. Flows that weir over Cactus Road eventually combine with flows directed southerly within Reems Road from CP146 located at the intersection of Cactus Road and Reems Road. The site is also impacted by off-site flows split at the intersection of Sarival Avenue and Peoria Avenue. 1639 cfs is directed easterly within Peoria Avenue and converges with the flows from Reems Road at the intersection of Peoria Avenue and Reems Road (CP-165).

As a result of the proposed development, the revised HEC-1 model by DEA & Associates was modified to reflect the new hydrologic conditions. According to the DEA HEC-1 model, two diversion points route flows east into the Rancho Gabriela subdivision. These diversions were removed so that these flows would be incorporated into the flows within the channel west of Reems Road. CP165, which represents the square mile surrounding the site, has been divided into two concentration points, CP165A and CP165B. Runoff generated from 165A is diverted east by a temporary berm and combines with CP2D165. Flows from 2D165 are then routed to CP165 and combines with CP165B at the intersection of Reems Road and Peoria Avenue. See Appendix A for the HEC-1 model revised for this project.

3.2. Off-Site Storm Water Management Plan

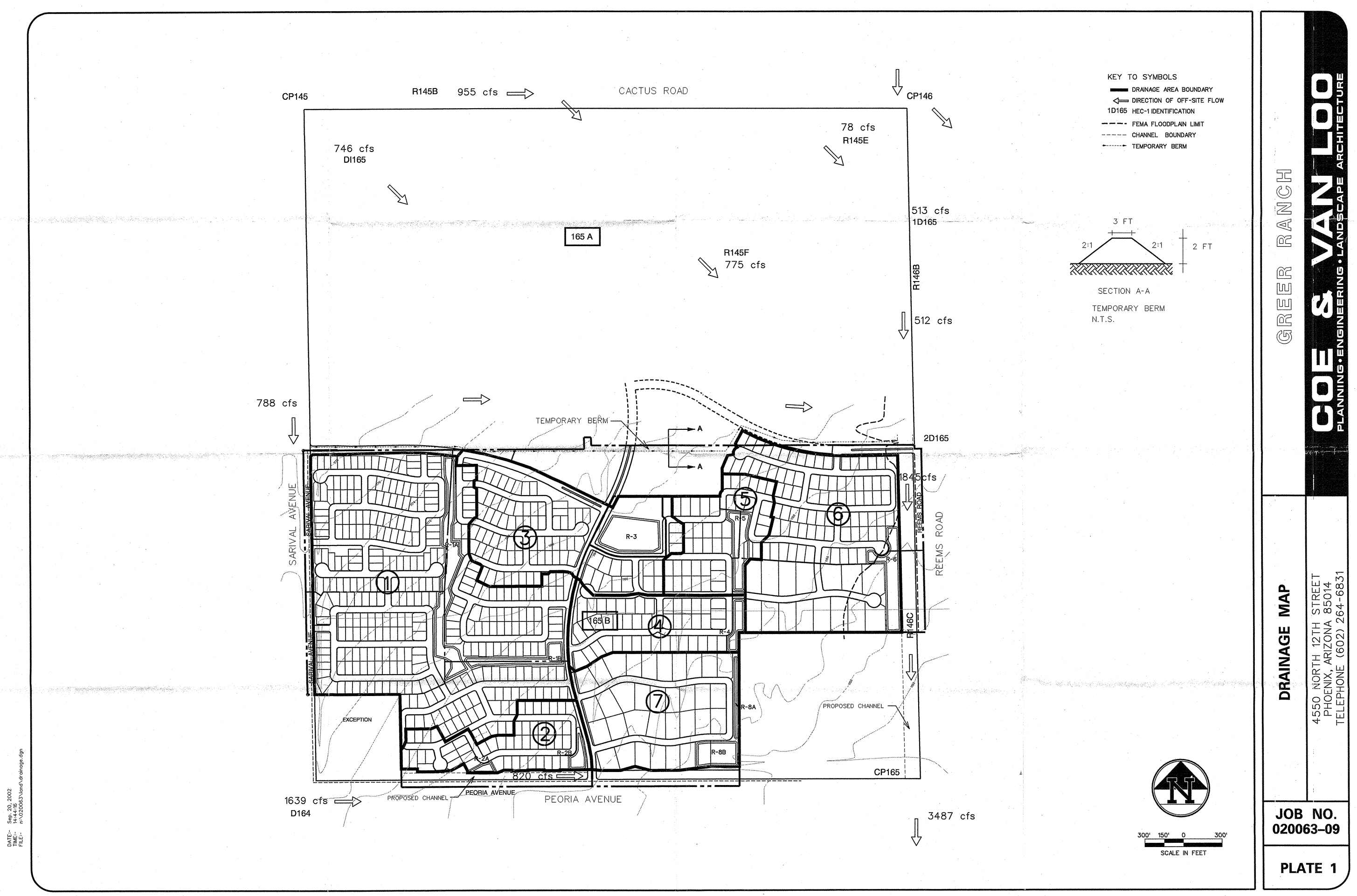
In order to safely mitigate off-site flows impacting the site, drainage channels and temporary levee berms are proposed to protect the site from the peak off-site flow during the 100-year frequency storm event.

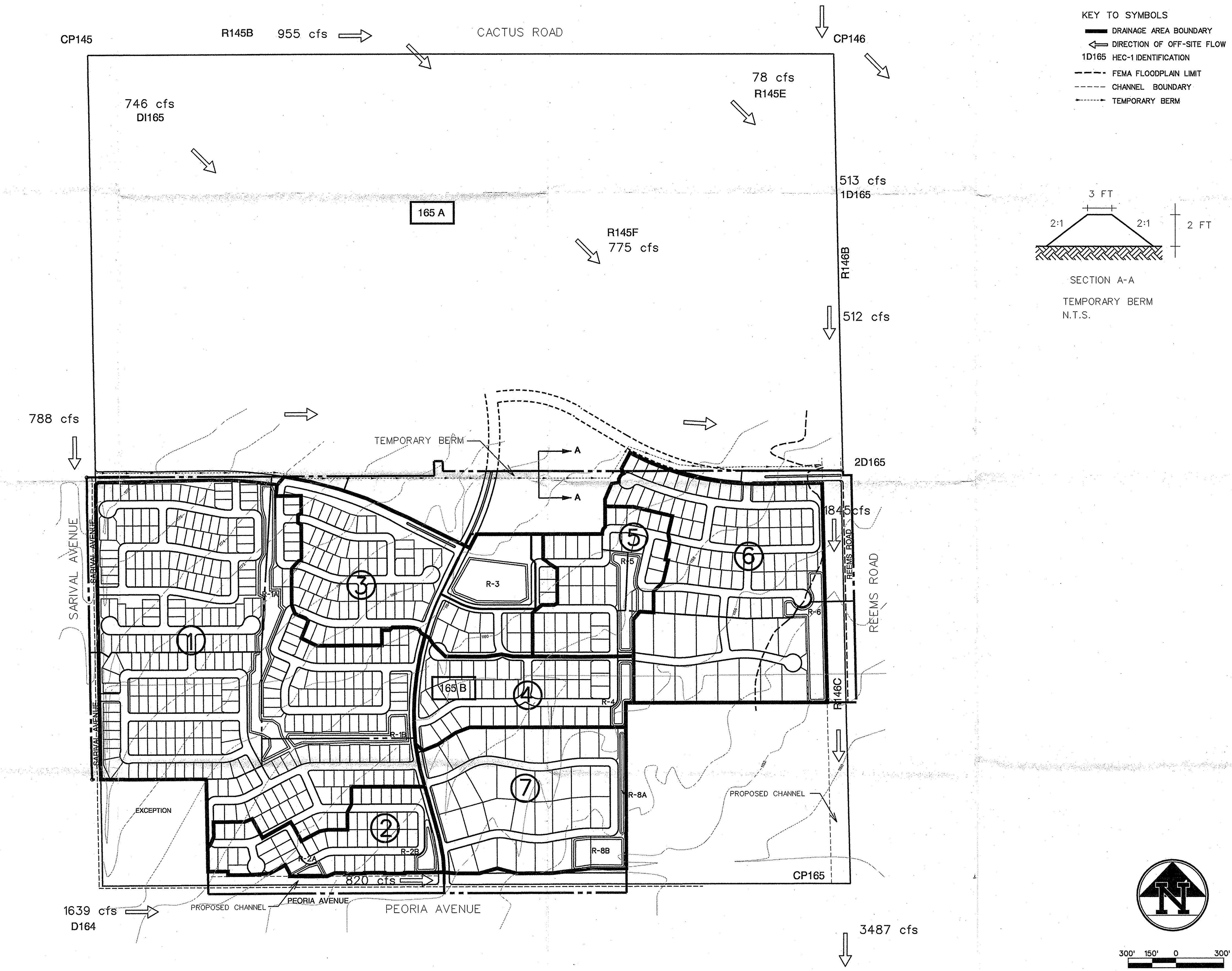
To protect the site from off-site flows approaching from the north, a temporary levee berm will be constructed along the northern boundary of the site and will direct flows easterly toward Reems Road. A channel is proposed adjacent to Reems Road on the west side to convey flows from the north and northwest. The channel will be constructed from Cactus Road to Peoria Avenue.

For flows impacting the site along the southern boundary, a channel will be constructed adjacent to Peoria Avenue to convey flows easterly toward the intersection of Peoria Avenue and Reems Road. The channel will be constructed adjacent to the lots being developed.

Off-site flows approaching the site from the west within Sarival Avenue will be directed southerly. Flows will be prevented from entering the development with raised entrances. In addition, finish floors will be designed a minimum of 1 foot above the 100-year water surface elevation within Sarival Avenue.

CVL





GREER RANCH

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

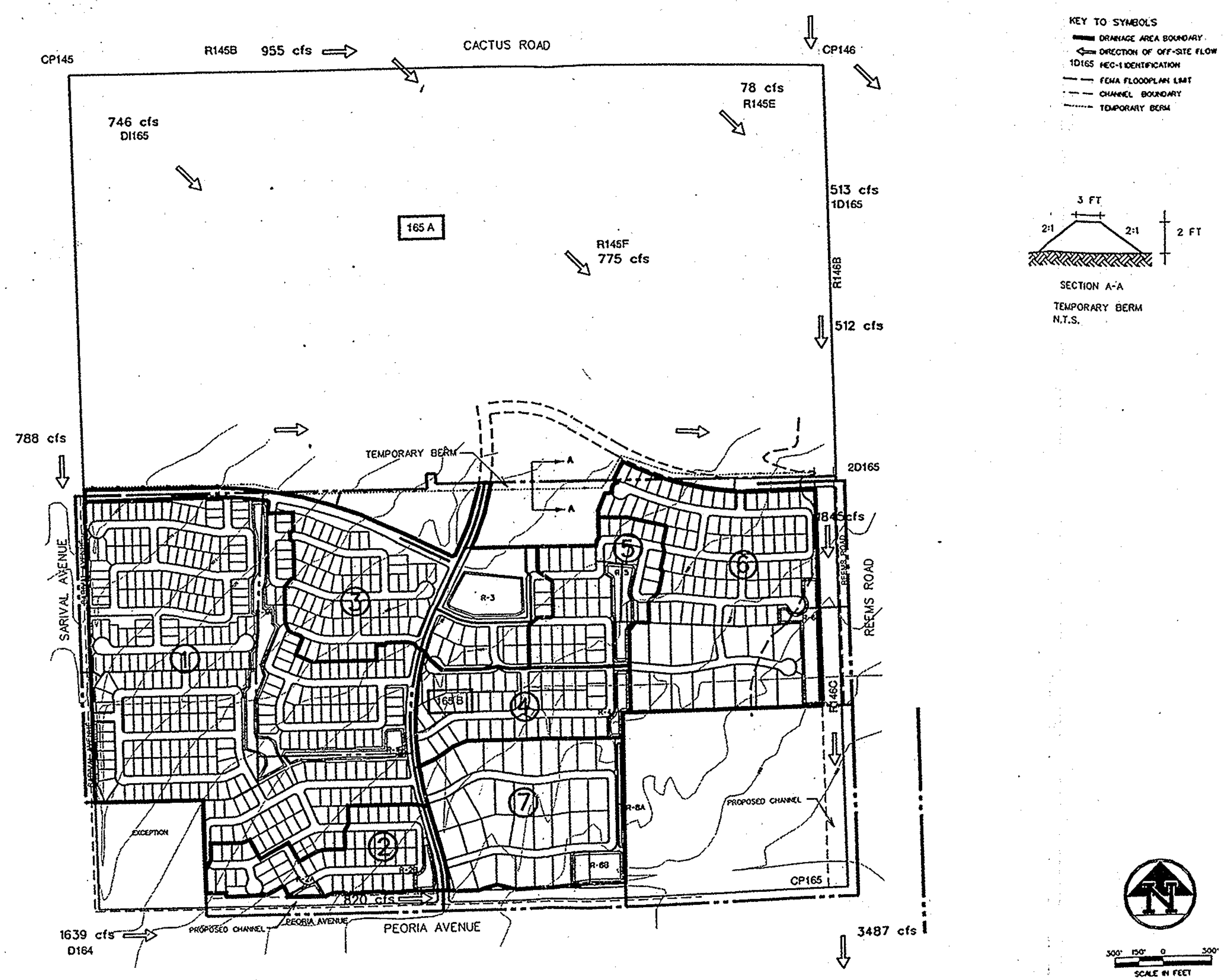
DRAINAGE MAP

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

JOB NO.
020063-09

PLATE 1

DATE- Sep. 20, 2002
TIME- 14:44:16
FILE- n:\020063\land\drainage.dgn



GREER RANCH

COE & VAN LOO

PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

DRAINAGE MAP - OFFSITE FLOW

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

JOB NO.
020063-09

EXHIBIT 1

n:/020063/land/drainage.dgn May. 14, 2003 13:18:48

FINAL DRAINAGE REPORT
FOR
PHASE 1 AND 2 OF
MOUNTAIN GATE

Prepared for:

Fairway Farms, L.L.C.
In care of William Lyon Homes, Inc.
3025 S. 48th Street, Suite 4
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Prepared by:

Stantec Consulting, Inc.
8211 South 48th Street
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(602) 438-2200

Ghassan Aouad

Registered Professional Engineer (Civil)
CERTIFICATE NO.
34565
GHASSAN
M. AOUAD
Date Signed 9-26-02
ARIZONA U.S.A.

March 25, 2002
Revised September 26, 2002
81500806

1.0 Scope

The purpose of this final drainage report is to present a drainage plan for phase 1 and 2 of the development known as Mountain Gate. This report addresses the offsite and onsite drainage and storm water storage requirements for the subject portion of the project site.

This report was prepared in accordance with the City of Surprise Comprehensive Development Guide (Ref. 1) and as supplemented by the drainage design manuals for the Flood Control District of Maricopa County "FCDMC" (Ref. 2 & 3).

2.0 Location

Mountain Gate, approximately 440 acres, (Fig. 1) is located within the City of Surprise, Arizona. It is bounded partly by Cactus Road on the north, Peoria Avenue on the south, partly by Litchfield Road on the east, and Bullard Avenue on the west.

The project is located within Section 21, Township 3 North, Range 1 West, Gila and Salt River Base and Meridian, Maricopa County, Arizona.

3.0 Classification by the FIRM

The Maricopa County, Arizona and Incorporated Area Flood Insurance Rate Map (FIRM), map numbers 0413C1585G, panel 1585 of 4350 and map number 04013C1605H, panel 1605 of 4350, both dated July 19, 2001, show that the project site falls within flood hazard zone "X" (shaded), (Fig. 2). Zone X (shaded) is defined by FEMA as:

Areas of 500-year flood; areas of 100-year flood with average depth of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

4.0 Description and Proposed Development

The project site, like the majority of the surrounding areas, is currently an agricultural field. The existing terrain slopes from the northwest to the southeast at about 0.5%. The bordering roads, except for Bullard Avenue on the west, are paved streets with one traffic lane in each direction. These streets do not have curb and gutter improvements. Bullard Avenue is a dirt road.

Phase 1 and 2 of the project site, approximately 187 acres, is proposed to be developed into a single-family residential and open space that includes a recreation area.

5.0 Offsite Drainage

5.1 BACKGROUND

The proposed Mountain Gate project falls within the Dysart Drain Watershed of the White Tanks/Agua Fria Area Drainage Master Study "ADMS". The ADMS was prepared by WLB Group, Inc. for the Flood Control District of Maricopa County (FCDMC) and was completed in 1994. The ADMS covers 220 square miles west of Agua Fria River, east of White Tanks Mountains, north of Gila River, and south of Deer Valley Road. The ultimate drainage outfalls of this area are the Agua Fria River on the east and the Gila River on the South.

Currently, the ADMS is being revised by URS for the FCDMC. The new study is titled "Loop 303 Corridor/White Tanks Area Drainage Master Plan Update." A draft report has been submitted to the FCDMC (Ref. 5). The City of Surprise has requested to utilize this latest draft of the revised White Tanks Master Study in addressing offsite drainage for the project site. Material from the revised master study that includes a partial copy of the HEC-1 key map (existing conditions) and HEC-1 data were included in Appendix A.

The hydrology of the White Tanks Master Study was prepared using the U.S. Army corps of Engineers Computer Program HEC-1. The storm frequency selected was the 100-year, 24-hour. The majority of the areas within the study limits, including the

vicinity of the project site, are composed of agricultural fields with surrounding berms and irrigation ditches. The natural terrain slopes from the northwest to the southeast at about 0.5%. The general drainage pattern is characterized by sheet flows from one agricultural field to the next where storm runoff concentrates at the southeast corner of the field and then split into two or three directions. There are few significant drainage collection systems within the ADMS limits. Storm runoff can sheet flows several miles before it reaches a drainage outlet.

It was estimated from the revised White Tanks Master Study (App. A) that the 100-year peak flows along the perimeters of the Mountain Gate project site are approximately 44 cfs on the north side of Cactus Road, 246 cfs along the west side of Bullard Avenue, 487 cfs along the north side of Peoria Avenue and 191 cfs along the west side of Litchfield Road. Additionally, the adjacent field located in the immediate southwest corner of Litchfield Road and Cactus Road (App A), which is a part of subbasin 167 of the revised White Tanks Master Study and which is labeled as subbasin 167A for the purpose of this report, drains southeasterly toward Litchfield Road. This flow, estimated to be approximately 154 cfs using the Rational Method (App A), will be added to the 191 cfs offsite flow along the west side of Litchfield Road for a total flow of approximately 345 cfs.

The original ADMS included an Area Drainage Master Plan (ADMP) in which several major drainage collection systems were proposed to collect the storm runoff from the study area and convey it to the ultimate drainage outfalls at the Agua Fria River on the east or the Gila River on the South. Two ADMP elements significant to this project are the Reems Road Channel, one mile east of the project and the Waddell Road Channel, one mile north of the project. These channels, if implemented can potentially reduce the offsite drainage area impact to the project site. However, these future elements will not be considered in this drainage analysis for the project site. The area within the ADMS limits, in the mean time, is already experiencing significant growth. All new developments are required to retain the onsite storm runoff volume from the 100-year 1-hour or 2-hour storm, depending on the jurisdictional entity, within the development boundaries. As the developments increase, the offsite flows for the downstream properties will be reduced to rare frequencies in excess of the retained storm.

5.2 PROPOSED OFFSITE FLOW MANAGEMENT

The normal depth method was applied on several cross sections taken across Cactus Road and Bullard Avenue, using the ADMS topography, to evaluate the peak flows estimated in the revised White Tanks Master Study (Appendix A). These calculations indicate that the peak flow of 44 cfs will be fully contained on the north side of Cactus Road, and the 246 cfs peak flow will be fully contained on the west side of Bullard Avenue.

It is proposed to convey the estimated current offsite peak flows along the north side of Peoria Avenue and the west side of Litchfield Road through the ultimate half street sections and adjacent drainage channels. The channels will be located within drainage easements. The proposed drainage easements along the Mountain Gate subdivision are 45 feet along Peoria Avenue and 40 feet along Litchfield Road. It is anticipated that similar sections will be provided along the commercial sites. As these offsite flows approach the southeast corner of the project site, and until potential extension of the channel by future developments, they will overtop the adjacent roads disperse to sheet flow into the downstream fields. Culvert crossings will be provided at the entrances for the project site off Peoria Avenue and Litchfield Road.

6.0 Onsite Drainage

6.1 ONSITE DRAINAGE PLAN

Onsite storm water runoff is proposed to be collected in local streets and conveyed into several proposed retention basins throughout the project site via catch basins (Fig. 3).

6.2 METHODOLOGY

Local streets were designed to contain the 10-year flow between the curbs, the fifty year between the buildings front yards, and the 100-year flow 1.0 feet below finished floors. Street capacity calculations are included in Appendix B.

The Rational method was used to estimate the onsite storm runoff peak flows in accordance with the Drainage Design Manual for Maricopa County, Volume I, Hydrology (Ref. 2) and consistent with the City of Surprise Comprehensive

Development Guide (Ref. 1). According to the Comprehensive Development Guide, a maximum time concentration of fifteen minutes may be used for the runoff across the lots. Peak flow calculations are included in Appendix C.

Hydraulic calculations, such as storm drainage inlets and storm drain pipes, were performed in accordance with the Drainage Design Manual for Maricopa County, volume II, Hydraulics (Ref. 3) and are included in Appendix D.

7.0 Retention Requirements

Onsite retention will be provided for the storm runoff volume of the 100-year, 2-hour storm, which falls within the area being developed. The corresponding rainfall intensity used in the Master Drainage Report for Mountain Gate (Ref. 6) was 2.65 inches, per the FCDMC charts. The City of Surprise however requested to use a rainfall intensity of 2.8 inches to reflect a revision to its drainage guidelines currently being undertaken. The retention basins were designed per the City of Surprise Comprehensive Development Guide. The retention basins will drain through dry wells within a maximum time of 36 hours. Retention and dry well calculations are included in Appendix E.

A temporary basin has been designed to intercept the interim flow from the northern section of the project site which will be developed in future phases (Fig. 3).

8.0 Finished Floor Elevations

All finished floor elevations were set at a minimum of 14 inches above the low outfall of the site. In addition, all finished floors were a minimum of 1.0 foot higher than the estimated 100-year water surface elevations at the project site.

9.0 References

1. City of Surprise, Arizona, Surprise Municipal Code, Title 16 Subdivision, Surprise Comprehensive Development Guide, 1/97.

2. Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, January 1, 1995.

3. Flood Control District of Maricopa County, Drainage Design Manual, Volume II, Hydraulics, January 28, 1996.

4. The WLB Group, Inc., White Tanks/ Agua Fria Area Drainage Master Study, prepared for the Flood Control District of Maricopa County, December 1994.

5. URS, Loop 303 Corridor/White Tanks Area Drainage Master Plan Update, Contract FCD 99-40, Draft, Existing Condition, Hydrology, June 2001.

6. Stantec Consulting Inc., Master Drainage Report for Mountain Gate, January 31, 2000.

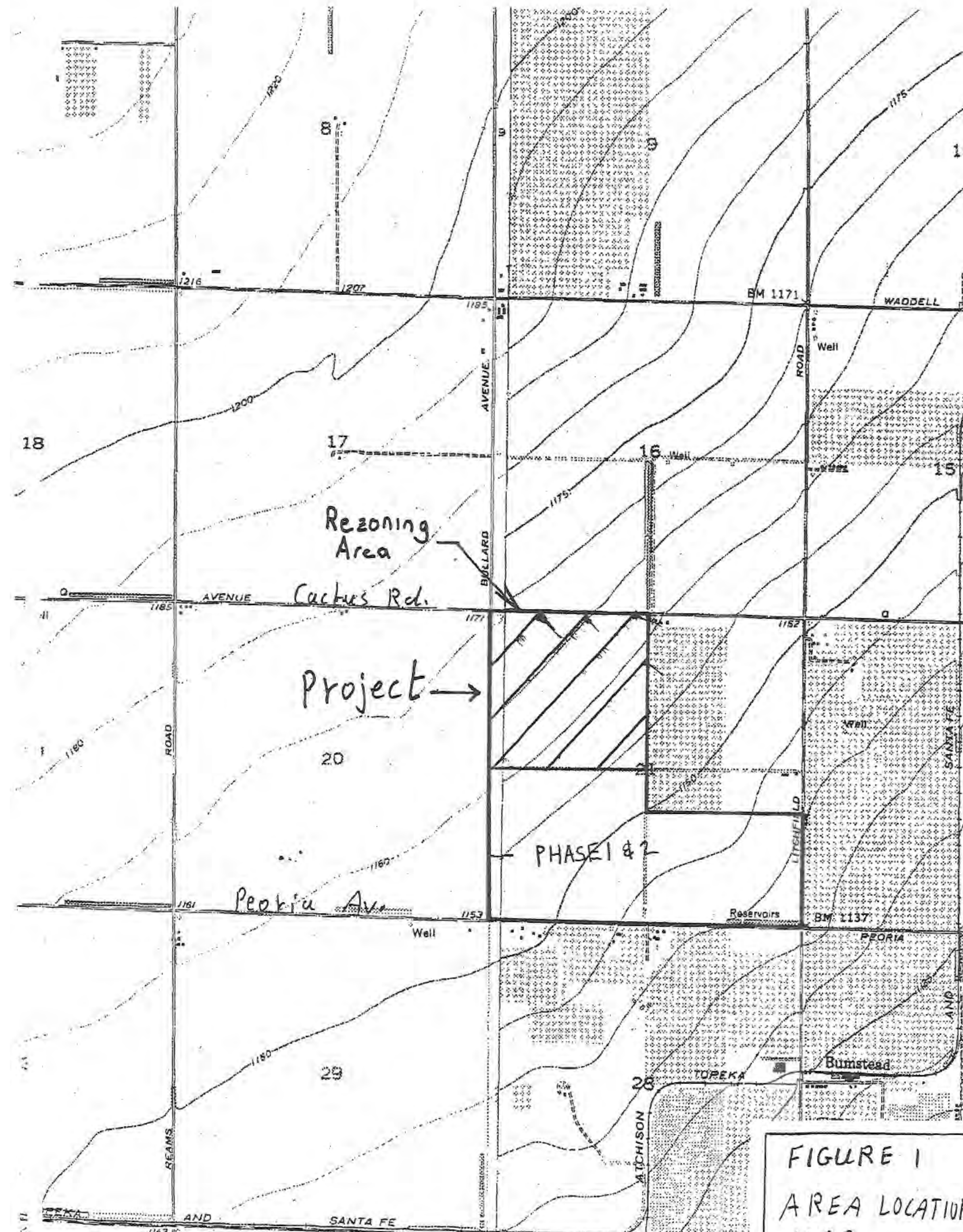
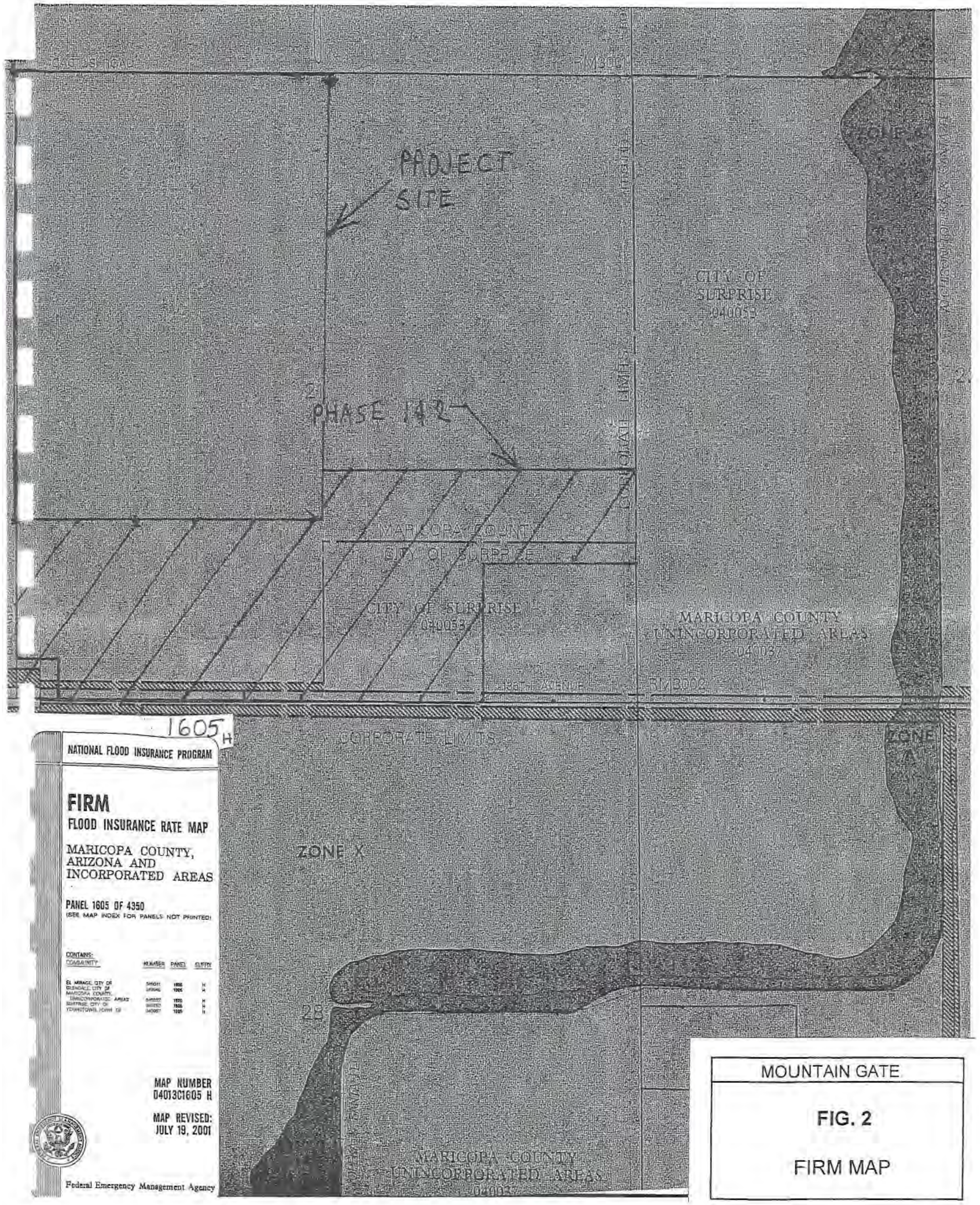


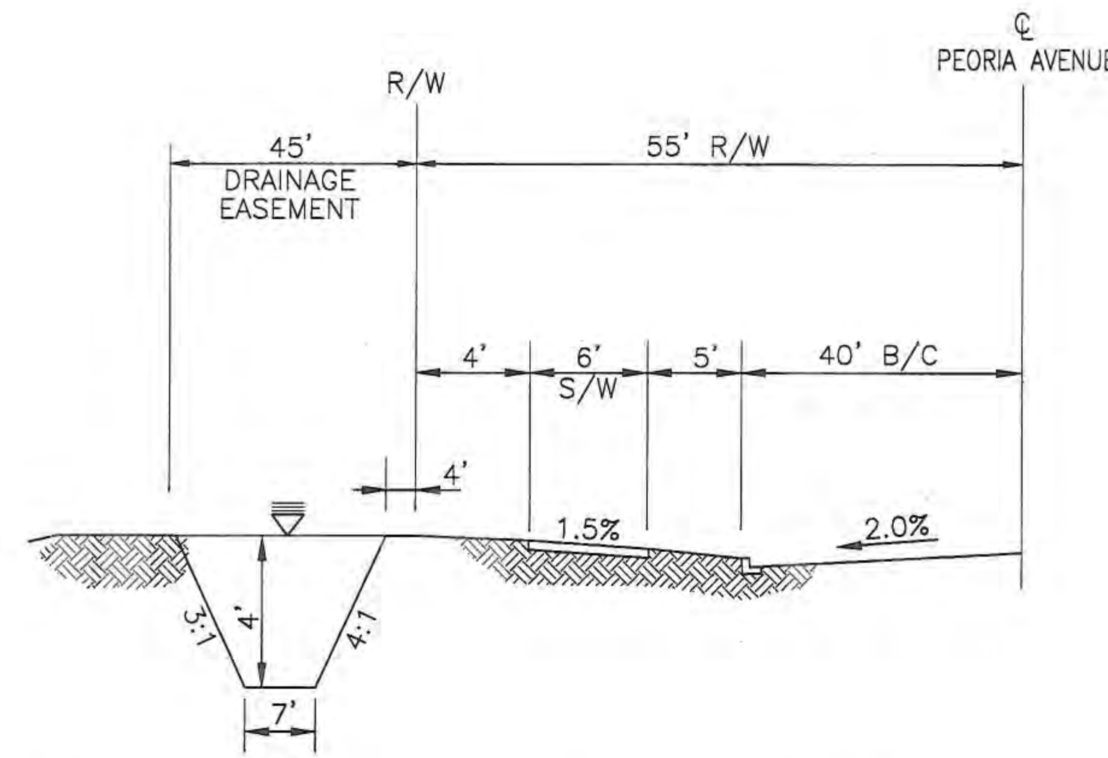
FIGURE 1
AREA LOCATION MAP



MOUNTAIN GATE

FIG. 2

FIRM MAP



PEORIA AVENUE/CHANNEL SECTION

NTS

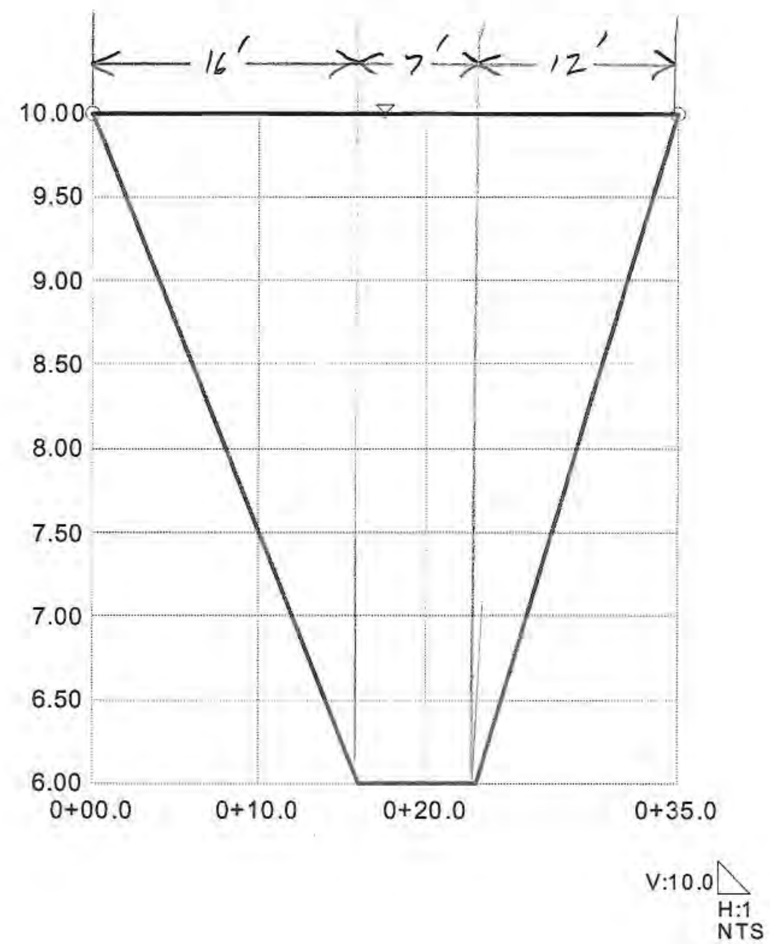
Cross Section
Cross Section for Irregular Channel

Channel Cross Section @ Peoria Entrance P-1 (See Figure 4)

Project Description	
Worksheet	Pearia Channel Phase 1 & :
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.025	
Slope	0.003000	ft/ft
Water Surface Elevation	10.00	ft
Elevation Range	6.00 to 10.00	
Discharge	479.82	cfs

Channel Capacity *



* Q_{100} = 487 cfs
The balance of the flow (487-480=7cfs) will be conveyed in the adjacent street section which has a capacity as shown on sheet 3/6

Worksheet
Worksheet for Irregular Channel

Channel Cross Section @ Peoria Entrance P-1 (See Figure 4)

Project Description	
Worksheet	Pearia Channel Phase 1 & :
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.003000	ft/ft
Water Surface Elevation	10.00	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.025	
Elevation Range	6.00 to 10.00	
Discharge	479.82	cfs
Flow Area	84.0	ft²
Wetted Perimeter	36.14	ft
Top Width	35.00	ft
Actual Depth	4.00	ft
Critical Elevation	9.25	ft
Critical Slope	0.007522	ft/ft
Velocity	5.71	ft/s
Velocity Head	0.51	ft
Specific Energy	10.51	ft
Froude Number	0.65	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+35.0	0.025

Natural Channel Points *

Station (ft)	Elevation (ft)
0+00.0	10.00
0+16.0	6.00
0+23.0	6.00
0+35.0	10.00

* Not actual elevations

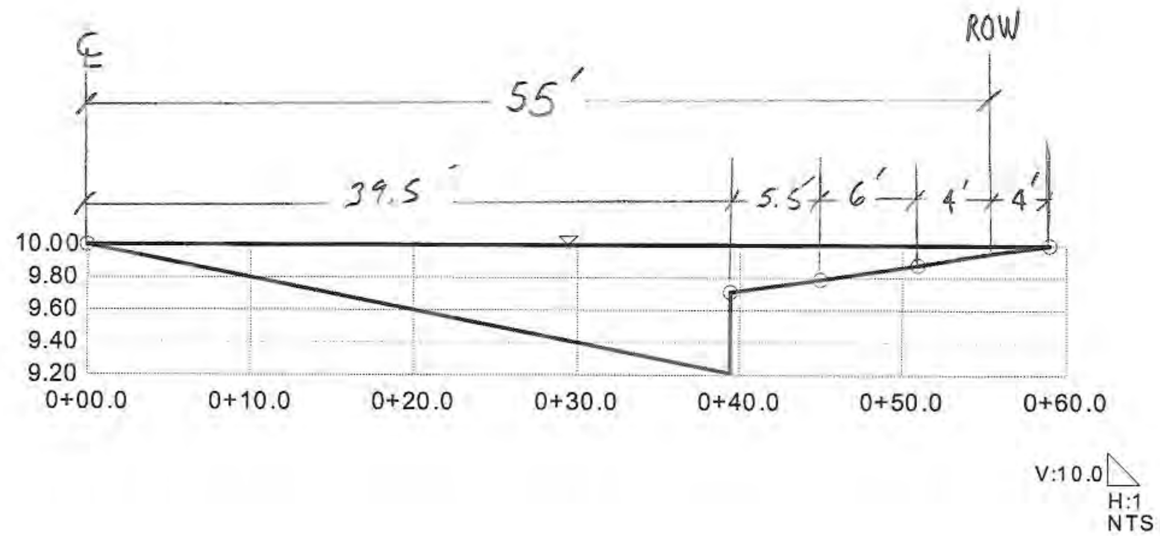
Cross Section
Cross Section for Irregular Channel

Street Cross Section @ Peoria Entrance P-1 (See Figure 4)

Project Description	
Worksheet	Pearia Ave with out channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Slope	0.003000 ft/ft
Water Surface Elevation	10.00 ft
Elevation Range	9.21 to 10.00
Discharge	49.22 cfs

Street Capacity



Worksheet
Worksheet for Irregular Channel

Street Cross Section @ Peoria Entrance P-1 (See Figure 4)

Project Description	
Worksheet	Pearia Ave with out channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.003000 ft/ft
Water Surface Elevation	10.00 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	9.21 to 10.00
Discharge	49.22 cfs
Flow Area	18.4 ft²
Wetted Perimeter	59.51 ft
Top Width	59.00 ft
Actual Depth	0.79 ft
Critical Elevation	9.96 ft
Critical Slope	0.004320 ft/ft
Velocity	2.67 ft/s
Velocity Head	0.11 ft
Specific Energy	10.11 ft
Froude Number	0.84
Flow Type	Subcritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+39.5	0.015
0+39.5	0+45.0	0.025
0+45.0	0+51.0	0.012
0+51.0	0+59.0	0.025

Natural Channel Points

Station (ft)	Elevation (ft) *
0+00.0	10.00
0+39.5	9.21
0+39.5	9.71
0+45.0	9.79
0+51.0	9.88
0+55.0	9.94
0+59.0	10.00

* Not actual elevations

Culvert at entrance
off of Peoria Ave.

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

Culvert #1

March 25, 2002

3-10'x3'

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	10.0
Culvert Rise (ft)	3.0
FHWA Chart Number	8
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.012
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	64.0
Invert Elevation at Downstream end of Culvert (ft)	0.0
Invert Elevation at Upstream end of Culvert (ft)	0.19
Culvert Slope (ft/ft)	0.003
Starting Flow Rate (cfs)	162.3
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	162.3
Starting Tailwater Depth (ft)	4.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	4.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
162.3	4.0	3.26	4.59	1.93	2.02	3.0	5.41

HYDROCALC Hydraulics for Windows, Version 1.2a
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

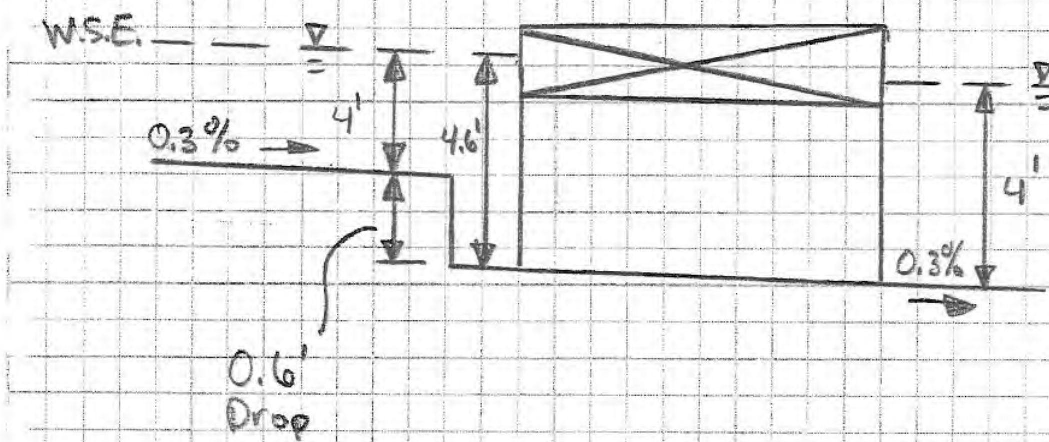
$Q_{100} = 487$ CFS

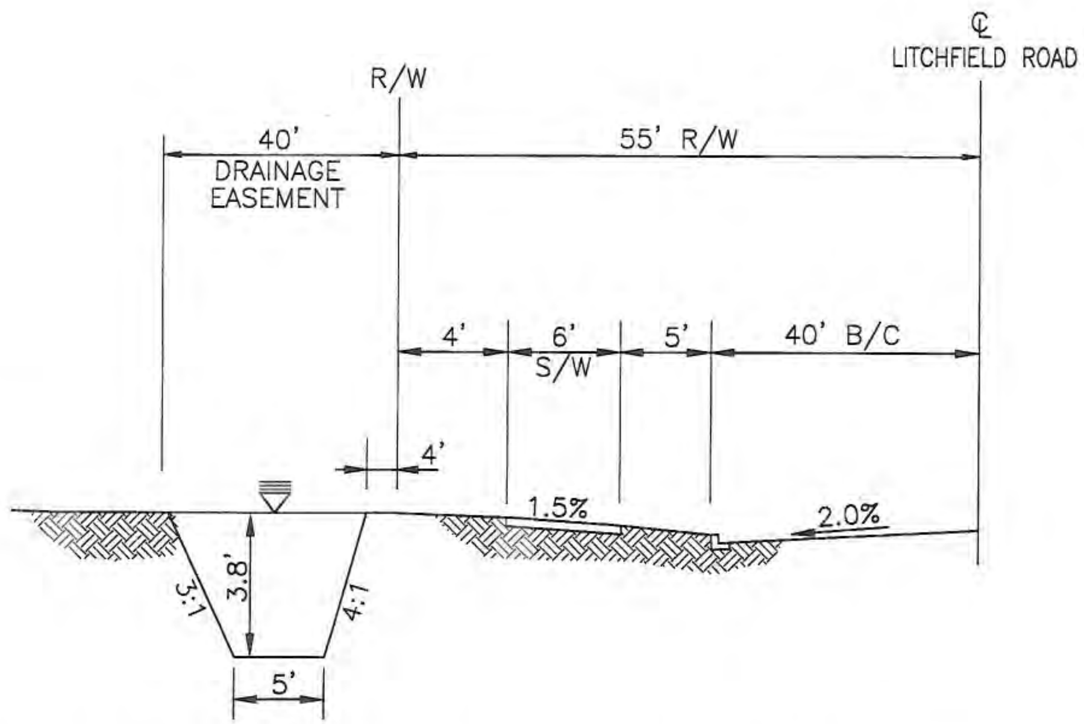
Stantec

Project: Mountain Gate
Project Number:
Notes: Culvert #1 (Peoria Ave)
Scale:
Page ___ of ___ Page(s)
Computed By: Date: / / Checked By: Date: / /

Culvert #1

(3 - 10' X 3' CBC)





LITCHFIELD ROAD/CHANNEL SECTION

NTS

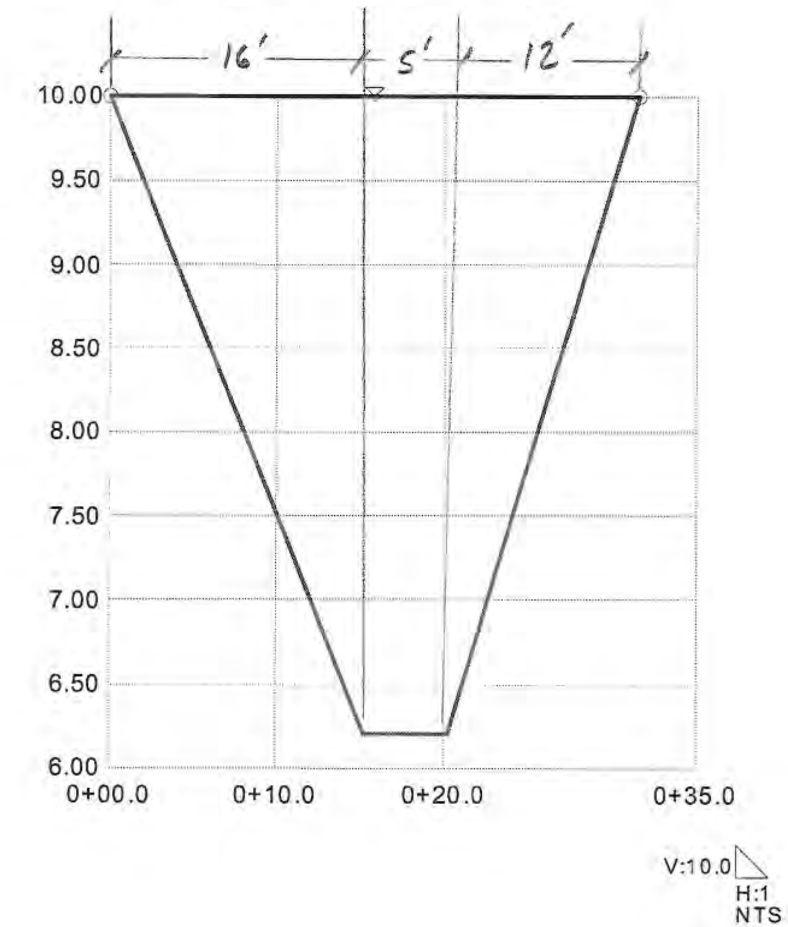
Cross Section
Cross Section for Irregular Channel

Channel Cross Section @ Litchfield Entrance L-1 (See Figure 4)

Project Description	
Worksheet	Litchfield Channel Phase 1 & 2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.025	
Slope	0.002500	ft/ft
Water Surface Elevation	10.00	ft
Elevation Range	6.20 to 10.00	
Discharge	341.87	cfs

← Channel Capacity



Worksheet
Worksheet for Irregular Channel

Channel Cross Section @ Litchfield Entrance L-1 (See Figure 4)

Project Description	
Worksheet	Litchfield Channel Phase 1 & 2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.002500	ft/ft
Water Surface Elevation	10.00	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Methoi	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.025	
Elevation Range	6.20 to 10.00	
Discharge	341.87	cfs
Flow Area	69.5	ft²
Wetted Perimeter	32.68	ft
Top Width	31.60	ft
Actual Depth	3.80	ft
Critical Elevation	9.16	ft
Critical Slope	0.007867	ft/ft
Velocity	4.92	ft/s
Velocity Head	0.38	ft
Specific Energy	10.38	ft
Froude Number	0.58	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+31.6	0.025

Natural Channel Points *

Station (ft)	Elevation (ft)
0+00.0	10.00
0+15.2	6.20
0+20.2	6.20
0+31.6	10.00

* Not actual elevations

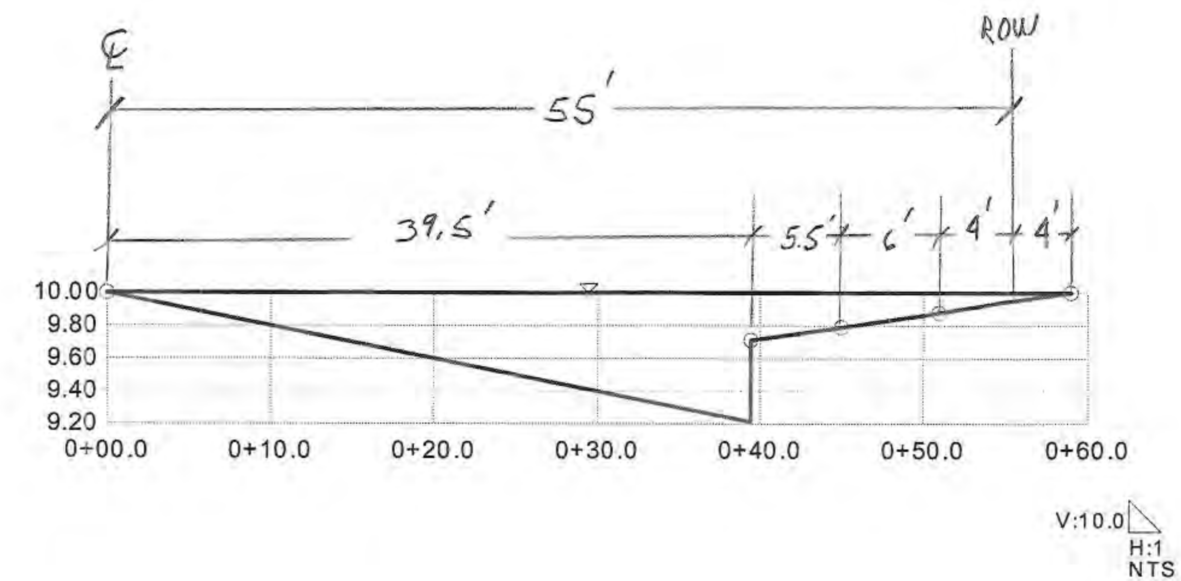
Cross Section
Cross Section for Irregular Channel

Street Cross Section @ Litchfield Entrance L-1 (See Figure 4)

Project Description	
Worksheet	Litchfield Road with out channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.014	
Slope	0.002500	ft/ft
Water Surface Elevation	10.00	ft
Elevation Range	9.21 to 10.00	
Discharge	44.93	cfs

← Street Capacity



Worksheet
Worksheet for Irregular Channel

Street Cross Section @ Litchfield Entrance L-1 (See Figure 4)

Project Description	
Worksheet	Litchfield Road with out channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.002500	ft/ft
Water Surface Elevation	10.00	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Methoi	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.014	
Elevation Range	9.21 to 10.00	
Discharge	44.93	cfs
Flow Area	18.4	ft²
Wetted Perimeter	59.51	ft
Top Width	59.00	ft
Actual Depth	0.79	ft
Critical Elevation	9.93	ft
Critical Slope	0.004363	ft/ft
Velocity	2.44	ft/s
Velocity Head	0.09	ft
Specific Energy	10.09	ft
Froude Number	0.77	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+39.5	0.015
0+39.5	0+45.0	0.025
0+45.0	0+51.0	0.012
0+51.0	0+59.0	0.025

Natural Channel Points

Station (ft)	Elevation (ft) *
0+00.0	10.00
0+39.5	9.21
0+39.5	9.71
0+45.0	9.79
0+51.0	9.88
0+55.0	9.94
0+59.0	10.00

* Not Actual elevations

Culvert at entrance Off of Litchfield Road

Culvert #2

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

March 25, 2002

PROGRAM INPUT DATA

3-8'x3'

DESCRIPTION	VALUE
Culvert Span (ft)	8.0
Culvert Rise (ft)	3.0
FHWA Chart Number	8
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.012
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	66.0
Invert Elevation at Downstream end of Culvert (ft)	0.0
Invert Elevation at Upstream end of Culvert (ft)	0.17
Culvert Slope (ft/ft)	0.0026
Starting Flow Rate (cfs)	115.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	115.0
Starting Tailwater Depth (ft)	3.7
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	3.7

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
115.0	3.7	3.0	4.15	1.92	1.86	3.0	4.79

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Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

$Q_{100} = 345$ cfs

Stantec

Project: Mountain Gate Project Number:

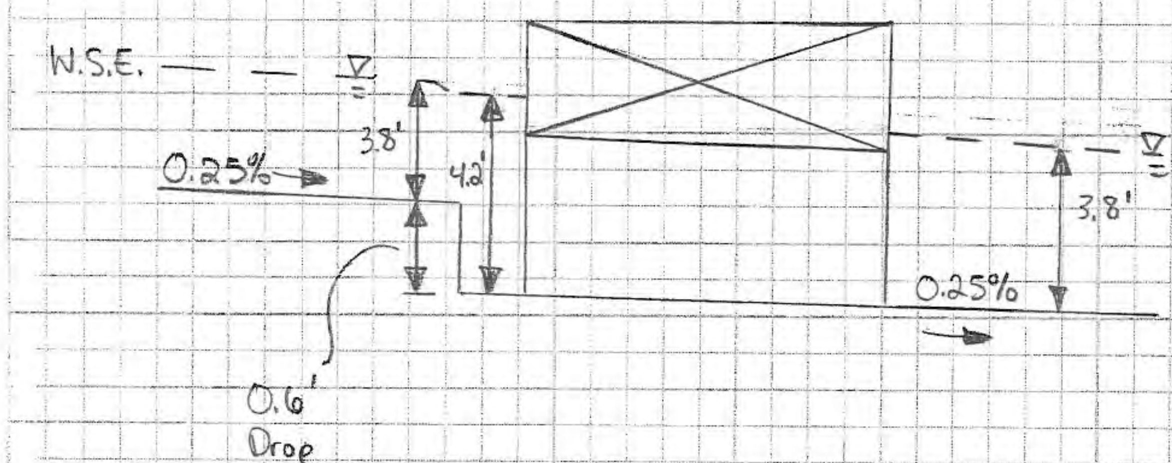
Notes: Culvert #2 (Litchfield) Scale:

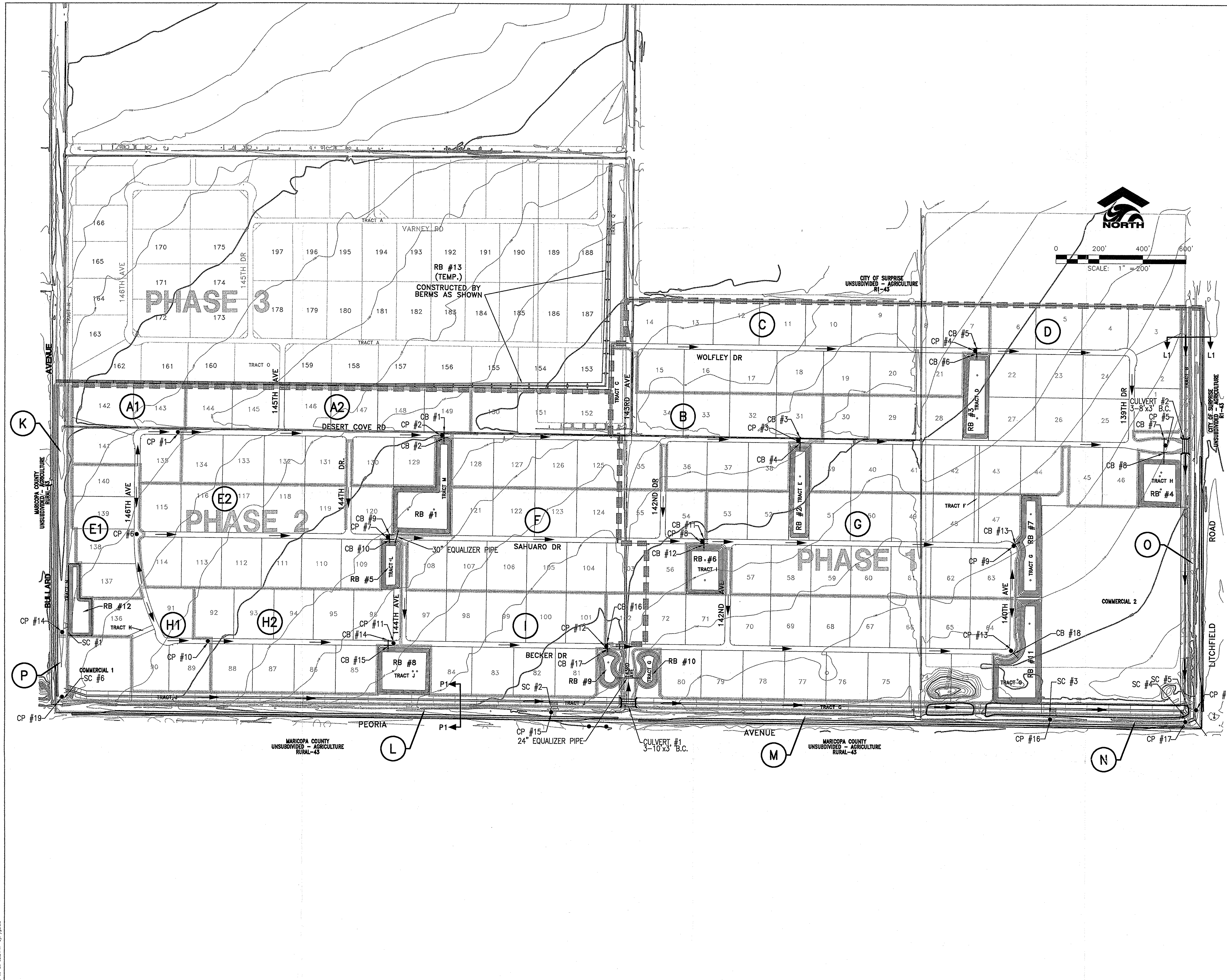
Page ___ of ___ Page(s)

Computed By: Date: Checked By: Date:

Culvert #2

(3-8'x3' CBC)





Stantec Consulting Inc.
8211 South 48th Street
Phoenix AZ USA
85044-5355
Tel. 602.438.2200
Fax. 602.431.9562
www.stantec.com

Stantec

LEGEND

(A1)	SUBBASIN A1
	SUBBASIN BOUNDARY
CB #1	CATCH BASIN NO. 1
• CP #1	CONCENTRATION POINT NO. 1
→	FLOW DIRECTION
RB #1	RETENTION BASIN NO. 1
	PHASE LINE

File Name: 806C101E.dwg	YG			03/22/02
	Dwn.	Chkd.	Dsgn.	Date

Permit/Seal

Registered Professional Engineer (Civil) 24021 MICHAEL J. SAMER ARIZONA, U.S.A.

CALL TWO WORKING DAYS BEFORE YOU DIG (602) 263-1100 1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

Client/Project

WILLIAM LYON HOMES, INC.
8800 E. Chaparral Road, Suite 260
Scottsdale, Arizona 85250
Telephone: (480) 893-1000

MOUNTAIN GATE

Surprise, Arizona

Title

DRAINAGE MAP EXHIBIT

Project No.	Scale	
81500806	1"=200'	
Drawing No.	Sheet	Revision
	1 of 1	

DESERT COVE COMMERCIAL PARK

LOCATED ON THE NORTHEAST CORNER OF LITCHFIELD ROAD AND PEORIA AVENUE

FINAL DRAINAGE REPORT

FEBRUARY 16, 2007
REVISED: MARCH 22, 2007

V3 PROJECT NO.: A04233

PREPARED FOR:

SAGE DEVELOPMENT CORPORATION
13550 W. PEORIA AVENUE, SUITE 1
SURPRISE, ARIZONA 85379
(623) 584-2525

PREPARED BY:

V3 COMPANIES OF ARIZONA, LTD.
1048 N. 44TH STREET, SUITE 100
PHOENIX, AZ 85008
(602) 648-4800

Registered Professional Engineer (Civil) CERTIFICATE NO. 41725 GREGORY V. WOLTERSTORFF Date Signed 3/23/07 ARIZONA, U.S.A.

2.0 HYDROLOGIC ANALYSIS

2.1 Off-Site Hydrology

In order to develop an adequate description of hydrologic conditions affecting the site, research conducted for this project included site visits, review of topographic mapping, and review of regional hydrologic analysis conducted for the Flood Control District of Maricopa County (FCDMC).

Visual reconnaissance was conducted for the site and surrounding area in order to observe and record information concerning present use and conditions for the site and surrounding area. The reconnaissance was conducted on September 8, 2004 by Mr. Robert E. McGee, E.I.T. of V3, with additional site visits conducted in February 2007 by Ms. Lisa M. Nelson, P.E. also of V3.

2.1.1 Impact(s) to Proposed Project Site

Offsite storm water discharges directed to the site will not adversely impact the site.

2.1.2 Development of Off-Site Peak Discharges

Off-site peak discharges were developed for this site in the *Loop 303 Corridor/White Tanks Area Drainage Master Plan* (ADMP) *Update* (Reference 5). Excerpts from the ADMP can be founding **APPENDIX A**. A review of the ADMP indicates that a 100-year, 24-hour peak flow of 41 cfs is directed to the site from the west in Peoria Avenue. A 100-year, 24-hour peak flow of 184 cfs is directed to the site from the north in Litchfield Road. Additionally a 100-year, 24-hour peak discharge of 170 cfs is intercepted at the intersection of Cactus Road and Litchfield Road to the north and is conveyed across the site towards the southeast via sheet flow.

2.1.3 Conveyance of Off-Site Discharge

A review of the *Final Drainage Report for Mountain Gate* (Reference 9) prepared by Stantec Consulting, Inc. indicates that a 100-year peak flow of 191 cfs is directed to the south along the west side of Litchfield Road. This 100-year flow is the peak flow for identifier 2D151 of the *Loop 303 Corridor/White Tanks Area Drainage Master Plan* (ADMP) *Update* (Reference 5). The HEC-1 model indicates that this flow is routed to the south along Litchfild Road (HEC-1 identifier R151) and has a peak flow of 184 cfs. However, the *Final Drainage Report for Mountain Gate* (Reference 9) assumes that all 191 cfs is directed towards the south in Litchfield Road. Stantec has taken this 191 cfs, in addition to the 100-year runoff from the field adjacent to Litchifeld Road and Cactus Road, and combined them for a 100-year peak flow of 345 cfs. This flow is then described in the Mountain Gate report as flowing on the west side of Litchfield Road and is done so by means of an engineered channel running parallel to Litchfield Road towards Peoria Avenue. At the intersection of Litchfield Road and Peoria Avenue this discharge will sheet flow out of the Mountain Gate site and will flow towards the south and southeast as it has historically done. At this intersection , 41 cfs will be directed to the east in Peoria Avenue past the Desert Cove Commercial Park (Reference 4). Excerpts from the *Final Drainage Report for Mountain Gate* (Reference 9), which include the HEC-1 map and 100-year flows used, channel calculations, and discussion of how the flow is conveyed can be found in **APPENDIX B**. Additionally, a copy of the Drainage Map for this subdivision is included as **EXHIBIT 3** and shows the location of the channel.

The 41 cfs that is directed toward Desert Cove Commercial Park in Peoria Avenue is contained within the roadway and will continue to flow to the east as it has historically done. The flow will not be collected and conveyed on site for several reasons. The first reason is that Peoria Avenue has the ability to convey this 100-year peak flow within the roadway cross section. The second reason is that the flow does not have a positive outlet at the east boundary of the site. This discharge would create an adverse impact on the property owner to the east, unless it is returned to Peoria Avenue. From the site reconnaissance, it was evident that this adjacent parcel is flood irrigated and contains earthen berms along the parcel boundaries to contain the irrigation water and does not receive storm water generated on Peoria Avenue. This would not only change the current flow path of the storm water in Peoria Avenue, but would greatly increase the potential for flooding and would change the current flow path of storm water directed to this residential parcel. Therefore, the 41 cfs will be allowed to be conveyed to the east within Peoria Avenue. However, it should be noted that some of this flow will be intercepted by the proposed inlets that are located along Peoria Avenue, and will be taken into the proposed retention basins. It is the responsibility of the Desert Cove development to retain the storm water generated by the half-street Peoria Avenue.

From a review of the ADMP (Reference 5) it was determined that a 100-year peak flow of 170 cfs is directed to the southeast at the intersection of Litchfield Road and Cactus Road, which is located to the north of the site. This flow is conveyed towards the southeast by way overland sheet flow. Since the improvements to the site only encompass Peoria Avenue and Litchfield Road at this time, this off-site discharge will continue to sheet flow across Desert Cove Commercial Park as it has done. Upon final engineering of the site, this off-site sheet flow will be captured and conveyed in accordance with the *Preliminary Drainage Report for Desert Cove Commercial Park* (Reference 10) so as to not adversely impact this development and the downstream developments.

Only the localized flows generated on the Peoria Avenue and Litchfield Road directly adjacent to the site are intercepted into the site via scuppers. The volume of storm water that is generated on the adjacent half-streets of Peoria Avenue and Litchfield Road during the 100-year, 2-hour storm is taken into the site and stored in retention basins in accordance with the *Preliminary Drainage Report for Desert Cove Commercial Park* (Reference 10).

2.1.4 Discharge at the entrance and exit points

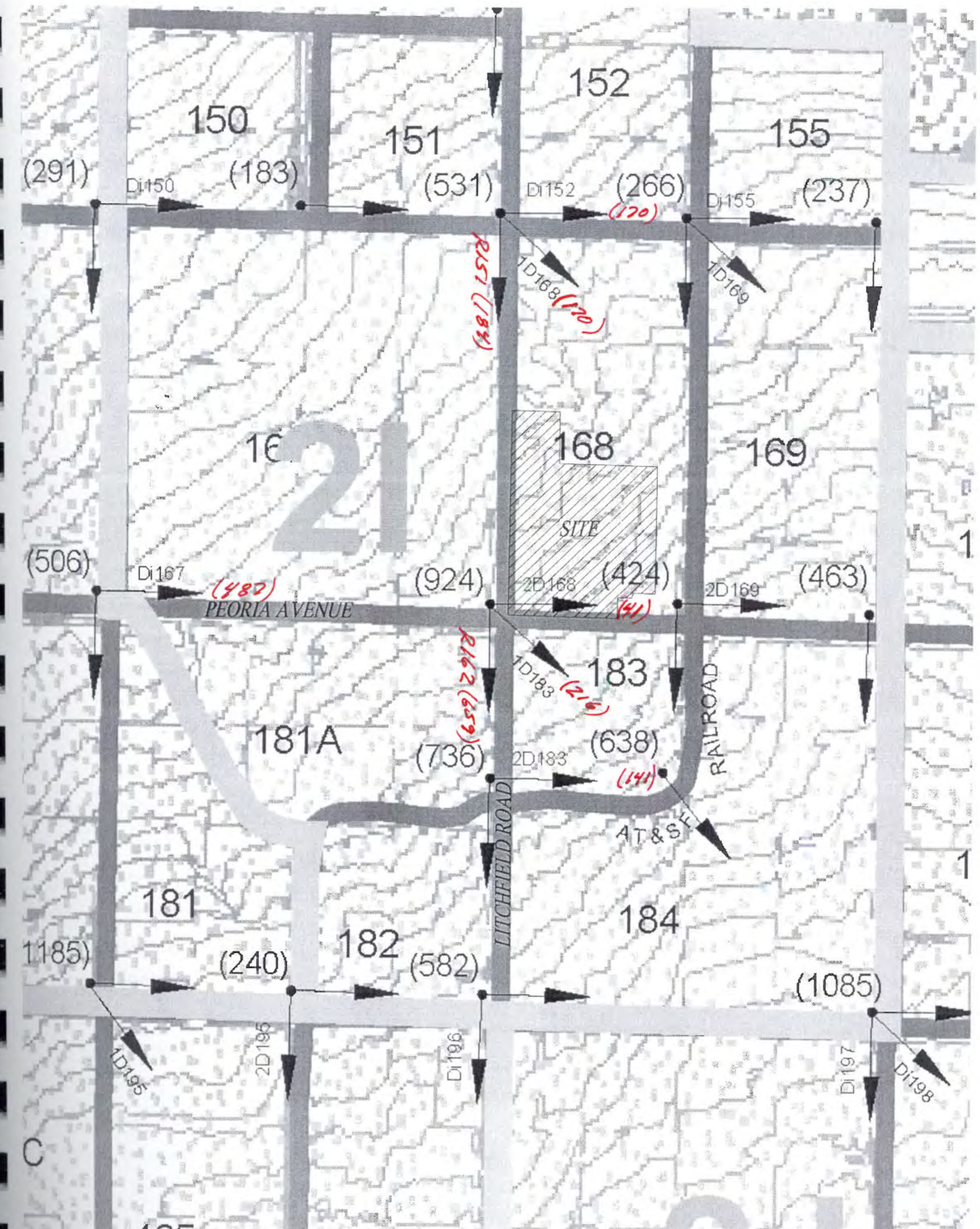
The entrances to the site are elevated in order to keep the off-site flows within Litchfield Road and Peoria Avenue. However, scuppers have been incorporated along the roadway to intercept the storm water generated on these roads immediately adjacent to the site for retention purposes during the 100-year, 2-hour storm event.

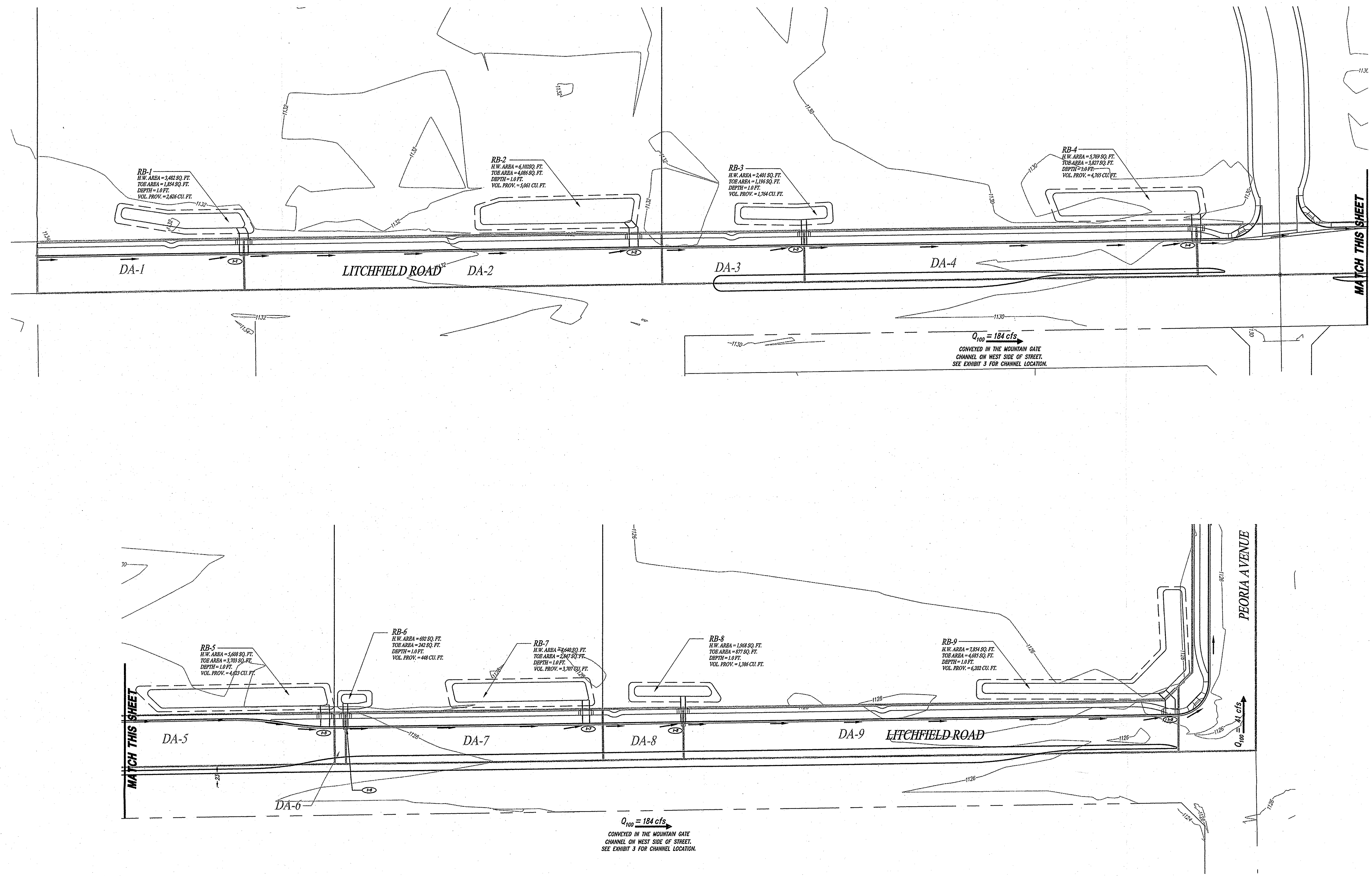
2.1.5 Existing Land Use

General land use in the vicinity of the site is agricultural with increasing low-density residential and commercial developments (**FIGURE 2**). The site is currently not developed.

2.2 On-Site Hydrology

Proposed site configuration and grading design indicates that the Rational Method of hydrology as described in the *Drainage Design Manual for Maricopa County, Volume I* (Reference 2) is applicable. Distinct drainage sub-basins were delineated for Peoria Avenue and Litchfield Road based on the final grading plan and site layout. The delineated sub-basins were given a unique





LEGEND

DA-1	DRAINAGE AREA I.D.
	DRAINAGE AREA BOUNDARY
RB-1	RETENTION BASIN I.D.
	RETENTION BASIN H.W.
	RETENTION BASIN TOE
I-1	INLET I.D.
	INLET
	FLOW ARROW
Q_{100} = 41 cfs	ADMP 100-YEAR, 24-HOUR PEAK FLOW

50 25 0 50 100

SCALE 1" = 50'

REVISIONS/SUBMITTALS

V3 COMPANIES OF ARIZONA
1048 North 44th Street
Suite 100
Phoenix, Arizona 85008
P. 602.648.4800
www.V3co.com

SITE DRAINAGEGE MAP - LITCHFIELD ROAD
DESERT COVE COMMERCIAL PARK

SECTION 22
T.3N., R. 1W. OF THE GILA AND SALT RIVER BASE AND MERIDIAN
SURPRISE, MARICOPA COUNTY, ARIZONA

EXHIBIT 1

JOB NO.	04233
DESIGNED	CJ
DRAWN	NRY
ACAD FILE	04233ED04
CHECKED	GVW
ORIG SUB DATE	03-22-2007

1 OF 1 SHEETS

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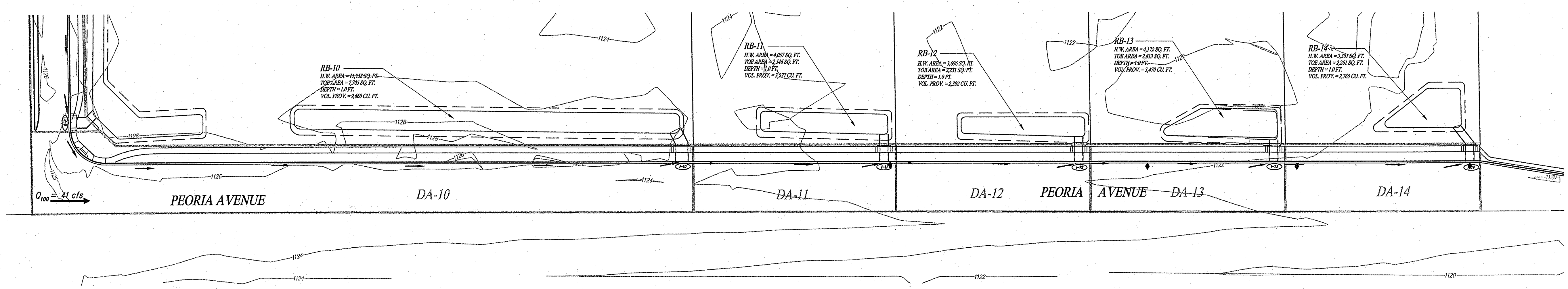

LEGEND

DA-1	DRAINAGE AREA I.D.
	DRAINAGE AREA BOUNDARY
RB-1	RETENTION BASIN I.D.
— — —	RETENTION BASIN H.W.
———	RETENTION BASIN TOE
	INLET I.D.
	INLET
	FLOW ARROW
Q_{100} = 41 cfs	ADMP 100-YEAR, 24-HOUR PEAK FLOW

N

50 25 0 50 100

SCALE 1" = 50'

REVISIONS/SUBMITTALS

V3 COMPANIES OF ARIZONA
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Phoenix, Arizona 85008
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SITE DRAINAGE MAP - PEORIA AVENUE
DESERT COVE COMMERCIAL PARK

SECTION 22
T.3N., R.1W., OF THE GILA AND SALT RIVER BASE AND MERIDIAN
SURPRISE, MARICOPA COUNTY, ARIZONA

EXHIBIT 2

JOB NO.	04233
DESIGNED	CJ
DRAWN	NRY
ACAD FILE	04233ED04
CHECKED	GVW
DATE	03-22-2007

1 OF 1 SHEETS

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MASTER DRAINAGE REPORT

FOR

SKYWAY BUSINESS PARK

Surprise, Arizona

Prepared for:

Skyway Business Park, L.L.C.
4301 N.75th Street, Suite 105
Scottsdale, Arizona 85251
Contact: Mr. Jim McDowell

Prepared by:

Project Design Consultants
3200 East Camelback Road, Suite 275
Phoenix, Arizona 85018

Job No. 2976.10

AUGUST 29, 2005
Revised October 31, 2005
Revised December 29, 2005

Registered Professional Engineer
CERTIFICATE NO. 15290
GREGORY A. SCHUELKE
Date Signed 1-11-06

2.0 HYDROLOGIC ANALYSIS

2.1 OFF-SITE HYDROLOGY

2.1.1 Impacts To Proposed Project Site and

2.1.2 Development of Off-Site Peak Discharges

The study site (Skyway Business Park) is isolated from low intensity offsite storms, since the area to the north is irrigated farmland. During larger storm events (e.g. the 100-year, 24-hour storm), offsite storm water flows are estimated to arrive from the northeast to the study site. **Figure 2** shows an excerpt from the Loop 303/ *White Tanks Area Drainage Master Plan (ADMP)* (Reference 4) affecting the proposed Skyway Business Park.

Several HEC-1 models were created in the ADMP, of which the following two are discussed in this report:

Existing Conditions: HEC-1 File: L303M1L.DAT

Future Case With Retention Volume Diverts: HEC-1 File: L303F8B.DAT

EXISTING CONDITIONS HEC-1 MODEL

The Burlington Northern and Sante Fe Railroad (BNSFRR) tracks along the west side of the Milgard site are raised up approximately 2.5-feet above adjacent ground to the west, which creates a barrier to low flows from the west. Based on field measurements of the railroad embankment and the channel west of the tracks, flow capacity estimates were made using Flow master normal-depth hydraulic software for Sections C-C and D-D (shown on Exhibit 1) with calculations in Appendix A. Based on these calculations, the initial 130 cfs of storm water from the northwest is conveyed south past the Milgard parcel facilities.

The HEC-1 model (File: L303M1L1.OUT) shows potential existing condition offsite drainage approaching the site. At the northwest corner of the site, the peak flow is estimated as 356.5 cfs, or the average of HEC-1 # 1I168 (289 cfs) and HEC-1 # CP168 (424 cfs). Removing the 130 cfs channel capacity south along the tracks leaves 226.5 cfs that could weir over the tracks and enter the Milgard facilities.

The HEC-1 Model does not have a specific concentration point at the northeast corner of the site, however the peak flow is estimated as 358 cfs at HEC-1 #1I169, which includes all of Sub area #169 and R155 at the southeast corner of the site.

At the southwest corner of the site, the peak flow is estimated as 108 cfs (HEC-1 # 2D169 or D168) entering the site along Peoria Avenue.

The total flow exiting the site along Peoria Avenue is estimated as 463 cfs (HEC-1 #CP169), which involves the combination of the above two HEC-1 ID's.

FUTURE CASE WITH RETENTION VOLUME DIVERTS HEC-1 MODEL

Another HEC-1 model (File: L303F8B.OUT) was developed as part of the Loop

303/White Tanks ADMP that modeled future build out with retention for the existing drainage patterns (no regional detention basins, channels, etc.). This HEC-1 Model estimated peak 100-year 24-hour flows at the northwest corner of the site of 250 cfs, or the average of HEC-1 # 1I168 (250 cfs) and HEC-1 # CP168 (249 cfs). Removing the estimated 130 cfs flowing south along the west side of the railroad tracks (discussed in Section above) results in 119 cfs potentially entering the site at its northwest corner for the future build out condition.

The HEC-1 model does not have a specific concentration point at the northeast corner of the site; however, the peak flow is estimated as 271 cfs (HEC-1 # 1I169) which includes all of Sub areas #169 and R155 at the southeast corner of the site.

At the southwest corner of the site, the peak flow is estimated as 52 cfs (HEC-1 # 2D1689or D168) entering the site along Peoria Avenue.

The total flow exiting the site along Peoria Avenue is estimated as 270 cfs (HEC # CP169).

MODIFIED EXISTING WITH PROPOSED SKYWAY HEC-1 MODEL

In order to obtain a better estimate of peak flow along the north side of the study site (Varney Road alignment), the HEC-1 model (File L303M1L.DAT) was copied and renamed (File: L303M1L1.DAT). This model was revised to break HEC-1 Sub area #169, into two sub areas; Sub area #169A, being the 160-acres north of the Varney Road alignment and Sub area #169B, being the study area, south of Varney Road. Sub area 169A (Skyway Business Park) was modeled as developed with a retention volume diversion for the 100-year 2-hour retention requirement.

100-Year-24 Hour Storm Event

For this HEC-1 Model, File: L303M1L1.OUT, the estimate of peak 100-year flow at the northwest corner of the Milgard site (Lot 27 of Skyway Business Park), is the average of HEC-1 #1I168 (289 cfs) and CP168 (424 cfs) or 713 cfs /2 = 356.5 cfs. Removing the estimated 130 cfs flowing south along the west side of the tracks, results in 226.5 cfs potentially entering the Milgard facilities as weir flow.

At the northeast corner of the site, the HEC-1 # 1I169A 100-year flow was computed as 305 cfs entering the site as offsite flow along the proposed Varney Road alignment, west of Dysart Road.

At the southwest corner of the site, the flow entering the site along Peoria Avenue is estimated as 108 cfs (HEC-1 # 2D168 or D168).

The total 100-year flow exiting (HEC-1 # CP169) was computed as 351 cfs along Peoria Avenue, approximately 800-feet west of Dysart Road.

10-Year-24-Hour Storm Event

The above HEC-1 model L303M1L1 was copied and renamed L303M1L5, and the only change was to model the 10-year 24-hour storm event with precipitation value of 2.50-inches. This HEC-1 model was performed to use in design of swales along both sides of 132[ND] Avenue and the east side of Milgard Way to convey the approximate 10-year 24-hour storm (from the north only, HEC-1 ID 1I169A), south to the retention basin along Peoria Avenue.

The following Table 1 summarizes the offsite discharges discussed above, with Figure 2, Offsite Drainage Map showing the sub areas from the ADMP. Pertinent excerpts of this HEC-1 model input and output are included in Appendix B.

Table 1-

Summary of Offsite Drainage Discharges

Location	HEC-1 ID's Used In Peak Flow Estimate	Existing Q100 (cfs)	Future W/Diverts Q100 (cfs)	Mod. Exist. Q100 (cfs)	Mod. Exist. Q10 (cfs)
HEC-1 Model File No.		L303M1L	L303F8B	L303M1L1	L303M1L5
Varney Road & BNSFRR	((#1I168+ #CP168)/2)-130cfs (Note 2)	226.5	119	226.5	45.5
N.E. Corner	1I169 (Note 4)	358	271	(1I169A) 305	(1I169A) 162
S.W. Corner	2D169 or D168 (Note 3)	108	52	108	40
Total Exiting @ Peoria Ave.	CP169	463	270	351	154

Explanation: Q100 = 100-Year Peak Discharge in cubic feet per second (cfs).

Notes: 1.) No drainage areas shown for these flows, since there are numerous diversions of flow in the HEC-1 model, making this an uncertain value.

2.) The average of HEC-1 # 1I168 + CP168, minus the estimated 130 cfs south along the BNSFRR, was used to estimate overflow into the study site. (See Appendix B for HEC-1 model input/output).

3.) The ADMP exhibit shows the diverted ID as #2D169, but when it is retrieved for later routing in HEC-1 it is renamed #D168, but is same flow.

4.) The revised HEC-1 models created the new HEC-1 ID # (1I169A) for the specific concentration point at the Varney Road alignment along the north side of the site.

2.1.3 Conveyance of Off-Site Discharge

The following Section 2.1.4 discusses how offsite storm water discharges will be conveyed through the site.

2.1.4 Discharge of Entrance and Exit Points

The modified existing condition HEC-1 model (File: L303M1L1) results will be used for the 100-year 24-hour storm offsite flow conditions.

As shown on Exhibit 1, 2 and 3, the100-year storm event offsite flow of 226.5 cfs (average of HEC-1 # 1I168 & # C168, minus the conveyance of 130 cfs along the west side of the railroad) is assumed to enter near the northwest corner of the Milgard site (Lot 27) but could enter as shallow flow all along the west side over the railroad tracks. The Milgard facilities, which are currently under design, will occupy approximately 2/3 of the northern portion of Lot 27. The Milgard facilities will install two spur railroad tracks within and along the west side of Lot 27. The offsite drainage entering the Milgard facility will be conveyed in paved driveway swales and/or earthen channels to the southeast corner of the Lot 27, where the flow will be conveyed in Milgard Way to the retention basin (ID. "A") along Peoria Avenue. See Exhibit 2 and 3 for typical street and channel sections. Excess offsite flow in the retention basin will weir over Peoria Avenue, matching historic flow patterns.

At the north side of the site, the existing 10- and 100-year event offsite flows of 162 and 305 cfs, respectively (HEC-1 # 1I169A) enter the site. Swales are proposed along both sides of 132nd Avenue and the east side of Milgard Way within 30-foot drainage easements. The swales will supplement the streets (132nd Avenue and Milgard Way in conveying the offsite drainage entering along the north side of the site to the retention basin along Peoria Avenue. Excess offsite flow in the retention basin will weir over Peoria Avenue, matching historic flow patterns.

At the southwest corner of the site, a 100-year flow of 108 cfs is estimated to enter the site along the north side of Peoria Avenue. Of this flow, approximately 27 cfs currently is conveyed in an existing 30-inch ID storm drain, that outlets into the site. The remaining flow is conveyed by the either the north half street of Peoria Avenue or frontage retention areas of the existing business into the Skyway site. Per input from the City, the 30-inch storm drain will be extended (as part of the Skyway project improvements) to Dysart Road and connected to the existing 24-inch ID irrigation pipe.

At the Peoria and Dysart Road intersection, the total combined 100-year flow leaving the property is estimated as 351 cfs at the HEC-1 #CP169. Of the flow exiting the site, currently the existing 24-inch ID irrigation pipe conveys approximately 20 cfs under Peoria Avenue, where it flows south in an unlined private irrigation ditch along the west side of Dysart Road. Any excess flow will weir over Peoria Avenue, matching historic flow patterns and flowing south across active irrigated farmland.

2.1.5 Existing Land Use

The existing land use of the proposed site is agricultural farmland. The irrigation system is private. The site receives most of its water from a well north of Cactus Road and east of the BNSF railroad, which is delivered by concrete supply ditch along the east side of the BNSF railroad, south from Cactus Road to the northwest corner of the site. The site intercepts some of its own tail water flows into an irrigation pond along the north side of Peoria Avenue. The site also intercepts some tail water irrigation flow from the private unlined tail water irrigation ditch which proceeds south along the west side of Dysart Road from north of Cactus Road to south of Peoria Avenue. The intercepted irrigation water in the pond along Peoria is pumped from the pond up to the northwest corner of the site and into the supply concrete ditches, where the well water supply also enters.

The existing private lined and unlined irrigation ditches on this land will be removed to facilitate the proposed site construction. The private unlined tail water flow irrigation canal along the west side of Dysart Road, between Peoria and Varney Roads, will be tiled to intercept irrigation waste water flow from the farmland to the north and convey them south across Peoria Avenue, thereby maintaining this existing private irrigation tail water ditch capacity.

2.2 ON-SITE HYDROLOGY

2.2.1 METHODOLOGY AND CRITERIA

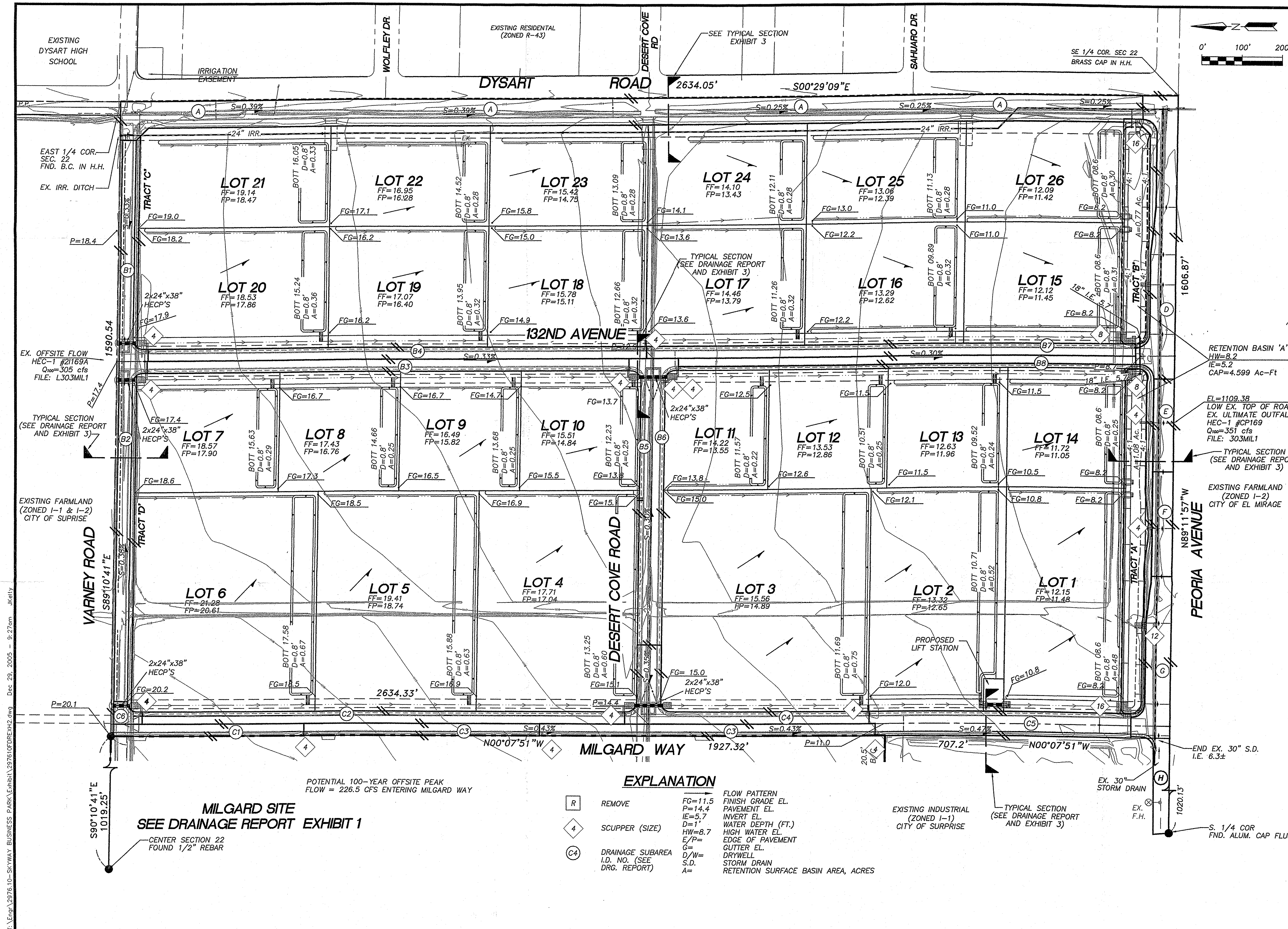
The onsite hydrology will utilize the Rational Method based on the Flood Control District of Maricopa County (FCDMC), where necessary to size drainage facilities. Onsite retention will also utilize the FCDMC procedures to determine the 100-year 2-hour precipitation values, runoff "C" coefficients.

2.2.2 EXISTING CONDITION DISCHARGES

The existing condition onsite peak discharges for this 142-acre site were estimated by the Rational For Windows Software, Flood Control District of Maricopa County Method. The 10-, 50-, and 100- year peak discharges were estimated as 45, 85 and 104 cfs, respectively as shown by the calculations in Appendix "C".

2.2.3 PROPOSED CONDITION DISCHARGES

Onsite proposed condition peak discharge calculations are summarized in the Table 2 below at pertinent locations of interest in evaluating scupper sizing and street capacity. Exhibit 2 shows the onsite drainage sub area boundaries and identification (ID) letters associated with each scupper location analyzed.



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PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Environmental | Engineering | Survey

DESIGNED BY: G.A.S. | CHECKED BY: JJB | DRAWN BY: JK/STAFF

15290 GREGORY A. SCHUELKE ARIZONA, U.S.A.

SKYWAY BUSINESS PARK

SURPRISE, ARIZONA

REVISIONS:
1. REVISED 11/04/05 PER CITY COMMENTS
2. REVISED 12/29/05 PER CITY COMMENTS

MASTER DRAINAGE REPORT

M.D.R. EXHIBIT 2

SHEET #: 2 OF 3
SCALE: 1"=100'
DATE: 09-18-05
PROJECT #: 2976.10

Appendix D
Technical Memorandum No. 4: Candidate Alternative Alignments and Evaluation

Peoria Avenue Corridor Improvement Study: Jackrabbit Trail Parkway to Dysart Road

Technical Memorandum #4: Candidate Alternative Alignments and Evaluation

April 2011

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1.0 INTRODUCTION

The Maricopa Association of Governments (MAG) prepared the Interstate 10/Hassayampa Valley Roadway Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the buildout of the area west of State Route 303 (SR 303L). This long-range regional transportation study identified the need for a roadway network consisting of freeways, parkways, and major arterial roads.

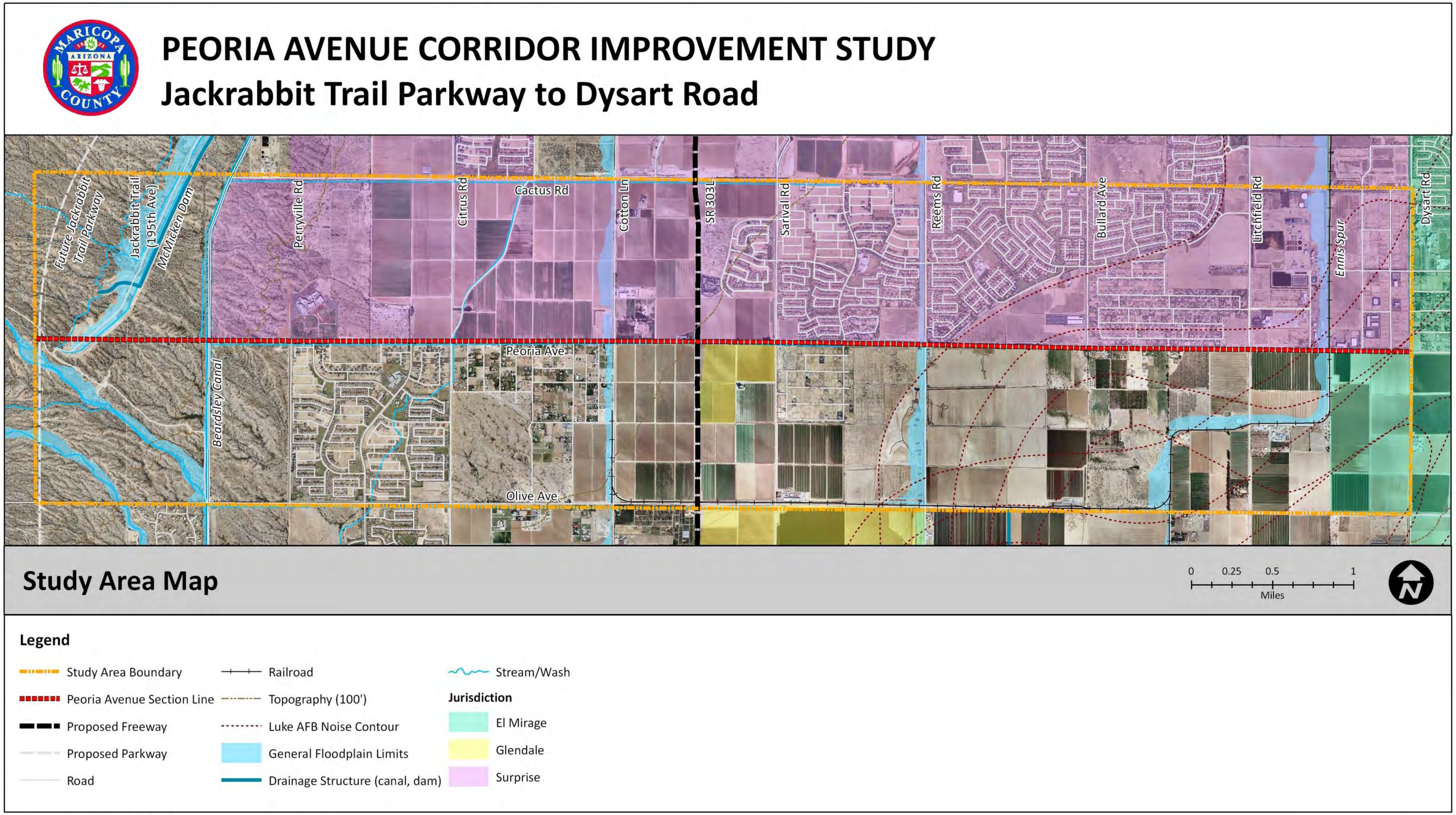
The Hassayampa Framework Study recommended an extension of Peoria Avenue west from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial from the future Jackrabbit Trail Parkway to Sarival Avenue. The study area for this project includes Peoria Avenue from the future Jackrabbit Trail Parkway alignment to Dysart Road (Peoria Avenue Corridor). The study area generally encompasses a two-mile wide corridor centered on the existing Peoria Avenue. The study area is shown in Figure 1.

This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also develop access management guidelines, determine design standards based upon which jurisdiction anticipates annexing the roadway, and develop an implementation plan. In general, the purpose of this Corridor Improvement Study is to provide the Maricopa County Department of Transportation (MCDOT) and other jurisdictions with a future "footprint" of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

The key objectives of this Corridor Improvement Study are to:

- Define and assess strategic issues within the project study area;
- Develop and evaluate conceptual alternative alignments within the corridor study area;
- Recommend a preferred alignment;
- Develop consensus for the preferred alignment;
- Define the characteristics of the preferred alignment; and
- Develop an implementation plan.

This technical memorandum presents the evaluation framework, including the evaluation criteria and performance objectives, and the description of corridor alternatives. The corridor is subdivided into nine segments, allowing for more detailed evaluation and analysis of each alternative. The evaluation of each alternative alignment and subsequent recommendations by project segment are presented last.



Source: Flood Control District of Maricopa County, ALRIS

September 2010

Figure 1 – Vicinity Map

2.0 EVALUATION FRAMEWORK

Evaluation Criteria and Performance Objectives

After completion of the inventory of existing conditions and traffic forecasts, the study team conducted a single-tiered process of developing and evaluating alternatives. Table 1 lists the evaluation criteria, a short description, and performance measures associated with each. The number of performance measures varies for each criterion, reflecting the inherent complexity and amount of data available for each element. The performance measures are intended to minimize or maximize an outcome that reflects fulfillment of the criterion. Some of the measures are evaluated numerically; others are based on a qualitative assessment.

Table 1 – Evaluation Criteria and Performance Measures

Criteria Title	Criteria Description	Criteria Performance Measure
Right-of-Way Considerations	An assessment of the amount and value of the right-of-way that would need to be acquired for corridor alternatives in relation to other alternatives under consideration for the segment.	Quantitative assessment of acres or square feet of acquisition
		Qualitative assessment of potential cost
Compatibility with Existing Developments	An estimate of the potential effect of proposed corridor alternatives on the existing developments most directly affected. Key considerations include the proximity to existing developments and potential displacements.	Qualitative assessment of compatibility
Compatibility with Planned Future Developments	An estimate of the potential effect of the corridor alternatives on planned developments and/or land that is currently under the jurisdiction of the Arizona State Land Department. Key considerations include compatibility with approved master plans and/or preliminary and final plats.	Qualitative assessment of compatibility
Compatibility with Existing and Planned Roadway Improvements	An assessment of the compatibility of the corridor alternatives with the existing and planned roadway improvements.	Qualitative assessment of compatibility
Engineering Complexity and Constructability	A general assessment of engineering complications, exclusive of cost considerations, which could arise from construction of the roadway. Key considerations include roadway geometry, permitting requirements, construction staging, etc.	Qualitative assessment of complexity and constructability

Criteria Title	Criteria Description	Criteria Performance Measure
Public Acceptability	Estimated community support for and acceptance of the corridor alternative, based on input from municipal staff, stakeholders, homeowner associations, and the public.	Qualitative assessment of acceptability
Local Agency Support	Estimated local agency (city) support for and acceptance of the corridor alternative, based on input from municipal staff.	Qualitative assessment of acceptability
Drainage/Flood Control Considerations	An estimate of potential impacts from the proposed corridor alternatives to both existing FCDMC facilities as well as to future improvements.	Qualitative assessment of potential impacts
Environmental Considerations	An assessment of social, ecological, and cultural environment in the study area.	Qualitative assessment of potential impacts to socioeconomic environment
		Qualitative assessment of potential impacts to physical and natural environment
		Qualitative assessment of potential impacts to cultural resources
Utility Considerations	Estimate of potential impacts from the proposed corridor alternative to both existing and planned future utility facilities such as the MWD canals, wells, reclaimed water delivery headers, and overhead lines.	Quantitative assessment of potential impacts

Source: Project Team, October 2010

3.0 DESCRIPTION OF ALTERNATIVE ALIGNMENTS

A series of three alternative alignments was considered for Peoria Avenue. For planning purposes, a 140-foot wide (minimum) corridor was used for each alternative. Alternative 1 includes widening the corridor symmetric about the section line. Alternative 2 includes widening the corridor to the south, maintaining the northern right-of-way (R/W) boundary. Alternative 3 includes widening the corridor to the north, maintaining the southern R/W boundary. Because the existing R/W throughout the corridor differs due to varying dedications of land, the degree of shifting to the north or south changes. For example, in some areas a shift may represent a difference of only five feet; in others, a shift could represent a change of 55 feet. To help in the analysis, the Peoria Avenue corridor was divided into nine segments for the evaluation process. Table 2 describes the alignment of each alternative within each segment. Because Peoria Avenue does not yet exist through Segments 1 and 2, and because of other constraints, fewer alternatives were considered for these segments than elsewhere. Appendix A contains plan sheets showing the various alternatives.

Table 2 – Alternative Alignment Descriptions

Segment	Alternative	Alternative Description	Additional Information
Segment 1: Future Jackrabbit Trail Parkway to Beardsley Canal	1	Centered on section line	Goes through basin and floodpool
	2	South of reconstructed McMicken Dam	Goes south of floodpool
Segment 2: Beardsley Canal to Perryville Road	1	Centered on section line	Matches Zanjero Trails Preliminary Plat
Segment 3: Perryville Road to Citrus Road	1	Centered on section line	140-foot wide corridor requires acquisition on both sides
	2	Centerline shifted 5 feet south of section line	Holds planned dedicated R/W along north side
	3	Centerline shifted 15 feet north of section line	Holds existing south R/W line
Segment 4: Citrus Road to Cotton Lane	1	Centered on section line	140-foot wide corridor requires acquisition on both sides
	2	Centerline shifted 5 feet south of section line	Holds planned dedicated R/W along north side
	3	Centerline shifted 37 feet north of section line	Places south R/W line approximately 10 feet south of irrigation ditch and allows room for potential frontage road
Segment 5: Cotton Lane to Sarival Road	1	Centered on section line	176-foot wide corridor requires acquisition on both sides; wider corridor adjacent to SR 303L/Peoria Avenue traffic interchange
	2	Centerline shifted 55 feet south of section line	Holds existing north R/W line
	3	Centerline shifted 55 feet north of section line	Holds existing south R/W line
Segment 6: Sarival Road to Reems Road	1	Centered on section line	140-foot wide corridor requires acquisition on both sides
	2	Centerline shifted 15 feet south of section line	Holds existing R/W line along developed areas
	3	Centerline shifted 5 feet north of section line	Holds existing R/W line along developed areas
Segment 7: Reems Road to Bullard Avenue	1	Centered on section line	140-foot wide corridor requires acquisition on both sides
	2	Centerline shifted 5 feet south of section line	Holds existing R/W line along developed areas
	3	Centerline shifted 30 feet north of section line	Holds existing south R/W line
Segment 8: Bullard Avenue to Litchfield Road	1	Centered on section line	140-foot wide corridor requires acquisition on both sides
	2	Centerline shifted 15 feet south of section line	Holds existing north R/W line
	3	Centerline shifted 30 feet north of section line	Holds existing south R/W line
Segment 9: Litchfield Road to Dysart Road	1	Centered on section line	140-foot wide corridor requires acquisition on both sides
	2	Centerline shifted south of section line (varies from 2 feet [west end], to 37 feet [middle], to 2 feet [east end])	Holds existing north R/W line
	3	Centerline shifted north of section line (varies from 30 feet [east end] to 37 feet [west end])	Holds existing south R/W line

Source: Project Team, November 2010

4.0 EVALUATION OF ALTERNATIVE ALIGNMENTS

Each alternative was evaluated with respect to each segment, and each segment was evaluated independently of the others. Tables 3 through 10 show the results of the evaluation. The left column of each table lists the evaluation criteria, subdivided into more specific measures where appropriate. For example, environmental considerations is a very comprehensive criterion, so it was divided into socioeconomics, physical and natural features, and cultural resources. Each alternative in each segment was rated with respect to each of the evaluation criteria. The rating system consisted of a simple three-point scale, with ● representing the worst possible rating, ◒ an intermediate rating, and ○ the best possible rating. The rating scale is strictly relative – alternatives were considered in relationship to each other for each segment. Just because an alternative receives the highest rating does not mean that it faces no issues or obstacles with respect to that criterion. An evaluation matrix for Segment 2 is not presented because that segment included only one alternative.

The evaluation was conducted by a multidisciplinary consultant team, with input from various sources, including the Technical Advisory Committee during December 2010 and January 2011 (for the Local Agency Support criterion), as well as the public at an open house meeting held on January 18, 2011.

Results and Recommendations

Through the evaluation process, some segments (2, 4, 6 and 8) contained constraints and/or opportunities that clearly favored one alternative. Once their alignment recommendations were established, these segments assisted in determining the recommended alternative for the adjacent segments (3, 5, 7 and 9). To show this process, the following evaluation highlights are presented out of numerical order.

Segment 2: Beardsley Canal to Perryville Road

The Zanjero Trails master planned community is planned on both sides of Peoria Avenue. The preliminary plat dedicates 136 feet of R/W for Peoria Avenue, centered on the section line. Because Zanjero Trails is expected to move forward with this plat configuration in the future, the section line option (Alternative 1) was decided to be the only practical alternative. Because this segment has only one alternative, no evaluation was necessary.

Segment 4: Citrus Road to Cotton Lane

Maricopa County does not have any R/W recorded in this segment, so the full width, regardless of alternative, will require R/W negotiations. Key factors for this segment include existing and planned land uses. To the north, the Prasada community is planned, although no preliminary plat yet exists. To the south, Peoria Avenue is lined with existing large-lot, single-family houses that front the roadway corridor and often have driveways that access Peoria Avenue. In addition, two irrigation canals run parallel to Peoria Avenue to the south. Because of the more imminent constraint that the existing land uses pose, the recommendation favors Alternative 3:

shifting the roadway north to minimize impacts on existing land uses to the south (Table 3). Alternative 3 also provides the opportunity to construct a frontage road along the south side of Peoria Avenue so the existing access locations do not have direct access to Peoria Avenue.

In addition to the alignments developed by the Project Team (shown in Table 2), other realignment alternatives were suggested at the January 18, 2011 public open house, as illustrated on Figure 2. The proposed alignment options for Peoria Avenue, west of Cotton Lane, share the alignment shift illustrated in white, relocating the corridor approximately one-half mile to the north (within the Prasada community), west of Cotton Lane and extending west to Perryville Road. This alignment option would disrupt existing plans for the Prasada and Zanjero Trails communities. Options, and any issues they may present, to provide a connection to Jackrabbit Trail Parkway include:

- Option A (blue): Peoria Avenue would be realigned to the north, as shown in white in Figure 2. Option A would continue to the west on the half-mile alignment (as shown in blue in Figure 2). This alignment change could have significant impacts on the Zanjero Trails development, which already has a preliminary plat on file. This alignment requires crossing McMicken Dam to provide the through connection to Jackrabbit Trail Parkway, which may be seen as a fatal flaw by the Flood Control District of Maricopa County (FCDMC) when other options are available.
- Option B (green): Peoria Avenue would be realigned to the north, as shown in white in Figure 2. Option B would continue to the west, but swing to the south to connect back to the Peoria Avenue section line (as shown in green in Figure 2) to provide a connection to Jackrabbit Trail Parkway. This alignment change could have significant impacts on the Zanjero Trails development, which already has a preliminary plat on file.
- Option C (yellow): Peoria Avenue would be realigned to the north, as shown in white in Figure 2. Option C would provide a continuation of the existing Peoria Avenue to the west along the Peoria Avenue section line (as shown in yellow in Figure 2). This option would result in offset intersections being located ½ mile apart. This option does not provide a continuous east-west facility, and will require the half-mile segment of Perryville Road north of Peoria Avenue to serve as a connector between the two facilities.
- Option D (red + yellow): Peoria Avenue would be realigned to the north, as shown in white in Figure 2. Option D would modify Option C (shown as red plus yellow in Figure 2) to provide a connection from the new Peoria Avenue to the old Peoria Avenue through the Prasada community. This option, like Option C, does not provide a continuous east-west facility, although it requires fewer intersection turn movements. In the future, however, the operational capacity at the intersection (where red meets white) may not be sufficient. Additionally, this option could impact Prasada, by routing Peoria Avenue through the middle, instead of the periphery, of the community.

Any of the realignment options would not maximize use of the existing Peoria Avenue improvements between Perryville and Citrus Roads, and would have significant impacts to the Zanjero Trails and Prasada communities. In addition, maintaining the roadway grid system allows for adequate spacing of intersections.

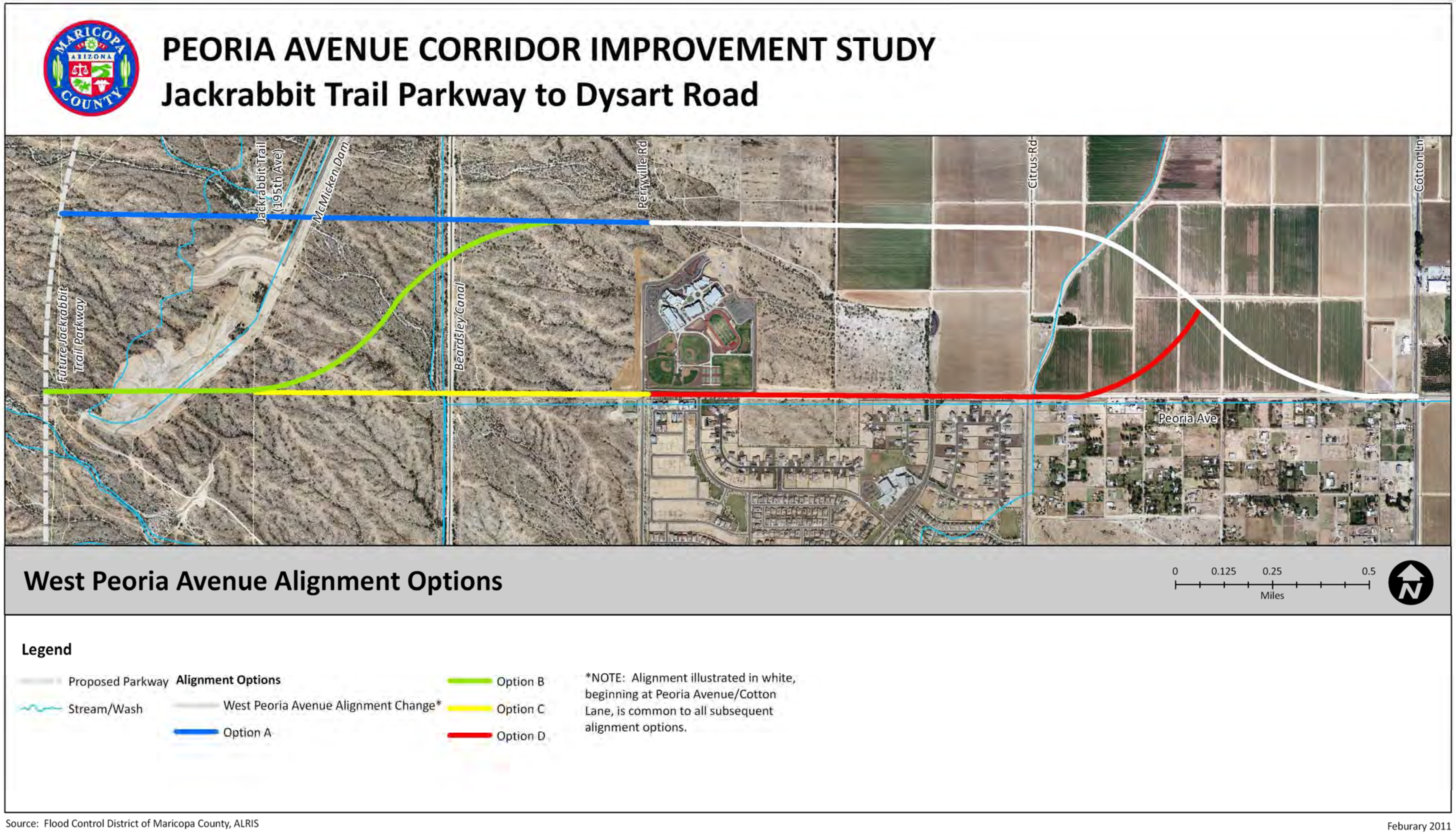


Figure 2 – West Peoria Avenue Alignment Options

Therefore, Alternative 3 is recommended to be further refined to minimize impacts to the south and north, while providing route continuity and a connection to Jackrabbit Trail Parkway.

Segment 6: Sarival Road to Reems Road

Existing residential development and related drainage facilities are located on both sides of Peoria Avenue through Segment 6. As these criteria potentially impact the corridor the greatest, an effort was made to balance the impacts to both sides of the corridor. Therefore, Alternative 1 (symmetric on section line) is recommended (Table 4).

Segment 8: Bullard Avenue to Litchfield Road

Like Segment 6, Segment 8 contains existing residential development on both sides of the corridor. To the north, a newer residential subdivision has a small landscaped buffer between the R/W and property lines. To the south, individual large-lot, single-family homes front Peoria Avenue but are offset approximately 100 feet from the roadway. Recommending Alternative 1 (symmetric on section line) best balances the impacts to existing development (Table 5).

Segments 2, 4, 6, and 8 provided the context that influenced the recommendation for the odd-numbered segments. Often, two or three alternatives in these segments achieved similar scores, with no alternative presenting a clear advantage. In these cases, connectivity with the adjacent segments helped determine the most practical solution. Likewise, transitional sub-segments were strategically placed to avoid constraints or take advantage of opportunities to seamlessly connect segments. Because of the relative equality of the impacts of the different alternatives, if conditions change in the future (e.g., wells removed, advanced development plats, etc.), the recommendations for the following segments could be reviewed and changed to reflect current conditions.

Segment 3: Perryville Road to Citrus Road

Existing and planned developments, as well as existing and planned roadway improvements, were the key factors for Segment 3. To the north, Shadow Ridge High School has been built at the west end. A portion of the remaining land is platted through Zanjero Trails and preliminarily planned as part of the Prasada community. To the south, the Cortessa subdivision has been constructed, as well as several irrigation facilities and wells. On the west end, between Cortessa and the high school, is the corridor's only street section constructed to full width. In an effort to maximize use of this full-width street, which is built symmetric on the section line, Alternative 1 is recommended. This supports a connection to Segment 2 to the west, which is also recommended to be located symmetric to the section line. To the east, Segment 4 is recommended to shift north. Because of the constraint that the existing development on the south side of the corridor poses in Segment 4, the transition area from the section line to a northerly shift is recommended to occur in the eastern portion of Segment 3 (Table 6).

Segment 5: Cotton Lane to Sarival Road

The key determinant for Segment 5 is ADOT's final design for SR 303L, which includes a traffic interchange at Peoria Avenue, centered on the section line. Very little development exists today through this segment. As SR 303L requires a section line alignment and such an alignment was also recommended for Segment 6, the recommendation for Segment 5 is to move forward with Alternative 1 (symmetric on section line). Because of the constraint that the existing development on the south side of the corridor poses in Segment 4, the transition area from the section line to a northerly shift is recommended to occur in the western portion of Segment 5, slightly impacting an existing development to the north, but no structures (Table 7).

Segment 7: Reems Road to Bullard Avenue

Because of the noise contours associated with Luke Air Force Base, the majority of this segment is undeveloped, with the exception of approximately four houses that back up to Peoria Avenue on the west end. However, the presence of these houses skews the evaluation away from an option that impacts the north side of the corridor. The south side of the corridor, however, contains irrigation facilities and well sites. Section line alignments are recommended for the adjacent links, Segments 6 and 8. In an effort to reduce impact to the drainage facilities and the existing development, and also to connect to the adjacent segments, the recommendation for this segment includes a northerly shift in the center of the segment to avoid the irrigation facilities and well sites, with transition areas back to the section line at the east and west ends, avoiding impact to the existing development (Table 8). If corridor conditions change in the future (e.g., removal of the irrigation facilities on the south side or new development on the north side) this recommendation could be reconsidered to recommend a section line alignment.

Segment 9: Litchfield Road to Dysart Road

Segment 9 contains no existing or platted development to the south. To the north of Peoria Avenue, existing land uses are next to the Ennis Spur of the BNSF Railway in the middle of the corridor. Development is planned and platted to the east and west. Half streets have been constructed on the north side throughout, but with no constant centerline offset. Therefore, the corridor's constructed half-street varies with differing amounts of R/W. To minimize impacts to existing land uses, the recommendation for this segment includes a southerly shift in the alignment, with transition areas to connect back to the section line on the east and west ends (Table 9). Like Segment 7, if corridor conditions change in the future (e.g., existing land uses are redeveloped), maintaining a section line alignment may be considered.

Segment 1: Jackrabbit Trail Parkway to Beardsley Canal

Segment 1 is unique because no roadway or existing development is currently present and no development plans are imminent. Only two alternatives are practical for this section – Alternative 1, alignment symmetric to the section line, and Alternative 2, which does not follow the other widening guidelines (e.g., maintaining the north or south R/W boundary). Alternative 2 in this segment dips south to miss the flood basin south of the truncated McMicken Dam.

Drainage impacts and local agency support (specifically of FCDMC) are the two key determining factors. After the Project Team's evaluation, Alternative 1, which travels through the flood basin, was seen to have the least drainage impacts, as Alternative 2 would cross numerous washes; Waterfall Wash may require a substantial crossing. The recommendation for Segment 1 is to move forward with Alternative 1, predicated upon consensus from FCDMC that it is less impactful to cross the basin than to cross a number of natural washes. By recommending a section line alignment, this alternative also maximizes the ability of the Arizona State Land Department (ASLD) to auction larger tracts of developable land in the future. (Currently, ASLD has a general master plan for the land, but no formal planning will be documented until a developer assumes responsibility.) In addition, Alternative 1 would provide better intersection spacing along the future Jackrabbit Trail Parkway (Table 10).

Figure 3 illustrates the recommended alignments, with a description of these recommendations in Table 11.

<u>Future Refinement</u>

These recommendations are based on a 140-foot R/W corridor. Once the typical section is defined, then further refinement of the centerline location will be required to provide the best-fit alignment.

Table 3 – Segment 4 Evaluation Matrix

Criteria		Segment 4: Citrus Road to Cotton Lane		
		Alternative 1 (on section line)	Alternative 2 (shift 5 feet south)	Alternative 3 (shift 37 feet north)
Right-of-way Considerations	Area	◒ 716,000 square feet	◒ 716,000 square feet	◒ 718,000 square feet
	Cost	◒	● Higher cost likely to south	○
Compatibility with Existing Developments		◒ Balances impacts	● Greatest impact to most properties	○ No known impacts
Compatibility with Planned Future Developments		◒ Balances impacts	○ No new planned development to south	● All planned development to the north
Compatibility with Existing and Planned Roadway Improvements		○ Half-street constructed at Citrus Rd	◒	◒
Engineering Complexity and Constructability		◒ Access fronting Peoria Ave	◒ Access fronting Peoria Ave	○ Opportunity for frontage road
Public Acceptability		●	●	○
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		◒ No existing drainage infrastructure constructed; must continue channel from the west	◒ No existing drainage infrastructure constructed; must continue channel from the west	◒ No existing drainage infrastructure constructed; must continue channel from the west
Environmental Considerations	Socioeconomic	● Impacts to private property	● Impacts to private property	○ No known impacts
	Physical and Natural	◒ Balances impacts	◒ Balances impacts	● Impacts to farmland
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch
Utility Considerations		● 1 well site; 5200 ft lined irrigation ditch; 20 power poles	● 1 well site; 5200 ft lined irrigation ditch; 20 power poles	◒ 5200 ft lined irrigation ditch; 20 power poles
Recommendations				Recommended Alignment – minimizes impacts to existing land uses to south

○ Lowest impact, Best performance   ◒ Moderate impact, Moderate performance   ● Highest impact, Worst performance

Table 4 – Segment 6 Evaluation Matrix

Criteria		Segment 6: Sarival Road to Reems Road		
		Alternative 1 (on section line)	Alternative 2 (shift 15 feet south)	Alternative 3 (shift 5 feet north)
Right-of-way Considerations	Area	◒ 182,000 square feet	◒ 182,000 square feet	◒ 182,000 square feet
	Cost	◒	○	● Greatest impact to existing and planned developments in right-of-way
Compatibility with Existing Developments		○ Balances impacts to both sides	◒ Minor impacts to south side	◒ Minor impacts to north side
Compatibility with Planned Future Developments		◒ Minor impact to future development to north	○ No known future development to south	● Impacts future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible with existing street and Reems Rd intersection	● Not compatible with existing street and Reems Rd intersection	◒ Not compatible with existing street but more compatible than #2 with Reems Rd intersection
Engineering Complexity and Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		○ Least impact to existing drainage facilities	◒ Minor impacts to existing drainage facilities	◒ Minor impacts to existing drainage facilities
Environmental Considerations	Socioeconomic	○ Minimal impact	○ Minimal impact	○ Minimal impact
	Physical and Natural	○ Minimal impact	○ Minimal impact	○ Minimal impact
	Cultural	○ No known impact	○ No known impact	○ No known impact
Utility Considerations		○ No known impacts to irrigation or power lines	◒ Potential relocation of underground irrigation facilities	○ No known impacts to irrigation or power lines
Recommendations		Recommended Alignment – balances impacts and scores best in drainage and existing development compatibility		

○ Lowest impact, Best performance; ◒ Moderate impact, Moderate performance; ● Highest impact, Worst performance

Table 5 – Segment 8 Evaluation Matrix

Criteria		Segment 8: Bullard Ave to Litchfield Rd		
		Alternative 1 (on section line)	Alternative 2 (shift 15 feet south)	Alternative 3 (shift 30 feet north)
Right-of-way Considerations	Area	◒ 235,000 square feet	◒ 235,000 square feet	◒ 233,000 square feet
	Cost	◒	● Highest cost likely to south	○
Compatibility with Existing Developments		◒ Balances impacts	● Impacts land uses to south	● Impacts land uses to north
Compatibility with Planned Future Developments		◒ Minor impacts to future development	○ No future development to south	● Impacts to future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Litchfield and Bullard intersections fully improved; centered on section line	◒	●
Engineering Complexity and Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		◒ Minor impacts to existing drainage facilities	○ Least impacts to existing drainage facilities	● Most impacts to existing drainage facilities (channel and box culverts)
Environmental Considerations	Socioeconomic	◒ Balanced impacts	● Impacts to private property lots	○ No known impacts
	Physical and Natural	◒ Balanced impacts	● Greatest impact to farmland and potential habitat areas	○ No known impacts
	Cultural	○ No known impacts	○ No known impacts	○ No known impacts
Utility Considerations		◒ 2 well sites	● 4 well sites	○ No well sites impacted
Recommendations		Recommended Alignment – balances impacts and scores better than #3 in drainage and existing development compatibility		

○ Lowest impact, Best performance; ◒ Moderate impact, Moderate performance; ● Highest impact, Worst performance

Table 6 – Segment 3 Evaluation Matrix

Criteria		Segment 3: Perryville Road to Citrus Road		
		Alternative 1 (on section line)	Alternative 2 (shift 5 feet south)	Alternative 3 (shift 15 feet north)
Right-of-way Considerations	Area	◒ 295,000 square feet	◒ 293,000 square feet	● 309,000 square feet
	Cost	◒	◒	◒
Compatibility with Existing Developments		◒ Moderate impact to existing land uses	◒ Moderate impact to existing land uses	○ Least impact to existing land uses
Compatibility with Planned Future Developments		◒ Moderate impact to planned land uses	◒ Moderate impact to planned land uses	● Least compatible with future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible with existing street improvements	◒	●
Engineering Complexity and Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		○ Minimal impact	○ Minimal impact	◒ Slight impact to existing drainage channel to the north
Environmental Considerations	Socioeconomic	◒ Slight impact to land; no impact to public access or structures	◒ Slight impact to land; no impact to public access or structures	◒ Slight impact to land; no impact to public access or structures
	Physical and Natural	◒ Some impact to farmland	◒ Some impact to farmland	◒ Some impact to farmland
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch
Utility Considerations		◒ 1600 ft lined irrigation ditch, 7 power poles, 2 well sites	◒ 1600 ft lined irrigation ditch, 7 power poles, 2 well sites	◒ 1600 ft lined irrigation ditch, 7 power poles, 2 well sites
Recommendations		Recommended Alignment with transition at east end – most compatible with existing improvements and developments		

○ Lowest impact Best performance ◒ Moderate impact Moderate performance ● Highest impact Worst performance

Table 7 – Segment 5 Evaluation Matrix

Criteria		Segment 5: Cotton Lane to Sarival Road		
		Alternative 1 (on section line)	Alternative 2 (shift 55 feet south)	Alternative 3 (shift 55 feet north)
Right-of-way Considerations	Area	● 543,000 square feet	◒ 453,000 square feet	◒ 457,000 square feet
	Cost	◒	○ Lower cost to south	● Highest cost to north
Compatibility with Existing Developments		◒ Balances impacts	○ No known impacts	● Impacts property to the north
Compatibility with Planned Future Developments		○ Least impact to all properties	◒ Balances impacts	● Greatest impact to most properties
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible w/ ADOT's plans for SR 303L interchange	◒	◒
Engineering Complexity and Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		○ Minimal impacts	○ Minimal impacts	○ Minimal impacts
Environmental Considerations	Socioeconomic	◒ Minor impacts to existing land uses	◒ Minor impacts to existing land uses	◒ Minor impacts to existing land uses
	Physical and Natural	◒ Minor impacts to farmlands	◒ Minor impacts to farmlands	◒ Minor impacts to farmlands
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	○ No known impacts
Utility Considerations		● 2 well sites; 4300 ft lined irrigation ditch; 14 power poles	● 2 well sites; 4300 ft lined irrigation ditch; 6 power poles	○ 8 power poles
Recommendations		Recommended Alignment w/ transition at west end - compatible with SR303 and transition at west end will minimize impacts to wells		

○ Lowest impact Best performance ◒ Moderate impact Moderate performance ● Highest impact Worst performance

Table 8 – Segment 7 Evaluation Matrix

Criteria		Segment 7: Reems Road to Bullard Ave					
		Alternative 1 (on section line)		Alternative 2 (shift 5 feet south)		Alternative 3 (shift 30 feet north)	
Right-of-way Considerations	Area	◒	227,000 square feet	◒	227,000 square feet	◒	224,000 square feet
	Cost	◒		◒		●	Higher cost likely to north; encroachment into residential lots
Compatibility with Existing Developments		◒	Balances impacts	◒	Balances impacts	●	All existing development to the north
Compatibility with Planned Future Developments		◒	Balances impacts to both sides	○	No future development plans to the south	●	All future development plans to the north
Compatibility with Existing and Planned Roadway Improvements		○	Reems Rd improved to full street section; centered on section line	◒		◒	
Engineering Complexity and Constructability		○		○		○	
Public Acceptability		◒		◒		◒	
Local Agency Support		◒		◒		◒	
Drainage/Flood Control Considerations		○	No known impacts	○	No known impacts	○	No known impacts
Environmental Considerations	Socioeconomic	◒	Impacts to agriculture	◒	Impacts to agriculture	●	Impacts to private property
	Physical and Natural	●	Potential impact to farms and habitat	●	Potential impact to farms and habitat	◒	Potential impact to habitat
	Cultural	◒	Impacts to irrigation ditch	◒	Impacts to irrigation ditch	○	No known impacts
Utility Considerations		●	5 well sites; 4500 ft lined irrigation ditch; 16 power poles	◒	5 well sites; 4500 ft lined irrigation ditch	○	3 well sites; 16 power poles
Recommendations							Recommended Alignment with transition at west end and east end. Would minimize impacts to irrigation facilities. Low scores due to impacts at west end.

○ Lowest impact Best performance ◒ Moderate impact Moderate performance ● Highest impact Worst performance

Table 9 – Segment 9 Evaluation Matrix

Criteria		Segment 9: Litchfield Rd to Dysart Rd					
		Alternative 1 (on section line)		Alternative 2 (shift south)		Alternative 3 (shift north)	
Right-of-way Considerations	Area	○	257,000 square feet	●	300,000 square feet	○	252,000 square feet
	Cost	◒	Moderate costs	○	Lowest cost likely to south	●	Highest cost likely to north, including potential building takes
Compatibility with Existing Developments		◒	Minor impacts to land uses to north	○	No known impacts	●	Impacts to land uses to north
Compatibility with Planned Future Developments		○	No known impacts to future development	◒	Minor impacts to future development to south	●	Impacts future development to north
Compatibility with Existing and Planned Roadway Improvements		○	Most compatible with existing half-streets and Litchfield and Dysart Rd intersections	◒	Balances impacts	●	Least compatible with existing half-streets and Litchfield and Dysart Rd intersections
Engineering Complexity and Constructability		○		○		○	
Public Acceptability		◒		◒		◒	
Local Agency Support		◒		◒		◒	
Drainage/Flood Control Considerations		◒	Balances impacts	○	Least impact to existing drainage facilities	●	Most impact to existing drainage facilities
Environmental Considerations	Socioeconomic	◒	Balances impacts	○	No known impacts	●	Impacts to private property to north
	Physical and Natural	◒	Balances impacts	●	Greatest impact to farmland	○	No known impacts
	Cultural	●	Impacts to Ennis Spur	●	Impacts to Ennis Spur	●	Impacts to Ennis Spur
Utility Considerations		●	2 well sites; 2 reclaim taps; 7 power poles	●	2 well sites; 2 reclaim taps; 7 power poles	○	No well sites, reclaim taps or power poles
Recommendations					Recommended Alignment with transitions at both ends – minimizes impacts to existing land uses		

○ Lowest impact Best performance ◒ Moderate impact Moderate performance ● Highest impact Worst performance

Table 10 – Segment 1 Evaluation Matrix

Criteria		Segment 1: Jackrabbit Trail Parkway to Beardsley Canal	
		Alternative 1 (on section line)	**Alternative 2 (shift to south)**
Right-of-way Considerations	Area	◒ 779,000 square feet	● 825,000 square feet
	Cost	◒	● Higher cost due to additional length
Compatibility with Existing Developments		○ No existing development	○ No existing development
Compatibility with Planned Future Developments		○ Provides higher amount of developable land near intersection	◒
Compatibility with Existing and Planned Roadway Improvements		○ Facilitates 1-mile intersection spacing along Jackrabbit Parkway	◒
Engineering Complexity and Constructability		◒	● Numerous wash and floodplain crossing
Public Acceptability		◒	◒
Local Agency Support		◒	◒
Drainage/Flood Control Considerations		◒	● Numerous wash and floodplain crossing
Environmental Considerations	Socioeconomic	○ No known impacts	○ No known impacts
	Physical and Natural	◒	● Greatest impact to wash corridors and floodplains
	Cultural	● Impacts to Beardsley Canal	● Impacts to Beardsley Canal
Utility Considerations		○ No known impacts	○ No known impacts
Recommendations		Recommended Alignment-likely lower cost; minimizes natural wash crossings; better intersection spacing along Jackrabbit Trail Parkway	

○ Lowest impact
Best performance

◒ Moderate impact
Moderate performance

● Highest impact
Worst performance

Table 11 – Recommended Alignment

Segment	Recommended Alignment	Comments
Segment 1: Future Jackrabbit Trail Parkway to Beardsley Canal	Alternative 1, centered on section line	Scored higher than second alternative due to shorter corridor length and less disturbance to drainage corridors.
Segment 2: Beardsley Canal to Perryville Road	Alternative 1, centered on section line	Independent evaluation not carried out; alignment is already set in the Zanjero Trails Preliminary Plat.
Segment 3: Perryville Road to Citrus Road	Alternative 1, centered on section line	Scored highest of the three alternatives; most compatible with existing street improvement on Peoria Avenue. Corridor will transition at east end to meet segment 4, shifted north of the section line.
Segment 4: Citrus Road to Cotton Lane	Alternative 3, centerline shifted 37 feet north of section line	Scored highest of the three alternatives; most compatible with existing development; likely to have least R/W cost.
Segment 5: Cotton Lane to Sarival Road	Alternative 1, centered on section line	All three alternatives scored similarly. Alternative 1 chosen due to compatibility with existing development and planned roadway improvements, specifically placement of SR 303L and the Peoria Avenue traffic interchange in this segment. Corridor will transition from Segment 4 north shift to centerline symmetry at the west end of this segment.
Segment 6: Sarival Road to Reems Road	Alternative 1, centered on section line	Scored highest of the three alternatives; balances impacts throughout segment and performs best in key factors, including compatibility with existing development and drainage/flood control considerations.
Segment 7: Reems Road to Bullard Avenue	Alternative 3, centerline shifted 30 feet north of section line for short distance in middle portion of segment	Although scoring the lowest due to impacts to existing development, maintaining section line alignment at west end and transitioning to the north, east of existing development allows alignment to miss well site and balance impacts throughout remainder of segment. Corridor will transition at east end to meet segment 8, centered on the section line.
Segment 8: Bullard Avenue to Litchfield Road	Alternative 1, centered on section line	Scored highest of the three alternatives; balances impacts throughout segment and performs better than Alternative 3 in key factors, including compatibility with existing development and drainage/flood control considerations.
Segment 9: Litchfield Road to Dysart Road	Alternative 2, centerline shifted south of section line	Because of the varying shifts associated with Alternative 2, it best minimizes impacts to existing land uses throughout the segment.

Source: Project Team, December 2010

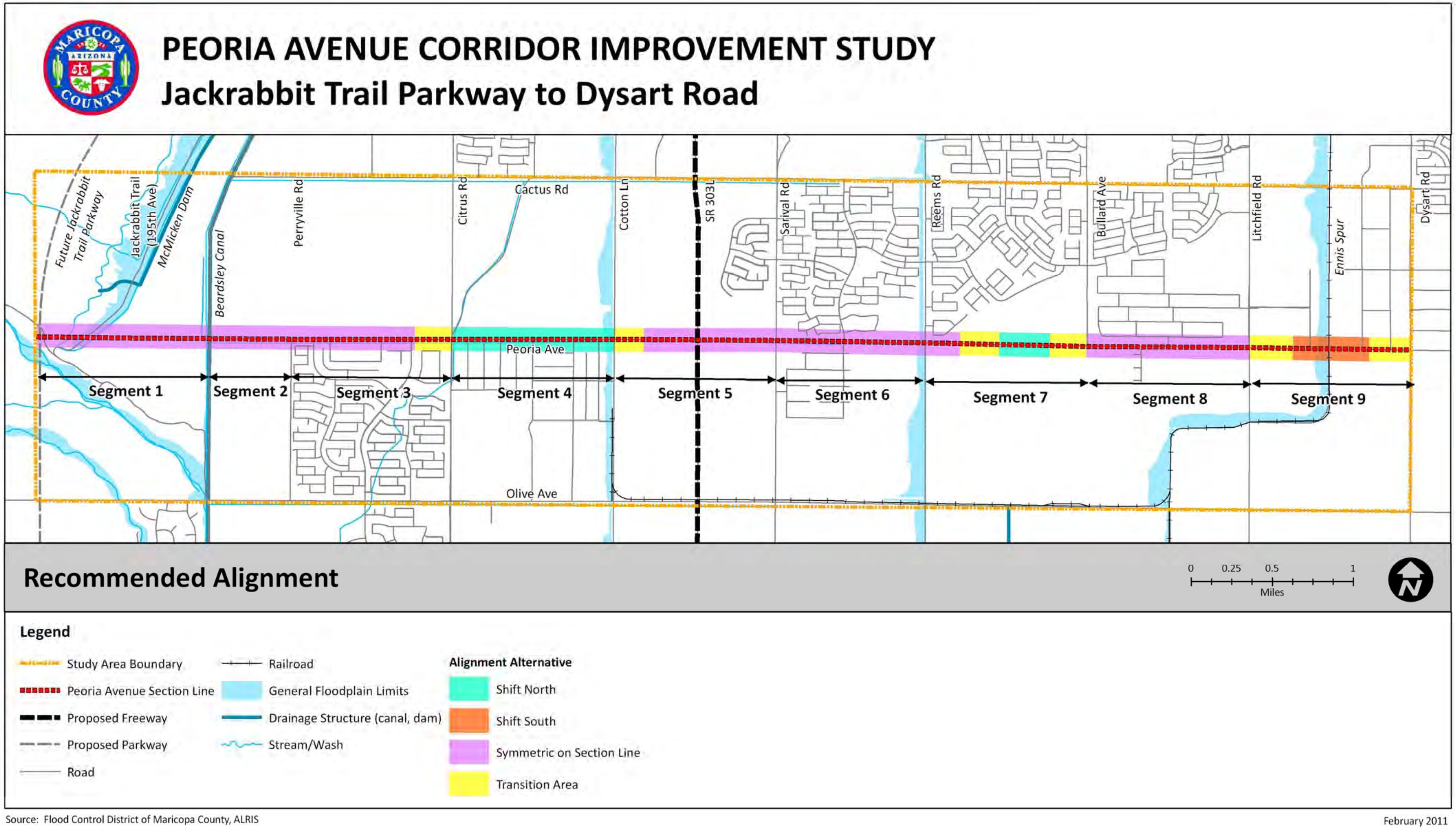


Figure 3 – Recommended Alignment

Appendix A

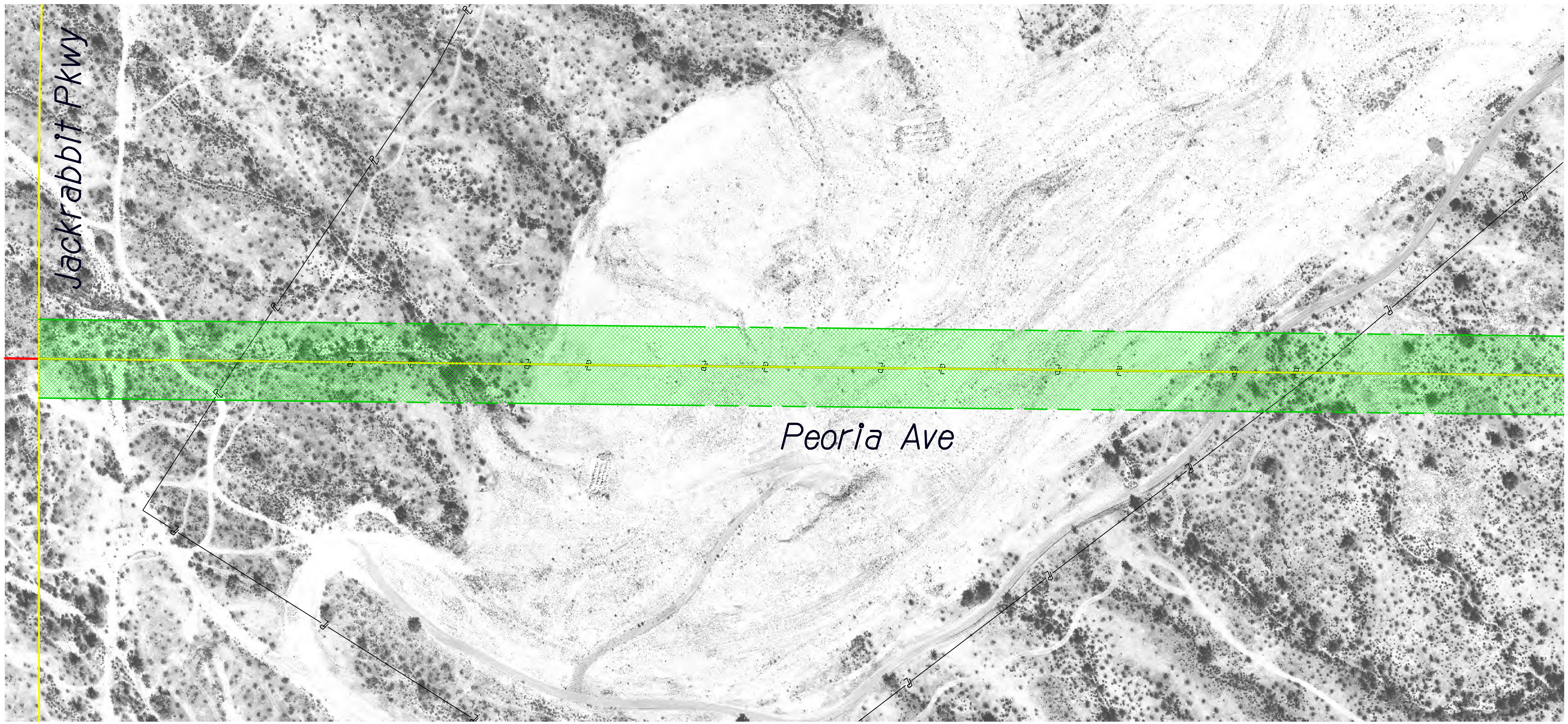
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"-200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Jackrabbit Trail to Beardsley Canal
Alternative # 1

SHEET
1 OF 2

n:\60160205\Prod\Exhibits\Alt #1\0001Alt_Jack_Beardsley.dgn

12/14/2010

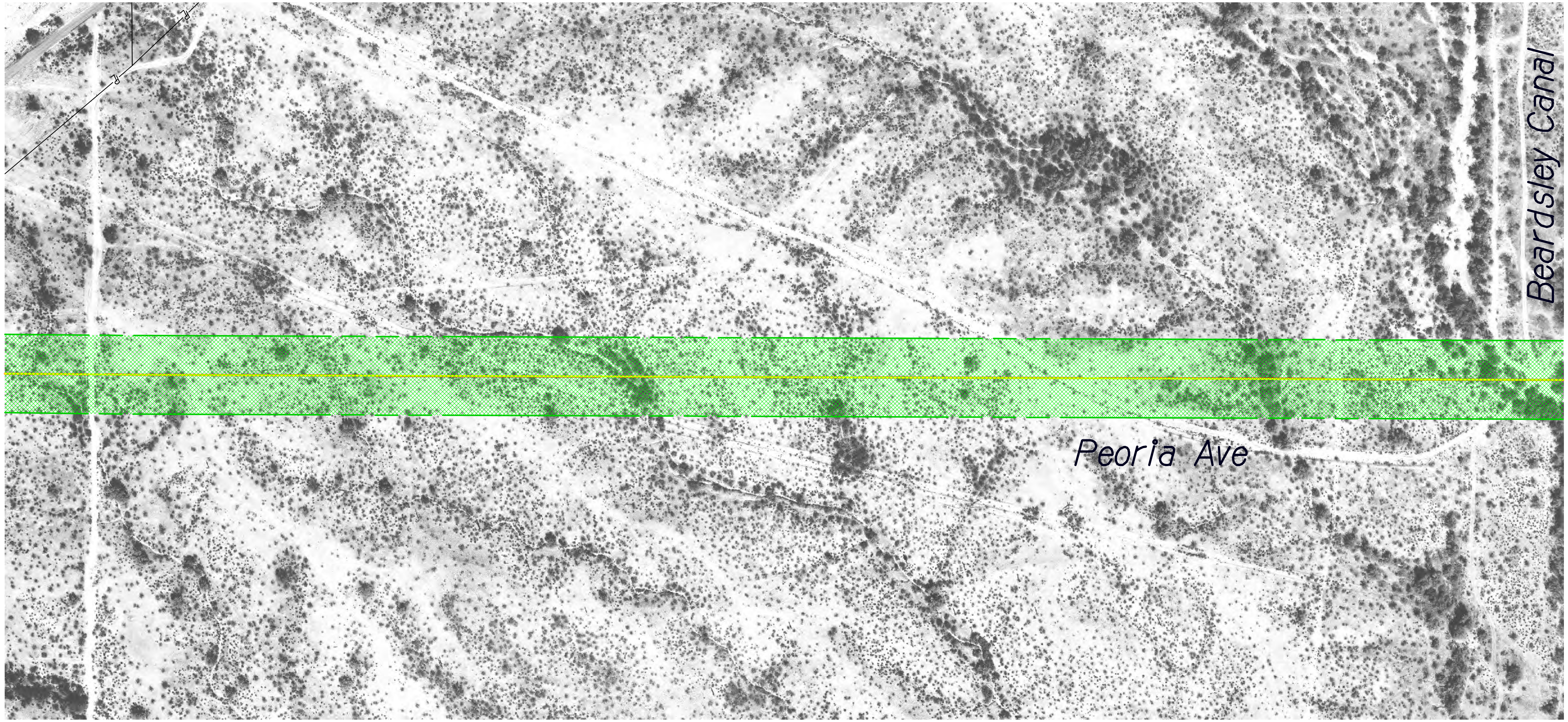
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

- Well
- Abandoned Well
- Reclaimed Water Delivery Header
- R/W Aquisition
- Section Line
- Roadway ℄
- New R/W
- Existing R/W

WELL

WELL

Reclaim

AECOM

Jackrabbit Trail to Beardsley Canal
Alternative # 1

SHEET 2 OF 2

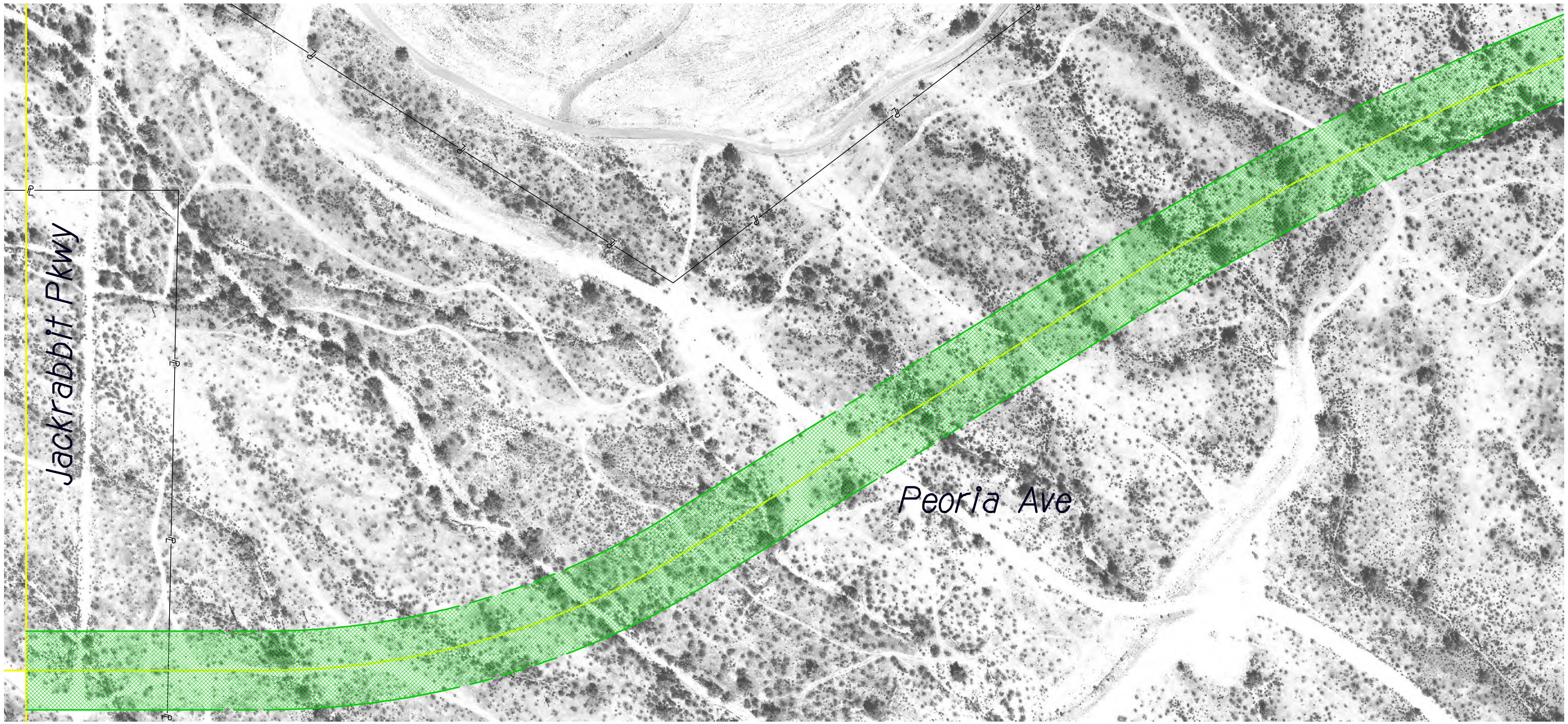
n:\60160205\Prod\Exhibits\Alt #1\001Alt1_Jack_Beardsley_2.dgn

12/14/2010

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'
200 0 200 400
SCALE IN FEET

N



Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Jackrabbit Trail to Beardsley Canal
Alternative # 2

SHEET
1 OF 2

n:\60160205\Prod\Exhibits\Alt #2\000IAlt2_Jack_Beardsley_1.dgn

12/14/2010

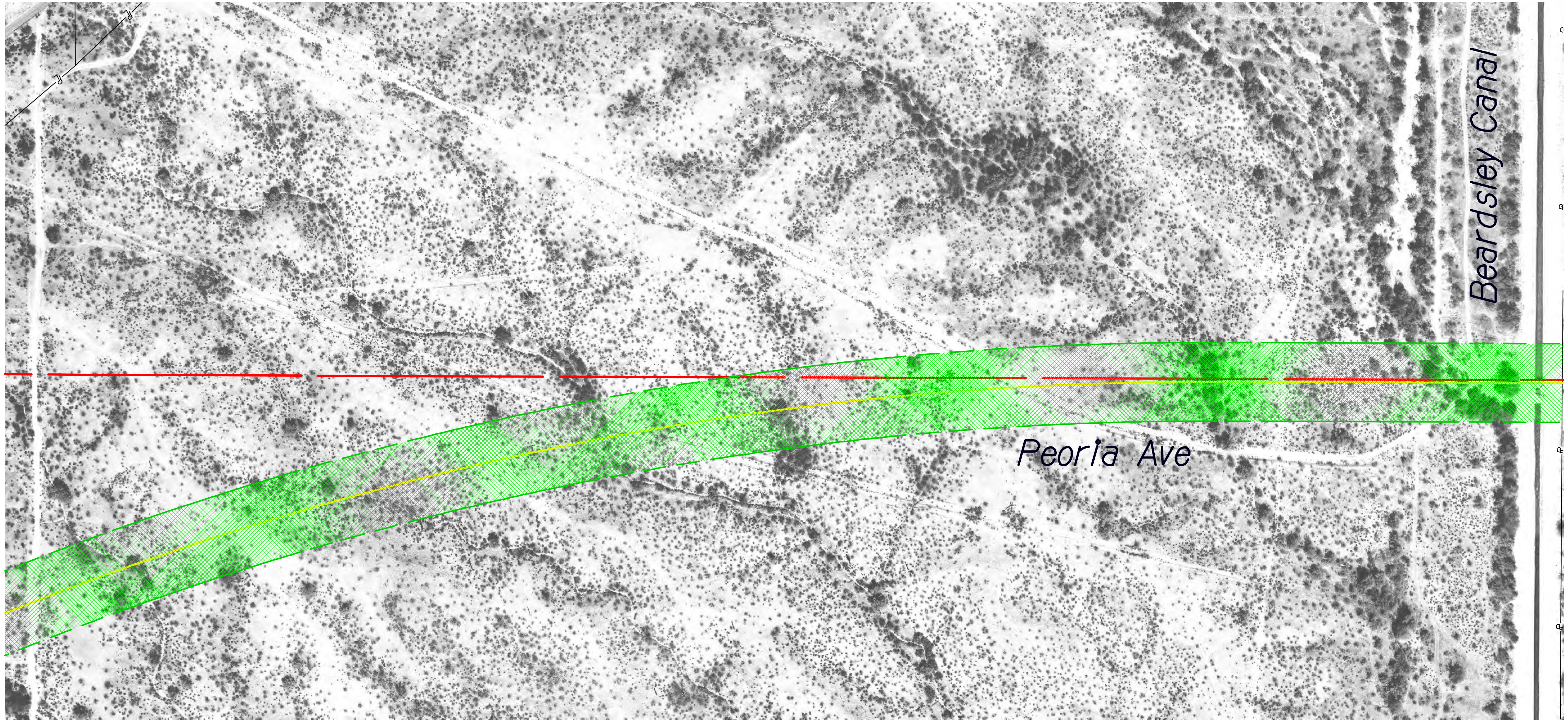
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Jackrabbit Trail to Beardsley Canal
Alternative # 2

SHEET
2 OF 2

n:\60160205\Prod\Exhibits\Alt #2\001Alt2_Jack_Beardsley_2.dgn

12/14/2010

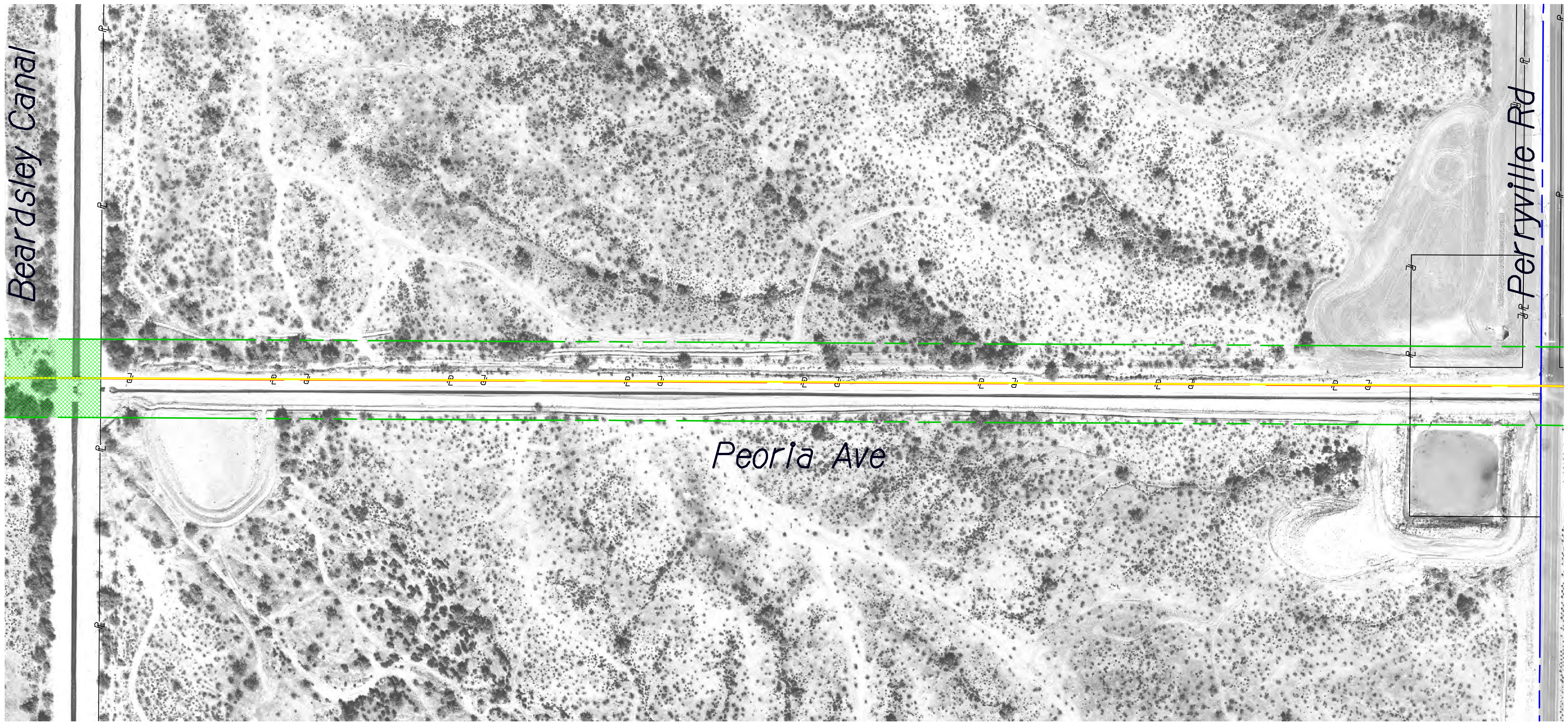
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

- WELL — Well
- WELL — Abandoned Well
- Reclaim — Reclaimed Water Delivery Header
- R/W Aquisition
- Section Line
- Roadway ℄
- New R/W
- Existing R/W

AECOM

Beardsley Canal to Perryville Rd
Alternative # 1

SHEET 1 OF 1

n:\60160205\Prod\Exhibits\Alt #1\001Alt_1Beardsley_Perry_1.dgn

12/14/2010

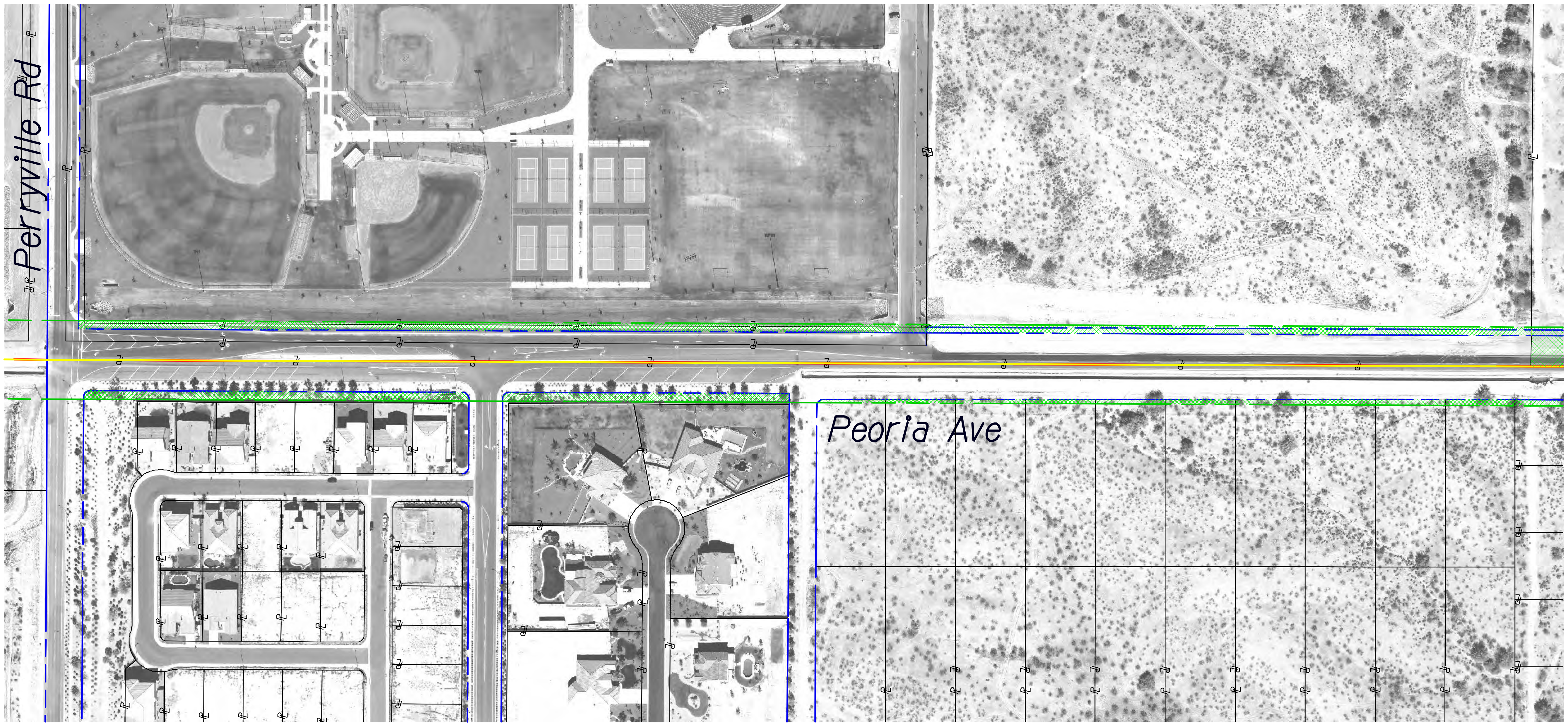
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL Well

WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Perryville Rd to Citrus Rd
Alternative # 1

SHEET
1 OF 2

n:\60160205\Prod\Exhibits\Alt #1\01Alt1_Perry_Citrus_1.dgn

12/14/2010

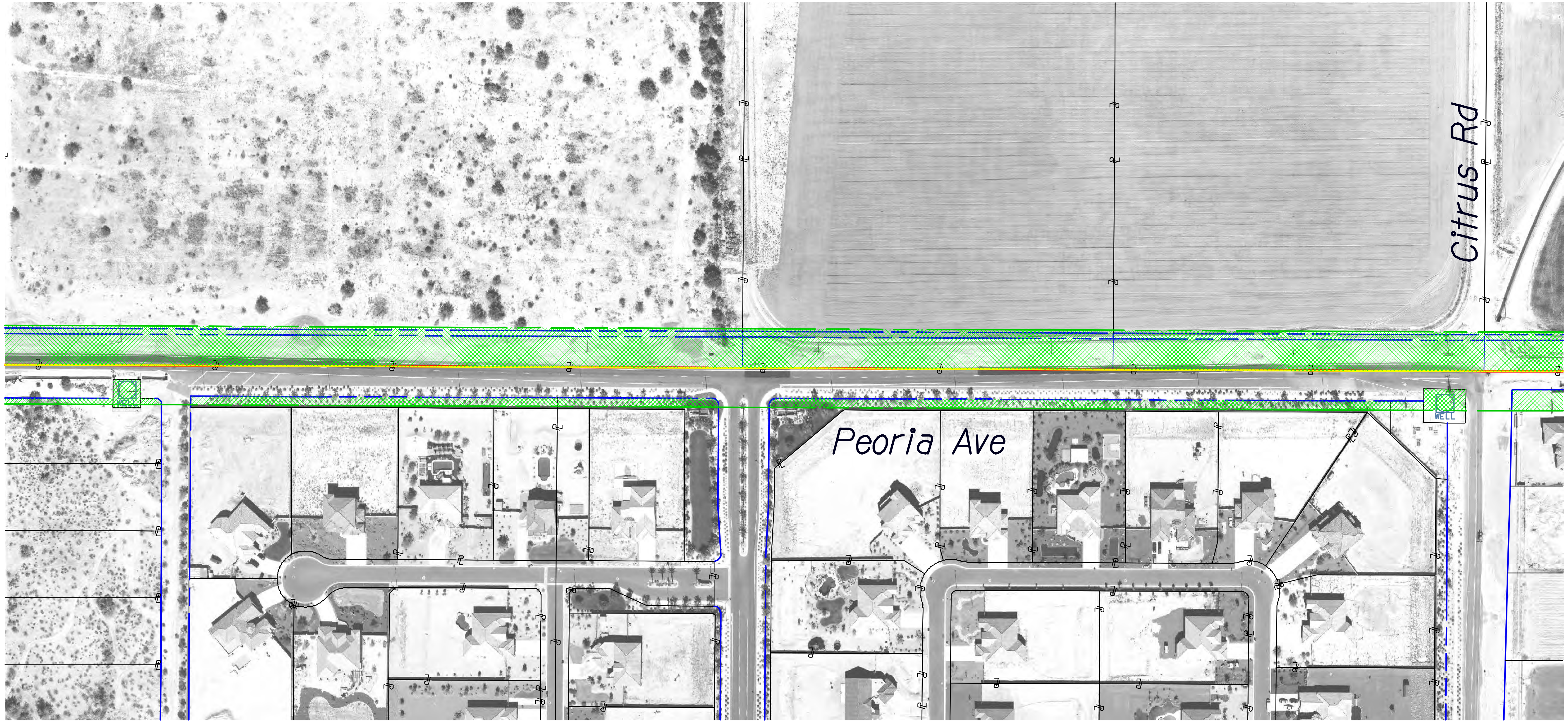
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL	Well		R/W Aquisition
WELL	Abandoned Well		Section Line
Reclaim	Reclaimed Water Delivery Header		Roadway ℄
			New R/W
			Existing R/W

AECOM

Perryville Rd to Citrus Rd
Alternative # 1

SHEET
2 OF 2

n:\60160205\Prod\Exhibits\Alt #1\02Alt1_Perry_Citrus_2.dgn

12/14/2010

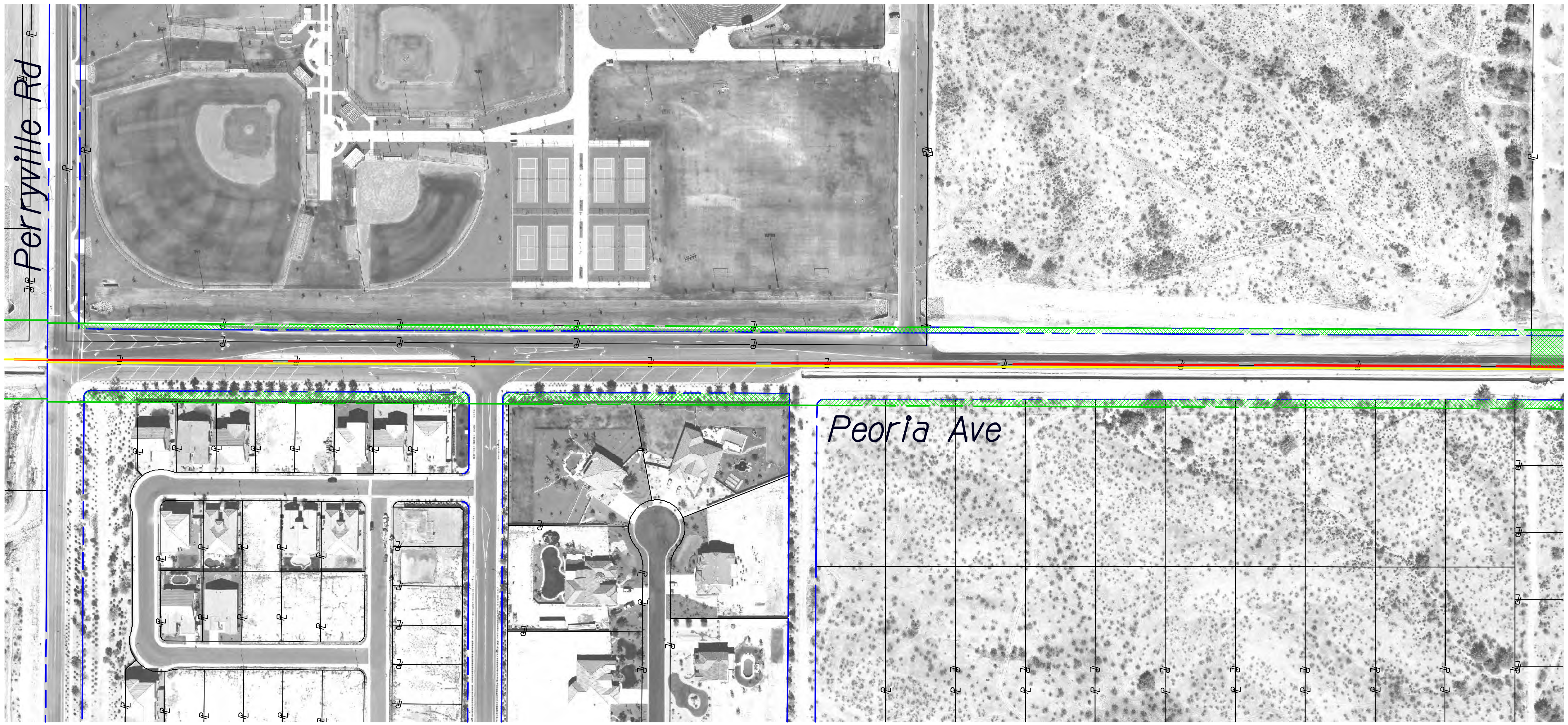
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL	Well		R/W Aquisition
WELL	Abandoned Well		Section Line
Reclaim	Reclaimed Water Delivery Header		Roadway ℄
			New R/W
			Existing R/W

AECOM

Perryville Rd to Citrus Rd
Alternative # 2

SHEET 1 OF 2

n:\60160205\Prod\Exhibits\Alt #2\01Alt2_Perry_Citrus_1.dgn

12/14/2010

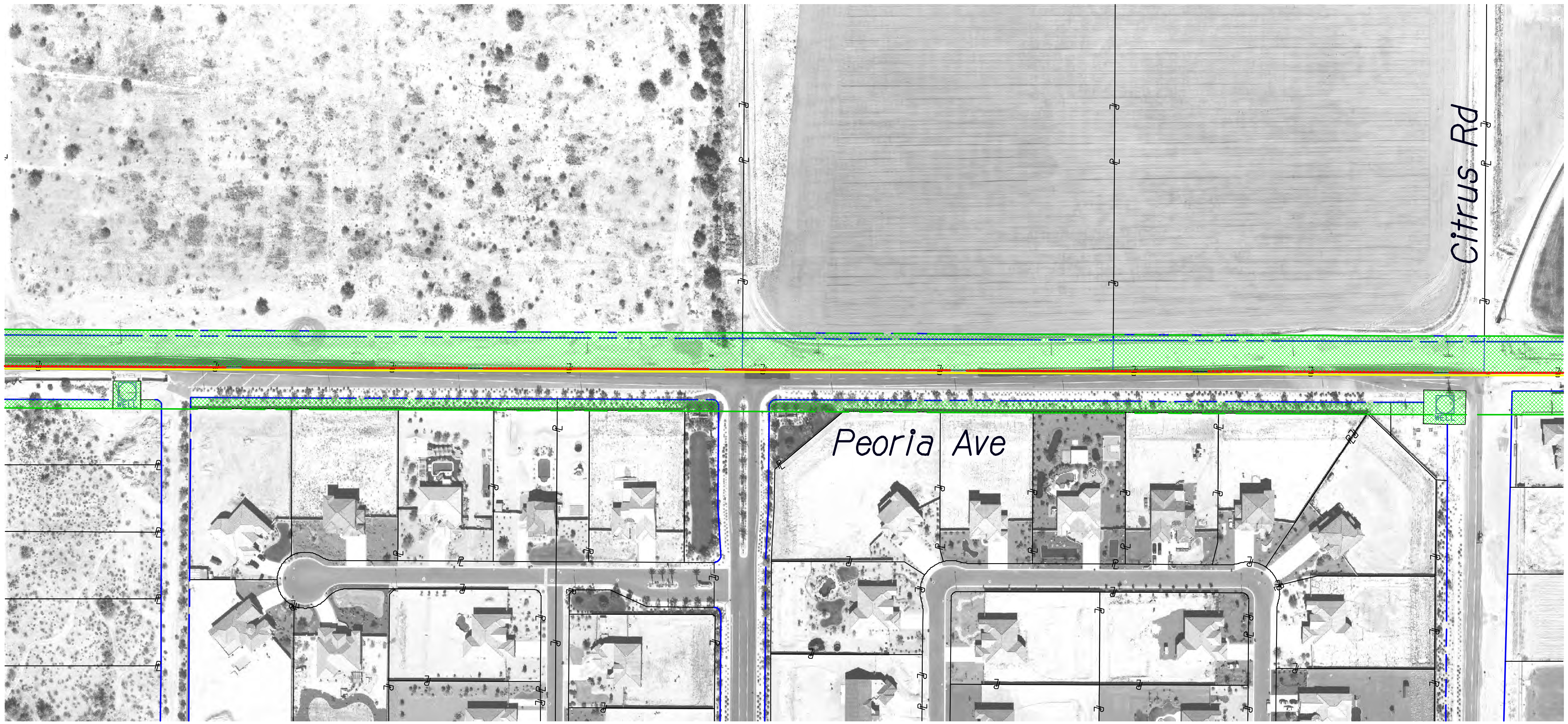
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL Well

WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Perryville Rd to Citrus Rd
Alternative # 2

SHEET 2 OF 2

n:\60160205\Prod\Exhibits\Alt #2\02Alt2_Perry_Citrus_2.dgn

12/14/2010

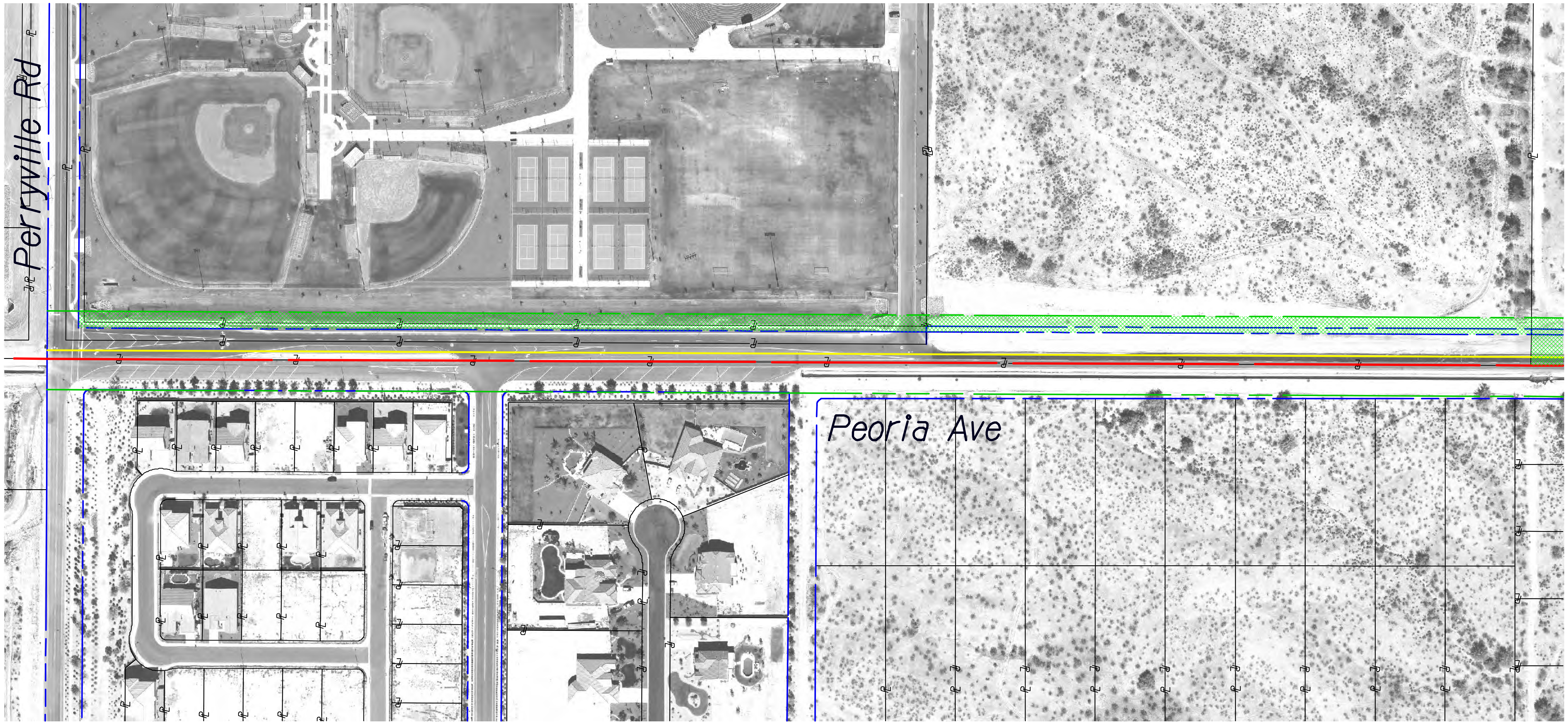
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

- Well (WELL)
- Abandoned Well (WELL)
- Reclaimed Water Delivery Header (Reclaim)
- R/W Aquisition
- Section Line
- Roadway ℄
- New R/W
- Existing R/W

AECOM

Perryville Rd to Citrus Rd
Alternative # 3

SHEET 1 OF 2

n:\60160205\Prod\Exhibits\Alt #3\01Alt3_Perry_Citrus_1.dgn

12/14/2010

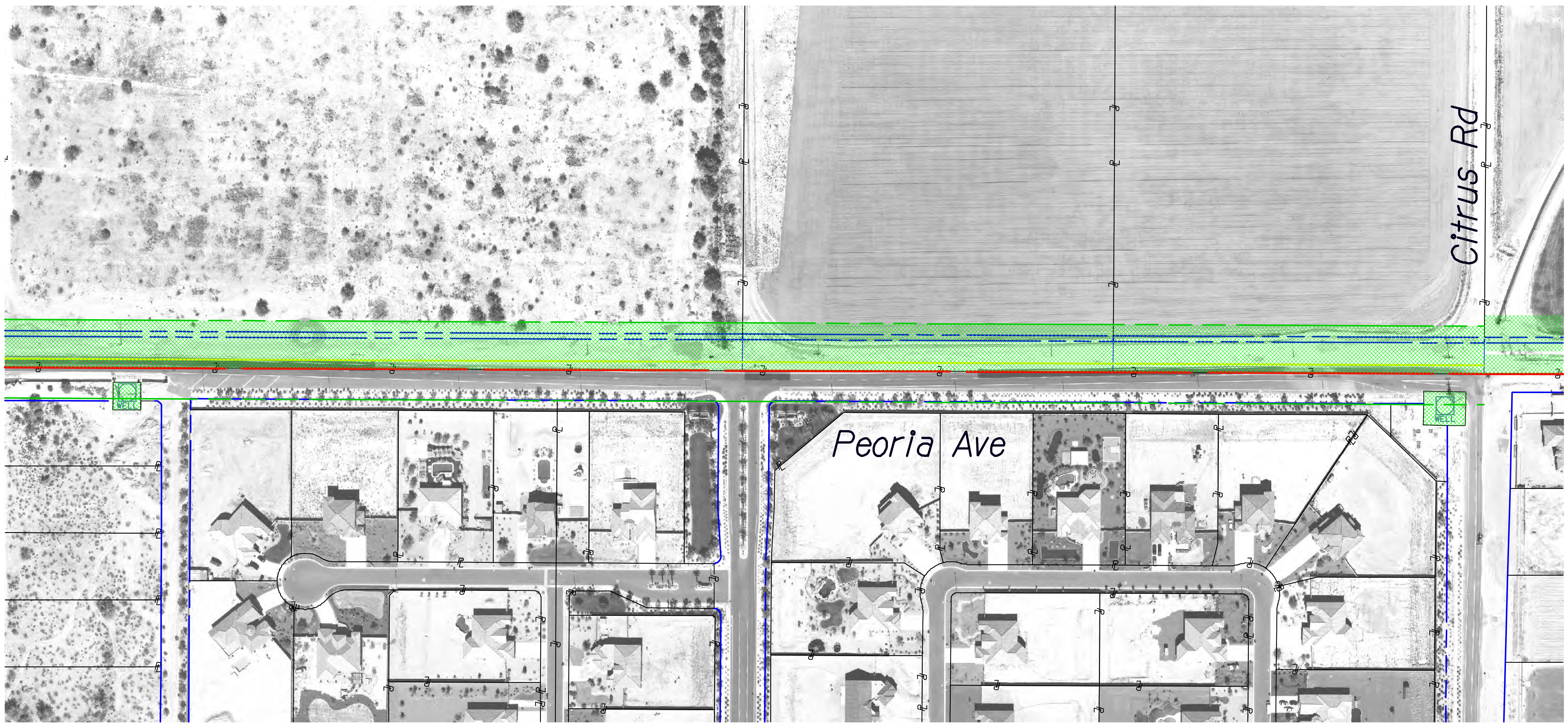
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL Well

WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Perryville Rd to Citrus Rd
Alternative # 3

n:\60160205\Prod\Exhibits\Alt #3\02Alt3_Perry_Citrus_2.dgn

12/14/2010

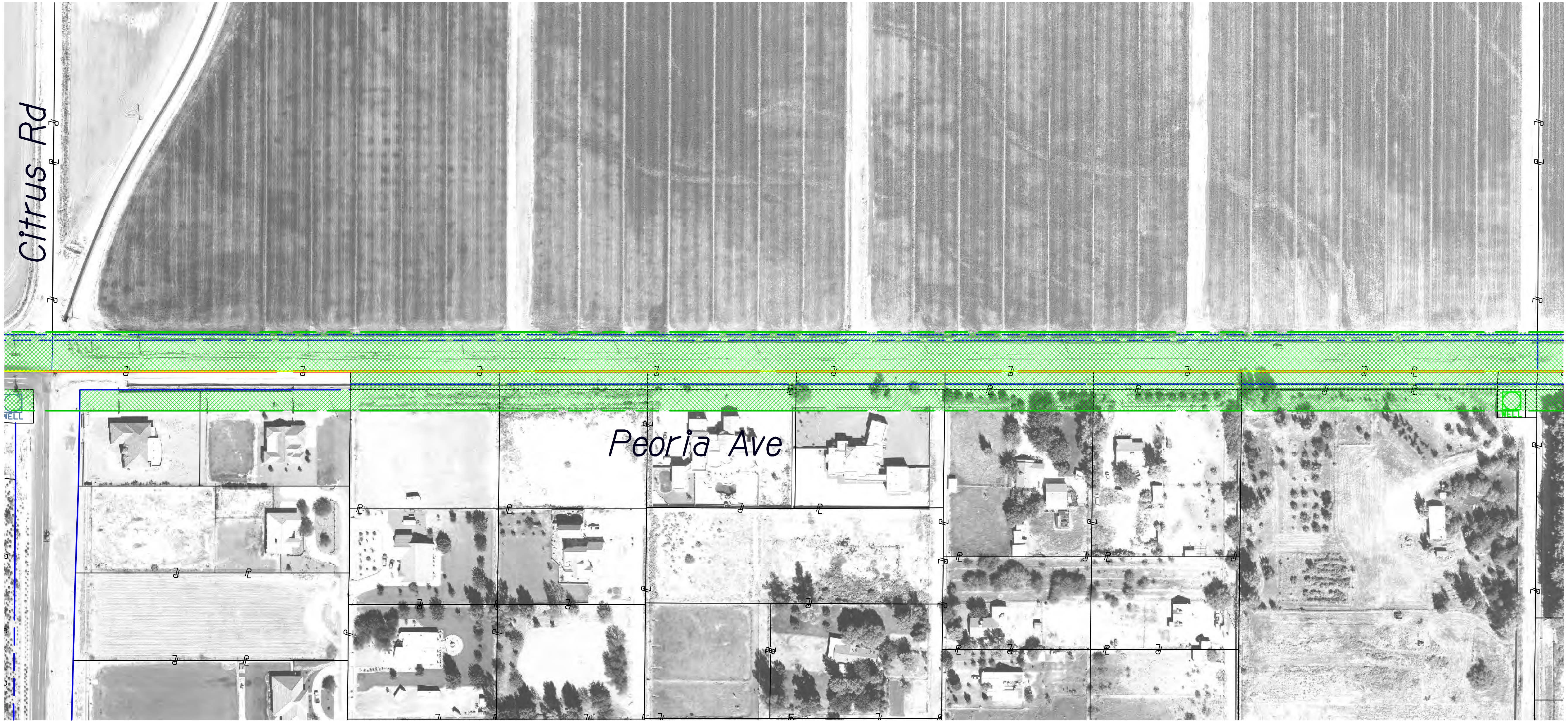
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Citrus Rd to Cotton Ln
Alternative # 1

SHEET
1 OF 2

n:\60160205\Prod\Exhibits\Alt #1\03Alt1_Citrus_Cotton_1.dgn

12/14/2010

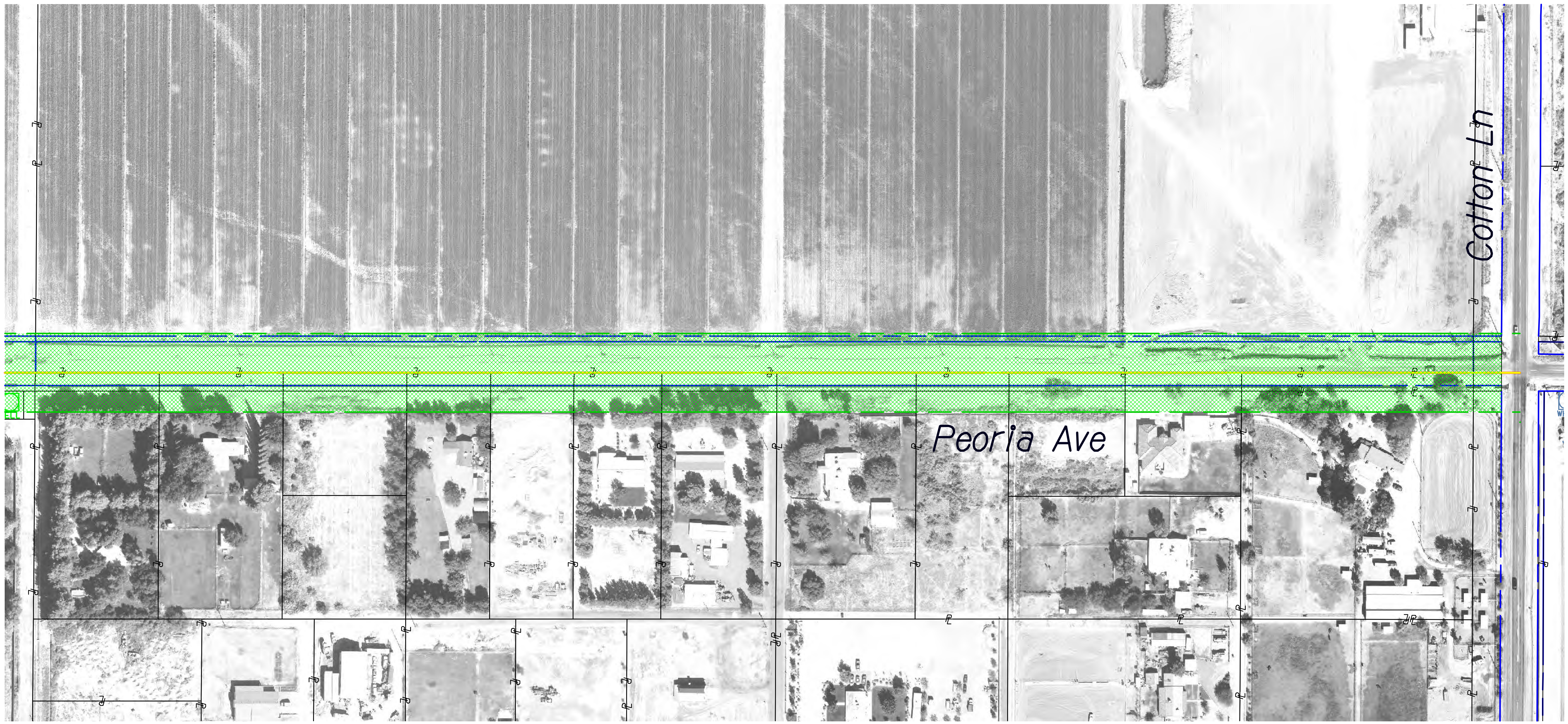
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Citrus Rd to Cotton Ln
Alternative # 1

SHEET
2 OF 2

n:\60160205\Prod\Exhibits\Alt #1\04Alt1_Citrus_Cotton_2.dgn

12/14/2010

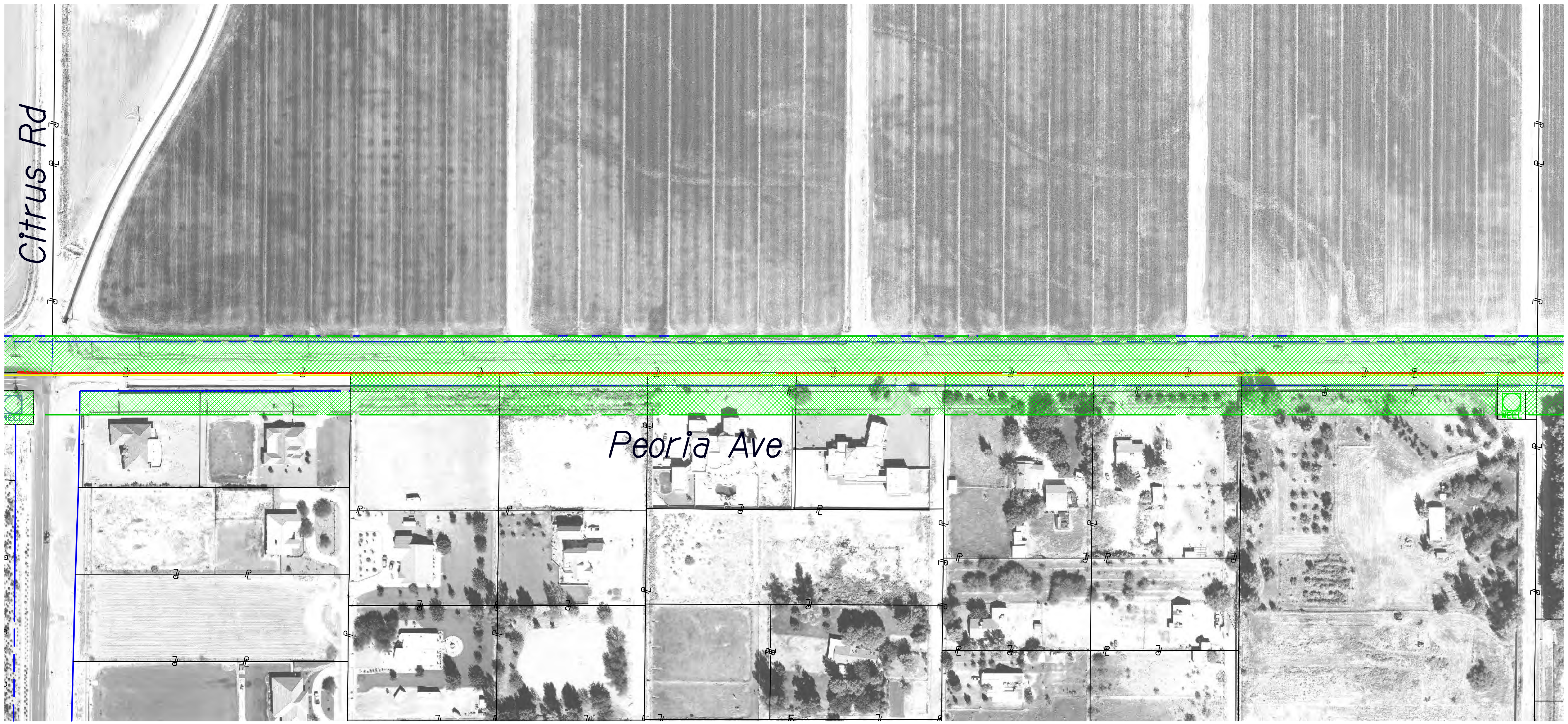
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Citrus Rd to Cotton Ln
Alternative # 2

SHEET
1 OF 2

n:\60160205\Prod\Exhibits\Alt #2\03Alt2_Citrus_Cotton_1.dgn

12/14/2010

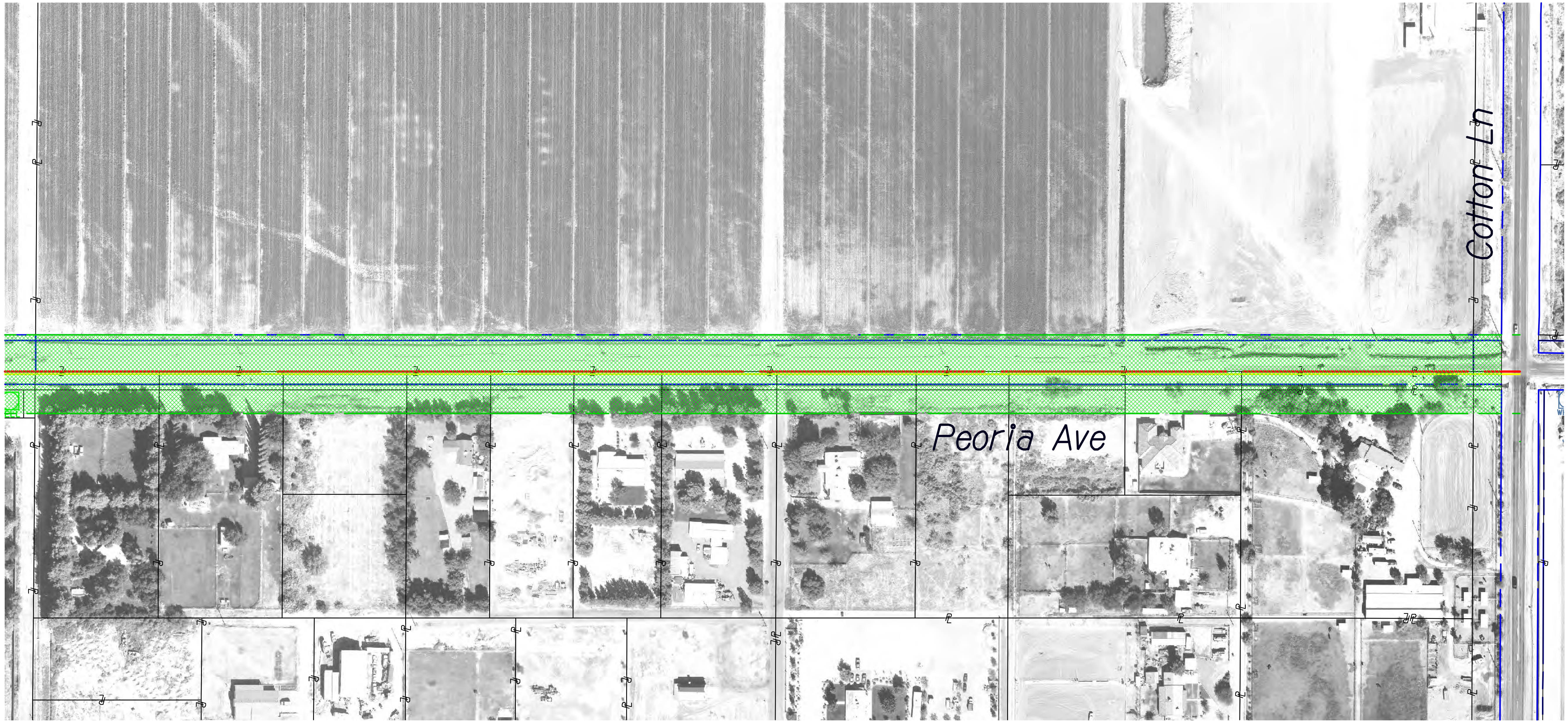
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL — Well

WELL — Abandoned Well

Reclaim — Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Citrus Rd to Cotton Ln
Alternative # 2

SHEET 2 OF 2

12/14/2010

n:\60160205\Prod\Exhibits\Alt #2\04Alt2_Citrus_Cotton_2.dgn

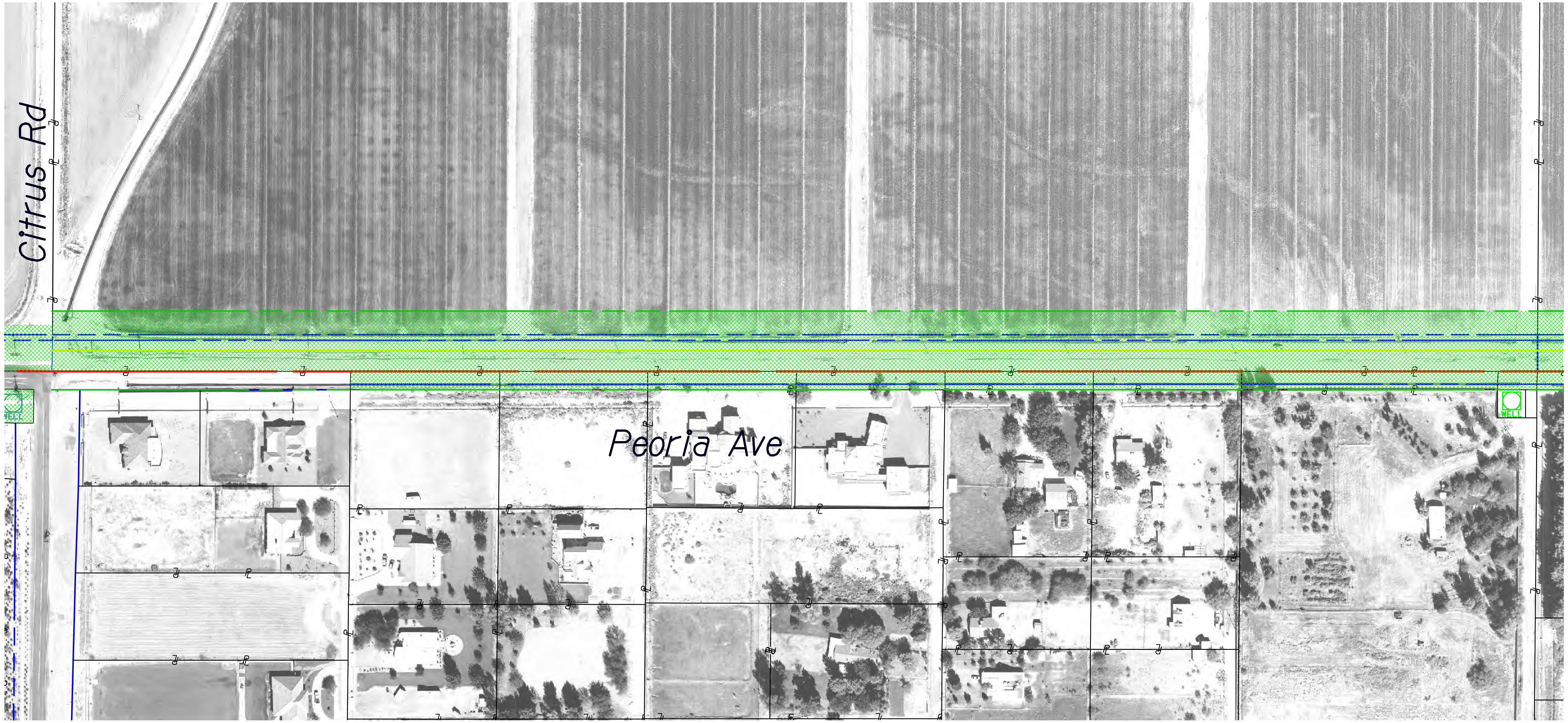
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header

- R/W Aquisition
- Section Line
- Roadway ℄
- New R/W
- Existing R/W

AECOM

Citrus Rd to Cotton Ln
Alternative # 3

SHEET 1 OF 2

n:\60160205\Prod\Exhibits\Alt #3\03Alt3_Citrus_Cotton_1.dgn

12/14/2010

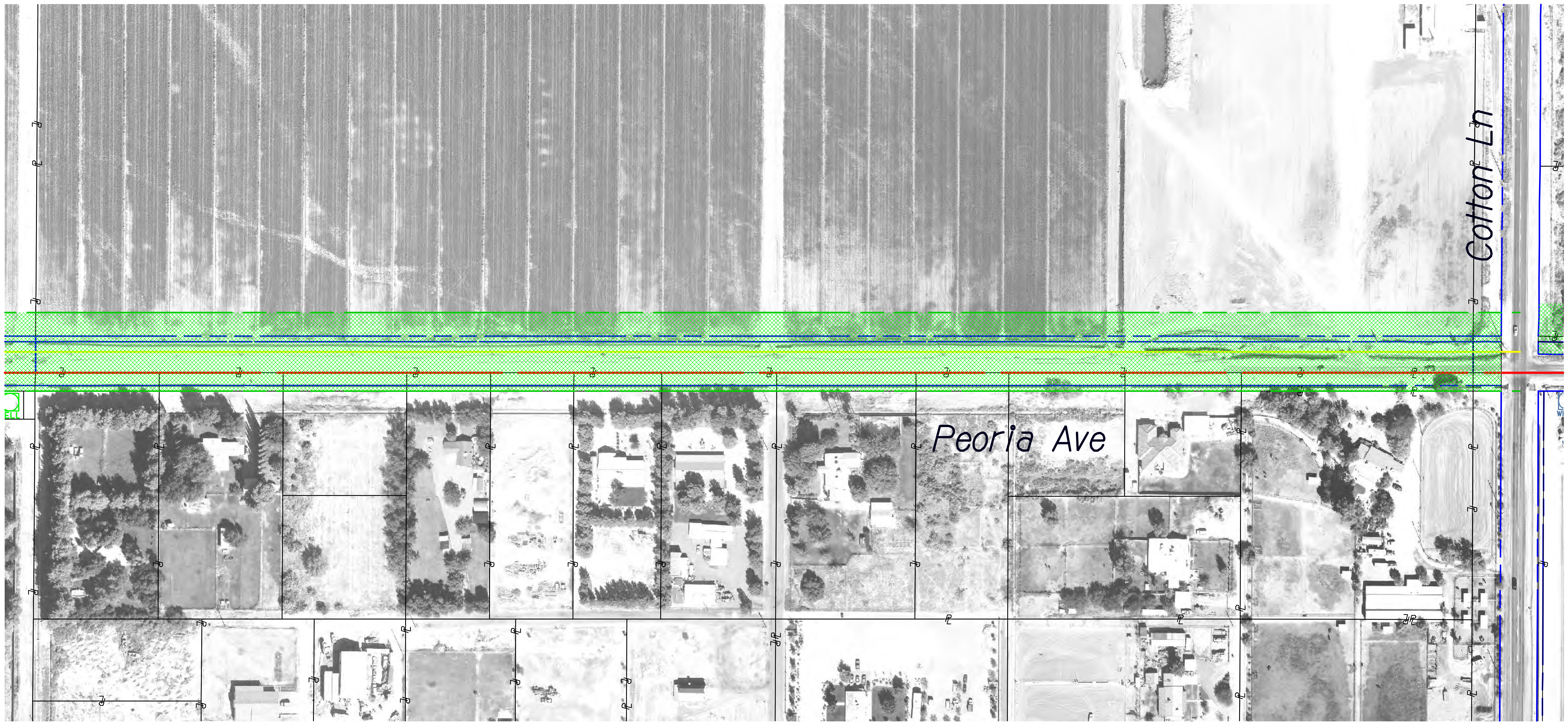
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"-200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL Well

WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Citrus Rd to Cotton Ln
Alternative # 3

SHEET 2 OF 2

n:\60160205\Prod\Exhibits\Alt #3\04Alt3_Citrus_Cotton_2.dgn

12/14/2010

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N

Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Cotton Ln to Sarival Rd
Alternative # 1

SHEET
1 OF 2

n:\60160205\Prod\Exhibits\Alt #1\05Alt1_Cotton_Sarival.dgn

12/14/2010

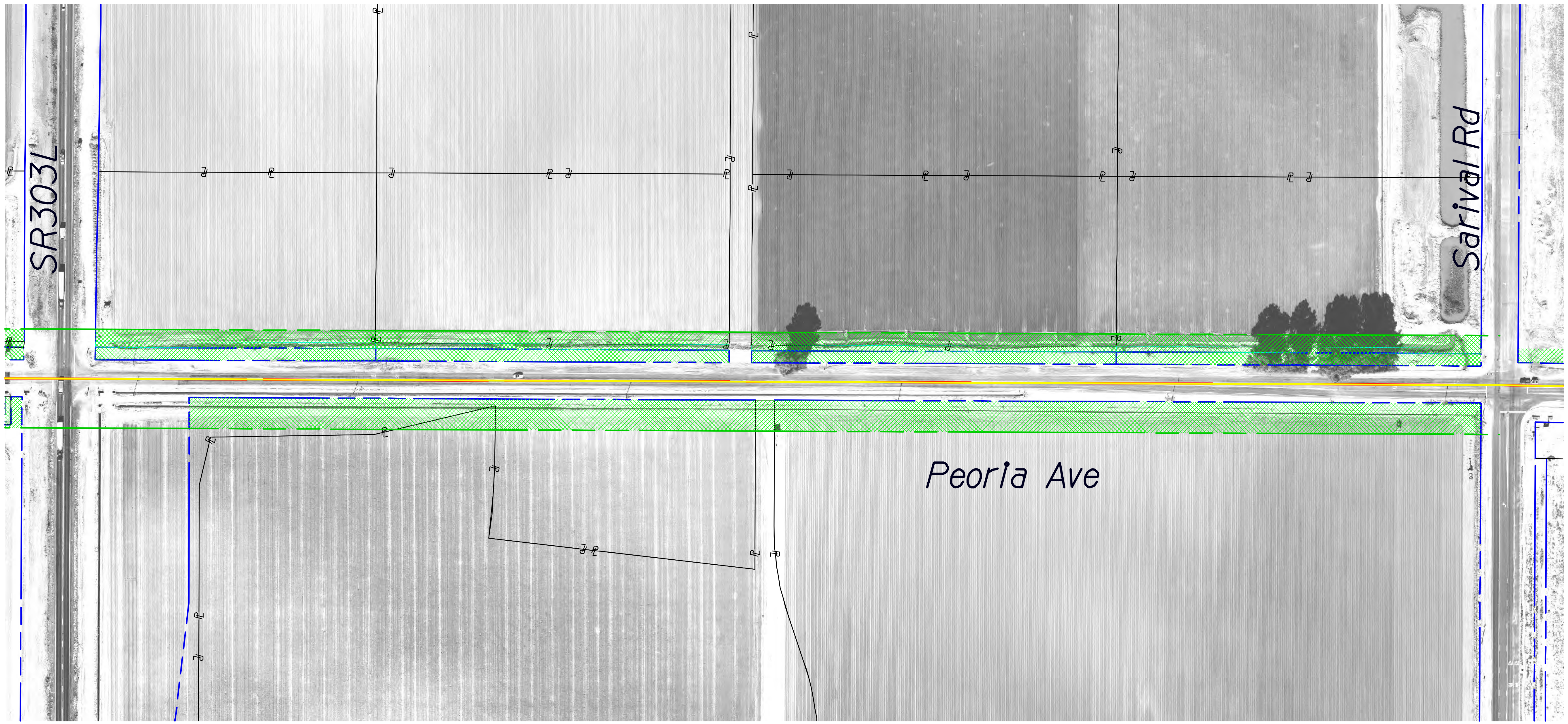
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Cotton Ln to Sarival Rd
Alternative # 1

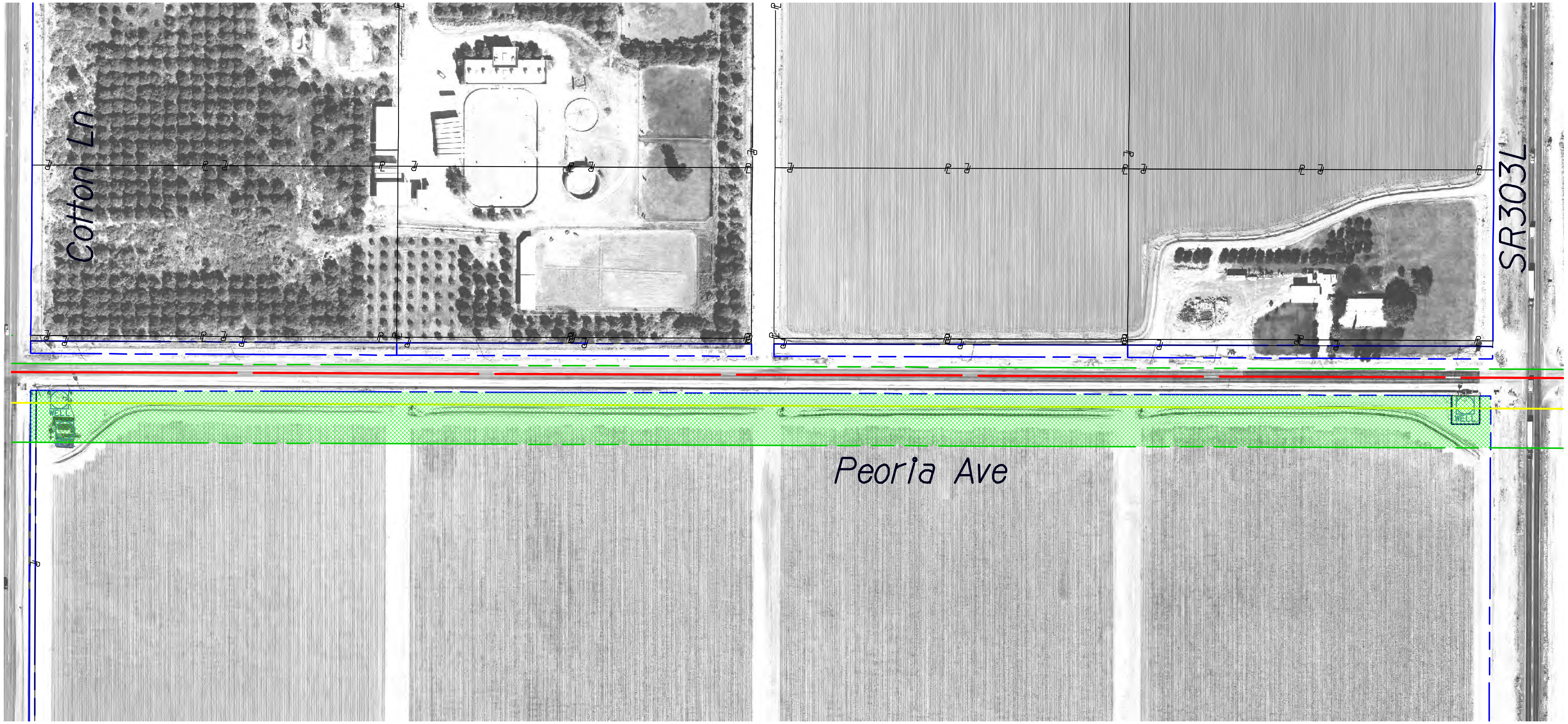
SHEET
2 OF 2

n:\60160205\Prod\Exhibits\Alt #1\06Alt1_Cotton_Sarival_2.dgn

12/14/2010

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'



Legend

WELL	Well		R/W Aquisition
WELL	Abandoned Well		Section Line
Reclaim	Reclaimed Water Delivery Header		Roadway ℄
			New R/W
			Existing R/W

AECOM

Cotton Ln to Sarival Rd
Alternative # 2

SHEET 1 OF 2

n:\60160205\Prod\Exhibits\Alt #2\05Alt2_Cotton_Sarival_1.dgn

12/14/2010

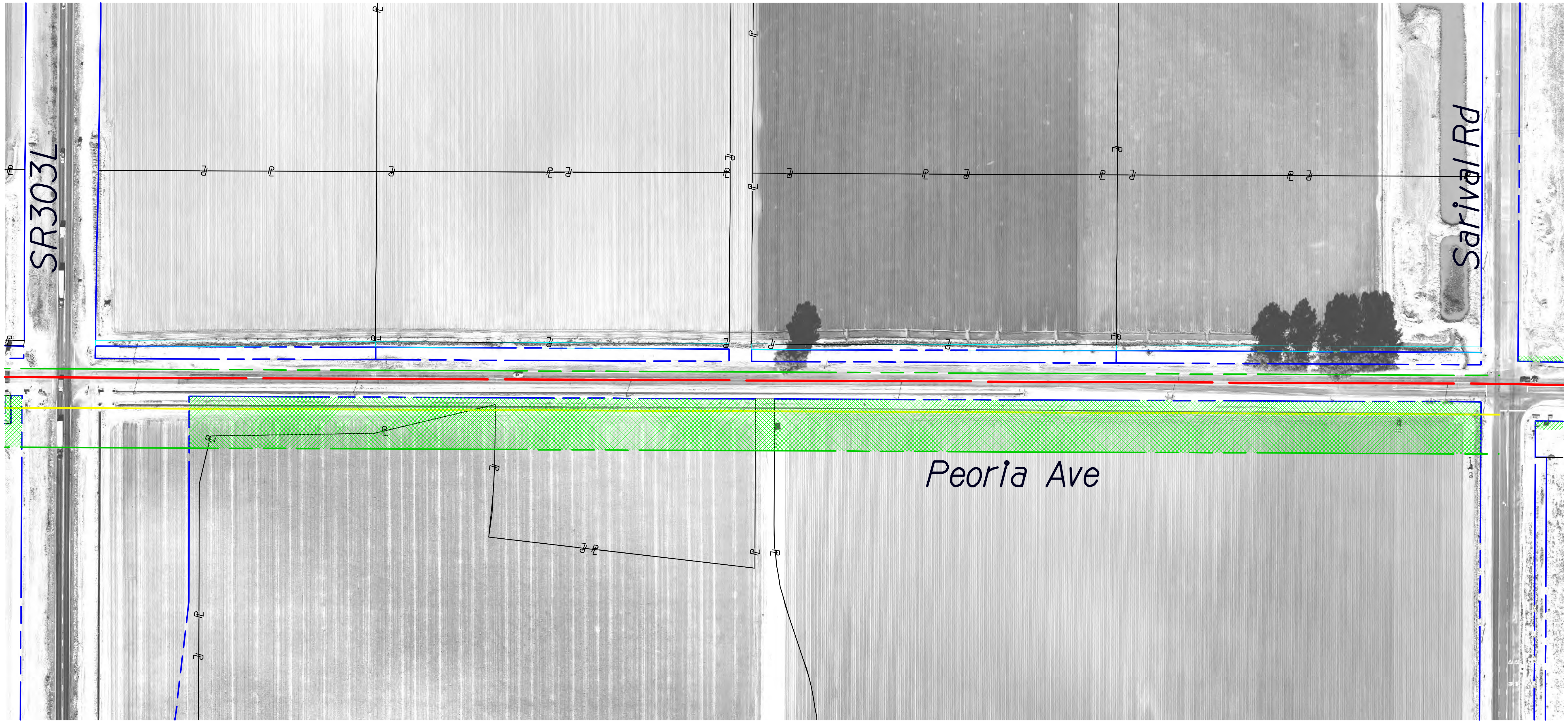
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL — Well

WELL — Abandoned Well

Reclaim — Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Cotton Ln to Sarival Rd
Alternative # 2

SHEET
2 OF 2

n:\60160205\Prod\Exhibits\Alt #2\06Alt2_Cotton_Sarival_2.dgn

12/14/2010

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'
200 0 200 400
SCALE IN FEET

N

Legend

WELL	Well
WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Cotton Ln to Sarival Rd
Alternative # 3

SHEET
1 OF 2

n:\60160205\Prod\Exhibits\Alt #3\05Alt3_Cotton_Sarival_1.dgn

12/14/2010

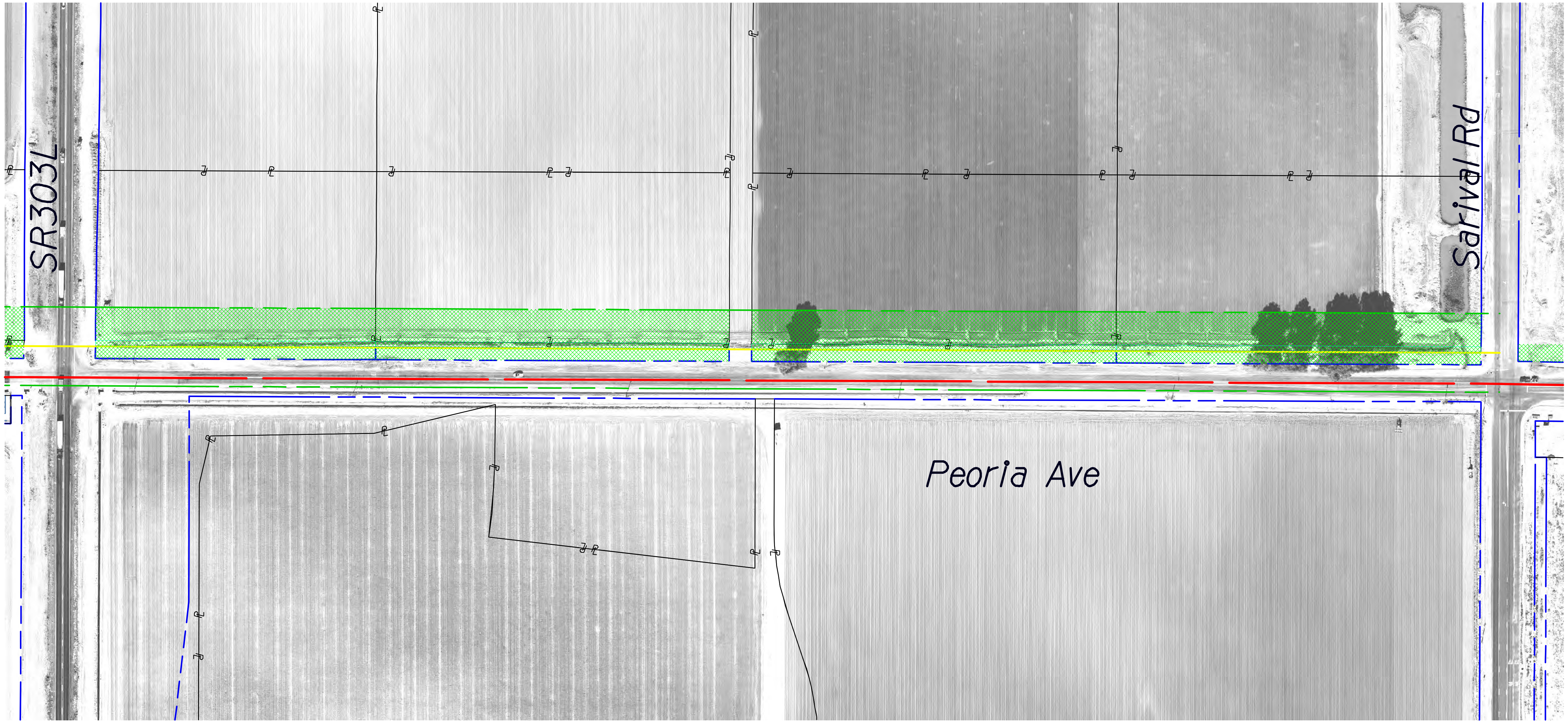
PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"-200'

200 0 200 400

SCALE IN FEET

N



Legend

WELL Well

WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Cotton Ln to Sarival Rd
Alternative # 3

SHEET 2 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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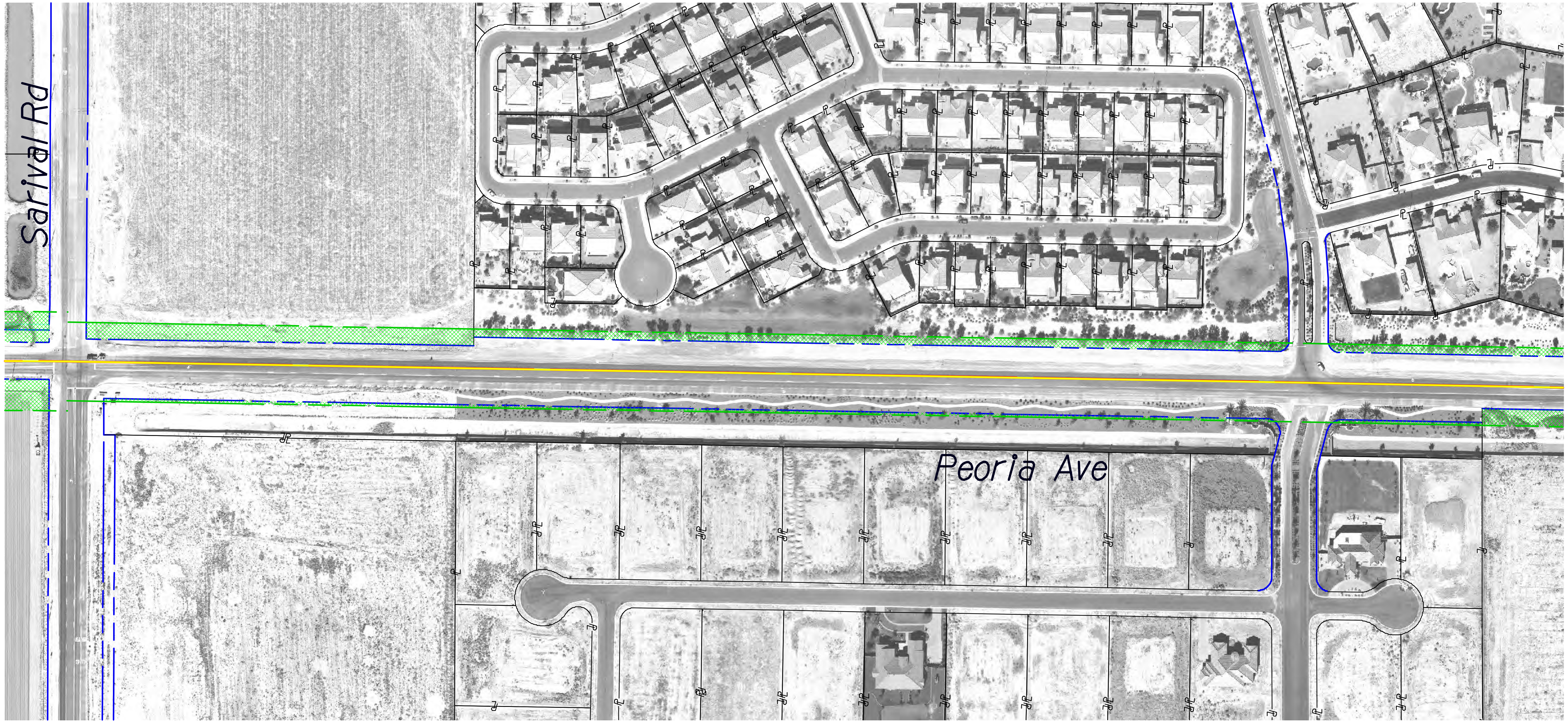

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WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Sarival Rd to Reems Rd
Alternative # 1

SHEET 1 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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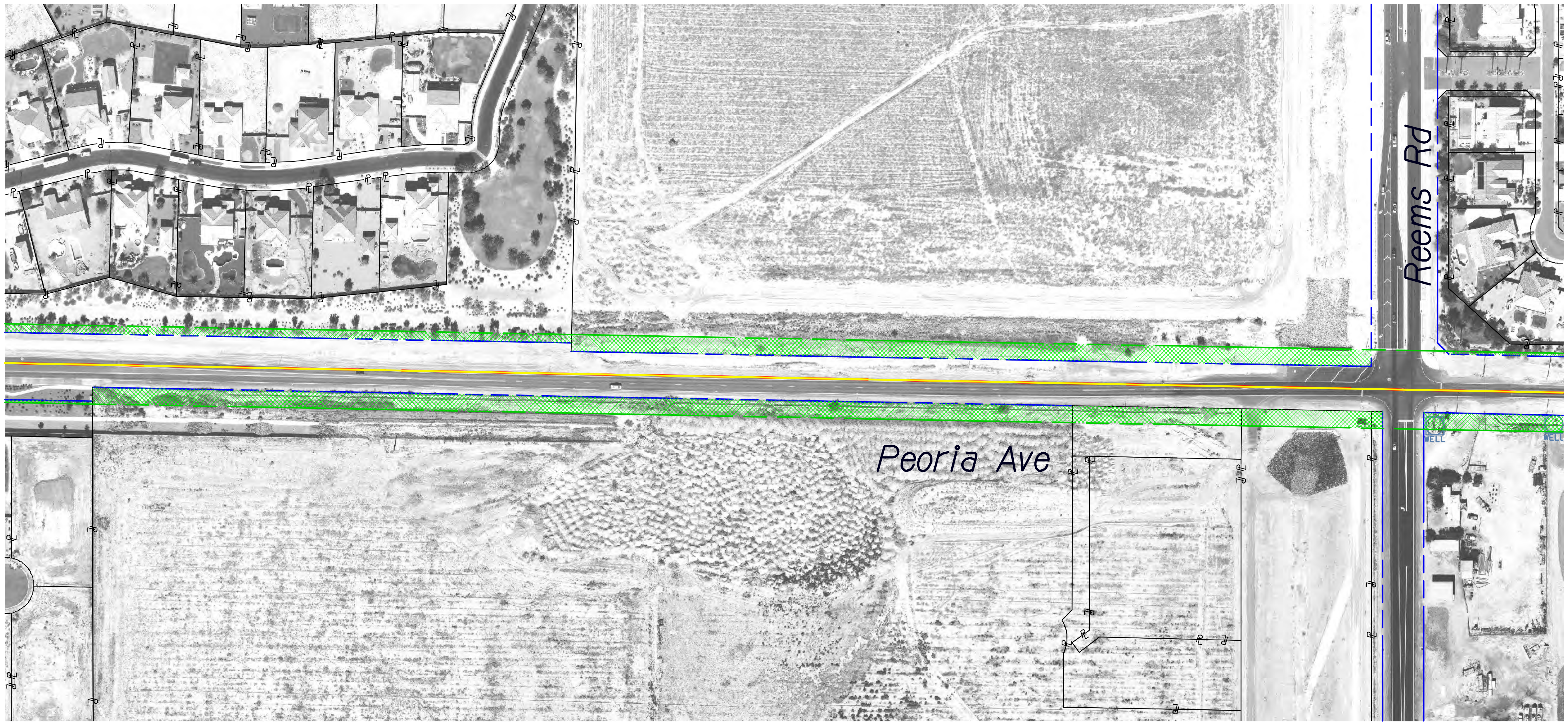

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WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Sarival Rd to Reems Rd
Alternative # 1

SHEET
2 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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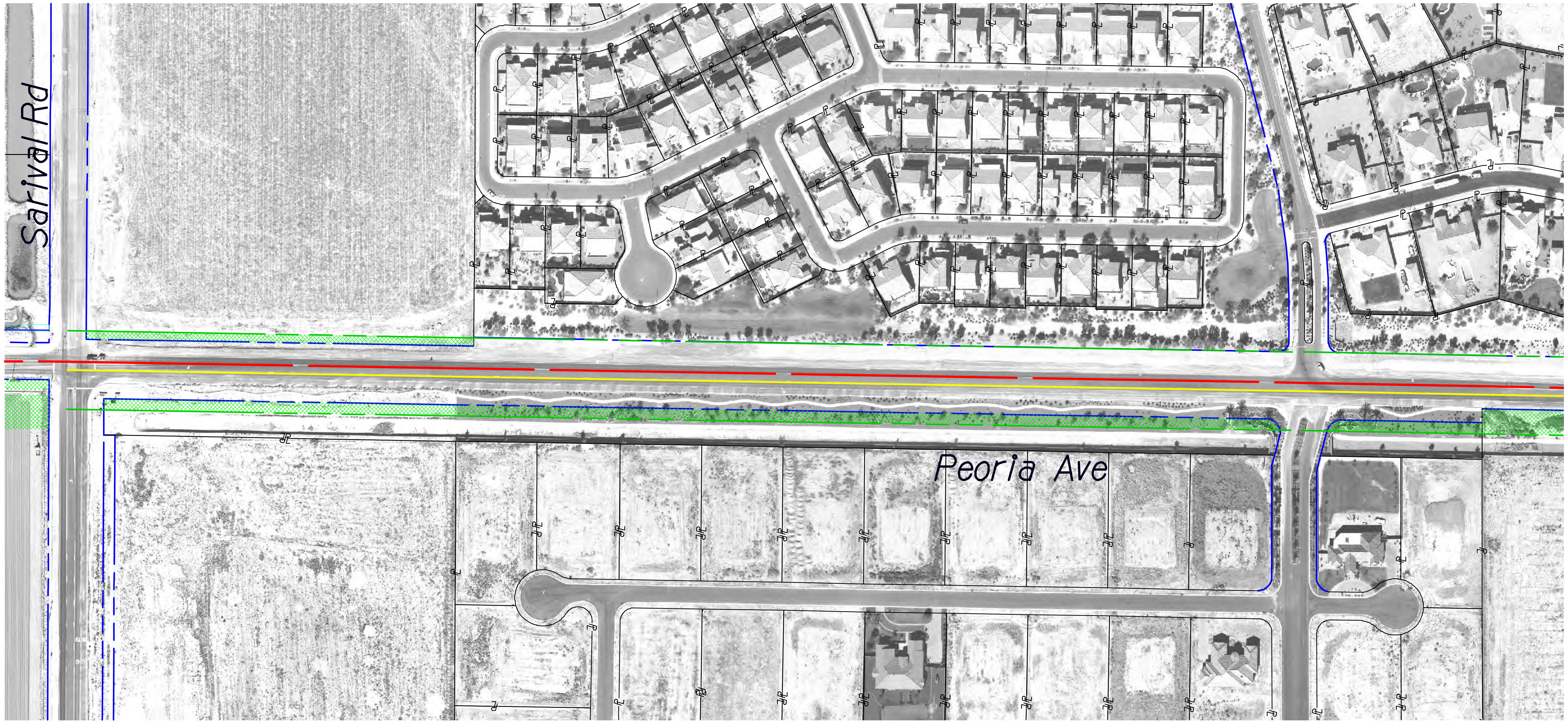

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WELL	Abandoned Well		Section Line
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			Existing R/W

AECOM

Sarival Rd to Reems Rd
Alternative # 2

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1 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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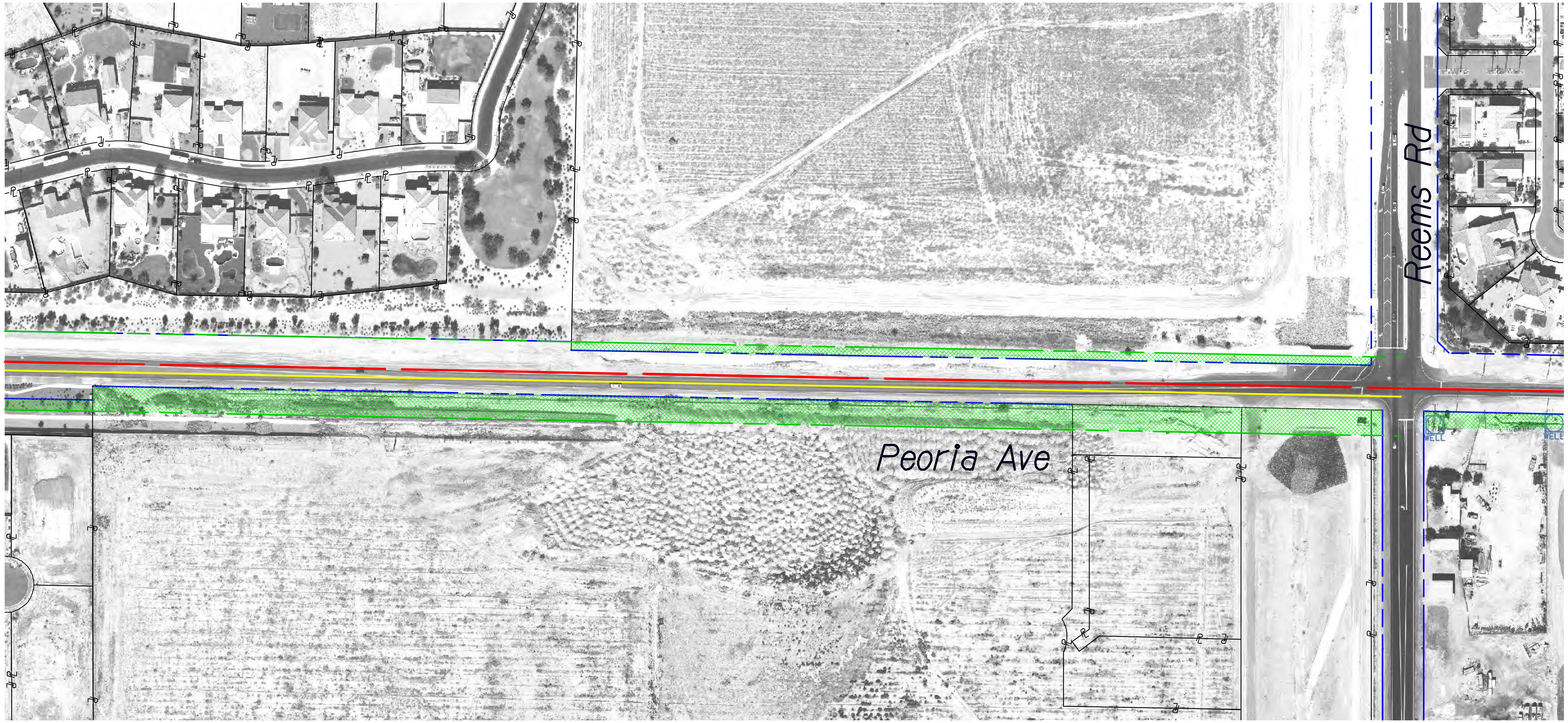

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WELL	Abandoned Well
Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Sarival Rd to Reems Rd
Alternative # 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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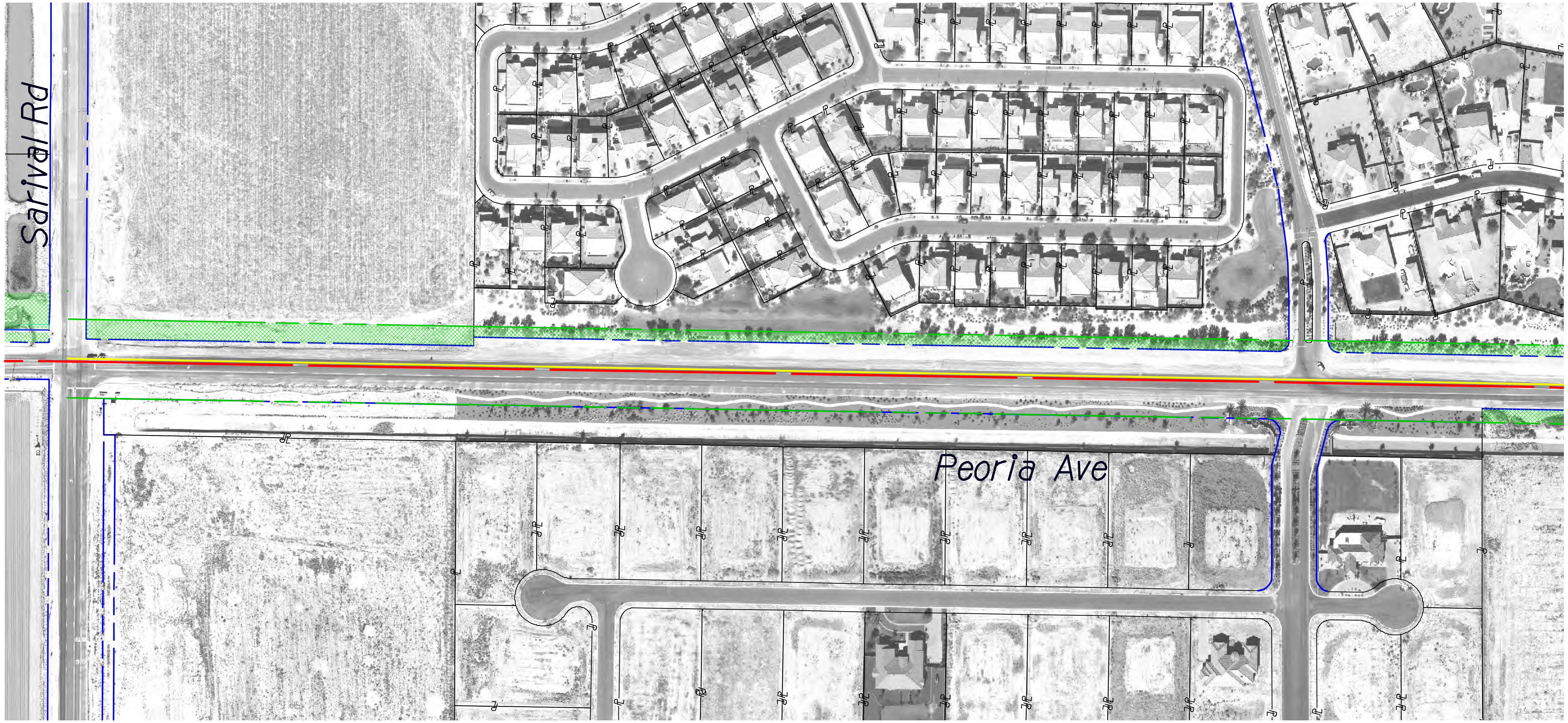

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			Existing R/W

AECOM

Sarival Rd to Reems Rd
Alternative # 3

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1 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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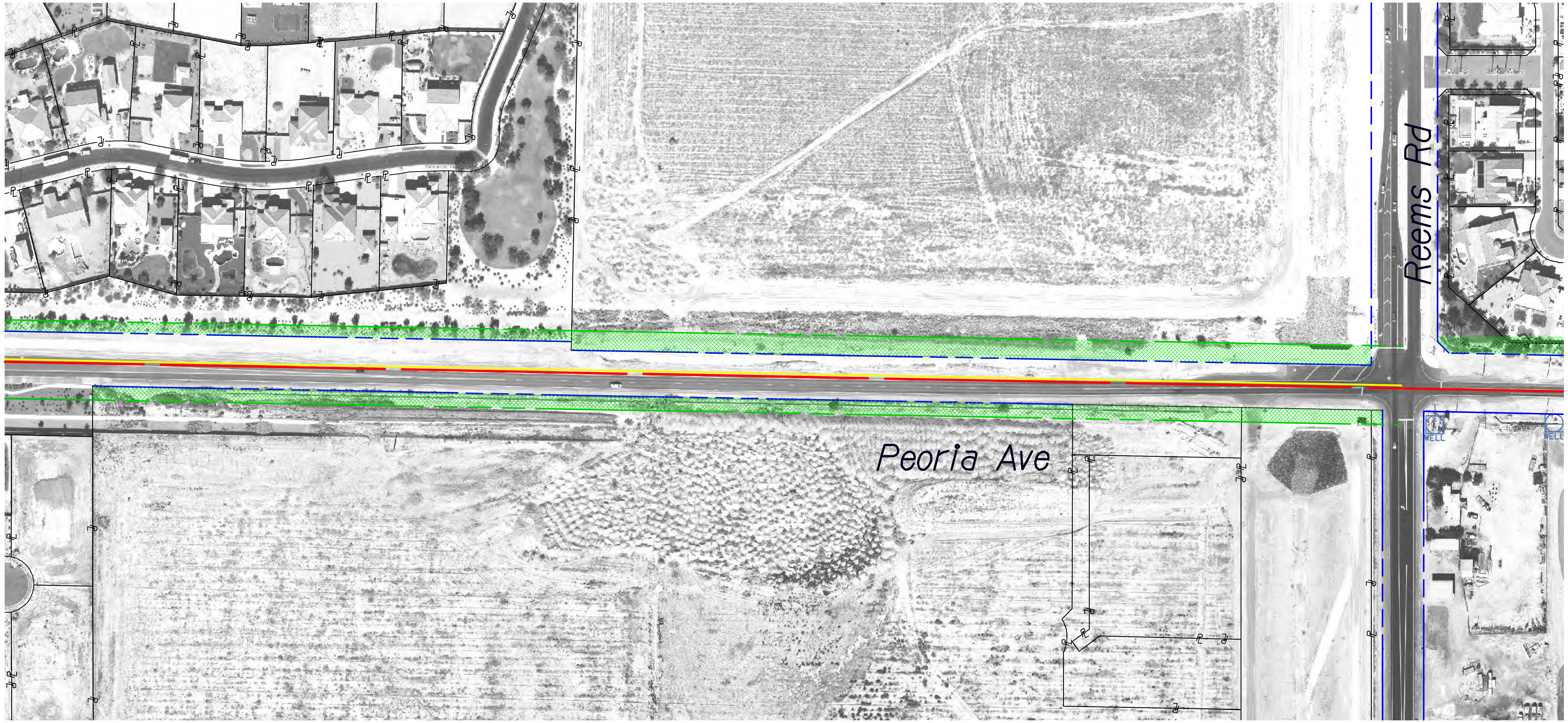

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			Existing R/W

AECOM

Sarival Rd to Reems Rd
Alternative # 3

SHEET
2 OF 2

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12/14/2010

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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SCALE IN FEET

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Legend

WELL Well

WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Reems Rd to Bullard Ave
Alternative # 1

SHEET 1 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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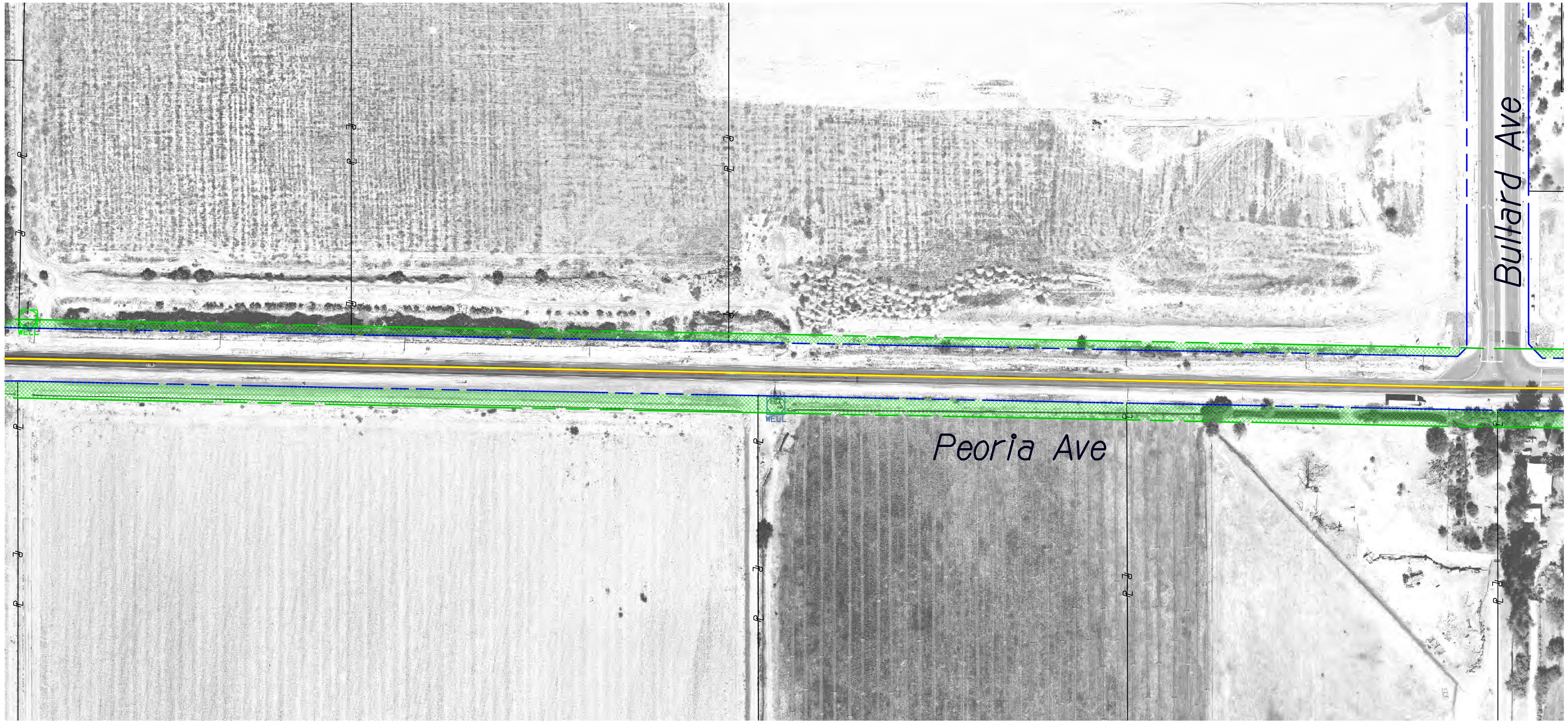

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WELL	Abandoned Well		Section Line
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			Existing R/W

AECOM

Reems Rd to Bullard Ave
Alternative # 1

SHEET
2 OF 2

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12/14/2010

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

SCALE: 1"=200'

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Legend

- Well
- Abandoned Well
- Reclaimed Water Delivery Header
- R/W Aquisition
- Section Line
- Roadway ℄
- New R/W
- Existing R/W

AECOM

Reems Rd to Bullard Ave
Alternative # 2

SHEET 1 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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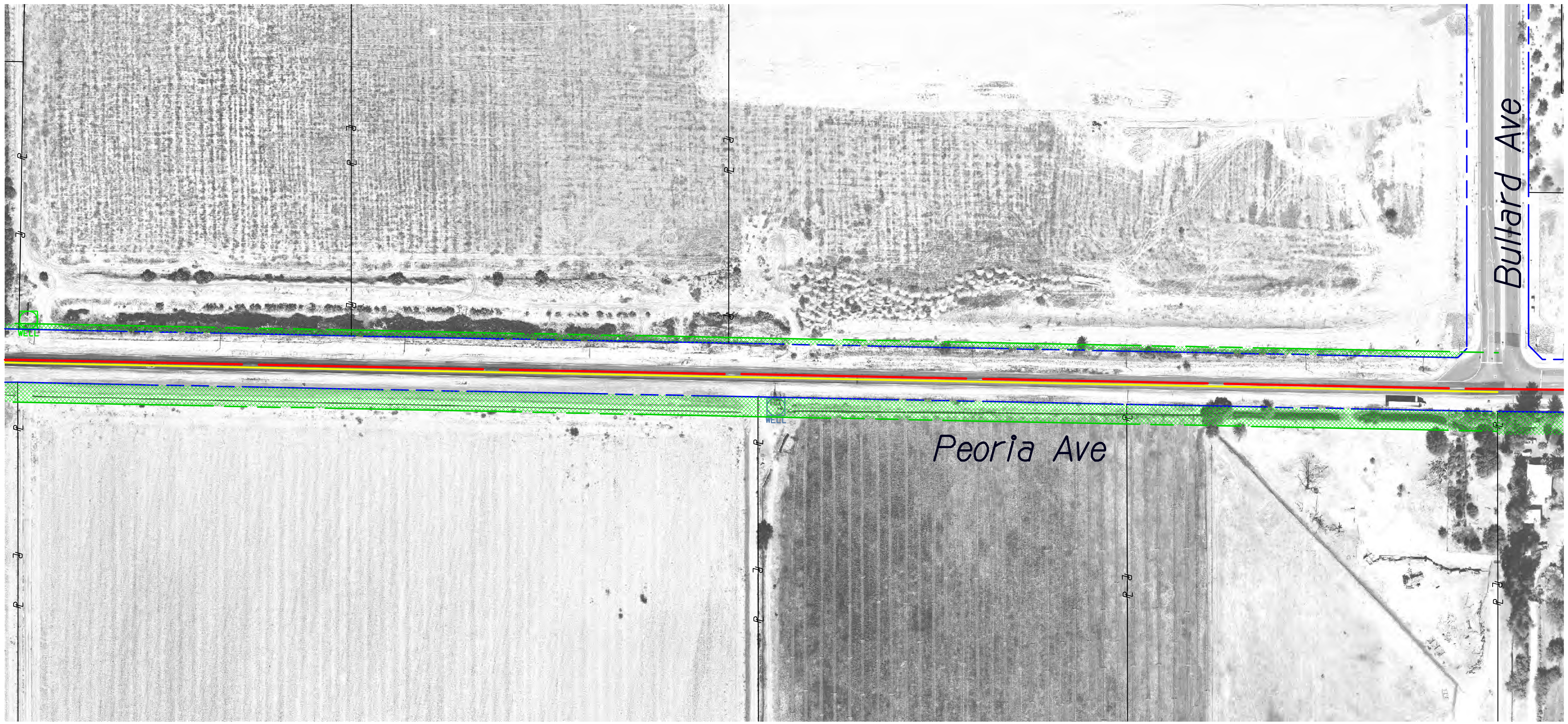

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Reclaim	Reclaimed Water Delivery Header
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AECOM

Reems Rd to Bullard Ave
Alternative # 2

SHEET
2 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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Legend

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Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
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AECOM

Reems Rd to Bullard Ave
Alternative # 3

SHEET
1 OF 2

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12/14/2010

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

MARICOPA COUNTY ARIZONA

SCALE: 1"=200'

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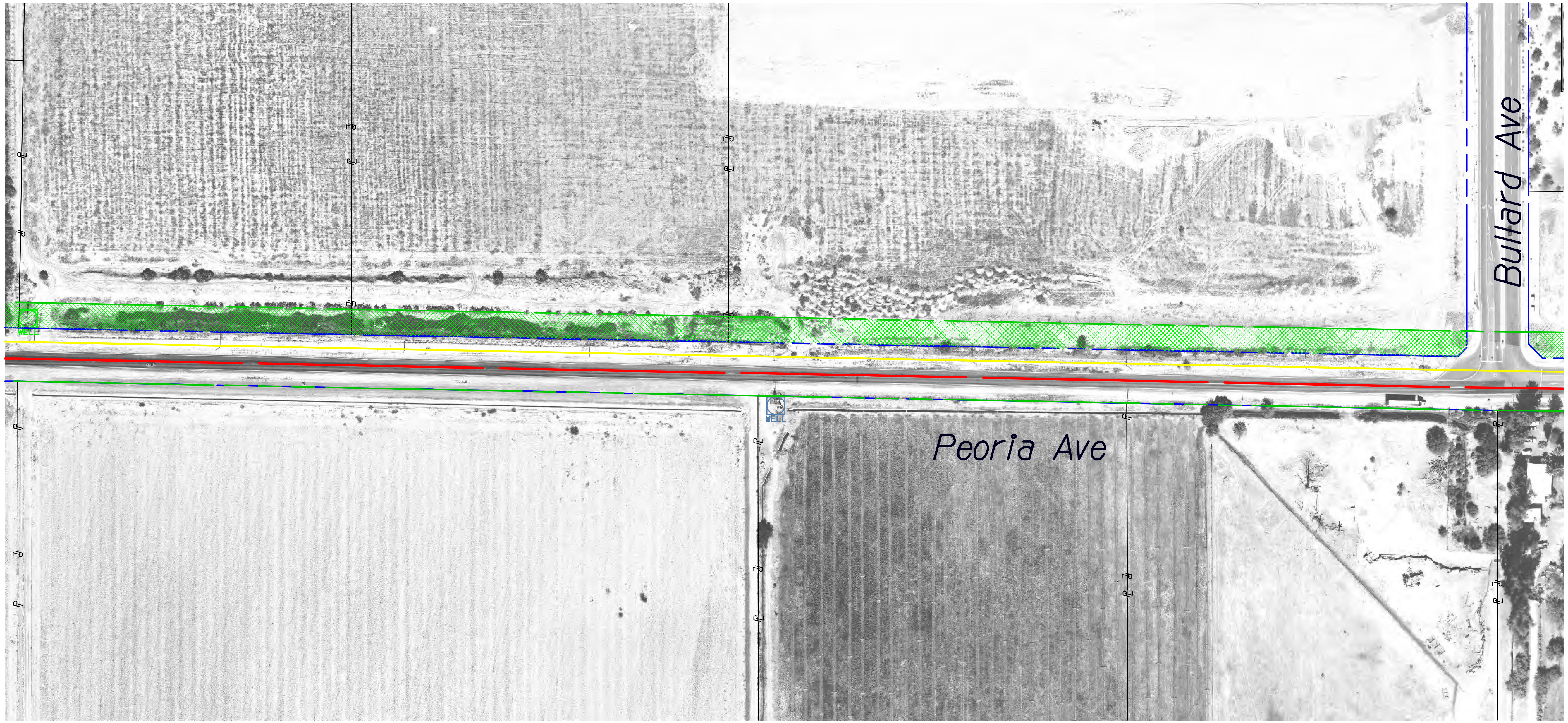

Legend

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WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

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Alternative # 3

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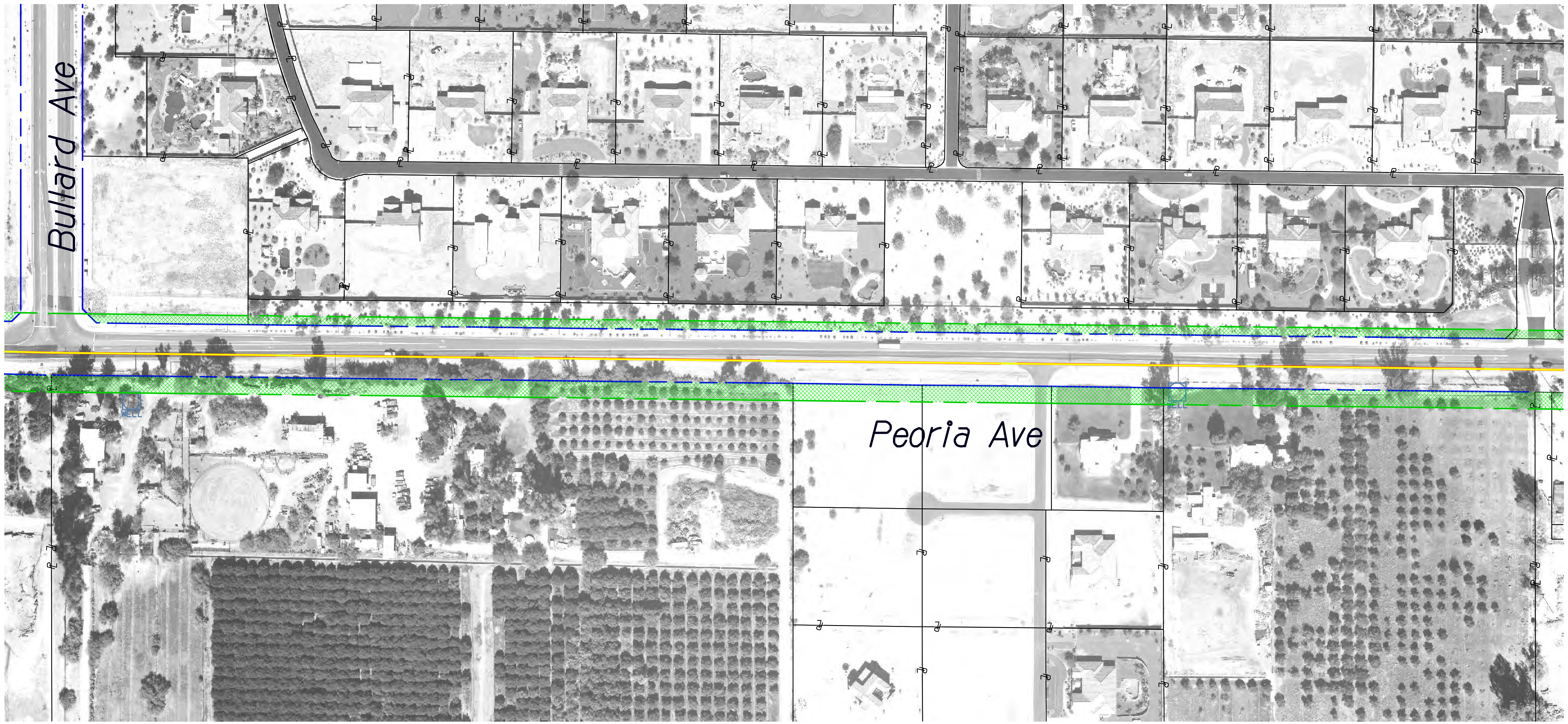

Legend

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Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Bullard Ave to Litchfield Rd
Alternative # 1

SHEET
1 OF 2

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12/14/2010

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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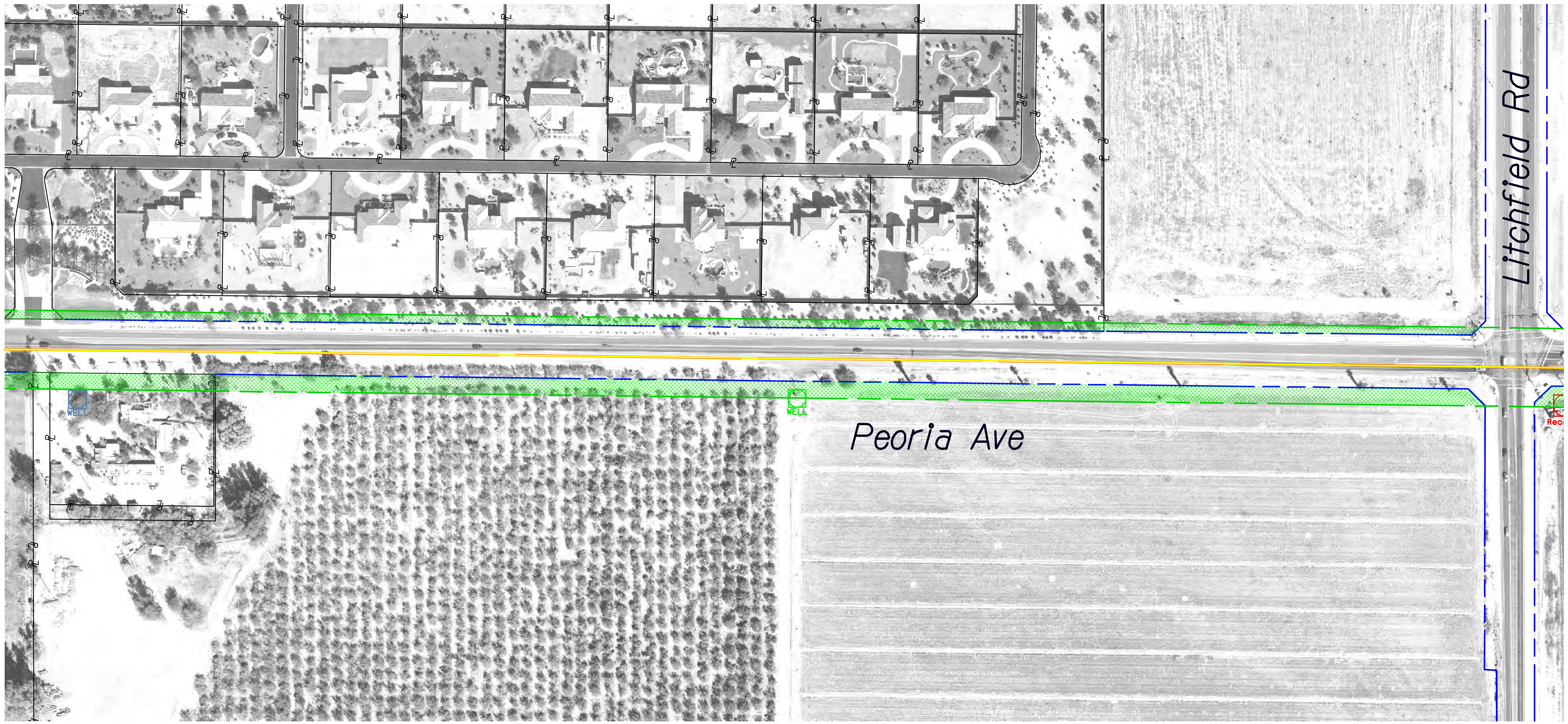

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WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Bullard Ave to Litchfield Rd
Alternative # 1

SHEET
2 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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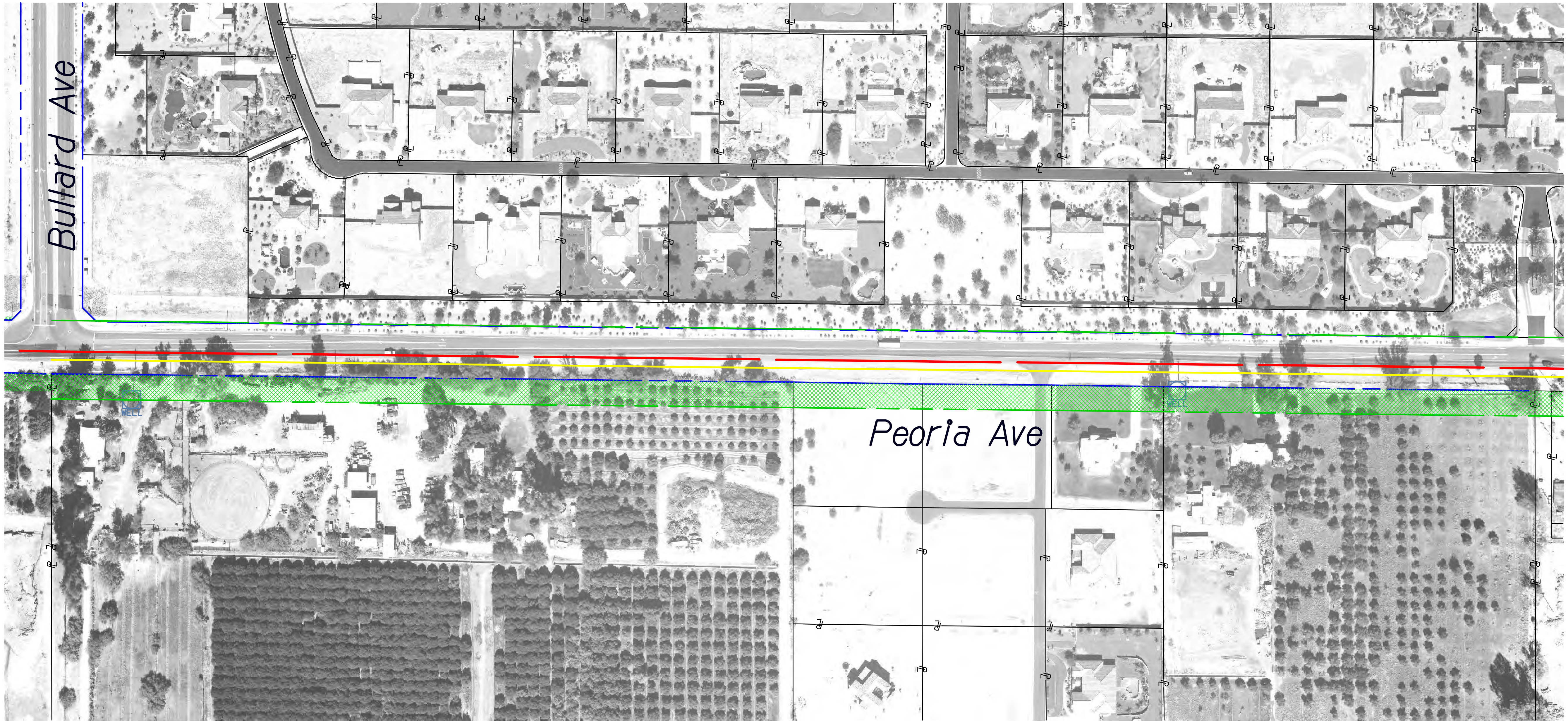

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	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Bullard Ave to Litchfield Rd
Alternative # 2

SHEET
1 OF 2

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Roadway ℄

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Existing R/W

AECOM

Bullard Ave to Litchfield Rd
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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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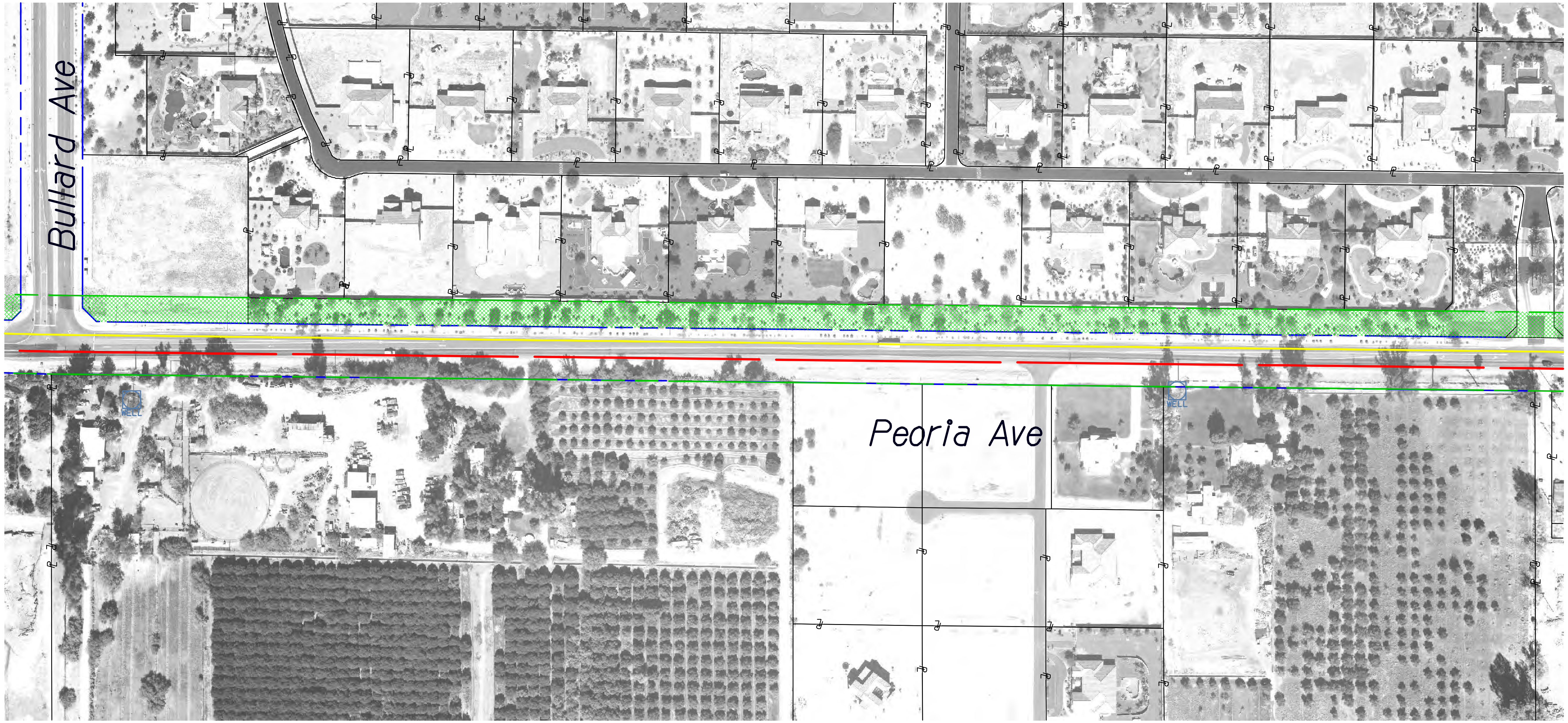

Legend

- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header
- R/W Aquisition
- Section Line
- Roadway ℄
- New R/W
- Existing R/W

AECOM

Bullard Ave to Litchfield Rd
Alternative # 3

SHEET 1 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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Legend

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Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
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Bullard Ave to Litchfield Rd
Alternative # 3

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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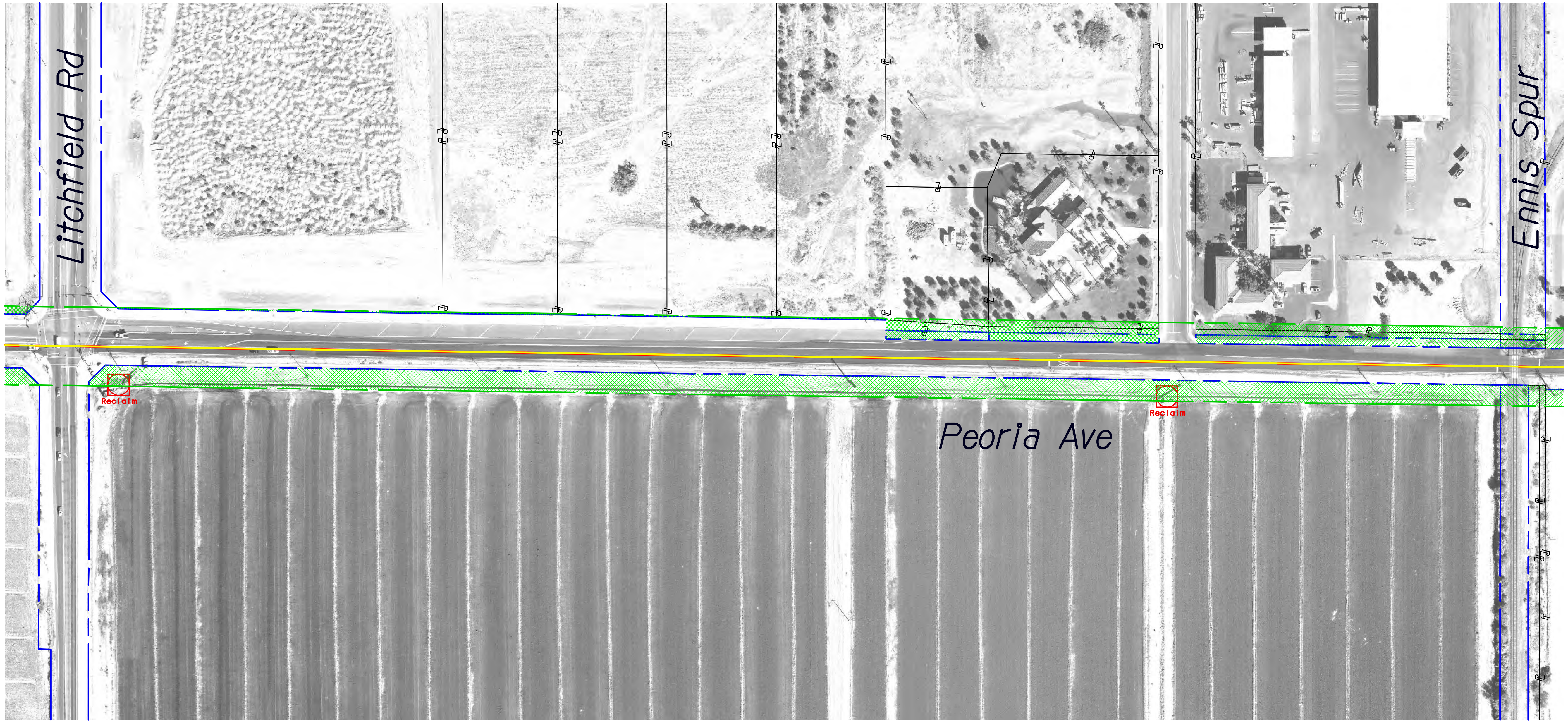

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Reclaim	Reclaimed Water Delivery Header
	R/W Aquisition
	Section Line
	Roadway ℄
	New R/W
	Existing R/W

AECOM

Litchfield Rd to Dysart Rd
Alternative # 1

SHEET
1 OF 2

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY

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SCALE IN FEET

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Legend

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WELL	Abandoned Well		Section Line
Reclaim	Reclaimed Water Delivery Header		Roadway ℄
			New R/W
			Existing R/W

AECOM

Litchfield Rd to Dysart Rd
Alternative # 1

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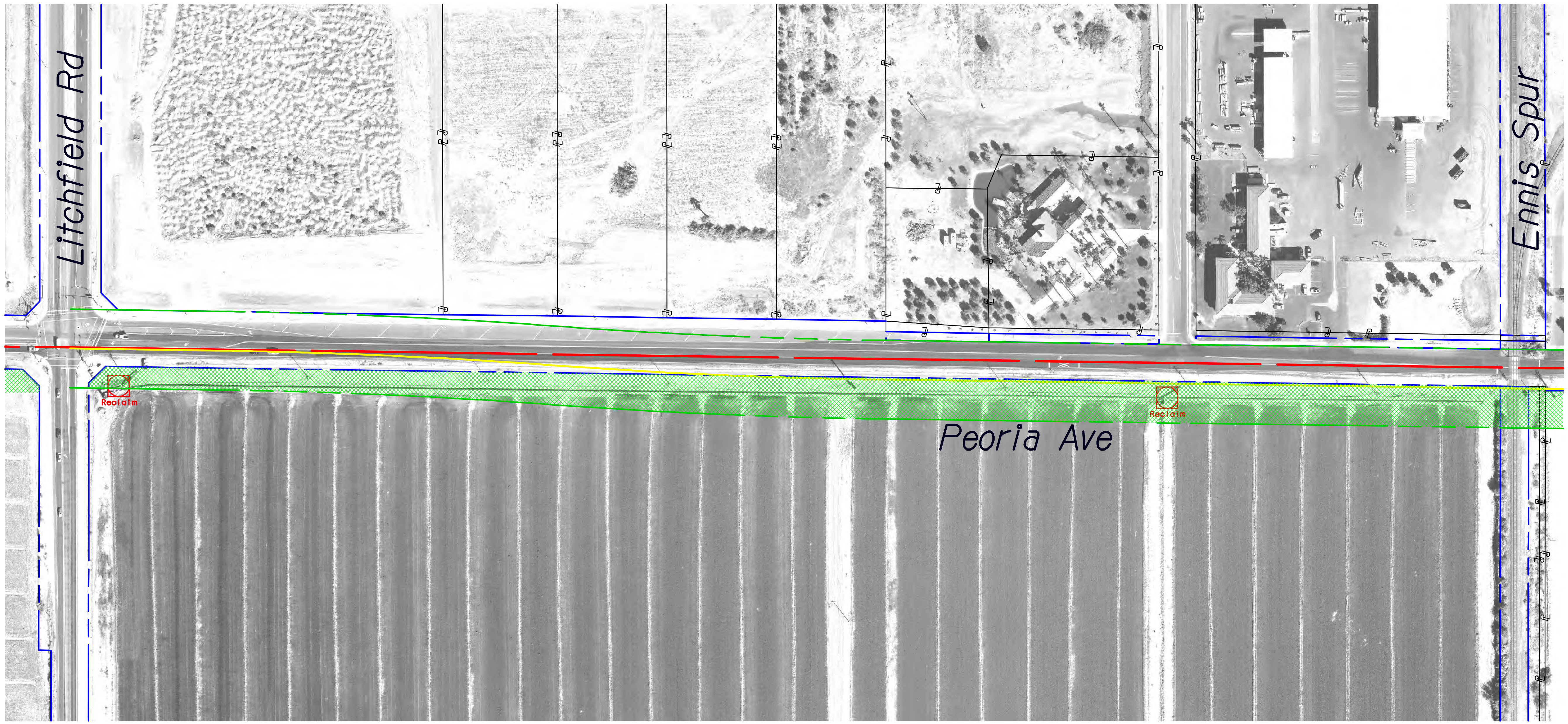

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SCALE IN FEET

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Legend

WELL Well

WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Litchfield Rd to Dysart Rd
Alternative # 2

SHEET 1 OF 2

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SCALE IN FEET

Legend

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Reclaim	Reclaimed Water Delivery Header		Roadway ℄
			New R/W
			Existing R/W

AECOM

Litchfield Rd to Dysart Rd
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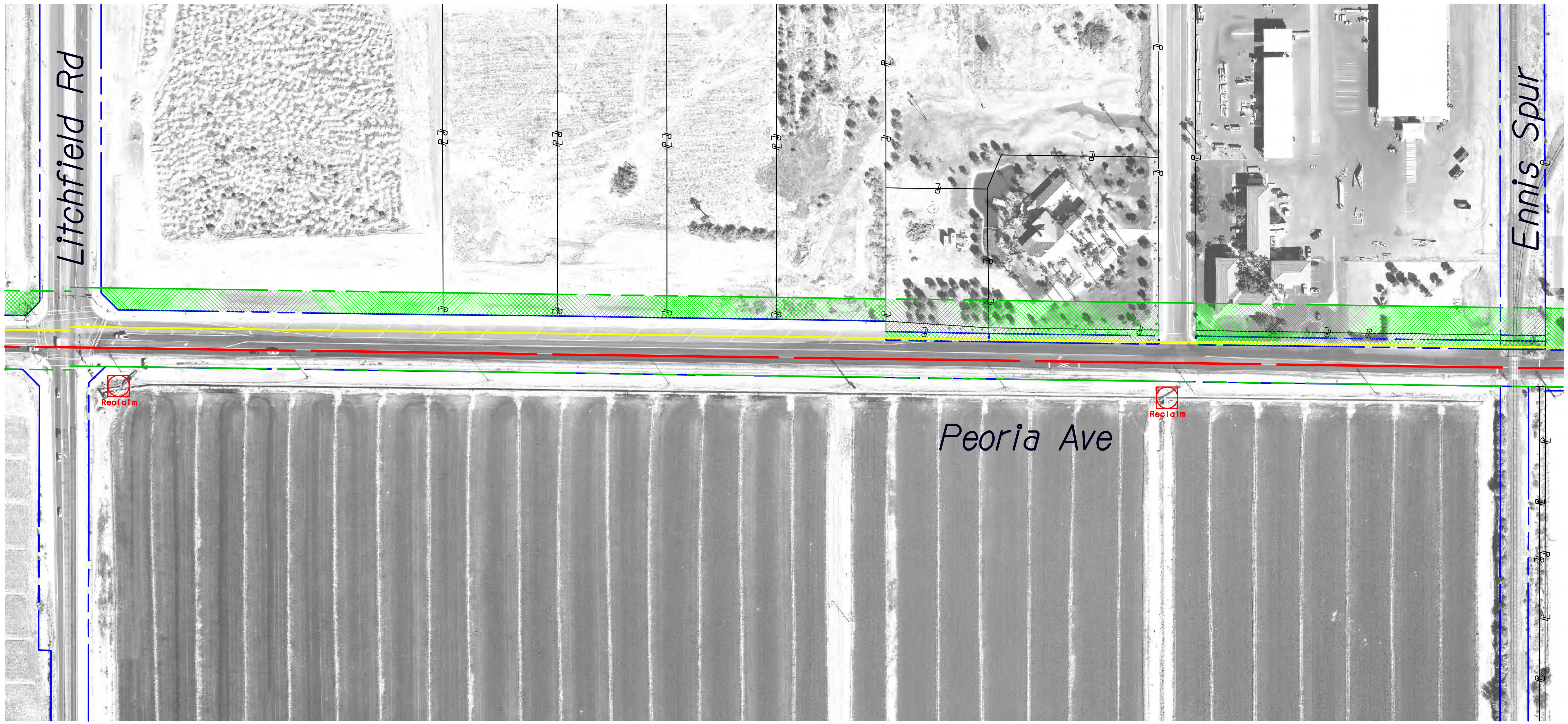

Legend

WELL Well

WELL Abandoned Well

Reclaim Reclaimed Water Delivery Header

R/W Aquisition

Section Line

Roadway ℄

New R/W

Existing R/W

AECOM

Litchfield Rd to Dysart Rd
Alternative # 3

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Legend

WELL	Well		R/W Aquisition
WELL	Abandoned Well		Section Line
Reclaim	Reclaimed Water Delivery Header		Roadway ℄
			New R/W
			Existing R/W

AECOM

Litchfield Rd to Dysart Rd
Alternative # 3

SHEET 2 OF 2

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12/14/2010

Appendix B

GAMMAGE & BURNHAM
A PROFESSIONAL LIMITED LIABILITY COMPANY
ATTORNEYS AT LAW
TWO NORTH CENTRAL AVENUE
FIFTEENTH FLOOR
PHOENIX, ARIZONA 85004-4470

TELEPHONE (602) 256-0566
FACSIMILE (602) 256-4475

WRITER'S DIRECT LINE

(602) 256-4422
sanderson@gblaw.com

March 21, 2011

RECEIVED/SENT
MAR 22 2011
Control #__________
Description:__________

Mitch Wagner
Maricopa County Dept. of Transportation
2901 W. Durango St.
Phoenix, AZ 85009

Re: Peoria Avenue Corridor Improvement Study

Dear Mr. Wagner:

We represent The Maricopa County Municipal Water Conservation District No. 1 ("MWD"). We are writing to provide MCDOT with MWD's comments regarding the current Peoria Avenue Corridor Improvement Study. MWD is an interested party to MCDOT's Study in two different respects.

First, MWD is an irrigation district providing water to its customers through the Beardsley Canal, wells, and a series of laterals throughout our service area. Any proposals that impact rights-of-way tend to almost always impact our water delivery systems as well. In that regard, please find attached a copy of a "water delivery" response previously submitted to you on March 9. This response generally describes the potential impacts of the realignments contemplated in the Study on MWD's water delivery system and its customers. MWD will continue to provide comments of this nature to you through this process.

Second, MWD is a large landowner in this area. Indeed, we believe MWD is the largest landowner in MCDOT's Study Area. As a responsible landowner, MWD has been engaged in an ongoing and highly detailed land use planning effort, detailed below. The balance of this letter is designed to provide MCDOT with MWD's comments on the current Study as the major landowner in the Study area, and specifically to inform you of MWD's opposition to any alignments that would relocate Peoria Avenue onto and through our property.

For a decade now, MWD has been engaged in the planning and development of a project called Zanjero Trails. In the course of these efforts, MWD has secured approvals for a DMP and zoning from Maricopa County, and annexation, General Plan Amendment, PAD zoning, and preliminary plats from the City of Surprise. MWD also has development agreements with Maricopa

County, MCDOT, and the City of Surprise, as well as Agreements with the Dysart Unified School District and Litchfield Elementary School District. MWD has invested millions of dollars in flood control improvements under an IGA with the MCFCD, wastewater lines now owned by Liberty Water, and a water wheeling agreement with Arizona American Water to serve their new potable water treatment facility. Perhaps most importantly and of direct relevance to your project, MWD has cooperated continuously with the Dysart Unified School District on the planning and construction of Shadow Ridge High School. Even now, Maricopa County staff continues to review our pending Preliminary Plat for the southernmost portions of Zanjero Trails.

On February 16, you issued an e-mail regarding Technical Memorandum No. 4 of the Peoria Avenue Corridor Study. This e-mail included some proposals that would realign Peoria Avenue from its normal section line alignment onto our land and into our planned project.

We object to any proposal that would relocate Peoria Avenue off the section line alignment and into our property and our project. For a decade, MWD has relied on the current alignment in developing all of the plans and agreements described above. We have gone through an entire planning process from General Plan to Preliminary Plat in reliance on the current alignment. The County has directly approved several of those efforts, and has been consulted on all of them. It is too late for the County to change course now. To proceed in such a manner would punish a responsible landowner who has invested years and hundreds of thousands of dollars in a bona fide planning effort. The County should consider our myriad entitlements before considering any such realignment. Your planning efforts should not take place in a vacuum any more than ours have.

It is worthwhile noting that MWD has accommodated realignments of section line roads at appropriate, earlier stages of our planning process. This has occurred in Maricopa County, with regard to Perryville Road adjacent to Clearwater Farms, and in Surprise, with regard to the linking of Perryville Road into Cactus. This is why we have a planning process: so that roadway alignments can be considered at a time that is fair to all parties. By contrast, any proposed realignment of Peoria simply comes too late.

MWD will oppose any attempt to realign Peoria Avenue, or any road, into our project once we have secured Preliminary Plat approval, as we have here, after years of diligent consideration and effort on our part.

Sincerely,

GAMMAGE & BURNHAM

By
Stephen W. Anderson

Enclosure
SWA/nrl

cc: Rodney Bragg (w/encl.)
AECOM
2777 E. Camelback Road, Ste. 200
Phoenix, AZ 85016

James R. Sweeney, General Manager, MWD (via e-mail and w/encl.)
Veronica Valenzuela, MWD (via e-mail and w/encl.)

Appendix E
Technical Memorandum No. 5: Preferred Alignment

Peoria Avenue Corridor Improvement Study: Jackrabbit Trail Parkway to Dysart Road

Technical Memorandum #5: Preferred Alignment

June 2011

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Appendices

Technical Memorandum #5
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

1.0 INTRODUCTION

The Maricopa Association of Governments (MAG) prepared the Interstate 10/Hassayampa Valley Roadway Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the buildout of the area west of State Route 303 (SR 303L). This long-range regional transportation study identified the need for a roadway network consisting of freeways, parkways, and major arterial roads.

The Hassayampa Framework Study recommended an extension of Peoria Avenue west from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial from the future Jackrabbit Trail Parkway to Sarival Avenue. The study area for this project includes Peoria Avenue from the future Jackrabbit Trail Parkway alignment to Dysart Road (Peoria Avenue Corridor). The study area generally encompasses a two-mile wide corridor centered on the existing Peoria Avenue. The study area is shown in Figure 1.

This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also develop access management guidelines, determine design standards based upon which jurisdiction anticipates annexing the roadway, and develop an implementation plan. In general, the purpose of this Corridor Improvement Study is to provide the Maricopa County Department of Transportation (MCDOT) and other jurisdictions with a future "footprint" of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

The key objectives of this Corridor Improvement Study are to:

- Define and assess strategic issues within the project study area;
- Develop and evaluate conceptual alternative alignments within the corridor study area;
- Recommend a preferred alignment;
- Develop consensus for the preferred alignment;
- Define the characteristics of the preferred alignment; and
- Develop an implementation plan.

This technical memorandum describes the Preferred Alignment, including the typical section, design criteria, drainage features, structures, right-of-way, utilities, access management, cost estimate, and implementation plan.

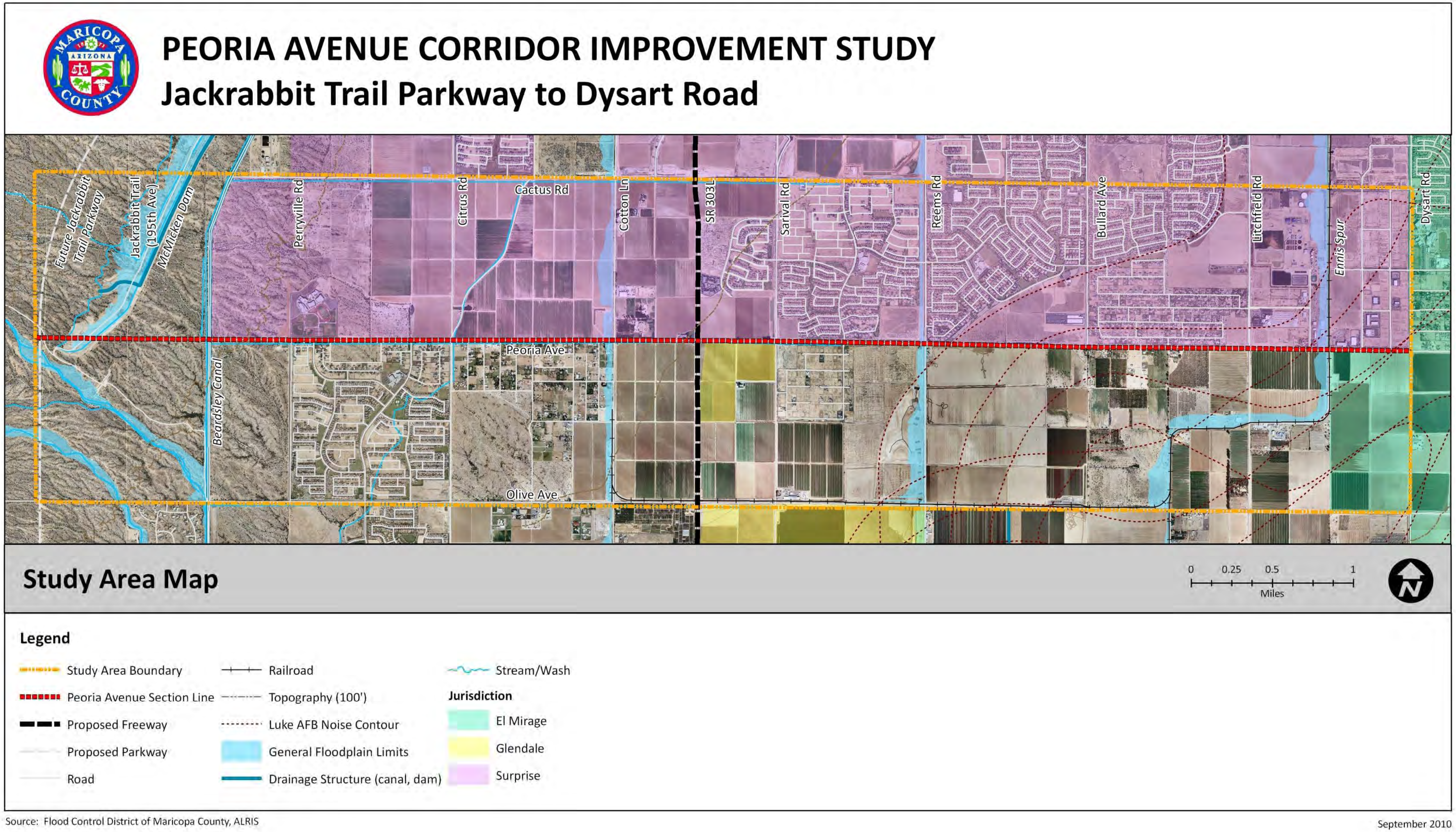


Figure 1 – Vicinity Map

2.0 DESIGN CRITERIA

Table 1 shows the major design features recommended for Peoria Avenue. These design criteria are for urban roadway sections and apply to the envisioned ultimate cross-section of Peoria Avenue. Interim construction may not include all of these elements.

Table 1 – Design Criteria

Description	Criteria
Typical Section	Urban Principal Arterial
Design Year	Design year for future projects should be 20 years after construction completion
Design Vehicle	WB-50
Design Speed	55 mph (urban)
Pavement Design Life	20 years
Number of Lanes	3 through lanes in each direction
Roadway Width	See typical sections (Figures 2 –7)
Drainage (Pavement)	10-year event
Minimum Right-of-Way Requirements	See typical sections (Figures 2 – 7)
Lane Widths	12 feet
Clear Zone Width	Approx. 25' min. (varies based on side slopes, design speed, and traffic volume)
Median	See typical sections (Figures 2 – 7)
Maximum Superelevation Rate	e_{max} = 4% (urban)
Maximum Gradient	5%
Minimum Radius @ normal crown	R = 10,000 feet (approx.)

Typical Section

Between the Beardsley Canal and Dysart Road, the Peoria Avenue section line is the southern boundary of the incorporated limits for the City of Surprise. South of the section line lies within unincorporated Maricopa County, with the exception of a parcel abutting SR 303L and a 10-foot strip of land along the south side of Peoria Avenue (located either 23 or 30 feet south of the Peoria Avenue section line) from Perryville Road to east of Litchfield Road. This annexation is part of the City of Glendale Strip Annex Area. Maricopa County Planning and Development Department administers the zoning and subdivision ordinances within unincorporated areas and the strip annex area. The Peoria Avenue section line serves as a boundary between two jurisdictional agencies with different design standards – the City of Surprise to the north, and Maricopa County to the south. Without an executed agreement in place, roadway designs and development plans will be reviewed and approved by one of the two different agencies, depending on whether the site is north or south of Peoria Avenue.

Due to the differing design standards for a principal arterial, hybrid typical sections were developed for Peoria Avenue. As shown in Figure 2, the half-street to the north reflects the City

of Surprise standard for a Major Arterial, while the half-street to the south reflects Figure 5.7 from the MCDOT Roadway Design Manual. This Standard Hybrid Typical Section would be utilized in the following areas: Jackrabbit Trail Parkway to Perryville Road; Reems Road to Bullard Avenue; and Litchfield Road to Dysart Road.

In numerous segments along the corridor, existing constraints limit the ultimate right-of-way to 120 feet. In these segments, the Narrow Hybrid Typical Section shown in Figure 3 would be utilized. This reduced-width typical section is similar to the typical section shown in Figure 2 with reduced median widths and buffer distances (offset from curb to right-of-way line). This typical section would be utilized in the following areas: Perryville Road to Citrus Road; Sarival Road to Reems Road; and Bullard Avenue to Litchfield Road.

The segment from Cotton Lane to Sarival Road would utilize the Widened Hybrid Typical Section shown in Figure 4, which is similar to Figure 2 with an expanded right-of-way width to facilitate the addition of turn lanes and/or auxiliary lanes near SR 303L.

If the City of Surprise, City of Glendale, City of El Mirage, and MCDOT enter into agreements stipulating that the City of Surprise will assume ownership and maintenance of Peoria Avenue, then the corridor's typical sections should conform to the City of Surprise standard, as shown in Figure 5, in areas included in that agreement. Figure 6, which is based upon the City of Surprise standard, with reduced right-of-way, should be utilized in the constrained areas that are included in that agreement.

The segment from Citrus Road to Cotton Lane contains numerous residential properties along the south side of Peoria Avenue that have direct access on to Peoria Avenue. The Narrow Hybrid with Frontage Road Typical Section, as shown in Figure 7, was developed for this segment as an access management strategy.

Since an agreement is not in place at the publication of this technical memorandum, the following typical sections are recommended:

Figure 2 (Standard Hybrid Typical Section):
- Jackrabbit Trail Parkway to Perryville Road
- Reems Road to Bullard Avenue
- Litchfield Road to Dysart Road

Figure 3 (Narrow Hybrid Typical Section):
- Perryville Road to Citrus Road
- Sarival Road to Reems Road
- Bullard Avenue to Litchfield Road

Figure 4 (Widened Hybrid Typical Section):
- Cotton Lane to Sarival Road

Figure 7 (Narrow Hybrid with Frontage Road Typical Section):
- Citrus Road to Cotton Lane

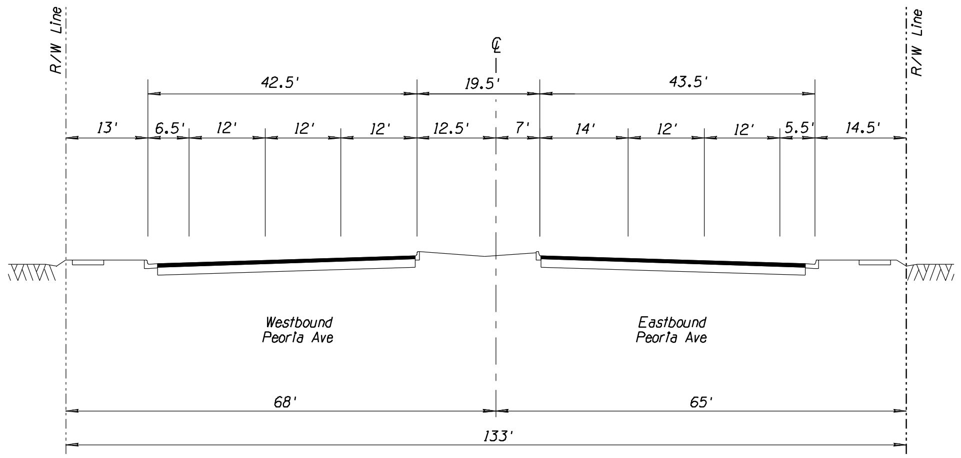


Figure 2 – Standard Hybrid Typical Section

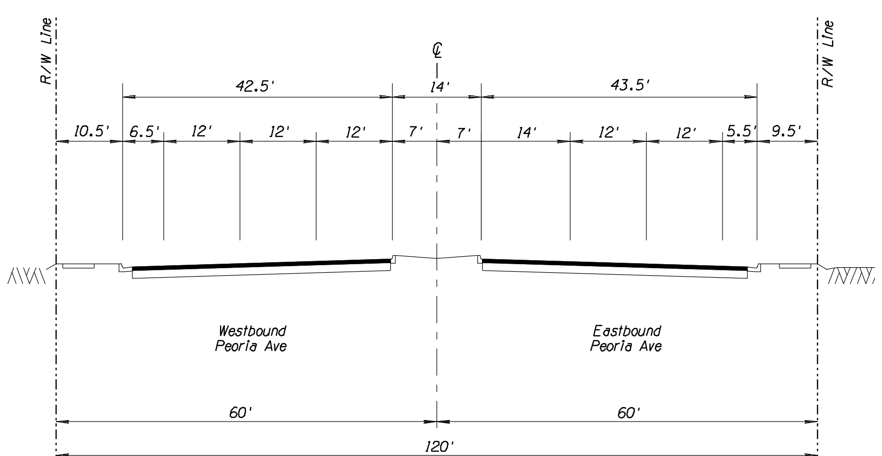


Figure 3 – Narrow Hybrid Typical Section

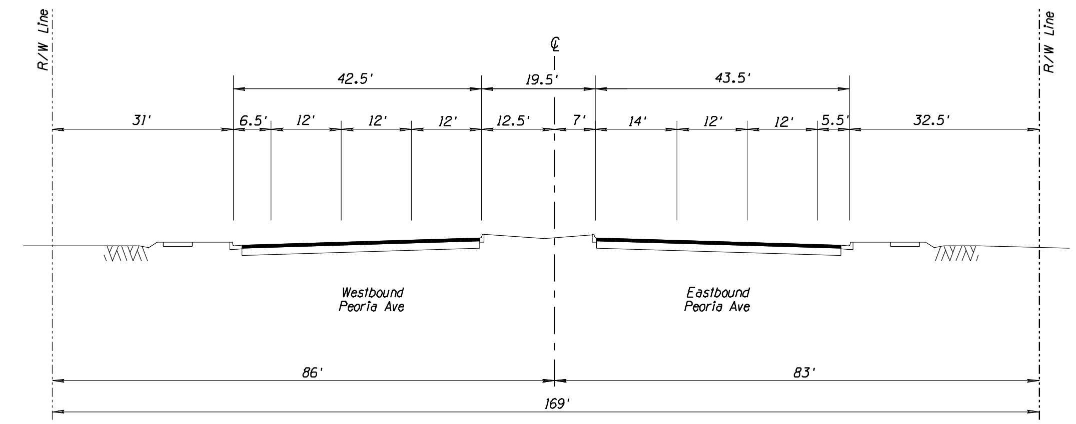


Figure 4 – Widened Hybrid Typical Section

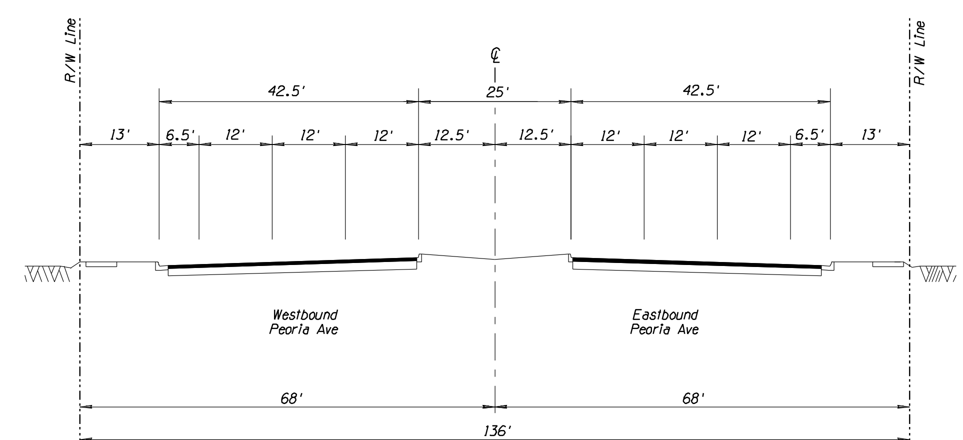


Figure 5 – Standard City of Surprise Typical Section

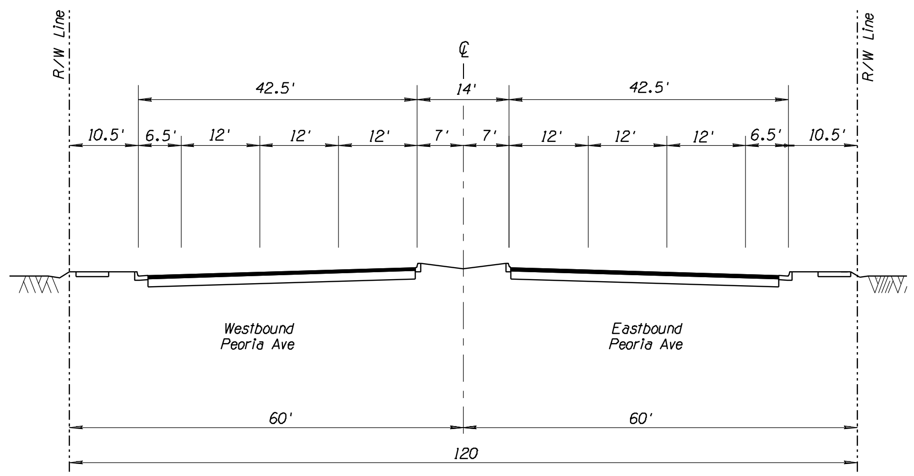


Figure 6 – Narrow City of Surprise Typical Section

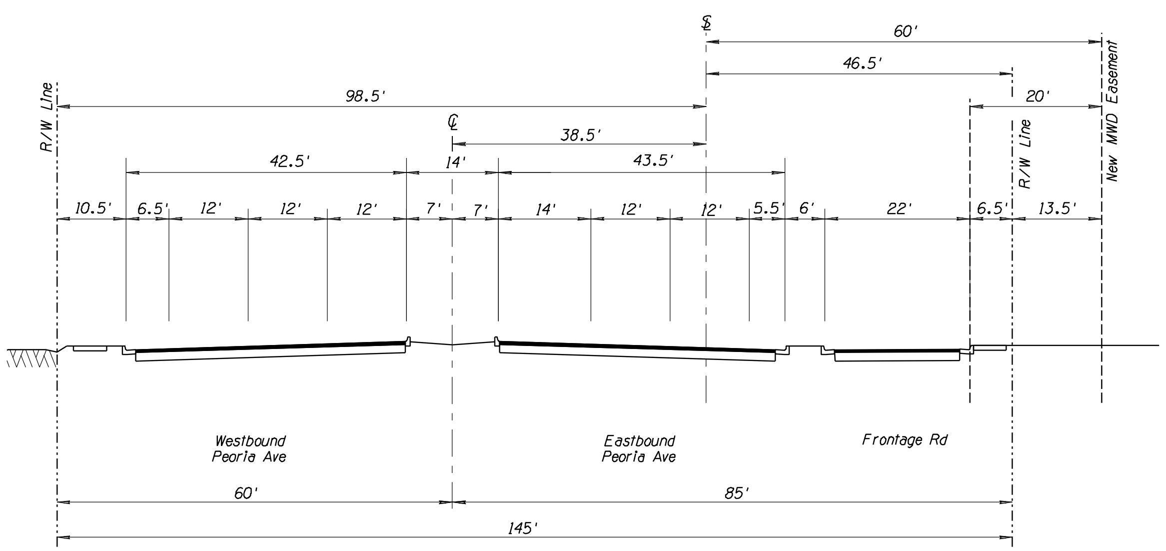


Figure 7 – Narrow Hybrid with Frontage Road Typical Section

3.0 FEATURES OF THE PREFERRED ALIGNMENT

Appendix A contains plan sheets illustrating the proposed conceptual alignment for Peoria Avenue. The plan sheets show the proposed centerline, pavement widths, and right-of-way widths superimposed on aerial photographs.

Geometrics

The preliminary corridor alignment recommendations were based on a 140 foot wide corridor. The recommended typical sections shown in Section 2 vary in width from 120 feet to 169 feet. Therefore, in some segments of the corridor, slight adjustments were made to the recommended centerline location to balance the improvements within the existing right-of-way. The resulting corridor horizontal alignment is shown in Figure 8 and described below.

Jackrabbit Parkway to Perryville Road

- Centerline coincident with section line
- 5' shift to north occurs just west of Perryville Road (55:1 taper)

Perryville Road to Citrus Road

- Centerline 5' north of and parallel to the section line
- Near Cortessa Parkway, horizontal curvature would shift the centerline to a 38.5' offset north of the section line, west of Citrus Road

Citrus Road to Cotton Lane

- Centerline 38.5' north of and parallel to the section line

Cotton Lane to Sarival Road

- East of Cotton Lane, horizontal curvature would shift the centerline to the south to be coincident with the section line
- Centerline remains coincident with section line to Sarival Road

Sarival Road to Reems Road

- 5' shift to the south occurs east of Sarival Road (55:1 taper)
- Centerline remains 5' south of and parallel to the section line
- 5' shift to the north (to become coincident with the section line) occurs west of Reems Road (55:1 taper)

Reems Road to Bullard Avenue

- Centerline coincident with section line
- Approximately 3,000 feet east of Reems Road, horizontal curvature would shift the centerline 30' to the north, and then transition to a 5' offset south of the section line, prior to reaching Bullard Avenue

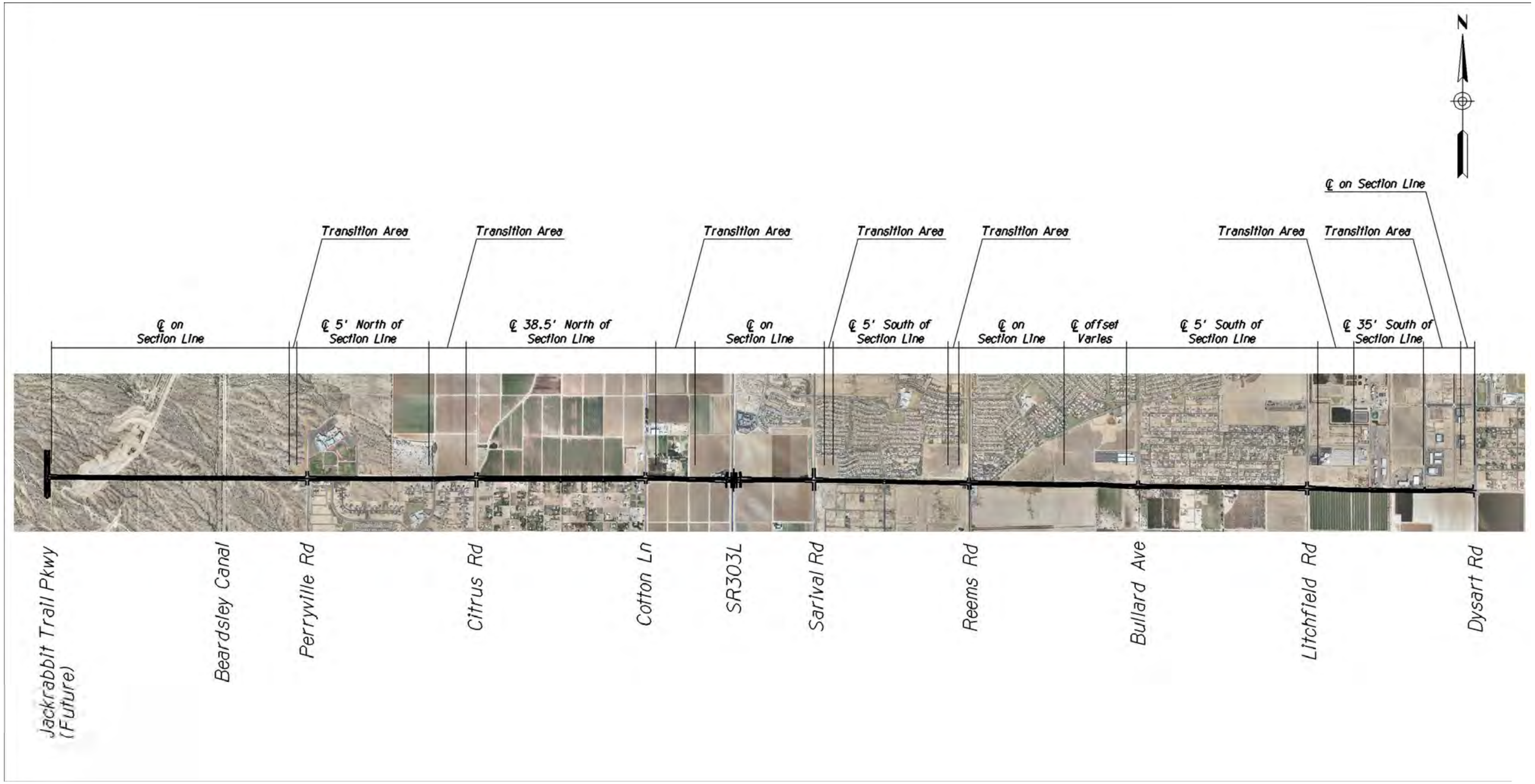


Figure 8 – Preferred Alignment

Bullard Avenue to Litchfield Road

- Centerline 5' south of and parallel to the section line

Litchfield Road to Dysart Road

- East of Litchfield Road, horizontal curvature would shift the centerline to the south to an offset 35' south of the section line
- Centerline would continue to the east, 35' south of and parallel to the section line for approximately 2,200 feet
- Horizontal curvature would be introduced to shift the alignment back to the section line, west of the Dysart Road

Based on the maximum superelevation rate of 4%, ten of the eleven curves are flat enough to not require superelevation and can remain at normal crown. The sharpest horizontal curve would occur west of Bullard Road where the alignment shifts to the north. One curve in this location has a radius of 4,000 feet which would result in a 2.6% crown. Table 2 contains a list of the horizontal curves planned along the Peoria Avenue centerline.

Table 2 – Horizontal Curves

Curve No.	PI Station (approx.)	Direction	Radius	Superelevation	Description
1	120+00	Left	10,000'	Normal Crown	Curve set to shift to the north
2	128+00	Right	10,000'	Normal Crown	
3	193+00	Right	10,000'	Normal Crown	Curve set to shift to the south
4	199+00	Left	10,000'	Normal Crown	
5	321+00	Left	10,000'	Normal Crown	Curve set to shift to the north and back to the south
6	327+00	Right	4,000'	2.6%	
7	334+00	Left	10,000'	Normal Crown	
8	400+00	Right	10,000'	Normal Crown	Curve set to shift to the south
9	405+00	Left	10,000'	Normal Crown	
10	433+00	Left	10,000'	Normal Crown	Curve set to shift to the north
11	439+00	Right	10,000'	Normal Crown	

Generally, the vertical alignment would closely follow the existing ground or existing roadway. SR 303L will be constructed to go over Peoria Avenue with Peoria Avenue remaining at-grade. According to the MCDOT Roadway Design Manual, the minimum longitudinal grade should be 0.25%, while the City of Surprise standards require a minimum longitudinal grade of 0.30%. Therefore, the minimum longitudinal grade should be 0.30%. In areas where the existing roadway does not meet this requirement, consideration should be given to increasing the longitudinal slope to meet this minimum requirement.

Drainage

For an arterial roadway, Maricopa County Drainage Policies and Standards require a drainage system with the capacity to:

- Maintain one 12-foot dry driving lane in each direction of travel and flow depths not to exceed the curb height for the 10-year storm event.
- Convey the 50-year frequency flow in adjacent channels, with a maximum allowed depth of 6 inches over the pavement surface for the 100-year frequency flow.
- Keep the headwater elevation at culvert crossings below the lowest adjacent road subgrade for the 50-year frequency flow, with a maximum allowed depth of 6 inches over the pavement surface for the 100-year frequency flow.
- Maintain a minimum of 2-feet freeboard below the low chord of bridges for the 100-year frequency flow.

The following off-site and on-site drainage improvements are recommended in order to meet these requirements.

Off-Site Improvements

Several improvements are required along the corridor, some of which are already planned by agencies and developers, to complete the off-site drainage system.

Starting at the west end, mitigation of impacts to the Flood Control District of Maricopa County (FCDMC) 500-year retention basin located south of the McMicken Dam will need to be implemented as a result of Peoria Avenue crossing the basin. Reconfiguration of the basin and/or addition of flood-pool leveling culverts would be needed to retain safety, function, operation, and capacity requirements of the basin. Management of outflows from the basin to Waterfall Wash and the presence of earth fissures and monitoring devices should also be addressed. A bridge crossing of Waterfall Wash would be required should the roadway alignment be shifted south of the basin.

Culvert crossings of Peoria Avenue are proposed to implement a pass-through system for the small washes downstream of the dam in the segment between the basin and the Beardsley Canal. Future development plans may reduce the need for off-site improvements as a result of development retention requirements that would intercept flows upstream of Peoria Avenue.

On-site retention for Zanjero Trails, from the Beardsley Canal to Perryville Road, will reduce off-site flows reaching Peoria Avenue. The existing channel along the north side of Peoria Avenue at Shadow Ridge High School is planned to be extended east in the development plans of Zanjero Trails and Prasada. The channel would convey flows east to Cotton Lane where box culverts, across Cotton Lane to the east and Peoria Avenue to the south, would split flows to maintain historic patterns, according to Prasada's concept. A new channel would need to be constructed along the north side of Peoria Avenue from Cotton Lane to the SR 303L channel to provide an ultimate outfall. This channel is not in any development plans at this time and will need to be coordinated with FCDMC and Arizona Department of Transportation (ADOT) for compliance with SR 303L design parameters. A culvert crossing of Peoria Avenue is proposed to discharge into the SR 303L channel downstream of the freeway channel's box culvert.

Development retention will also reduce off-site flows reaching Peoria Avenue in the segment between SR 303L and Sarival Road. A culvert crossing of Sarival Road and a channel extension to the east is proposed along the north side of Peoria Avenue to allow the conveyance of flows from the Sarival Road Channel to the Greer Ranch channel, mitigating current flooding problems at the Sarival Road intersection. The existing Greer Ranch channel conveys flows to the Reems Road Channel.

No additional facilities are proposed for the segment between Reems Road and Litchfield Road, as on-site retention and the existing Copper Canyon channel already address off-site requirements. A culvert crossing of the intersection of Litchfield Road and Peoria Avenue, and a new channel along the south side of Peoria Avenue are proposed to convey flows from the Copper Canyon channel to the future BNSF Railway (Ennis Spur) Channel. The south side of Peoria Avenue is proposed for the channel because of conflicts with existing development and private retention basins on the north side.

Additional off-site facilities are not required east of the BNSF Ennis Spur as a result of on-site retention north of Peoria Avenue. A pipe culvert that crosses the intersection of Dysart Road and Peoria Avenue will need to be extended as a result of the Peoria Avenue widening. Consequently, a roadside channel along the west side of Dysart Road would need to be relocated for the widened intersection.

Figure 9 shows off-site drainage crossings along the corridor centerline. 100-year and 50-year peak flows are shown at ten drainage crossings.

Table 3 is a summary of existing, planned (by others), and proposed (in this study) culvert crossings of Peoria Avenue and its crossroads. Table 4 is a summary of existing, planned and proposed channels. The proposed culvert and channel improvements at the intersections of Peoria Avenue with Sarival Road and Litchfield Road could be completed ahead of the ultimate roadway widening to resolve current drainage problems. The opportunity to include these spot intersection improvements in ongoing development efforts by ADOT and FCDMC of the SR 303L and BNSF Ennis Spur regional drainage facilities should be explored. Additional study is required to establish design parameters and determine capacity of culverts and channels needed to convey runoff from these intersections to the flood control channels.

Implementation of off-site drainage improvements will likely occur in multiple phases with varying interim conditions. Outfalls may not be available during the interim conditions and future designs will need to address this issue. The recommended drainage improvements are consistent with the overall plan for the area and are compatible with the current FCDMC plans.

On-Site Improvements

On-site pavement runoff can be collected in catch basins and scuppers along Peoria Avenue, and where needed, conveyed through storm drain laterals to the nearest off-site channel or culvert. The use of off-site facilities as outfall for on-site runoff is viable due to differences in frequency and time of concentration between off-site and on-site design events, and the excess capacity of the off-site channels due to the future reduction of off-site peak flows resulting from build-out of the watershed. First-flush requirements would need to be addressed during design to satisfy water quality policies.

Table 3 – Culvert Summary

Size and Type	Location	Status	Owner (Blank if Undefined)
48"x150' RCP	Across Peoria Ave, west of 195th Ave	Proposed	
48"x210' RCP	Across Peoria Ave, west of Beardsley Canal	Proposed	
48"x140' RCP	Across Peoria Ave, west of Beardsley Canal	Proposed	
10'x6'x160' CBC	Across Peoria Ave, west of Beardsley Canal	Proposed	
48"x135' CMP	Across Perryville Road, north of Peoria Ave	Existing	Municipal
5-36"x60' CMP	Across Shadow Ridge High School access road, north of Peoria Ave	Existing	Municipal
5-36"x60' CMP	Across 183rd Ave, north of Peoria Ave	Planned	Zanjero Trails
3-12'x4'x150' CBC	Across Citrus Rd, north of Peoria Ave	Planned	Prasada
3-12'x4'x65' CBC	Across 175th Ave, north of Peoria Ave	Planned	Prasada
4-8'x4'x190' CBC	Across Peoria Ave, west of Cotton Ln	Planned	Prasada
3-10'x4'x65' CBC	Across Cotton Ln, north of Peoria Ave	Planned	Prasada
2-72"x330' CMP	Across Peoria Ave, west of SR 303L	Proposed	
3-10'x6'x221' CBC	Across Peoria Ave, west of SR 303L	Planned	ADOT
3-8'x6'x130' CBC	Across Sarival Rd, north of Peoria Ave	Proposed	
3-10'x4'x90' CBC	Across Greer Ranch Pkwy, north of Peoria Ave	Existing	Greer Ranch
3-10'x6'x90' CBC	Across 159th Ave, south of Peoria Ave	Existing	Twelve Oaks Estates
6-10'x4x142' CBC	Across Peoria Ave, west of Reems Rd	Existing	FCDMC
2-6'x3'x122' CBC	Across Bullard Ave, north of Peoria Ave	Existing	Municipal
3-10'x3'x66' CBC	Across 143rd Ave, north of Peoria Ave	Existing	Copper Canyon Ranch
3-10'x6'x226' CBC	Across Peoria Ave, at Litchfield Rd	Proposed	
Ennis Spur RCP	Across Peoria Ave, west of BNSF Ennis Spur	Planned	FCDMC
36"x40' RCP	Across Peoria Ave, at Dysart Rd	Proposed	

RCP – Reinforced Concrete Pipe
CBC – Concrete Box Culvert
CMP – Corrugated Metal Pipe

Table 4 – Channel Summary

Top Width	Location Relative To Peoria Avenue	Termini	Length	Status	Owner (Blank if Undefined)
27'	North	Perryville Rd to HS Entrance	1,420'	Existing	Shadow Ridge High School
32'	North	HS Entrance to 183rd Ave	1,060'	Planned	Zanjero Trails
80'	North	183rd Ave to Citrus Rd	2,540'	Planned	Prasada
83'	North	Citrus Rd to Cotton Ln	5,100'	Planned	Prasada
28'(Est.)	North	Cotton Ln to SR 303L	2,145'	Proposed	
28'(Est.)	North	Sarival Ave to 161st Ln	665'	Proposed	
34'	North	161st Ln to Reems Rd	3,865'	Existing	Greer Ranch
30'	South	Sarival Ave to 167th Dr	3,300'	Existing	Twelve Oaks Estates
30'	North	Bullard Ave to Litchfield Rd	5,075'	Existing	Copper Canyon Ranch
30'(Est.)	South	Litchfield Rd to BNSF Ennis Spur	2,420'	Proposed	

Segments of Peoria Avenue where there are no off-site channels along the roadway will require storm drain trunk lines to collect flows from laterals and convey them to the nearest outfall, such as the segments from the Beardsley Canal to Perryville Road, SR 303L to Sarival Road, Reems Road to Bullard Avenue, and the BNSF Ennis Spur to Dysart Road. Future development on either side of Peoria Avenue may be able to accommodate pavement runoff within their on-site retention and therefore eliminate the need for trunk lines. The on-site retention alternative is more viable where the parcels of land on both sides of the roadway are undeveloped, as opposed to segments where existing private retention basins on one side may have insufficient capacity to accept larger flows from a widened Peoria Avenue half-street.

Structures

Immediately west of Reems Road, a 6-barrel 10'x4'x142' concrete box culvert (CBC) conveys the Reems Road Channel beneath Peoria Avenue. The southern headwall is located 75 feet south of the section line while the northern headwall is located 65 feet north of the section line. Based on the ultimate plan for Peoria Avenue (as shown in Appendix A), this CBC will need to be extended to accommodate the planned turn lanes and future bus bay.

Existing Concrete Box Culvert West of Reems Road

A crossing of the Maricopa Water District's (MWD) Beardsley Canal is planned west of Perryville Road. This crossing could be a CBC or a bridge structure. Coordination will be required with MWD to comply with their crossing requirements and to secure the necessary easements and/or permits to cross their facility.

A future box culvert crossing under Citrus Road is planned north of Peoria Avenue. This crossing will be in conflict with the existing MWD Cross-Cut Canal. Future design and coordination efforts are needed to address this crossing.

ADOT's SR 303L project will construct a new 3-barrel 10'x6'x221' CBC to convey the SR 303L drainage channel beneath Peoria Avenue, and a new 2-span AASHTO girder bridge to carry SR 303L traffic over Peoria Avenue. It is envisioned that both of these structures will be compatible with the ultimate Peoria Avenue cross-section and that additional improvements will not be necessary.

Multimodal Accommodations

The ultimate typical section includes sidewalks to accommodate pedestrians, and an outside shoulder that can accommodate bicycles. Local bus routes are envisioned along Peoria Avenue, therefore far-side bus bays should be included in future designs, in coordination with Valley Metro/Regional Public Transportation Authority (RPTA).

Trails

A planned Maricopa County trail runs along the west side of the Beardsley Canal. At Peoria Avenue, this trail is planned to turn west and may be adjacent to Peoria Avenue. In addition, Maricopa County Parks and Recreation Department is planning a trailhead staging area at the south end of the McMicken Dam. Future studies and designs should plan for an appropriate interface between pedestrian, equestrian, and vehicular movements.

Utilities

There are numerous existing and planned utilities along Peoria Avenue. A portion of the study area, including the properties between the Beardsley Canal and Reems Road, is within the MWD Conservation District Number One service area boundaries. MWD is primarily an irrigation water conservation district providing water services to its customers. The District's irrigation conveyance and delivery channels and pipelines span the entire length of its service areas along Peoria Avenue.

Existing MWD Lateral 8

Many MWD wells and private irrigation wells (active and inactive) are also sited along Peoria Avenue. Under a contract with Arizona Public Service (APS), MWD also delivers power and energy through APS's distribution facilities to wells owned by the District and its customers.

As improvements to Peoria Avenue are constructed, the MWD facilities will be impacted. MWD Lateral 8, which is located along the south side of Peoria Avenue, will need to be relocated outside of the roadway right-of-way in an MWD easement. In addition, numerous MWD and private well sites will be impacted and will require new wells to replace those that are removed or abandoned with the roadway improvements. Coordination will be required with MWD to relocate these facilities. Appendix B contains a detailed list of the facilities that would likely be impacted, and also contains MWD Easement Guidelines.

A future box culvert crossing under Citrus Road is planned north of Peoria Avenue. This crossing will be in conflict with the existing MWD Cross-Cut Canal. Future design and coordination efforts will be needed to address this crossing.

Existing Reclaimed Water Delivery Header

Numerous overhead power distribution lines run in an east-west direction parallel to Peoria Avenue along both sides of the roadway, and in a north-south direction along several cross-streets: Cotton Lane, Sarival Avenue, Dysart Road, and the BNSF Ennis Spur. Above ground power lines along Peoria Avenue are fragmented, a result of gradual burying of overhead distribution lines in front of new housing developments over the years. The future APS West Valley-North 230kV power transmission line is scheduled to be in service in 2015, in a corridor west of and parallel to SR 303L from Olive Avenue to Cactus Road where it will then turn west to parallel Cactus Road to the north. Power substation sites are planned on the major arterials adjacent to Peoria Avenue (Olive Avenue and Cactus Road).

City utilities along Peoria Avenue include underground water and sewer lines and appurtenances, and a 30-inch reclaimed water line and reclaimed water delivery headers on the south side of Peoria Avenue across from the Surprise South Water Reclamation Plant. The reclaimed water delivery headers will be impacted and will require relocation.

Other public utilities along Peoria Avenue include Southwest Gas natural gas lines and Qwest overhead and underground communication lines. A majority of the underground utilities will not be directly impacted by the roadway itself. However, future designs will need to verify that sufficient cover is provided with the new roadway. Relocations may be necessary due to the drainage facilities associated with the roadway improvements. Utility companies will be responsible for relocation costs if they cannot prove prior rights.

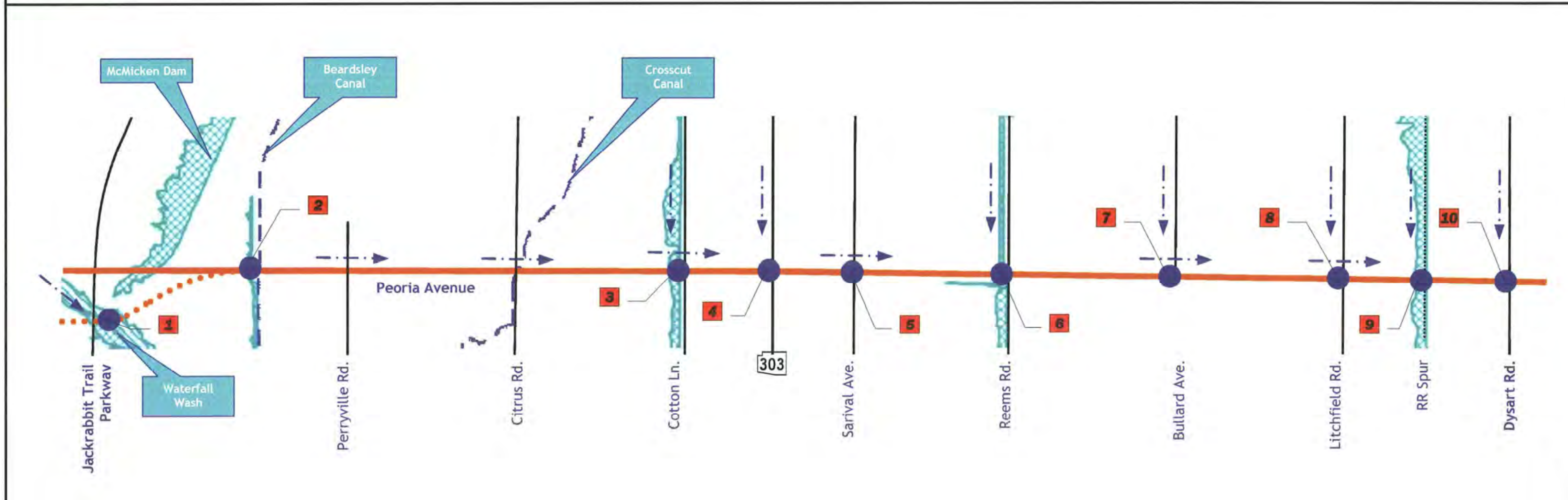
Ennis Spur

The BNSF Railway (BNSF) owns and operates a north-south railroad spur (Ennis Spur) that crosses Peoria Avenue at the half-mile between Litchfield and Dysart Roads. The Ennis Spur connects to a major branch line (Peavine) that links the Phoenix metropolitan area with the Transcon mainline in northern Arizona. The nine-mile long Ennis Spur runs from Ennis, a junction on the Peavine in the Surprise area, west and south through farmland to Fennemore siding, where a fertilizer plant is located. Three other freight customers are currently served by way of the Ennis Spur. The primary commodities carried on the Ennis Spur are natural gas, fertilizer and lumber.

The City of Surprise is working with BNSF and private developers to create a new industrial park along the Ennis Spur. New warehouse districts, distribution centers, and commercial enterprises are expected to double the business demand on the BNSF branch in the future. Additionally, BNSF plans to improve the Ennis Spur with construction of a new wye at Grand Avenue (US 60) and a new rail-oriented business park adjacent to Luke Air Force Base, likely causing rail traffic crossing Peoria Avenue to increase in the future.

The existing Ennis Spur crossing of Peoria Avenue is at-grade and the improvements shown in Appendix A maintain the at-grade crossing. However, in the future, if the rail traffic using the Ennis Spur were to increase along with increased vehicular traffic on Peoria Avenue, it may be desirable to implement a grade separated crossing at this location. Future development plans near the Ennis Spur should provide building set-backs to allow the future potential implementation of a grade separated crossing. Without providing set-backs, it may not be feasible to grade separate Peoria Avenue from the Ennis Spur, if needed in the future. Figure 10 shows a conceptual layout of a grade separation and provides a conceptual footprint. Future development plans should include building set-backs to avoid this footprint.

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road



Points of Concentration along Corridor Centerline

Not to Scale

N

Legend

- Peoria Avenue
- Crossroads
- Floodplain
- Point of Concentration
- Direction of Flow

Peak Flows at Concentration Points (cfs)

Point	Q_{100}	Q_{50}	Point	Q_{100}	Q_{50}
1	2657	2104	6	573	94
2	150	87	7	65	22
3	5	0	8	66	20
4	518	80	9	724	585
5	92	8	10	11	0

Andes Engineering

Source: FCDMC – White Tanks ADMPU HEC-1 Model (2009) – Future Conditions with CIP

April 2011

Figure 9 – Off-Site Drainage Flow

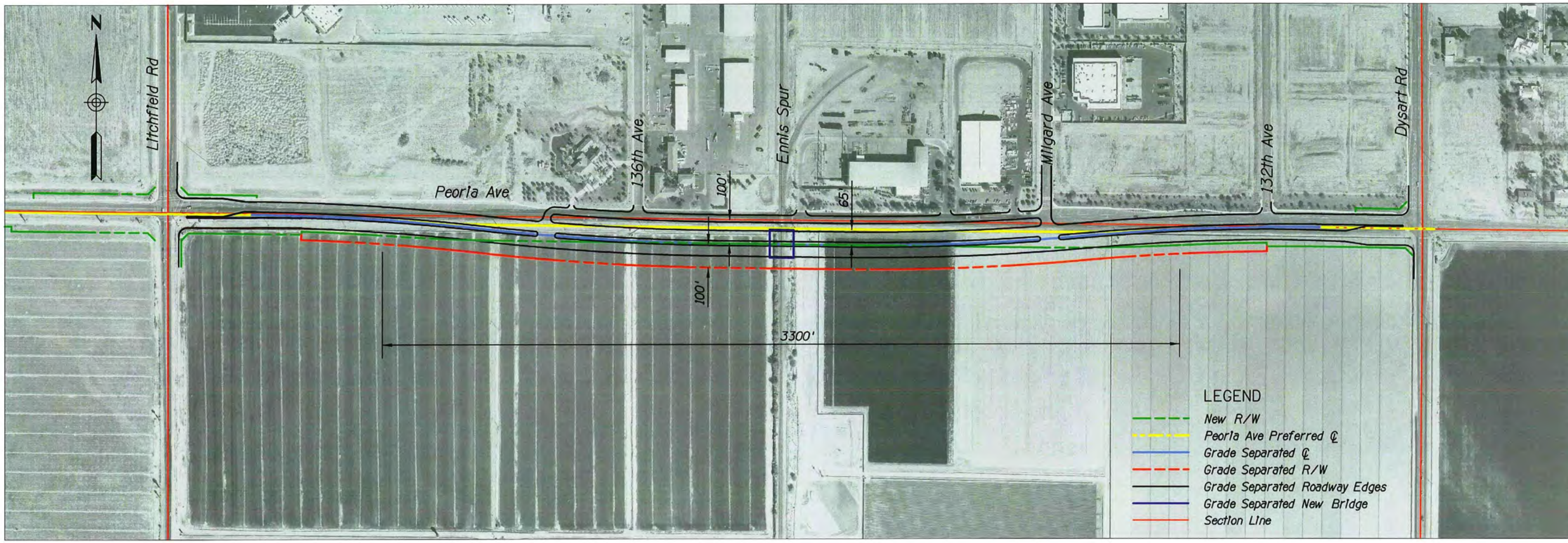


Figure 10 – Ennis Spur Grade Separation

Corridor Traffic Management/Intelligent Transportation System

As traffic volumes and congestion increase throughout the metropolitan area, agencies and jurisdictions seek ways to operate and manage their infrastructure more efficiently. Traffic congestion, road closures and traffic-related incidents can be better managed through application of intelligent transportation systems (ITS). ITS tools such as cameras, traffic detectors, dynamic message signs and traffic signals interconnected by fiber-optic lines all help to provide real-time travel information for both travelers and traffic managers.

As the Peoria Avenue corridor and regional roadway infrastructure is developed, consideration should be given to deploying ITS infrastructure. Partnering agencies will effectively manage the corridor through integration between individual systems, devices and networks. It is recommended that the following elements be considered for design and implementation on the Peoria Avenue corridor:

- Develop a centrally controlled signal system management plan for the corridor.
- Implement traffic detection and counting capabilities to achieve real-time signal operations.
- Equip the corridor for video camera-based real-time traffic monitoring by the operators at the traffic management center.
- Implement a traveler information system.
- Conduct incident response and on-site incident management through Regional Emergency Action Coordinating Team (REACT).
- Procure all devices, equipment and systems per owning agencies or mutually agreed specifications.
- Develop, implement, and maintain an operations plan for the corridor detailing the roles and responsibilities of each agency.
- Install ITS systems and equipment compliant with National Transportation Communications ITS Protocol (NTCIP).

Right-of-Way

The minimum right-of-way requirements are shown in Figures 2 through 7. Additional right-of-way and/or easements may be needed for turn lanes, bus bays, drainage facilities, side slopes, utilities, or landscaping. The right-of-way shown in Appendix A accounts for an 80 foot half-width near the major intersections to facilitate additional turn lanes and a far-side bus bay.

Additional right-of-way beyond the standard widths may be needed at the Beardsley Canal crossing, or the retention basin crossing west of the Beardsley Canal. Additional right-of-way will be needed between Citrus Road and Cotton Lane to accommodate the proposed frontage road, whose typical section is illustrated in Figure 7. Additional right-of-way and/or easements will be needed for the drainage channel along Peoria Avenue, and the MWD irrigation facilities along the south side of Peoria Avenue. Building set-backs should be provided near the Ennis Spur, as discussed earlier.

Table 5 shows the amount of new right-of-way required for the ultimate corridor and includes all right-of-way shown in Appendix A. Table 5 does not account for impacts outside of the roadway right-of-way such as drainage easements or MWD easements. A parcel-by-parcel assessment was not conducted to determine the size of the remnant parcels or whether total acquisition is warranted. It is envisioned that a majority of the right-of-way will be obtained through dedications as development of the adjacent land occurs, and only a limited amount will be acquired through actual purchases.

Table 5 – New Right-of-Way

Segment	New R/W (acres)	New R/W (sq ft)
Jackrabbit Trail Parkway to Perryville Road	25.2	1,097,100
Perryville Road to SR 303L	26.0	1,134,000
SR 303L to Bullard Avenue	12.0	522,390
Bullard Avenue to Dysart Road	10.6	460,460

Considerations for Future Study and Design

Arizona State Land Department Holding West of Beardsley Canal

The west end of the corridor from Jackrabbit Trail Parkway to Beardsley Canal is owned by the Arizona State Land Department (ASLD). The State Trust Lands held by ASLD will likely be sold or leased to private interests for development. At such time, a detailed land development plan will be developed, including roadway alignments. The Preferred Alignment for Peoria Avenue is coincident with the section line in this segment. However, future development plans could result in a different alignment for Peoria Avenue as long as the connection to Jackrabbit Trail Parkway is maintained and regional connectivity to the east is provided.

The Preferred Alignment crosses a flood retention basin owned by FCDMC. A FCDMC right-of-way use permit would be required for any improvements that are located on FCDMC property. Future coordination will be required with FCDMC on all studies and design efforts pertaining to this proposed roadway alignment. The roadway must not impact the safety and function of the existing FCDMC facilities and associated basin, channel and dam. For example, the proposed roadway must not reduce the existing basin volume or adversely impact existing flow conveyance. In addition, all FCDMC requirements pertaining to operations and maintenance, environment, and land rights must be met.

Citrus Road to Cotton Lane

Between Citrus Road and Cotton Lane, the Preferred Alignment includes a shift to the north and the construction of a frontage road along the south side of Peoria Avenue. The Preferred Alignment would require approximately 100 feet of right-of-way north of the section line. The planned Prasada development within the City of Surprise contained provisions for a landscape buffer along the north side of Peoria Avenue to accommodate a drainage channel. The proposed Peoria Avenue shift to the north would likely affect the planned landscape buffer and drainage channel. Further investigation and coordination is needed to determine the drainage channel and landscape configuration.

This unpaved one-mile segment of the corridor generated the most interest from the public during the open house meetings conducted during this study. The primary feedback was to immediately implement improvements to mitigate dust issues, and to place the ultimate roadway as far north as possible. In addition, concern was expressed regarding vehicle speeds along Peoria Avenue adjacent to the homes along the south side, with a strong desire for a reduced speed limit (below 40 miles per hour) within this segment. In addition, the public requested to limit the number of connections to the frontage road from the south, such that some of the existing north-south streets would not connect to the frontage road.

A future box culvert crossing under Citrus Road is planned north of Peoria Avenue. This crossing will be in conflict with the existing MWD Cross-Cut Canal. Future design and coordination efforts will be needed to address this crossing.

Realignment West of Bullard Avenue

West of Bullard Avenue, the Preferred Alignment includes a northerly shift near the center of the segment to avoid the existing irrigation facilities and well sites. If corridor conditions change in the future (e.g., removal of the irrigation facilities on the south side or new development on the north side) this recommendation should be reconsidered. For example, if development occurs first on the south side of Peoria Avenue, the existing irrigation facilities would likely be relocated as part of the development. If this were the case, then the alignment could stay on the section line and the realignment would not be necessary. However, if development were to occur first on the north side of Peoria Avenue, then the northerly shift should be implemented to avoid relocation of the irrigation facilities.

Ennis Spur

The existing BNSF Ennis Spur crossing of Peoria Avenue is at-grade and the improvements shown in Appendix A maintain the at-grade crossing. Future development plans near the Ennis Spur should provide building set-backs to allow the future implementation of a grade separated crossing, if deemed necessary in the future. Figure 10 shows a conceptual layout of a grade separation and provides a conceptual footprint.

Planning-Level Cost Estimate

Preliminary planning-level cost estimates for the Preferred Alignment were developed with the following assumptions:

- 6-lane typical section
- Two traffic signals per mile (every ½ mile)
- Underground signal equipment provided at ¼ mile locations
- Traffic signal interconnection system for the entire length
- No street lighting
- 8' masonry sound wall adjacent to existing development (actual noise mitigation to be based on future study at time of construction following current noise abatement policy)
- Eight driveways per mile per side
- Minimal earthwork assuming roadway would be at or near existing ground
- Remove and replace existing roadway features

- On-site roadway drainage system includes catch basins spaced approximately every 500' that discharge into a drainage channel along the roadway
- $4 per square foot for right-of-way acquisition

Table 6 summarizes the planning-level cost estimates in 2010 dollars while Table 7 summarizes the costs adjusted for inflation. In addition to construction, several other types of project costs are included in the overall cost estimates:

- Design costs are assumed to be 12% of the construction cost
- Construction management costs are assumed to be 15% of the construction cost
- Administration costs are assumed to be 10% of the construction cost

Table 6 – Full Width Ultimate Facility Planning Level Cost Estimates

Cost Category	2010 Dollars			
	Jackrabbit Trail Pkwy to Perryville Rd (1.5 miles)	Perryville Rd to SR 303L (2.5 miles)	SR 303L to Bullard Ave (2.5 miles)	Bullard Ave to Dysart Rd (2 miles)
Construction	$7,750,000	$13,700,000	$11,830,000	$10,540,000
Design	$930,000	$1,640,000	$1,420,000	$1,260,000
Construction Management	$1,160,000	$2,050,000	$1,770,000	$1,580,000
Right-of-Way	$4,390,000	$4,540,000	$2,090,000	$1,840,000
Structures	$310,000	$1,570,000	$560,000	$580,000
Utility Relocation	$440,000	$7,380,000	$6,170,000	$7,850,000
Administration	$770,000	$1,370,000	$1,180,000	$1,050,000
Total	$15,750,000	$32,250,000	$25,020,000	$24,700,000

Table 7 – Full Width Ultimate Facility Planning Level Cost Estimates Adjusted for Inflation

Cost Category	Inflation Adjusted*			
	Jackrabbit Trail Pkwy to Perryville Rd (1.5 miles)	Perryville Rd to SR 303L (2.5 miles)	SR 303L to Bullard Ave (2.5 miles)	Bullard Ave to Dysart Rd (2 miles)
Construction	$9,200,000	$16,260,000	$14,050,000	$12,520,000
Design	$1,100,000	$1,950,000	$1,680,000	$1,500,000
Construction Management	$1,380,000	$2,440,000	$2,110,000	$1,880,000
Right-of-Way	$5,210,000	$5,390,000	$2,480,000	$2,190,000
Structures	$360,000	$1,860,000	$660,000	$680,000
Utility Relocation	$530,000	$8,760,000	$7,320,000	$9,330,000
Administration	$920,000	$1,620,000	$1,400,000	$1,250,000
Total	$18,700,000	$38,280,000	$29,700,000	$29,350,000

* 5 years @ 3.5% annual inflation rate

Tables 6 and 7 are based on implementation of the ultimate facility and include full reconstruction in areas where Peoria Avenue currently exists. However, a majority of this corridor will be built by developers as the adjacent land is developed, as discussed in Section 5

(Implementation Plan). Therefore, additional cost estimates were prepared for the projects that most likely will be implemented by either the city or county, as follows:

- Perryville Road to Citrus Road – minor improvements at west end and east end to provide 6 lane roadway
- Citrus Road to Cotton Lane – south ½ street including frontage road and realignment west of Citrus Road and east of Cotton Lane
- Bullard Avenue to Litchfield Road – south ½ street from approximately Bullard Avenue to 143rd Avenue; and north half-street from approximately Bullard Avenue to 140th Avenue
- Litchfield Road to Dysart Road – full street width from Litchfield Road to Ennis Spur; and north ½ street from Ennis Spur to Dysart Road

Table 8 summarizes these planning-level cost estimates in 2010 dollars, while Table 9 summarizes these costs adjusted for inflation. Costs for improvements between Sarival Road and Reems Road which are currently planned the City of Surprise to construct half-street improvements along the north side of Peoria Avenue are not included in Tables 8 and 9. Costs to upgrade this half-street to be compatible with the recommendations of this study are also not included in Tables 8 and 9. In addition, other minor improvements may be needed which are not described above or included in Tables 8 and 9.

Table 8 – Interim Implementation Planning Level Cost Estimates

Cost Category	2010 Dollars			
	Perryville Rd to Citrus Rd	Citrus Rd to Cotton Ln	Bullard Ave to Litchfield Rd	Litchfield Rd to Dysart Rd
Construction	$2,990,000	$6,370,000	$3,950,000	$5,400,000
Design	$360,000	$760,000	$470,000	$650,000
Construction Management	$450,000	$960,000	$590,000	$810,000
Right-of-Way	$290,000	$2,070,000	$490,000	$620,000
Structures	$0	$520,000	$130,000	$580,000
Utility Relocation	$1,400,000	$5,600,000	$3,610,000	$610,000
Administration	$300,000	$640,000	$390,000	$540,000
Total	$5,790,000	$16,920,000	$9,630,000	$9,210,000

Table 9 – Interim Implementation Planning Level Cost Estimates Adjusted for Inflation

Cost Category	Inflation Adjusted*			
	Perryville Rd to Citrus Rd	Citrus Rd to Cotton Ln	Bullard Ave to Litchfield Rd	Litchfield Rd to Dysart Rd
Construction	$3,560,000	$7,560,000	$4,690,000	$6,410,000
Design	$430,000	$910,000	$560,000	$770,000
Construction Management	$530,000	$1,130,000	$700,000	$960,000
Right-of-Way	$340,000	$2,460,000	$580,000	$740,000
Structures	$0	$610,000	$160,000	$680,000
Utility Relocation	$1,660,000	$6,640,000	$4,290,000	$730,000
Administration	$350,000	$760,000	$470,000	$640,000
Total	$6,870,000	$20,070,000	$11,450,000	$10,930,000

* 5 years @ 3.5% annual inflation rate

Technical Memorandum #5
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

4.0 ACCESS MANAGEMENT

Definition

Access management consists of the planning, design and implementation of land use and transportation strategies that maintain a safe flow of traffic while accommodating the access needs of adjacent properties. Access is managed through the regulation of vehicular access to public roadways from adjoining properties, and vice versa. Management of access is provided through legal, administrative and technical strategies available to political jurisdictions under their police powers to maintain public health, safety and welfare.

Access management can be categorized as either full or partial access control. Full access control means that properties abutting a roadway do not have direct access, and that access is provided only at grade-separated interchanges. Partial access control allows some at-grade crossing and some private driveway connections, but only at designated points and often for designated movements (e.g., right-in and right-out only). Uncontrolled access means that all abutting properties are allowed direct access to the roadway.

Purpose and Need for Access Management

The purpose of access management is to preserve the capacity and maintain safety of public roadways, while retaining access to private land. Access management is intended to balance a roadway's two main functions: mobility and access. The proper balance between these two functions depends on the classification of the roadway. In general, the higher the functional classification, the more importance is given to through traffic mobility, as opposed to access to adjoining properties. Higher functional classification roadways, such as principal arterials, are designed to satisfy the public need for high mobility over substantial distances. Fast, efficient travel in a safe, uniform manner is the primary objective of these roads, and therefore access is often limited.

It is desirable for major transportation corridors to facilitate the safe and efficient movement of people and goods with minimal delay or interference from conflicting vehicle movements. However, over time, the addition of more traffic signals and/or curb cuts with resulting turning movements degrades the intended function of the transportation corridor. The use of land along a major transportation corridor is heavily dependent upon vehicular access to the corridor. Often, no direct (lateral) access exists between adjacent properties along a corridor, necessitating indirect access via the through roadway. Therefore, uncoordinated internal circulation systems force more trips onto major roadways. As traffic congestion increases, the level of service provided by the transportation corridor erodes. Crashes along such a corridor generally increase due to the large number of turning vehicles and other conflicts along the route.

As the motoring public experiences increasing travel delays, requests for solutions are made to transportation officials. Typical solutions include adding more travel lanes and constructing raised medians. However, these retrofitting techniques are expensive to implement and disrupt the traveling public as well as adjacent land uses. If demand for the roadway continues to exceed the supplied roadway capacity, then businesses begin to feel the effects due to a deterioration of access. Potential customers are deterred by delays in leaving and re-entering the main road, or if they perceive a safety risk in making difficult turning movements. In response, some businesses may relocate to areas that offer better accessibility. Frequently, as economic activity declines in the area with congested traffic, so does the property value and tax base. Ultimately, the roadway is transformed into a low-speed road with a confusing mixture of signs and curb cuts that is no longer useful as a major transportation corridor.

Techniques

Access rights are property rights protected by the U.S. and Arizona constitutions. An owner of a property abutting a public roadway has a private right or easement for the purpose of ingress to and egress from the property. This easement may not be taken or substantially impaired without compensation. Property right of access is not an absolute right, however, and is subject to the public's right of passage. Thus, the right of access is a right of reasonable access and not a private right of direct access. An owner is deemed to have a right to access the public road system in a reasonably convenient manner, but not to any specific street or any specific point of access. The following access management techniques are not an all-inclusive list, but have been found to be among the most effective techniques to enhance traffic safety and mobility along a major arterial, while preserving the basic access to the public roadway system to which every adjacent property is entitled.

Raised Medians at Intersections

Raised medians at intersections (signalized or unsignalized) provide an obstruction to prevent some turning movements from occurring. For example, medians can be constructed to allow for left-turn in only/no left-turn out, which facilitates access to the adjacent property and leaves right turns unrestricted. Right-in/right-out driveways are also commonly used, often in conjunction with raised medians.

Raised medians at signalized intersections are especially desirable because they can prevent left-turns to and from driveways located near the intersection. Such turning movements create special hazards because of the complexity of traffic operations at many signals, including queuing of vehicles. One disadvantage of this treatment is that motorists entering from driveways may need to make u-turns elsewhere along the roadway.

Full Raised or Non-Traversable Medians

Continuous raised or wide non-traversable medians provide a barrier on the main roadway that separates opposing travel lanes and prevents both left turns and cross traffic. Full raised medians reduce conflict points by restricting turn movements to right-in/right-out only, except at full median breaks. Continuous raised medians are an especially effective access management measure on roadways with high traffic volumes and high driveway densities. The main advantage of a raised median is that it limits roadway crossings and left turns to specific locations where adequate sight distance and vehicle storage can be provided. If the median is wide enough, it can also provide a refuge for pedestrians crossing the roadway. By removing left-turning vehicles from through traffic, continuous raised medians with left-turn lanes at designated breaks help maintain roadway operating speed. Raised medians also provide space

for landscaping and other aesthetic treatments. A disadvantage of providing medians is that by limiting the number of locations where one can cross the roadway, the number of u-turns will most likely increase.

Because raised medians are a restrictive access management technique, building such a median along an arterial often generates controversy among business and property owners. Two-way left-turn lanes are less restrictive, but are also a less effective access management technique because they fail to physically restrict turning and crossing movements. Businesses and property owners may perceive that installation of raised medians will have a large, negative impact on their customers, sales, and property values.

Driveway Spacing and Consolidation

A critical aspect of access management is maintaining adequate spacing between driveways. The speed differences caused by traffic turning into and out of driveways can produce conflicts that may lead to broadside and rear-end collisions between vehicles. Spacing requirements may be based on posted speed limits, the classification of the roadway, and the amount of traffic generated by a development along with other design considerations.

Driveways are consolidated to limit the number of access points per mile along a road and provide adequate spacing between driveways in order to reduce the number of conflicts. Driveway consolidation can be achieved by closing driveways, creating alternative access ways, creating shared driveways, relocating entrances to side streets, and promoting cross access (i.e., lateral access between adjacent commercial properties to remove very short trips from the main roadway). These techniques can be applied individually or through projects such as installation of medians, two-way left-turn lanes, and frontage or reverse access roads. This access management technique requires property owners to agree to reduce/combine their access points or share access with adjacent property owners. Reducing the number of driveways can benefit owners of commercial property both directly (by freeing up space for parking or other use) and indirectly (by making access safer and less confusing to drivers on the main road; this is especially important to merchants who rely on drive-by traffic). In some cases, consolidation of driveways serving a major retail center can justify installation of a right-turn deceleration lane.

Joint Driveways/Cross Access

Joint access requirements provide for a unified on-site circulation plan serving several properties on a commercial corridor. This serves as an alternative method of achieving adequate driveway spacing where lot frontage is otherwise inadequate. This method could also be employed to provide a definition of a driveway in an area where driveway/access locations are not well defined. Cross access requirements allow for circulation between sites and may be applied in accordance with a joint access plan, or as a means of connecting major developments to allow such circulation. This method requires establishment of joint-use driveways and cross access easements between properties to provide a logical circulation system. Cross-circulation between adjacent properties and provision for service roads allows movement across adjacent parcels without re-entry to the major roadway.

Corner Clearance

Adequate corner clearance (i.e., the distance from the edge of the intersection to the nearest curb cut) is important in maintaining safe and efficient operations at the intersection. Driveways and access points should be located outside the functional intersection area, as drivers on the main roadway are making decisions regarding the intersection and do not expect turning movements from adjacent driveways. The functional intersection area is defined by AASHTO's *Policy on Geometric Design of Highways and Streets* (2004), which states that "the functional area extends both upstream and downstream from the physical intersection area and includes the longitudinal limits of auxiliary lanes." The functional area includes the turn lanes approaching the intersection as well as the perception-reaction distance of the driver approaching the intersection. This functional area is longer on the upstream (approach) side of the intersection than the downstream (departure) side.

Dedicated Left and Right Turn Lanes

One way to accomplish a smooth flow of traffic is to provide dedicated turn lanes to remove turning vehicles from the through traffic flow at roadway intersections and near busy driveways. Turning traffic reduces the capacity of lanes to carry through traffic, causing congestion and delay to increase. This is most noticeable in the case of left-turning vehicles, which must await a safe gap in opposing traffic. However, right-turning vehicles also delay through traffic because of the need to slow down to a safe turning speed. Turning movements from through lanes result in speed differentials that contribute to crashes, especially rear-end collisions which are often the most common crash type in urban environments. Dedicated turn lanes allow through traffic to keep moving at a steady speed. A combination of medians and turn lanes provides protection for turning movements, thus reducing the crash potential.

Alternative Access Ways

Alternative access ways can be provided to sites adjoining the main road by either frontage or reverse access roads that run parallel to the mainline route. Alternative access may be achieved by using frontage, collector or arterial roads off the major roadway right-of-way. Property access is provided along the frontage or reverse access road, which accesses the main roadway from a smaller crossroad. This reduces the number and density of conflict points along the arterial. Frontage roads are typically constructed adjacent to the major roadway providing access to properties fronting the roadway, thereby funneling local traffic to a common point to gain access. Frontage roads can be one-way or two-way, depending on the situation. Reverse access or "backage" roads also parallel the main roadway, but are offset from the right-of-way to provide site access along the "back side" of the property rather than the arterial side. Both types of alternative access ways are beneficial in providing convenient access to local properties, while preserving the safety and capacity of the major roadway. Operational problems involving queues on the smaller crossroad blocking closely spaced intersections can occur if adequate separation is not provided between the frontage road and the roadway. Therefore, an effective frontage road system requires additional right-of-way.

Recommended Techniques for Peoria Avenue

Recommended access management techniques for Peoria Avenue include:

- A divided cross-section with a raised, physical median
- Full-access median breaks limited to four per mile
- Left turn lanes at all locations where left turns are permitted
- Minimum driveway spacing of 200' on the north side (City of Surprise) and 165'- 330' on the south side (MCDOT)
- Minimum corner clearance at major intersections of 300' on the north side (City of Surprise), and 115' (approach) or 230' (departure) on the south side (MCDOT)
- A frontage road along the south side from Citrus Road to Cotton Lane
- No on-street parking

Development policies intended to help achieve access management that can be implemented through future development and redevelopment include:

- Encourage alternative access ways that connect to Peoria Avenue at identified major access points
- Encourage on-site circulation or parallel routes that would discourage direct access to Peoria Avenue
- Encourage the use of direct access to minor roadways connecting to the corridor
- Minimize the number of driveways to reduce traffic conflicts

5.0 IMPLEMENTATION PLAN

The recommendations of this study are intended to be used to preserve corridor right-of-way since construction of improvements will not likely be completed in the near-term, but rather as development occurs along the corridor, as shown in Figure 11. All timetables are subject to change, however, depending on such circumstances as identification of additional funding, new opportunities for cost-sharing with partner jurisdictions, and development of land adjacent to Peoria Avenue.

In the near-term, projects that are already programmed should be completed, such as improvements at the SR 303L/Peoria Avenue interchange to be constructed by ADOT when SR 303L is upgraded to a freeway facility, as well as the City of Surprise planned completion of the north half-street between Sarival and Reems Roads. Other near-term improvements recommended for consideration include:

- Acquire right-of-way and construct a two-lane roadway between Citrus Road and Cotton Lane
- Drainage improvements at Litchfield and Sarival Roads

Assuming completion of the segments to be implemented by developers, several additional improvement projects would be needed in the mid-term timeframe to provide a continuous 4-lane facility by the year 2030, including:

- South half-street and frontage road construction between Citrus Road and Cotton Lane
- Cotton Lane intersection improvements
- Reems Road intersection improvements
- South half-street construction between Bullard Avenue and Litchfield Road
- South half-street construction between Litchfield Road and Ennis Spur

Long-term (likely beyond 2030) improvements will focus on bringing uniformity to the corridor and widening to the ultimate 6-lane facility. Areas where these improvements would occur include:

- Perryville Road to Citrus Road
- Sarival Road to Reems Road
- Bullard Road to Litchfield Road
- Litchfield Road to Dysart Road

The MCDOT Transportation Improvement Program (TIP), updated annually, is based on a 5-year projection of available transportation funding and a countywide prioritization of roadway system needs. No projects (Design Concept Report, design, or construction) along this portion of Peoria Avenue are a part of the current 5-year TIP.

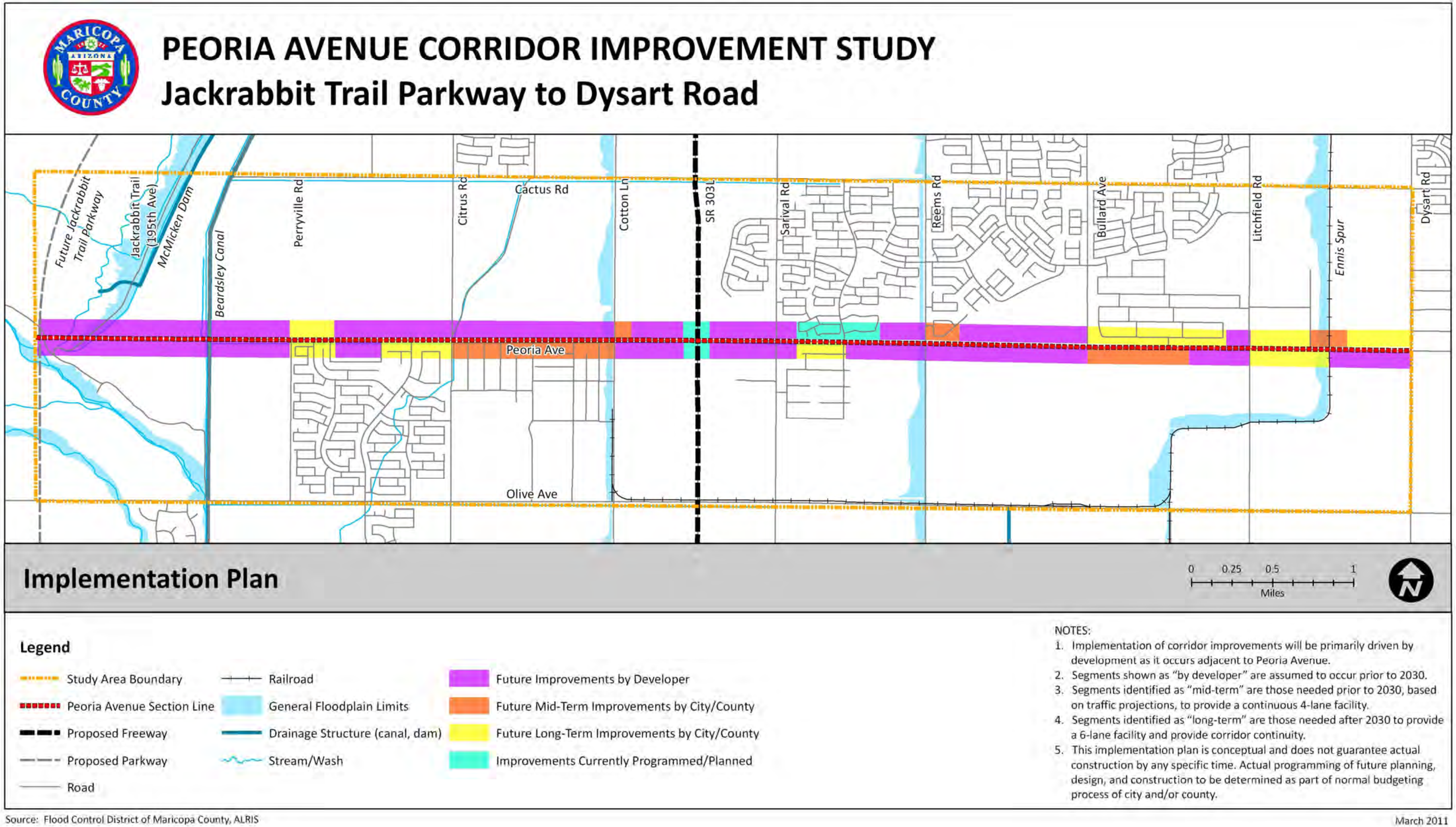


Figure 11 – Implementation Plan

Appendix A:
Preferred Alignment Plan Sheets

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	XXXXX	XXX	XXX	XXXXX

Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

NO.	REVISION	BY	DATE
1			
2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	R.R.D	04/01/11
	DRAWN	R.R.D	04/01/11
	CHECKED	R.L.B	04/01/11

TRANSPORTATION
AECOM TECHNICAL SERVICES, Inc.
2777 E. Camelback Rd, Suite 200
Phoenix, Arizona 85016
T 602.337.2777 F 602.337.2629
AECOM
www.aecom.com

PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 1 OF 17

TRACS NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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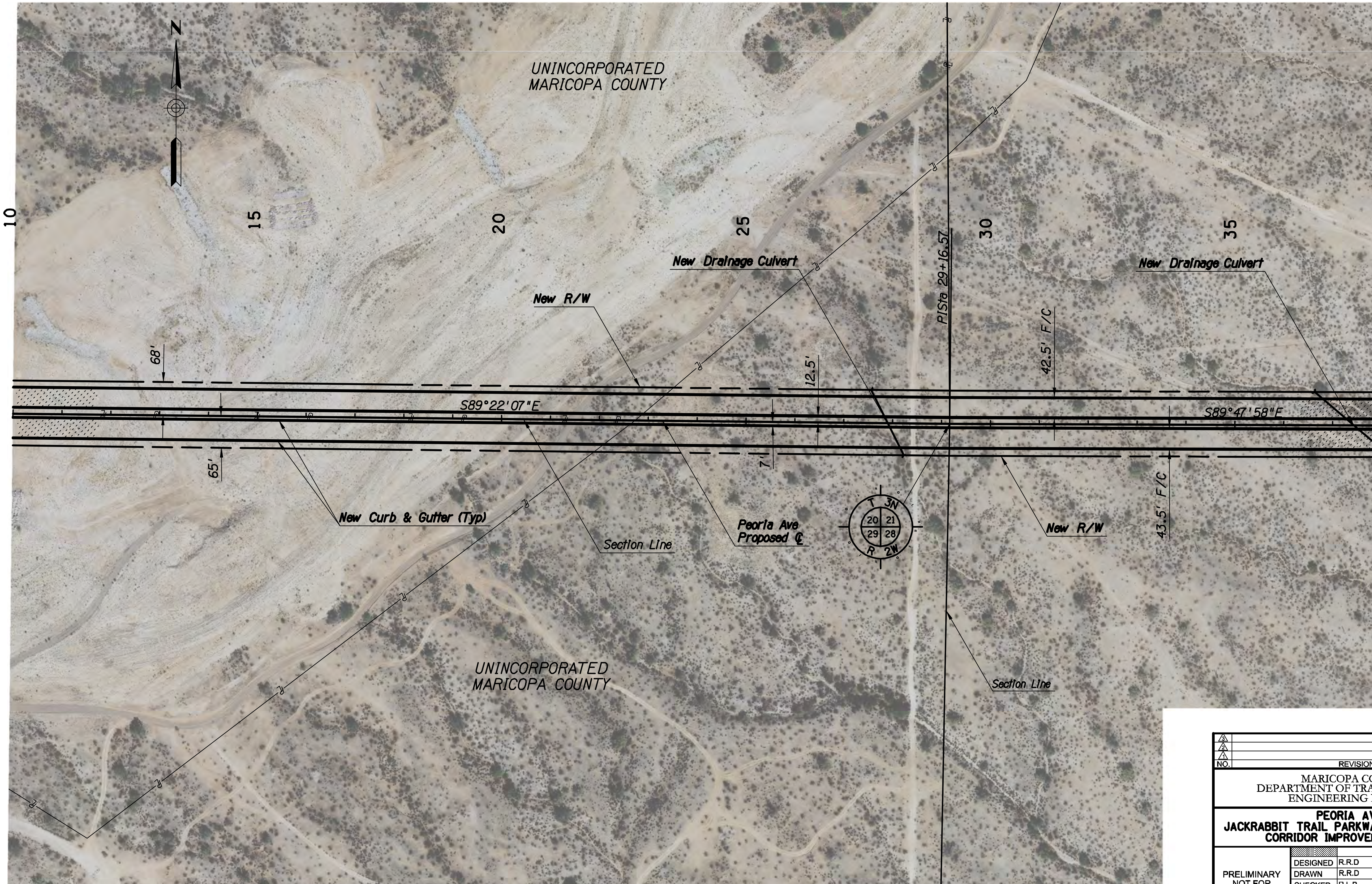

Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

NO.	REVISION	BY	DATE
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3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

PRELIMINARY NOT FOR CONSTRUCTION

	BY	DATE
DESIGNED	R.R.D	04/01/11
DRAWN	R.R.D	04/01/11
CHECKED	R.L.B	04/01/11

TRANSPORTATION
AECOM TECHNICAL SERVICES, Inc.
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AECOM
www.aecom.com

PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 2 OF 17

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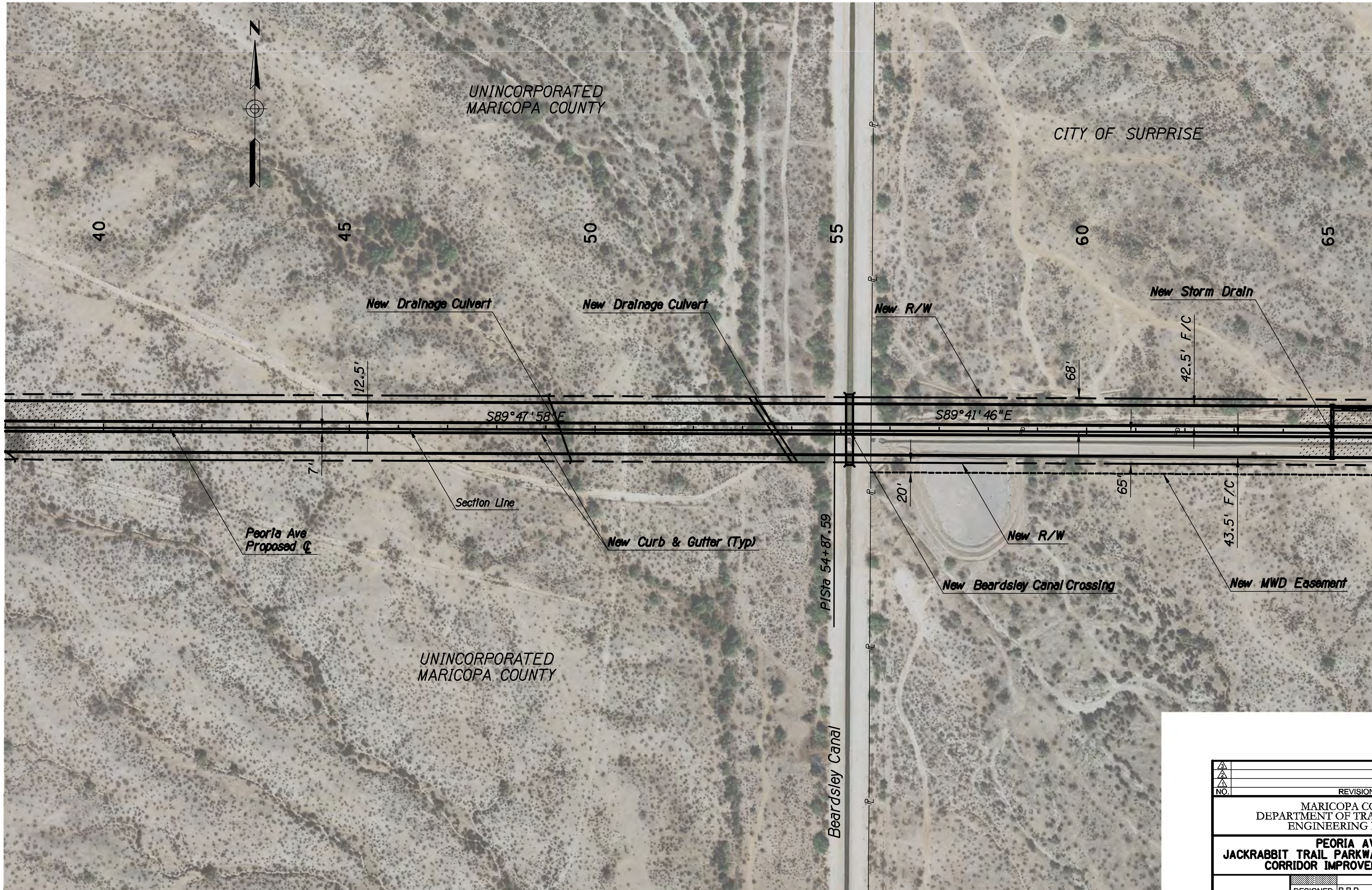

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

PRELIMINARY NOT FOR CONSTRUCTION		BY	DATE
	DESIGNED	R.R.D	04/01/11
	DRAWN	R.R.D	04/01/11
	CHECKED	R.L.B	04/01/11

TRANSPORTATION

AECOM TECHNICAL SERVICES, Inc.
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AECOM
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Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 3 OF 17

TRACS NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	R.R.D	04/01/11
	DRAWN	R.R.D	04/01/11
	CHECKED	R.L.B	04/01/11

TRANSPORTATION
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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 4 OF 17

TRACS NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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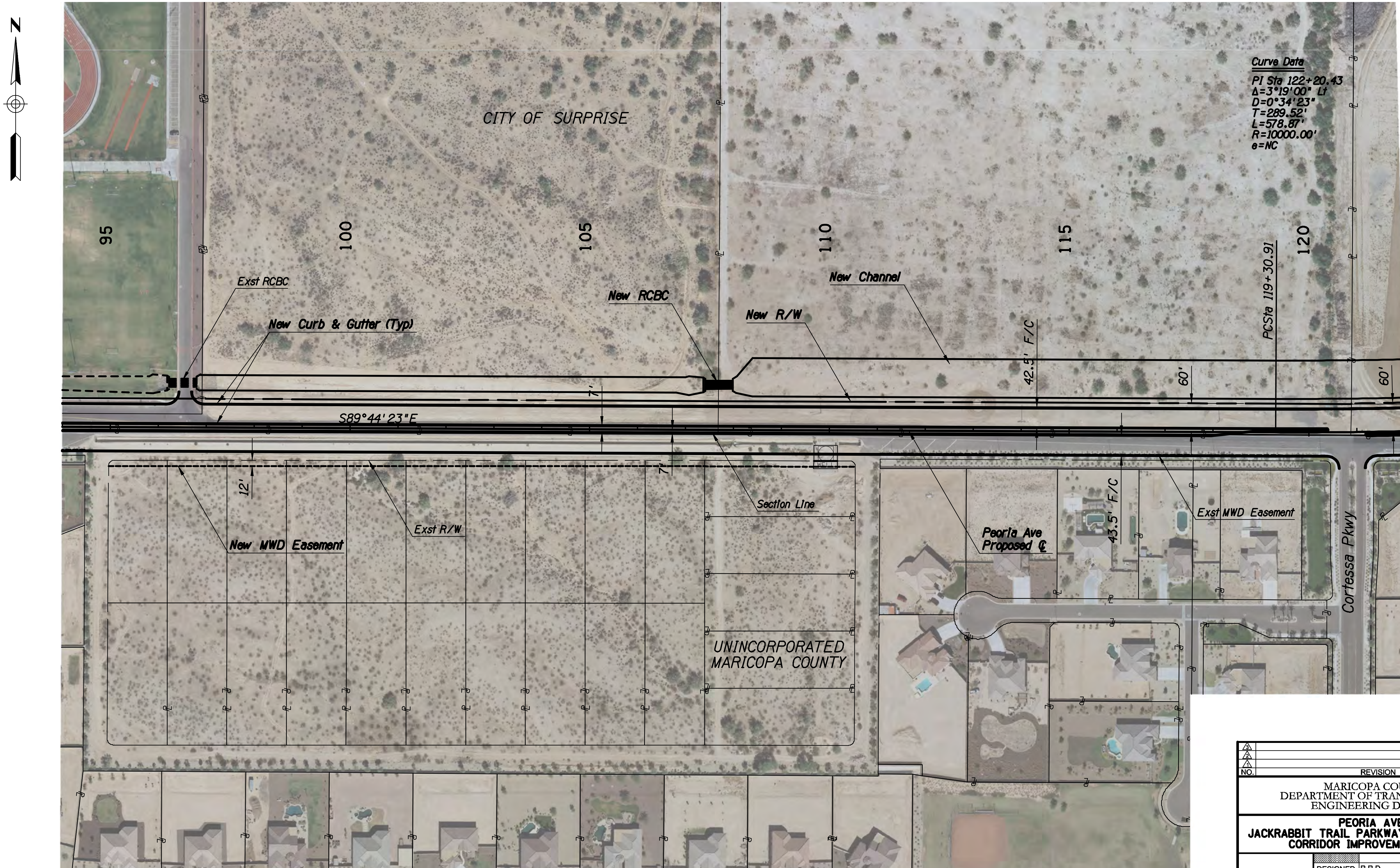

Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

PRELIMINARY NOT FOR CONSTRUCTION

	BY	DATE
DESIGNED	R.R.D	04/01/11
DRAWN	R.R.D	04/01/11
CHECKED	R.L.B	04/01/11

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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 5 OF 17

TRACS NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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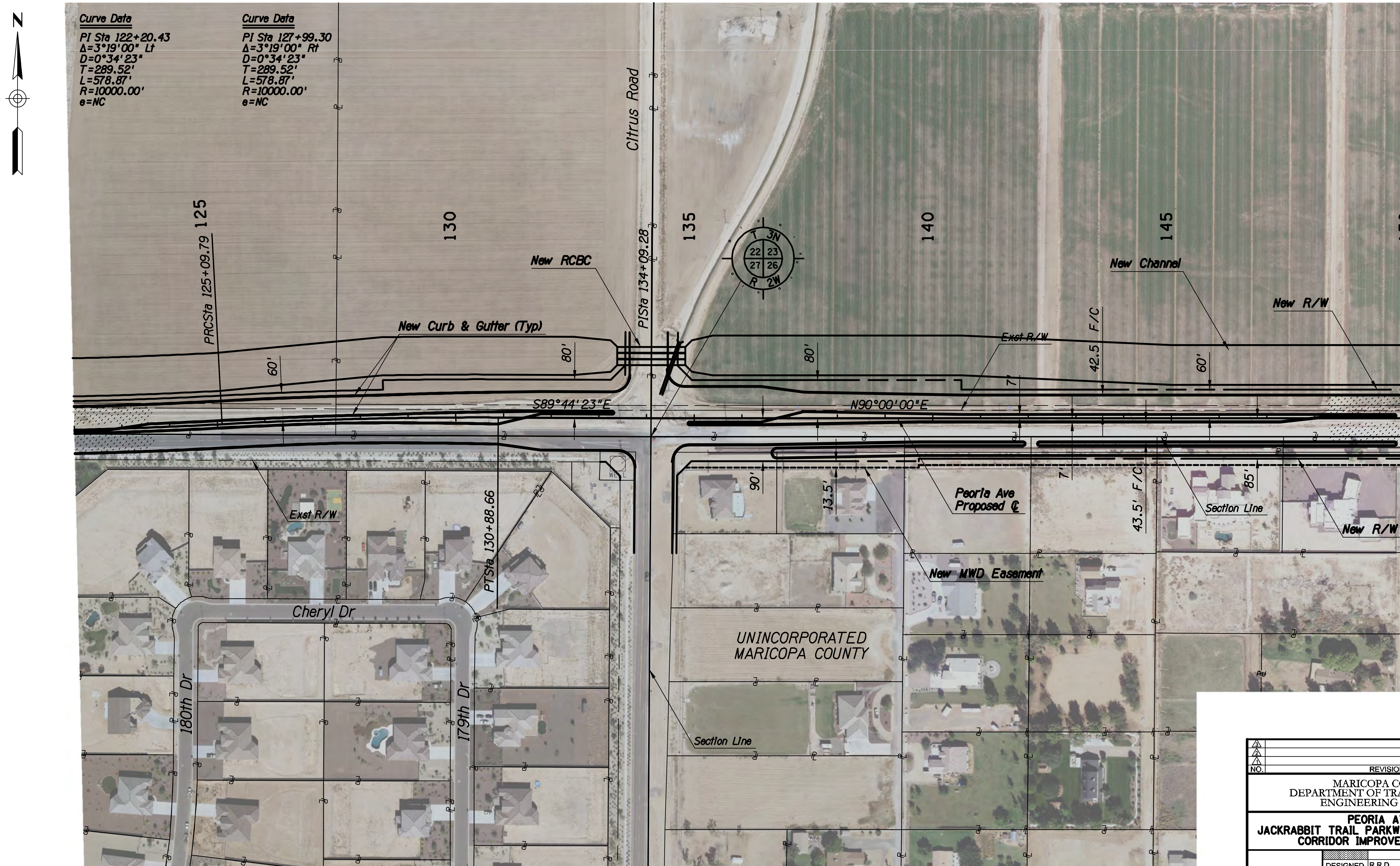

Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 6 OF 17

TRACS NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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Note: *Parcel and R/W Information Shown based on Maricopa County Assessor data.*

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
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PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 7 OF 17

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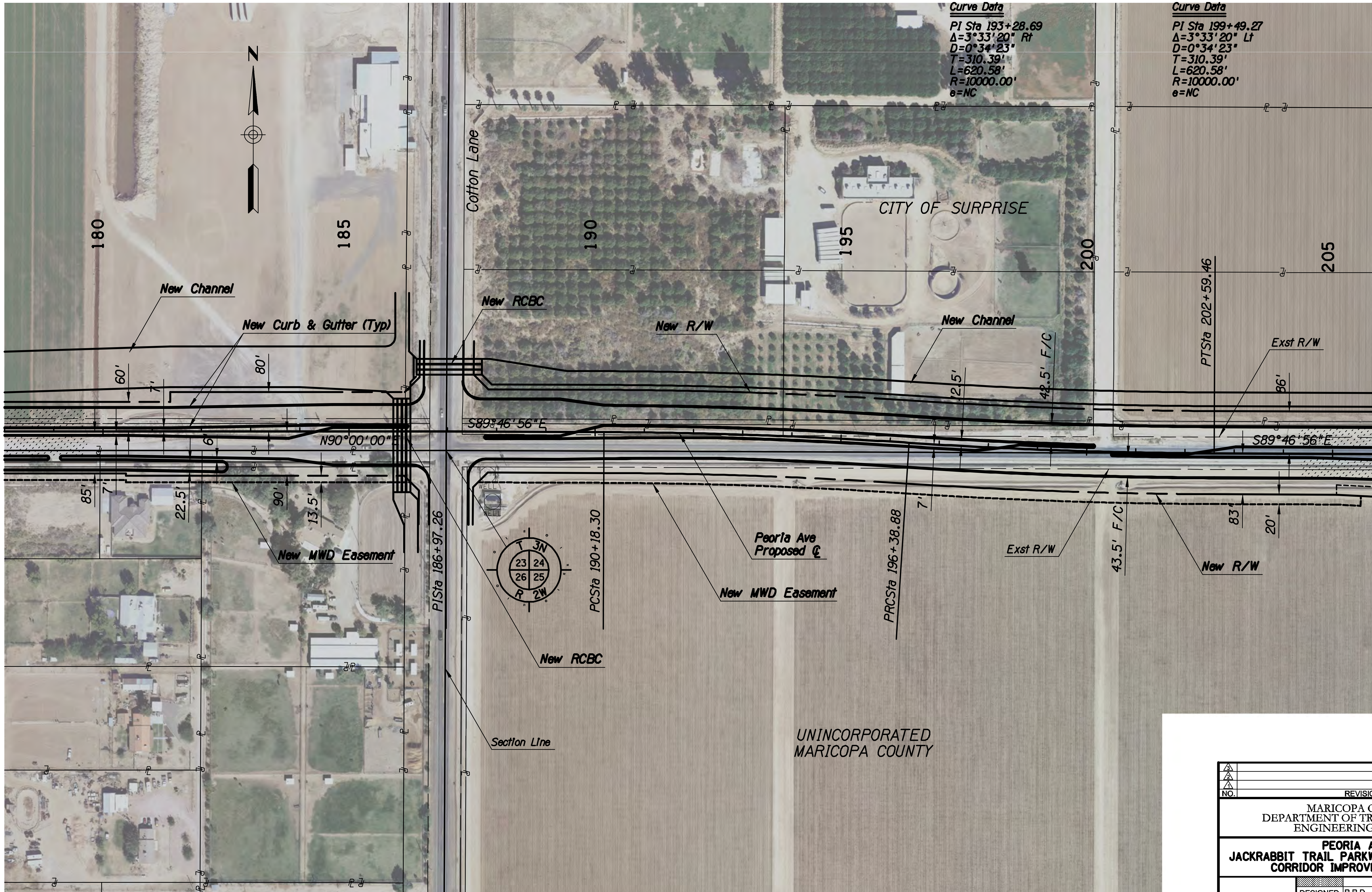

Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT — SHEET 8 OF 17

TRACS NO.

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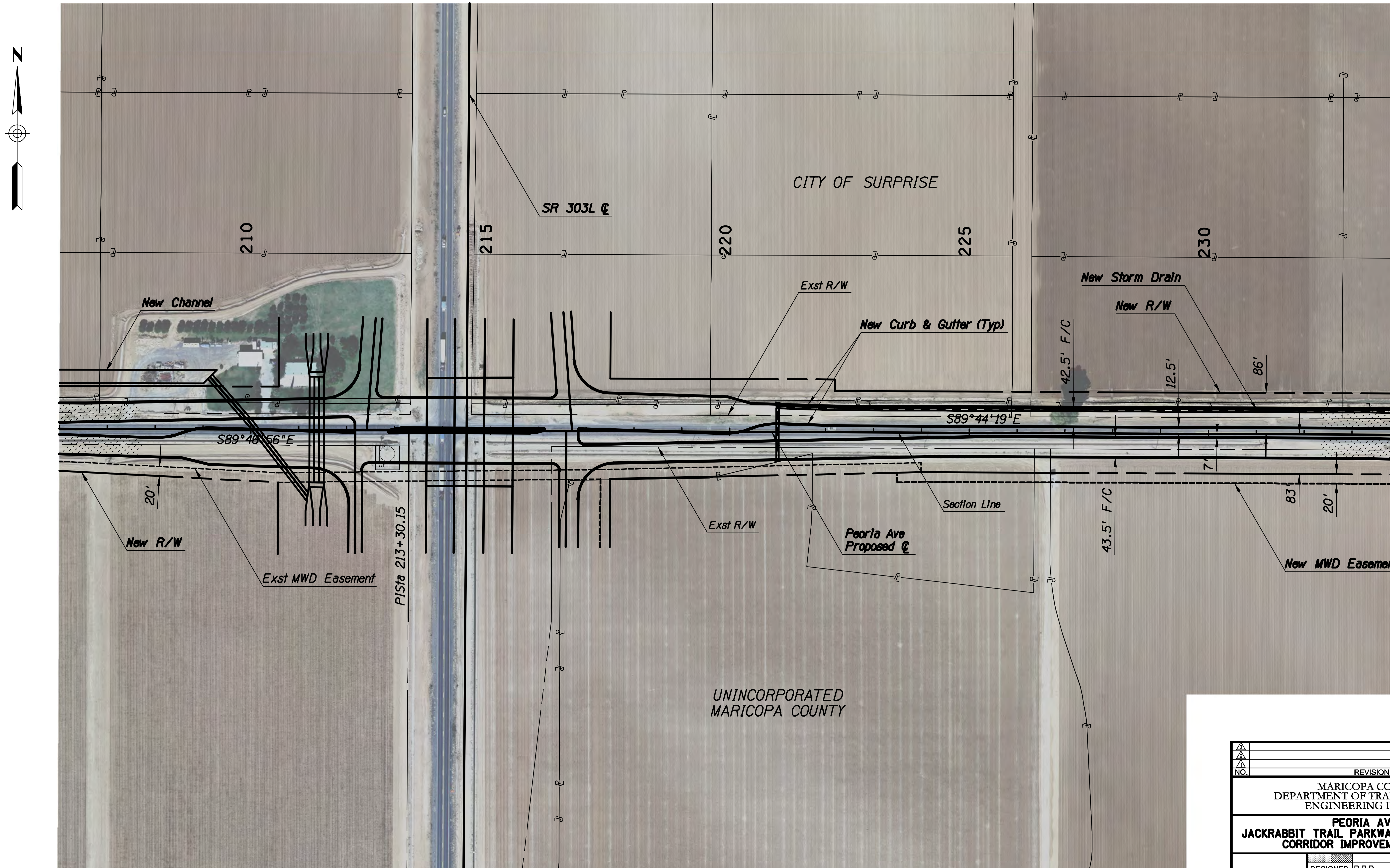

Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 9 OF 17

TRACS NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	XXXXX	XXX	XXX	XXXXX

<u>Note</u>: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT — SHEET 10 OF 17

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

PRELIMINARY NOT FOR CONSTRUCTION

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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 11 OF 17

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Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 12 OF 17

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
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PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 13 OF 17

TRACS NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT | SHEET 15 OF 17

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Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 16 OF 17

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Note: Parcel and R/W Information Shown based on Maricopa County Assessor data.

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

PEORIA AVENUE
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
CORRIDOR IMPROVEMENT STUDY

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PEORIA AVENUE PREFERRED ALIGNMENT

SHEET 17 OF 17

TRACS NO.

Appendix B:
MWD Letter

MWD EASEMENT GUIDELINES

Form, as approved by the MWD Board on April 10, 2007 and revised on July 19, 2010.

MWD EASEMENT GUIDELINES

MWD EASEMENTS – PIPELINES & RELATED MWD FACILITIES:

MWD requires an exclusive Easement.

Size of MWD Easement: MWD Easements must be a minimum width of 20 feet. Depending upon the pipeline size and depth and other design factors, MWD may require an Easement as wide as 40 feet.

MWD Easement Location:
The following, in order by MWD preference, are acceptable locations for the MWD Easements:

1. Adjacent to, but outside of the Road Right-Of-Way.

2. If the Public Utility Easement ("PUE") or Municipal Utility Easement ("MUE") is located outside of the Road Right-Of-Way, then adjacent to, but outside of the PUE or MUE and the Road Right-Of-Way.

3. Within, or partially within, the Road Right-Of-Way, but a minimum of 10 feet back of curb. Right turn lanes and bus bays are exempt from this requirement; however, they are subject to the restrictions and other criteria below. (See Attached Examples.)

Restrictions and Other Criteria:

1. MWD Easements must be placed outside of the pavement section, curb and gutter, where practical.

2. A sidewalk may be placed over an MWD Easement, subject to MWD approval of the plan and to the terms and conditions of the MWD Easement.

3. Drainage channels and retention basins are not allowed within MWD Easements.

4. Cross Slopes within MWD Easements must not exceed 2%.

5. No PUE's or MUE's are allowed within MWD Easements.

6. Utility crossings of MWD Easements are allowed, provided the design for such crossings is approved by MWD and the utility crossings are separately licensed by MWD or, if within the City of Surprise, granted an IGA approval by MWD and all license or IGA fees are paid.

7. Parallel installations of utilities within MWD Easements are not allowed. Parallel installations of landscaping irrigation lateral lines which are not under constant pressure are allowed provided that the plans are approved by MWD and the line installations are subject to the terms and conditions of the MWD Easement.

8. Structures, footings, and facilities, other than structures and facilities owned by MWD, are not allowed within MWD Easements. This includes, but is not limited to, walls, buildings, fences, fixtures, valves, pull boxes, fire hydrants and

assemblies, monuments, manholes, street lights, back flow preventers, and irrigation control boxes.

9. Small shrubs, landscaping ground cover, and landscaping berms up to a maximum of 1 Foot high, may be placed within MWD Easements, subject to approval by MWD of the landscaping plan and to the terms and conditions of the MWD Easement. Trees, oleanders, or other plants with aggressive water-seeking root systems are not allowed within MWD Easements. Please reference MWD Standard Detail 106 for recommended planting distances for such plants with aggressive water-seeking root systems.

MWD EASEMENTS – TURNOUT & OTHER STRUCTURES:

MWD requires an exclusive Easement.

Size of MWD Easement: MWD Easements must be a minimum of 40 feet by 40 feet (40'x40). Depending upon the design of the structure or structures, MWD may require a larger size or different configuration in certain locations.

MWD Easement Location:
The following, in order by MWD preference, are acceptable locations for the MWD Easements:

1. Adjacent to, but outside of the Road Right-Of-Way.

2. If the PUE or MUE is outside of the Road Right-Of-Way, then adjacent to, but outside of the PUE or MUE and the Road Right-Of-Way.

3. Within, or partially within, the Road Right-Of-Way, but a minimum of 10 feet back of curb with the exception of right turn lanes or bus bays, subject to the restrictions and other criteria below. (See Attached Examples.)

Restrictions and Other Criteria:

1. MWD requires unimpeded vehicular access to and over the MWD Easements. As a result, no structures, improvements or utilities are allowed to be placed within the MWD Structure Easement.

2. MWD will allow ground cover to be placed within the MWD Easement, subject to approval by MWD of the landscaping plan and to the terms and conditions of the MWD Easement. No other landscaping is allowed.

3. If the MWD Easement Location Option #2 above is chosen for the location of the MWD Easement, then MWD requires an Access Easement over the PUE or MUE to provide vehicular access into the MWD Easement.

4. MWD Easements must be placed outside of the pavement section, curb and gutter, where practical.

5. Drainage channels and retention basins are not allowed within MWD Easements.

6. Cross Slopes within MWD Easements must not exceed 2%.

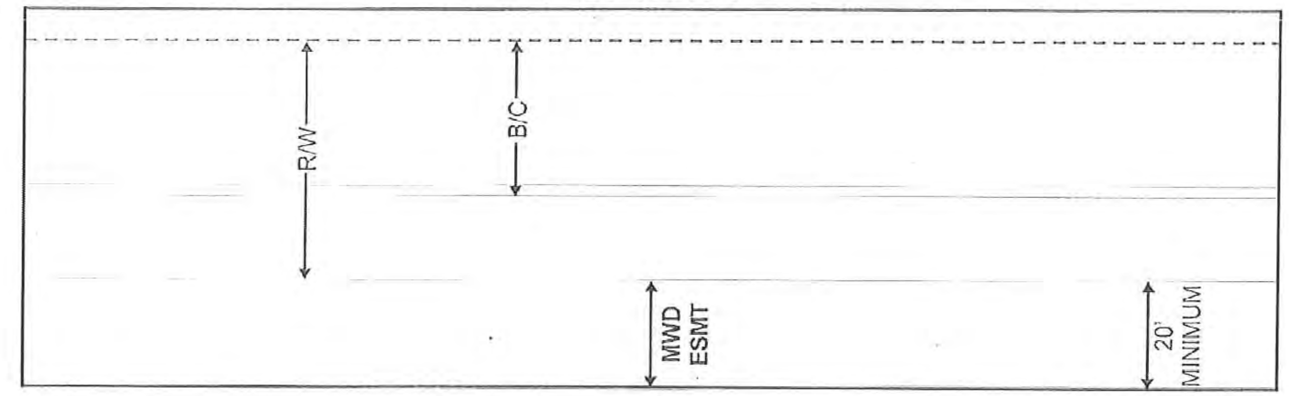
7. No PUE's or MUE's are allowed within MWD Easements.

8. Parallel installations of utilities within MWD Easements are not allowed. Parallel installations of landscaping irrigation lateral lines which are not under constant pressure are allowed provided that the plans are approved by MWD and the line installations are subject to the terms and conditions of the MWD Easement.

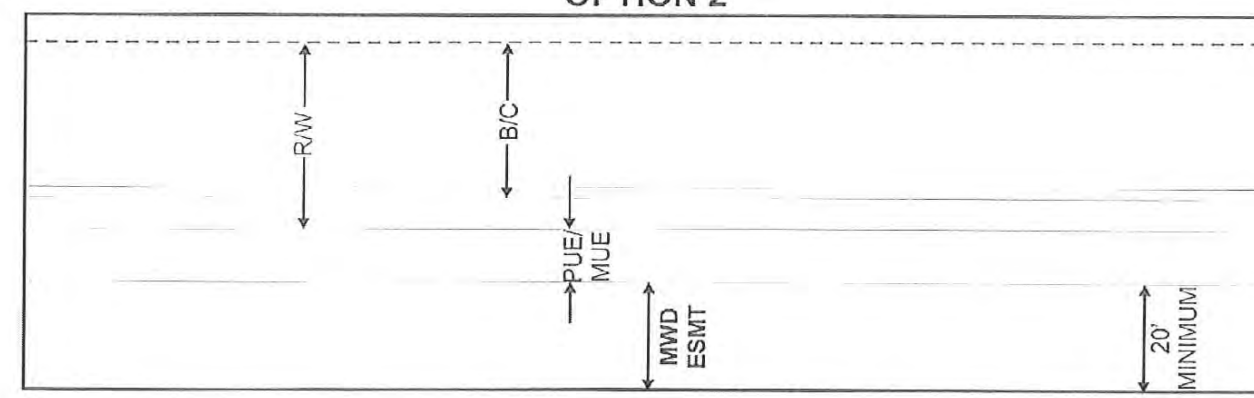
9. Structures, footings, and facilities, other than structures and facilities owned by MWD, are not allowed within MWD Easements. This includes, but is not limited to, walls, buildings, fences, fixtures, valves, pull boxes, fire hydrants and assemblies, monuments, manholes, street lights, back flow preventers, and irrigation control boxes.

MWD EASEMENT GUIDELINES
EASEMENT LOCATION OPTIONS

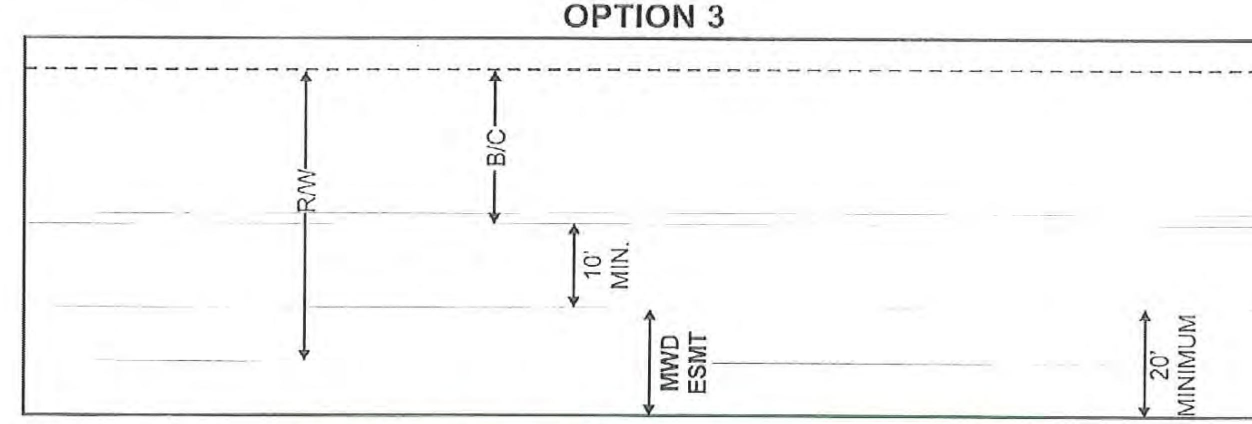
OPTION 1



OPTION 2



OPTION 3



R/W = Right of Way B/C = Back of Curb PUE/MUE = Public Utility Easement/Municipal Utility Easement

MWD Easement Guidelines - Easement Location Options - 11/7/07

MARICOPA WATER DISTRICT
IMPROVEMENT PLAN REVIEW

DATE: 3/9/2011

EMAIL RESPONSE ONLY

FILE COPY

TO: **Rodney Bragg, P.E.**
AECOM
E-Mail Rodney.Bragg@aecom.com

CC: **Mitch Wagner, MCDOT**
E-Mail mitchwagner@mail.maricopa.gov

Nick Mascia, City of Surprise
E-Mail engineering.info@surpriseaz.com

FROM: **Veronica Valenzuela, Maricopa Water District**

RE: **MCDOT - PEORIA AVE CORRIDOR IMPROVEMENT STUDY (JACK RABBIT TRAIL TO DYSART ROAD) ALTERNATIVE ALIGNMENTS**
DRAWING #: 60181526 **DATED:** 12/14/10

MWD Review:

____ MWD Is Not Impacted.
____ MWD may be impacted. **(See Comments below).**
_X_ MWD has or will have facilities or property interests that are impacted by the referenced plan. **(See Comments and/or Approval below).**

MWD Approval:

____ MWD hereby approves.
____ MWD hereby approves, **subject to Comments below.**

Additional Drawing Requirements:

_X_ Submit Two (2) Full-Size copies and Four (4) 11 x 17 copies of the revised drawings to MWD for review & approval.
____ Submit One (1) 11 x 17 copy of the revised drawings to George Cairo Engineering for review.
____ If changes are made to the above-referenced plans after MWD approval, submit One (1) Full-Size copy and Two (2) 11 x 17 of the finalized drawing to MWD for its records.
____ No further drawings are required.

MWD COMMENTS: PLEASE SEE ATTACHED MWD COMMENTS.

Should you have any questions or comments, please contact me at MWD at (623) 546-8266.

KKK / GV / DB / JL / OU / BK / CC / JO / VV / PJH / FILE

MCDOT - PEORIA AVE CORRIDOR IMPROVEMENT STUDY
JACKRABBIT TRAIL TO REEMS ROAD
ALTERNATIVE ALIGNMENTS
Prepared by MCDOT; Dated 12/14/10; Job No. 60181526

MWD Review Comments – March 9, 2011

FILE COPY

GENERAL:
MWD has reviewed these plans and has determined that all Alternatives would have a significant impact on MWD Facilities and/or Property Interests along Peoria Ave from the Beardsley Canal to Reems Road. In an effort to help you better understand our comments set forth in the Agency Evaluation Matrix, these comments are MWD's factual and technical comments regarding our MWD wells and irrigations facilities as set forth in:

JACKRABBIT TRAIL TO BEARDSLEY CANAL:
ALTERNATIVE 1
- This Alternative reflects MCDOT acquiring property on the North and South sides of Peoria Ave., which will impact the following MWD Property Interests and Facilities:
  - MWD's 75' Beardsley Canal Fee Title, located in Section 21-3N-2W and Section 28-3N-2W;

ALTERNATIVE 2
- Same comments as given for Alternative 1.

BEARDSLEY CANAL TO PERRYVILLE ROAD:
ALTERNATIVE 1
- Along with MCDOT acquiring property on the North and South sides of Peoria Ave. at the Beardsley Canal, this Alternative also reflects the proposed Right of Way alignment impacting the following MWD Property Interests and Facilities:
  - MWD's 75' Beardsley Canal and Fee Title Property, located in Section 21-3N-2W and Section 28-3N-2W; and Turnout Structure located at the Beardsley Canal along the South side of Peoria Ave. in Section 28-3N-2W
  - MWD's Lateral 8 and Flow Measuring Structure, located adjacent to the Beardsley Canal along the South side of Peoria Ave. in Section 28-3N-2W;

PERRYVILLE ROAD TO CITRUS ROAD:
ALTERNATIVE 1
- This Alternative reflects MCDOT acquiring property on the North and South sides of Peoria Ave., which impacts the following MWD Property Interests and Facilities:
  - MWD's Lateral 8 ROW and Concrete Ditch, located along the South side of Peoria Ave;
  - MWD's Lateral 8 Easement, Turnout Structure and Pipeline, located along the South side of Peoria Ave;
  - MWD's Lateral 8 Sublateral B ROW, located at the North Quarter Corner of Section 27-3N-2W;
  - MWD's Well 8-27 and Fee Title property, located in the Northwest Quarter of the Northeast Quarter of Section 27-3N-2W;
  - MWD's Well 8-27E and Fee Title property, located in the Northeast Corner of Section 27-3N-2W;

ALTERNATIVE 2
- Same comments as given for Alternative 1.

ALTERNATIVE 3
- This Alternative reflects MCDOT acquiring property on the North and South sides of Peoria Ave., which impacts the following MWD Property Interests and Facilities:
  - MWD's Well 8-27 and Fee Title property, located in the Northwest Quarter of the Northeast Quarter of Section 27-3N-2W;
  - MWD's Well 8-27E and Fee Title property, located in the Northeast Corner of Section 27-3N-2W;

<u>CITRUS ROAD TO COTTON LANE:</u>
ALTERNATIVE 1
- This Alternative reflects MCDOT acquiring property to the North and South sides of Peoria Ave., which impacts the following MWD Property Interests and Facilities:
  - MWD's 40' Crosscut Easement and Ditch, located at the Northwest Corner of Citrus Rd & Peoria Ave;
  - MWD's Lateral 8 ROW, Ditch and Turnout Structure, located along the South Side of Peoria;
  - MWD's Well 8-26 and Fee Title property, located at the North Quarter Corner of Section 26-3N-2W;
  - MWD's Lateral 8 Sublateral D ROW and Concrete Ditch, located along the North-South Midsection Line of Section 26-3N-2W

ALTERNATIVE 2
- Same comments as given for Alternative 1.

ALTERNATIVE 3
- Same comments as given for Alternative 1 & 2

<u>COTTON LANE TO SARIVAL ROAD:</u>
ALTERNATIVE 1
- This Alternative reflects MCDOT acquiring property on the North and South sides of Peoria Ave., which appears to impact the following MWD Property Interests and Facilities:
  - MWD's 20' Lateral 8 Sublateral E ROW; located on the East side and running parallel of Cotton Lane;
  - MWD's 10' Lateral 8 Sublateral E Extension Fee Title, Concrete Ditch and Turnout Structure, located along the East side and running parallel of Cotton Lane;
  - MWD's 20' Lateral 8 ROW, Ditch and Turnout Structures, located along the South Side of Peoria;
  - MWD's Lateral 8 Sublateral D ROW and Concrete Ditch, located along the North-South Midsection Line of Section 25-3N-2W
  - MWD's Lateral 8 Sublateral F ROW and Concrete Ditch, located on the East side of the North-South Mid-Section Line in Section 25-3N-2W.
  - MWD's Well 8-25 and Fee Title property, located at the North Quarter Corner of Section 25-3N-2W. However, please be advised that this well will be relocated due to ADOT's proposed SR303 improvements at Peoria Ave and the amount of impacts are not determined at this time.

ALTERNATIVE 2
- Same comments as given for Alternative 1.

ALTERNATIVE 3
- While the Right Of Way Acquisition, reflected on this Alternative, does not appear to impact MWD's Facilities and Property Interests, any future road improvements that are within the Existing Right of Way would likely impact MWD's Facilities and Property Interests along the south side of Peoria Ave.

<u>SARIVAL ROAD TO REEMS ROAD:</u>
ALTERNATIVE 1
- This Alternative reflects MCDOT acquiring property on the North and South sides of Peoria Ave., which may negatively impact the following MWD Property Interests and Facilities:
  - MWD's 20' Lateral 8 ROW, located along the South side of Peoria Ave in the Northwest Quarter of Section 30-3N-2W.
  - MWD's 33' Romola Ltd Fee and lateral 9 Concrete Ditch, located along the South side of Peoria Ave in the Northeast Quarter of Section 30-3N-2W.
  - MWD's 12' Easement, Pipeline and Turnout Structures, located along the South side of Peoria Ave.;
  - MWD's 40' Lateral 8 Sublateral H Easement, located along the North-South Mid-Section Line of Section 30-3N-2W.

ALTERNATIVE 2
- Same comments as given for Alternative 1.

ALTERNATIVE 3
- Same comments as given for Alternative 1 & 2.

Appendix C:
Cost Estimates

Summary

Project Name: Peoria Ave
Termini: Jackrabbit Trail to Perryville Rd

2010 SUMMARY COST ESTIMATES (Current Dollars)

COST CATEGORIES	Factors	No Build	Alternative 1	Alternative 2
Construction		$ -	$ 7,750,951.56	$ -
Design (10% TO 15%)	12%	$ -	$ 930,114.19	$ -
Construction Management	15%	$ -	$ 1,162,642.73	$ -
Right-of-Way		$ -	$ 4,390,000.00	$ -
Structures		$ -	$ 306,170.00	$ -
Utility Relocation		$ -	$ 442,329.13	$ -
Administration (8% TO 13%)	10%	$ -	$ 775,095.16	$ -
Total		**$ -**	**$ 15,757,302.77**	**$ -**

PRELIMINARY SUMMARY COST ESTIMATES (Adjusted for Inflation)

Assumed Annual Inflation Rate = 3.50%
Assumed Number of Years = 5

Adjusted Construction Cost	$ -	$ 9,205,699.02	$ -
Design	$ -	$ 1,104,683.88	$ -
Construction Management	$ -	$ 1,380,854.85	$ -
Right-of-Way	$ -	$ 5,213,942.88	$ -
Structures	$ -	$ 363,633.92	$ -
Utility Relocation	$ -	$ 525,348.25	$ -
Administration	$ -	$ 920,569.90	$ -
Adjusted Total	**$ -**	**$ 18,714,732.71**	**$ -**

Road Construction

Project Name: Peoria Ave
Termini: Jackrabbit Trail to Perryville Rd

Alternative:				
Item Description	**Unit**	**Quantity**	**Unit Cost**	**Total**
N.P.D.E.S.	Lump Sum	1	$ 31,858.71	$ 31,858.71
Community Relations	Allowance	1	$ 12,790.30	$ 12,790.30
Engineer's Field Office	Lump Sum	1	$ 139,708.51	$ 139,708.51
Roadway Excavation	C YD	39,900	$ 4.26	$ 170,012.37
Borrow Excavation (if anticipated)	C YD	90,375	$ 8.37	$ 756,614.01
Channel & Retention Basin Excavation	C YD		$ 2.88	$ -
Subgrade Preparation	SQ YD	72,969	$ 1.59	$ 116,378.77
New Asphalt Concrete Pavement (see Pavement sheet)	SQ YD	0	$ 13.85	$ -
New Rubberized Asphalt Pavement (see Pavement sheet)	SQ YD	72,969	$ 19.45	$ 1,419,249.21
Asphalt Rubber Overlay (see Pavement sheet)	SQ YD	0	$ 7.70	$ -
Chip Seal on AC Pavement (see Pavement sheet)	SQ YD	0	$ 2.65	$ -
Double Chip Seal on Aggregate Base (see Pavement sheet)	SQ YD	0	$ 4.90	$ -
Concrete Single Curb	LF	15,865	$ 14.42	$ 228,766.91
Concrete Curb & Gutter	LF	16,091	$ 12.36	$ 198,864.16
Concrete Sidewalk Ramp Std Det 231, Type "A"	EA	8	$ 1,522.65	$ 12,181.19
Concrete Sidewalk Std Det 230	SQ YD	10,727	$ 50.41	$ 540,746.28
Concrete Driveway with 5' Wings, Std Det 250	SQ YD	289	$ 27.28	$ 7,881.39
Traffic Signing & Striping - 2 lanes	LF	0	$ 2.41	$ -
Traffic Signing & Striping - 5 lanes	LF	0	$ 4.58	$ -
Traffic Signing & Striping - 7 lanes	LF	8,100	$ 4.85	$ 39,265.21
Traffic Signal, Full Intersection	EA	2	$ 494,973.19	$ 989,946.39
Interconnect/Traffic Signals	LF	8,100	$ 9.47	$ 76,735.14
Traffic Signal, Future "Box-in"	EA	2	$ 6,049.47	$ 12,098.94
Catch Basin	EA	2	$ 6,631.89	$ 13,263.78
Scupper	EA		$ 5,001.54	$ -
Drywell	EA		$ 41,998.26	$ -
Storm Drain System (retention basin option)	Mile		$ 816,688.61	$ -
18" CMP and smaller	LF		$ 57.51	$ -
24" CMP	LF		$ 78.02	$ -
30" CMP	LF		$ 116.44	$ -
36" CMP	LF		$ 122.02	$ -
42" CMP	LF		$ 103.53	$ -
54" CMP	LF		$ 231.91	$ -
60" CMP	LF		$ 318.29	$ -
18" & 24" RGRCP, Class III	LF		$ 95.00	$ -
30" & 36" RGRCP, Class III	LF		$ 105.00	$ -
42" & 48" RGRCP, Class III	LF	500	$ 154.00	$ 77,000.00
54" & 60" RGRCP, Class III	LF	1,322	$ 230.00	$ 304,060.00
54" & 60" Storm Drain Manhole	EA	3	$ 4,137.04	$ 12,411.12
Headwall (MAG details)	EA	0	$ 5,941.91	$ -
Irrigation Junction Box (MAG details)	EA		$ -	$ -
Concrete Slip Form Irrigation Ditch	LF		$ 52.58	$ -
Earth Irrigation Ditch/Special Drainage Ditch, 6' Top	LF		$ 4.57	$ -
Box Culvert (see Structure sheet)	LS		$ 306,170.00	$ 306,170.00
Irrigation Structure with Gates	EA	0	$ 2,789.56	$ -
Bridge < 100' (see Structure sheet)	SF		$ -	$ -
Bridge >= 100' (see Structure sheet)	SF		$ -	$ -
Guardrail without Approach End Section	LF	0	$ 47.71	$ -
Guardrail Approach End Section, New ADOT Type	EA	0	$ 2,558.97	$ -
Median Fine Grading, Pre-emergent, & D.G.	SQ YD	16,723	$ 27.50	$ 459,801.89
8' Masonry Soundwall**	LF	0	$ 85.00	$ -
Concrete Soundwall**	SQ YD	0	$ 431.00	$ -
	Subtotal			$ 5,925,804.30
Removal of Existing Improvements @ 2%	Lump Sum	1	$ 118,516.00	$ 118,516.00
Mobilization/Demobilization @ 4%	Lump Sum	1	$ 237,032.00	$ 237,032.00
Traffic Control @ 3%	Lump Sum	1	$ 177,774.00	$ 177,774.00
	SUBTOTAL Construction			$ 6,459,126.30
	Contingency		20%	$ 1,291,825.26
	TOTAL			**$ 7,750,951.56**

**Calculated current costs for the 8' Masonry Soundwall and Concrete Soundwall items above were not available in the current projects and therefore they were calculated using the ADOT construction cost 2008 - 2010 projects.

***Pavement Sawcut Removed as pay item

6/18/2011

Structures

Project Name: Peoria Ave
Termini: Jackrabbit Trail to Perryville Rd

BOX CULVERT COST CALCULATIONS

TYPE OF ROAD	BOX LENGTH (ft)	BOX DESCRIPTION	BOX WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	0		0	0.00	SQ FT	$ 85.00	$0.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	160	H=6	10	1,600.00	SQ FT	$ 85.00	$136,000.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	143	H=6	14	2,002.00	SQ FT	$ 85.00	$170,170.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)				0.00	SQ FT	$52.00	$0.00
							$306,170.00

* Top surface area of box.
** Includes cost of standard wing walls and bridge barrier. For special construction review unit cost with MCDOT bridge section.
*** 16 m box with approval only. Generally a non-section line, low volume location.
Cost in Red is from FY 2006 as there was not any new data available for FY 2010

BRIDGE COST CALCULATIONS

TYPE OF ROAD	BRIDGE LENGTH (ft)	DESCRIPTION	BRIDGE WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	0		89.58	0	SQ FT	$ 190.00	$0.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		94.49	0	SQ FT	$ 190.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		104.33	0	SQ FT	$ 190.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		52.49	0	SQ FT	$ 190.00	$0.00
						<100' Long	$0.00
						>=100' Long	$0.00

* Top surface area of bridge.
** Cost includes bridge railings, barriers, approach slabs, piers, and other items used in bridge construction.
Note: Show cost of channel excavation and other bridge site work on Road Construction Sheet.
*** 16 m bridge with approval only. Generally a non-section line, low volume location.

6/18/2011

Utility Relocation

Project Name: Peoria Ave
Termini: Jackrabbit Trail to Perryville Rd

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Relocate 12 kv Wood Pole (Tangent)	EA		$5,000.00	
Relocate 12 kv Wood Pole (Dead-End)	EA		$7,000.00	
Relocate 69 kv Wood Pole (Tangent)	EA		$18,000.00	
Relocate 69 kv Steel Pole (Tangent)	EA		$20,000.00	
Relocate 69 kv Wood Pole (Dead-End)	EA		$38,000.00	
Relocate 69 kv Steel Pole (Dead-End)	EA		$40,000.00	
Other Poles associated w/ 69kv Power Line	EA		$8,400.00	
Railroad Crossing	EA		$650,000.00	
Irrigation (See Irrigation sheet)			$368,607.61	$368,607.61
Subtotal Construction				$368,607.61
Contingency			20%	$73,721.52
Total				$442,329.13

Irrigation

Project Name: Peoria Ave
Termini: Jackrabbit Trail to Perryville Rd

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Mobilization	LS	1	$5,398.49	$5,398.49
Clearing, Grubbing and Site Clean Up	EA	1	$5,398.49	$5,398.49
Irrigation Structure w/ Gates, Medium	EA	0	$70,911.55	$0.00
Irrigation Structure w/ Gates, Large	EA		$129,596.98	
24" RGRCP	LF		$95.00	$0.00
30" & 36" RGRCP	LF	2,600	$105.00	$273,000.00
42" & 48" RGRCP	LF		$154.00	$0.00
54" & 60" RGRCP	LF		$230.00	$0.00
Headwall w/ Trash Rack	EA	1	$14,426.83	$14,426.83
Headwall	EA		$10,025.43	$0.00
Manhole	EA	5	$7,091.16	$36,874.01
Remove Existing Structures	LS		$30,809.85	$0.00
Concrete Lined Ditch	LF		$106.37	$0.00
Well Site Relocation	EA	0	$750,000.00	$0.00
Catch Basin	EA			$0.00
Subtotal Construction				$335,097.83
Irrigation System Design			10%	$33,509.78
Total SRP Relocation Estimate				$368,607.61
****Note: English units used per SRP standards***				

Summary

Project Name: Peoria Ave
Termini: Perryville Rd to SR 303L

2010 SUMMARY COST ESTIMATES (Current Dollars)				
COST CATEGORIES	**Factors**	**No Build**	**Alternative 1**	**Alternative 2**
Construction		$ -	$ 13,694,691.31	$ -
Design (10% TO 15%)	12%	$ -	$ 1,643,362.96	$ -
Construction Management	15%	$ -	$ 2,054,203.70	$ -
Right-of-Way		$ -	$ 4,540,000.00	$ -
Structures		$ -	$ 1,567,825.00	$ -
Utility Relocation		$ -	$ 7,378,699.75	$ -
Administration (8% TO 13%)	10%	$ -	$ 1,369,469.13	$ -
Total		**$ -**	**$ 32,248,251.85**	**$ -**

PRELIMINARY SUMMARY COST ESTIMATES (Adjusted for Inflation)

Assumed Annual Inflation Rate = 3.50%
Assumed Number of Years = 5

Adjusted Construction Cost	$ -	$ 16,264,997.33	$ -
Design	$ -	$ 1,951,799.68	$ -
Construction Management	$ -	$ 2,439,749.60	$ -
Right-of-Way	$ -	$ 5,392,095.83	$ -
Structures	$ -	$ 1,862,084.28	$ -
Utility Relocation	$ -	$ 8,763,580.65	$ -
Administration	$ -	$ 1,626,499.73	$ -
Adjusted Total	**$ -**	**$ 38,300,807.10**	**$ -**

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Road Construction

Project Name: Peoria Ave
Termini: Perryville Rd to SR 303L

Alternative:				
Item Description	**Unit**	**Quantity**	**Unit Cost**	**Total**
N.P.D.E.S.	Lump Sum	1	$ 31,858.71	$ 31,858.71
Community Relations	Allowance	1	$ 12,790.30	$ 12,790.30
Engineer's Field Office	Lump Sum	1	$ 139,708.51	$ 139,708.51
Roadway Excavation	C YD	96,019	$ 4.26	$ 409,131.22
Borrow Excavation (if anticipated)	C YD	90,421	$ 8.37	$ 757,001.60
Channel & Retention Basin Excavation	C YD	47,223	$ 2.88	$ 136,050.29
Subgrade Preparation	SQ YD	138,553	$ 1.59	$ 220,978.65
New Asphalt Concrete Pavement (see Pavement sheet)	SQ YD	0	$ 13.85	$ -
New Rubberized Asphalt Pavement (see Pavement sheet)	SQ YD	138,553	$ 19.45	$ 2,694,853.69
Asphalt Rubber Overlay (see Pavement sheet)	SQ YD	0	$ 7.70	$ -
Chip Seal on AC Pavement (see Pavement sheet)	SQ YD	0	$ 2.65	$ -
Double Chip Seal on Aggregate Base (see Pavement sheet)	SQ YD	0	$ 4.90	$ -
Concrete Single Curb	LF	24,795	$ 14.42	$ 357,533.92
Concrete Curb & Gutter	LF	34,635	$ 12.36	$ 428,044.27
Concrete Sidewalk Ramp Std Det 231, Type "A"	EA	40	$ 1,522.65	$ 60,905.94
Concrete Sidewalk Std Det 230	SQ YD	17,212	$ 50.41	$ 867,627.09
Concrete Driveway with 5' Wings, Std Det 250	SQ YD	722	$ 27.28	$ 19,703.49
Traffic Signing & Striping - 2 lanes	LF	0	$ 2.41	$ -
Traffic Signing & Striping - 5 lanes	LF	0	$ 4.58	$ -
Traffic Signing & Striping - 7 lanes	LF	13,075	$ 4.85	$ 63,381.81
Traffic Signal, Full Intersection	EA	5	$ 494,973.19	$ 2,474,865.97
Interconnect/Traffic Signals	LF	13,075	$ 9.47	$ 123,865.67
Traffic Signal, Future "Box-in"	EA	5	$ 6,049.47	$ 30,247.36
Catch Basin	EA	44	$ 6,631.89	$ 291,803.24
Scupper	EA		$ 5,001.54	$ -
Drywell	EA		$ 41,998.26	$ -
Storm Drain System (retention basin option)	Mile		$ 816,688.61	$ -
18" CMP and smaller	LF		$ 57.51	$ -
24" CMP	LF		$ 78.02	$ -
30" CMP	LF		$ 116.44	$ -
36" CMP	LF	300	$ 122.02	$ 36,606.04
42" CMP	LF		$ 103.53	$ -
54" CMP	LF		$ 231.91	$ -
60" CMP	LF		$ 318.29	$ -
72" CMP	LF	660		
18" & 24" RGRCP, Class III	LF	2,592	$ 95.00	$ 246,240.00
30" & 36" RGRCP, Class III	LF		$ 105.00	$ -
42" & 48" RGRCP, Class III	LF	0	$ 154.00	$ -
54" & 60" RGRCP, Class III	LF	0	$ 230.00	$ -
54" & 60" Storm Drain Manhole	EA	0	$ 4,137.04	$ -
Headwall (MAG details)	EA		$ 5,941.91	$ -
Irrigation Junction Box (MAG details)	EA		$ -	$ -
Concrete Slip Form Irrigation Ditch	LF		$ 52.58	$ -
Earth Irrigation Ditch/Special Drainage Ditch, 6' Top	LF		$ 4.57	$ -
Box Culvert (see Structure sheet)	LS		$ 1,567,825.00	$ -
Irrigation Structure with Gates	EA		$ 2,789.56	$ -
Bridge < 100' (see Structure sheet)	SF		$ -	$ -
Bridge >= 100' (see Structure sheet)	SF		$ -	$ -
Guardrail without Approach End Section	LF	0	$ 47.71	$ -
Guardrail Approach End Section, New ADOT Type	EA	0	$ 2,558.97	$ -
Median Fine Grading, Pre-emergent, & D.G.	SQ YD	18,338	$ 27.50	$ 504,220.00
8' Masonry Soundwall**	LF	6,618	$ 85.00	$ 562,530.00
Concrete Soundwall**	SQ YD	0	$ 431.00	$ -
	Subtotal			$ 10,469,947.76
Removal of Existing Improvements @ 2%	Lump Sum	1	$ 209,399.00	$ 209,399.00
Mobilization/Demobilization @ 4%	Lump Sum	1	$ 418,798.00	$ 418,798.00
Traffic Control @ 3%	Lump Sum	1	$ 314,098.00	$ 314,098.00
	SUBTOTAL Construction			$ 11,412,242.76
	Contingency		20%	$ 2,282,448.55
	TOTAL			**$ 13,694,691.31**

**Calculated current costs for the 8' Masonry Soundwall and Concrete Soundwall items above were not available in the current projects and therefore they were calculated using the ADOT construction cost 2008 - 2010 projects.
***Pavement Sawcut Removed as pay item

6/18/2011

Structures

Project Name: Peoria Ave
Termini: Perryville Rd to SR 303L

BOX CULVERT COST CALCULATIONS

TYPE OF ROAD	BOX LENGTH (ft)	BOX DESCRIPTION	BOX WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS	150	H=4	36	5,400.00	SQ FT	$ 85.00	$459,000.00
(27 m or 88.58' for 5 lanes & 2 sidewalks)	65	H=4	36	2,340.00	SQ FT	$ 85.00	$198,900.00
URBAN MINOR ARTERIAL W/ BIKE LANES	135	H=4	30	4,050.00	SQ FT	$ 85.00	$344,250.00
(28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	115	H=4	5	575.00	SQ FT	$ 85.00	$48,875.00
URBAN MAJOR ARTERIAL	190	H=4	32	6,080.00	SQ FT	$ 85.00	$516,800.00
(31.8 m or 104.33' for 7 lanes & 2 S/W's)							
SPECIAL LOW VOLUME ROAD CONDITION***				0.00	SQ FT	$52.00	$0.00
(16 m or 52.49' for 2 lanes with shoulders)							
							$1,567,825.00

* Top surface area of box.
** Includes cost of standard wing walls and bridge barrier. For special construction review unit cost with MCDOT bridge section.
*** 16 m box with approval only. Generally a non-section line, low volume location.
Cost in Red is from FY 2006 as there was not any new data available for FY 2010

BRIDGE COST CALCULATIONS

TYPE OF ROAD	BRIDGE LENGTH (ft)	DESCRIPTION	BRIDGE WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS	0		89.58	0	SQ FT	$ 190.00	$0.00
(27 m or 88.58' for 5 lanes & 2 sidewalks)							
URBAN MINOR ARTERIAL W/ BIKE LANES	0		94.49	0	SQ FT	$ 190.00	$0.00
(28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)							
URBAN MAJOR ARTERIAL	0		104.33	0	SQ FT	$ 190.00	$0.00
(31.8 m or 104.33' for 7 lanes & 2 S/W's)							
SPECIAL LOW VOLUME ROAD CONDITION***	0		52.49	0	SQ FT	$ 190.00	$0.00
(16 m or 52.49' for 2 lanes with shoulders)							
						<100' Long	$0.00
						>=100' Long	$0.00

* Top surface area of bridge.
** Cost includes bridge railings, barriers, approach slabs, piers, and other items used in bridge construction.
Note: Show cost of channel excavation and other bridge site work on Road Construction Sheet.
*** 16 m bridge with approval only. Generally a non-section line, low volume location.

Utility Relocation

Project Name: Peoria Ave
Termini: Perryville Rd to SR 303L

Alternative:

Item Description	*Unit*	*Quantity*	*Unit Cost*	*Total*
Relocate 12 kv Wood Pole (Tangent)	EA	35.00	$5,000.00	$175,000.00
Relocate 12 kv Wood Pole (Dead-End)	EA		$7,000.00	
Relocate 69 kv Wood Pole (Tangent)	EA	1	$18,000.00	$18,000.00
Relocate 69 kv Steel Pole (Tangent)	EA		$20,000.00	
Relocate 69 kv Wood Pole (Dead-End)	EA		$38,000.00	
Relocate 69 kv Steel Pole (Dead-End)	EA		$40,000.00	
Other Poles associated w/ 69kv Power Line	EA		$8,400.00	
Railroad Crossing	EA		$650,000.00	
Irrigation (See Irrigation sheet)			$5,955,916.46	$5,955,916.46
Subtotal Construction				$6,148,916.46
Contingency			20%	$1,229,783.29
Total				$7,378,699.75

Irrigation

Project Name: Peoria Ave
Termini: Perryville Rd to SR 303L

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Mobilization	LS	1	$5,398.49	$5,398.49
Clearing, Grubbing and Site Clean Up	EA	1	$5,398.49	$5,398.49
Irrigation Structure w/ Gates, Medium	EA	1	$70,911.55	$70,911.55
Irrigation Structure w/ Gates, Large	EA		$129,596.98	
24" RGRCP	LF		$95.00	$0.00
30" & 36" RGRCP	LF	13,075	$105.00	$1,372,875.00
42" & 48" RGRCP	LF	0	$154.00	$0.00
54" & 60" RGRCP	LF	0	$230.00	$0.00
Headwall w/ Trash Rack	EA	1	$14,426.83	$14,426.83
Headwall	EA	1	$10,025.43	$10,025.43
Manhole	EA	26	$7,091.16	$185,433.71
Remove Existing Structures	LS		$30,809.85	$0.00
Concrete Lined Ditch	LF		$106.37	$0.00
Well Site Relocation	EA	5	$750,000.00	$3,750,000.00
Catch Basin	EA			$0.00
Subtotal Construction				$5,414,469.51
Irrigation System Design			10%	$541,446.95
Total SRP Relocation Estimate				$5,955,916.46
***Note: English units used per SRP standards**				

6/18/2011

Summary

Project Name: Peoria Ave
Termini: SR 303L to Bullard Ave

2010 SUMMARY COST ESTIMATES (Current Dollars)				
COST CATEGORIES	**Factors**	**No Build**	**Alternative 1**	**Alternative 2**
Construction		$ -	$ 11,829,148.14	$ -
Design (10% TO 15%)	12%	$ -	$ 1,419,497.78	$ -
Construction Management	15%	$ -	$ 1,774,372.22	$ -
Right-of-Way		$ -	$ 2,090,000.00	$ -
Structures		$ -	$ 555,900.00	$ -
Utility Relocation		$ -	$ 6,166,504.30	$ -
Administration (8% TO 13%)	10%	$ -	$ 1,182,914.81	$ -
Total		**$ -**	**$ 25,018,337.25**	**$ -**

PRELIMINARY SUMMARY COST ESTIMATES (Adjusted for Inflation)

Assumed Annual Inflation Rate = 3.50%
Assumed Number of Years = 5

Adjusted Construction Cost	$ -	$ 14,049,317.25	$ -
Design	$ -	$ 1,685,918.07	$ -
Construction Management	$ -	$ 2,107,397.59	$ -
Right-of-Way	$ -	$ 2,482,264.38	$ -
Structures	$ -	$ 660,234.82	$ -
Utility Relocation	$ -	$ 7,323,872.72	$ -
Administration	$ -	$ 1,404,931.72	$ -
Adjusted Total	**$ -**	**$ 29,713,936.54**	**$ -**

6/18/2011

Road Construction

Project Name: Peoria Ave
Termini: SR 303L to Bullard Ave

Alternative:				
Item Description	**Unit**	**Quantity**	**Unit Cost**	**Total**
N.P.D.E.S.	Lump Sum	1	$ 31,858.71	$ 31,858.71
Community Relations	Allowance	1	$ 12,790.30	$ 12,790.30
Engineer's Field Office	Lump Sum	1	$ 139,708.51	$ 139,708.51
Roadway Excavation	C YD	61,335	$ 4.26	$ 261,345.29
Borrow Excavation (if anticipated)	C YD	30,000	$ 8.37	$ 251,158.18
Channel & Retention Basin Excavation	C YD	1,429	$ 2.88	$ 4,115.56
Subgrade Preparation	SQ YD	120,700	$ 1.59	$ 192,504.46
New Asphalt Concrete Pavement (see Pavement sheet)	SQ YD	0	$ 13.85	$ -
New Rubberized Asphalt Pavement (see Pavement sheet)	SQ YD	120,700	$ 19.45	$ 2,347,608.52
Asphalt Rubber Overlay (see Pavement sheet)	SQ YD	0	$ 7.70	$ -
Chip Seal on AC Pavement (see Pavement sheet)	SQ YD	0	$ 2.65	$ -
Double Chip Seal on Aggregate Base (see Pavement sheet)	SQ YD	0	$ 4.90	$ -
Concrete Single Curb	LF	23,294	$ 14.42	$ 335,890.10
Concrete Curb & Gutter	LF	24,438	$ 12.36	$ 302,022.40
Concrete Sidewalk Ramp Std Det 231, Type "A"	EA	28	$ 1,522.65	$ 42,634.16
Concrete Sidewalk Std Det 230	SQ YD	16,292	$ 50.41	$ 821,251.49
Concrete Driveway with 5' Wings, Std Det 250	SQ YD	722	$ 27.28	$ 19,703.49
Traffic Signing & Striping - 2 lanes	LF	0	$ 2.41	$ -
Traffic Signing & Striping - 5 lanes	LF	0	$ 4.58	$ -
Traffic Signing & Striping - 7 lanes	LF	12,300	$ 4.85	$ 59,624.95
Traffic Signal, Full Intersection	EA	4	$ 494,973.19	$ 1,979,892.78
Interconnect/Traffic Signals	LF	12,300	$ 9.47	$ 116,523.73
Traffic Signal, Future "Box-in"	EA	5	$ 6,049.47	$ 30,247.36
Catch Basin	EA	6	$ 6,631.89	$ 39,791.35
Scupper	EA		$ 5,001.54	$ -
Drywell	EA		$ 41,998.26	$ -
Storm Drain System (retention basin option)	Mile		$ 816,688.61	$ -
18" CMP and smaller	LF		$ 57.51	$ -
24" CMP	LF		$ 78.02	$ -
30" CMP	LF		$ 116.44	$ -
36" CMP	LF		$ 122.02	$ -
42" CMP	LF		$ 103.53	$ -
54" CMP	LF		$ 231.91	$ -
60" CMP	LF		$ 318.29	$ -
18" & 24" RGRCP, Class III	LF	143	$ 95.00	$ 13,585.00
30" & 36" RGRCP, Class III	LF		$ 105.00	$ -
42" & 48" RGRCP, Class III	LF		$ 154.00	$ -
54" & 60" RGRCP, Class III	LF	6,166	$ 230.00	$ 1,418,180.00
54" & 60" Storm Drain Manhole	EA	12	$ 4,137.04	$ 49,644.48
Headwall (MAG details)	EA		$ 5,941.91	$ -
Irrigation Junction Box (MAG details)	EA		$ -	$ -
Concrete Slip Form Irrigation Ditch	LF		$ 52.58	$ -
Earth Irrigation Ditch/Special Drainage Ditch, 6' Top	LF		$ 4.57	$ -
Box Culvert (see Structure sheet)	LS		$ 555,900.00	$ -
Irrigation Structure with Gates	EA		$ 2,789.56	$ -
Bridge < 100' (see Structure sheet)	SF		$ -	$ -
Bridge >= 100' (see Structure sheet)	SF		$ -	$ -
Guardrail without Approach End Section	LF	0	$ 47.71	$ -
Guardrail Approach End Section, New ADOT Type	EA	0	$ 2,558.97	$ -
Median Fine Grading, Pre-emergent, & D.G.	SQ YD	19,378	$ 27.50	$ 532,809.64
8' Masonry Soundwall**	LF	480	$ 85.00	$ 40,800.00
Concrete Soundwall**	SQ YD	0	$ 431.00	$ -
	Subtotal			$ 9,043,690.45
Removal of Existing Improvements @ 2%	Lump Sum	1	$ 180,874.00	$ 180,874.00
Mobilization/Demobilization @ 4%	Lump Sum	1	$ 361,748.00	$ 361,748.00
Traffic Control @ 3%	Lump Sum	1	$ 271,311.00	$ 271,311.00
SUBTOTAL Construction				$ 9,857,623.45
	Contingency		20%	$ 1,971,524.69
	TOTAL			**$ 11,829,148.14**

**Calculated current costs for the 8' Masonry Soundwall and Concrete Soundwall items above were not available in the current projects and therefore they were calculated using the ADOT construction cost 2008 - 2010 projects.

***Pavement Sawcut Removed as pay item

6/18/2011

Structures

Project Name: Peoria Ave
Termini: SR 303L to Bullard Ave

BOX CULVERT COST CALCULATIONS

TYPE OF ROAD	BOX LENGTH (ft)	BOX DESCRIPTION	BOX WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	130	H=6	24	3,120.00	SQ FT	$ 85.00	$265,200.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	31	H=6	60	1,860.00	SQ FT	$ 85.00	$158,100.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	130	H=3	12	1,560.00	SQ FT	$ 85.00	$132,600.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		0	0.00	SQ FT	$52.00	$0.00
							$555,900.00

* Top surface area of box.
** Includes cost of standard wing walls and bridge barrier. For special construction review unit cost with MCDOT bridge section.
*** 16 m box with approval only. Generally a non-section line, low volume location.
Cost in Red is from FY 2006 as there was not any new data available for FY 2010

BRIDGE COST CALCULATIONS

TYPE OF ROAD	BRIDGE LENGTH (ft)	DESCRIPTION	BRIDGE WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	0		89.58	0	SQ FT	$ 190.00	$0.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		94.49	0	SQ FT	$ 190.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		104.33	0	SQ FT	$ 190.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		52.49	0	SQ FT	$ 190.00	$0.00
						<100' Long	$0.00
						>=100' Long	$0.00

* Top surface area of bridge.
** Cost includes bridge railings, barriers, approach slabs, piers, and other items used in bridge construction.
Note: Show cost of channel excavation and other bridge site work on Road Construction Sheet.
*** 16 m bridge with approval only. Generally a non-section line, low volume location.

6/18/2011

Utility Relocation

Project Name: Peoria Ave
Termini: SR 303L to Bullard Ave

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Relocate 12 kv Wood Pole (Tangent)	EA	24.00	$5,000.00	$120,000.00
Relocate 12 kv Wood Pole (Dead-End)	EA		$7,000.00	
Relocate 69 kv Wood Pole (Tangent)	EA		$18,000.00	
Relocate 69 kv Steel Pole (Tangent)	EA		$20,000.00	
Relocate 69 kv Wood Pole (Dead-End)	EA		$38,000.00	
Relocate 69 kv Steel Pole (Dead-End)	EA		$40,000.00	
Other Poles associated w/ 69kv Power Line	EA		$8,400.00	
Railroad Crossing	EA		$650,000.00	
Irrigation (See Irrigation sheet)			$5,018,753.59	$5,018,753.59
Subtotal Construction				$5,138,753.59
Contingency			20%	$1,027,750.72
Total				$6,166,504.30

6/18/2011

Irrigation

Project Name: Peoria Ave
Termini: SR 303L to Bullard Ave

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Mobilization	LS	1	$5,398.49	$5,398.49
Clearing, Grubbing and Site Clean Up	EA	1	$5,398.49	$5,398.49
Irrigation Structure w/ Gates, Medium	EA	1	$70,911.55	$70,911.55
Irrigation Structure w/ Gates, Large	EA		$129,596.98	
24" RGRCP	LF		$95.00	$0.00
30" & 36" RGRCP	LF	12,300	$105.00	$1,291,500.00
42" & 48" RGRCP	LF		$154.00	$0.00
54" & 60" RGRCP	LF		$230.00	$0.00
Headwall w/ Trash Rack	EA	1	$14,426.83	$14,426.83
Headwall	EA		$10,025.43	$0.00
Manhole	EA	25	$7,091.16	$174,867.89
Remove Existing Structures	LS		$30,809.85	$0.00
Concrete Lined Ditch	LF		$106.37	$0.00
Well Site Relocation	EA	4	$750,000.00	$3,000,000.00
Catch Basin	EA			$0.00
Subtotal Construction				$4,562,503.26
Irrigation System Design			10%	$456,250.33
Total SRP Relocation Estimate				$5,018,753.59

***Note: English units used per SRP standards**

6/18/2011

Summary

Project Name: Peoria Ave
Termini: Bullard Ave to Dysart Rd

2010 SUMMARY COST ESTIMATES (Current Dollars)				
COST CATEGORIES	**Factors**	**No Build**	**Alternative 1**	**Alternative 2**
Construction		$ -	$ 10,543,606.21	$ -
Design (10% TO 15%)	12%	$ -	$ 1,265,232.74	$ -
Construction Management	15%	$ -	$ 1,581,540.93	$ -
Right-of-Way		$ -	$ 1,840,000.00	$ -
Structures		$ -	$ 576,300.00	$ -
Utility Relocation		$ -	$ 7,852,395.52	$ -
Administration (8% TO 13%)	10%	$ -	$ 1,054,360.62	$ -
Total		**$ -**	**$ 24,713,436.02**	**$ -**

PRELIMINARY SUMMARY COST ESTIMATES (Adjusted for Inflation)

Assumed Annual Inflation Rate = 3.50%
Assumed Number of Years = 5

Adjusted Construction Cost	$ -	$ 12,522,496.70	$ -
Design	$ -	$ 1,502,699.60	$ -
Construction Management	$ -	$ 1,878,374.51	$ -
Right-of-Way	$ -	$ 2,185,342.80	$ -
Structures	$ -	$ 684,463.62	$ -
Utility Relocation	$ -	$ 9,326,182.62	$ -
Administration	$ -	$ 1,252,249.67	$ -
Adjusted Total	**$ -**	**$ 29,351,809.53**	**$ -**

6/18/2011

Road Construction

Project Name: Peoria Ave
Termini: Bullard Ave to Dysart Rd

Alternative:				
Item Description	**Unit**	**Quantity**	**Unit Cost**	**Total**
N.P.D.E.S.	Lump Sum	1	$ 31,858.71	$ 31,858.71
Community Relations	Allowance	1	$ 12,790.30	$ 12,790.30
Engineer's Field Office	Lump Sum	1	$ 139,708.51	$ 139,708.51
Roadway Excavation	C YD	49,279	$ 4.26	$ 209,973.88
Borrow Excavation (if anticipated)	C YD	68,465	$ 8.37	$ 573,183.27
Channel & Retention Basin Excavation	C YD	5,378	$ 2.88	$ 15,493.47
Subgrade Preparation	SQ YD	103,065	$ 1.59	$ 164,379.20
New Asphalt Concrete Pavement (see Pavement sheet)	SQ YD	0	$ 13.85	$ -
New Rubberized Asphalt Pavement (see Pavement sheet)	SQ YD	103,065	$ 19.45	$ 2,004,618.57
Asphalt Rubber Overlay (see Pavement sheet)	SQ YD	0	$ 7.70	$ -
Chip Seal on AC Pavement (see Pavement sheet)	SQ YD	0	$ 2.65	$ -
Double Chip Seal on Aggregate Base (see Pavement sheet)	SQ YD	0	$ 4.90	$ -
Concrete Single Curb	LF	19,896	$ 14.42	$ 286,892.31
Concrete Curb & Gutter	LF	20,926	$ 12.36	$ 258,618.57
Concrete Sidewalk Ramp Std Det 231, Type "A"	EA	36	$ 1,522.65	$ 54,815.35
Concrete Sidewalk Std Det 230	SQ YD	13,951	$ 50.41	$ 703,228.93
Concrete Driveway with 5' Wings, Std Det 250	SQ YD	578	$ 27.28	$ 15,762.79
Traffic Signing & Striping - 2 lanes	LF	0	$ 2.41	$ -
Traffic Signing & Striping - 5 lanes	LF	0	$ 4.58	$ -
Traffic Signing & Striping - 7 lanes	LF	10,500	$ 4.85	$ 50,899.35
Traffic Signal, Full Intersection	EA	4.5	$ 494,973.19	$ 2,227,379.38
Interconnect/Traffic Signals	LF	10,500	$ 9.47	$ 99,471.48
Traffic Signal, Future "Box-in"	EA	4	$ 6,049.47	$ 24,197.89
Catch Basin	EA	10	$ 6,631.89	$ 66,318.92
Scupper	EA		$ 5,001.54	$ -
Drywell	EA		$ 41,998.26	$ -
Storm Drain System (retention basin option)	Mile		$ 816,688.61	$ -
18" CMP and smaller	LF		$ 57.51	$ -
24" CMP	LF		$ 78.02	$ -
30" CMP	LF		$ 116.44	$ -
36" CMP	LF	40	$ 122.02	$ 4,880.81
42" CMP	LF		$ 103.53	$ -
54" CMP	LF		$ 231.91	$ -
60" CMP	LF		$ 318.29	$ -
18" & 24" RGRCP, Class III	LF	526	$ 95.00	$ 49,970.00
30" & 36" RGRCP, Class III	LF		$ 105.00	$ -
42" & 48" RGRCP, Class III	LF		$ 154.00	$ -
54" & 60" RGRCP, Class III	LF	1,688	$ 230.00	$ 388,240.00
72" RGRCP, Class III	LF	750	$ 318.29	$ 238,717.08
54" & 60" Storm Drain Manhole	EA	4	$ 4,137.04	$ 16,548.16
Headwall (MAG details)	EA		$ 5,941.91	$ -
Irrigation Junction Box (MAG details)	EA		$ -	$ -
Concrete Slip Form Irrigation Ditch	LF		$ 52.58	$ -
Earth Irrigation Ditch/Special Drainage Ditch, 6' Top	LF		$ 4.57	$ -
Box Culvert (see Structure sheet)	LS		$ 576,300.00	$ -
Irrigation Structure with Gates	EA		$ 2,789.56	$ -
Bridge < 100' (see Structure sheet)	SF		$ -	$ -
Bridge >= 100' (see Structure sheet)	SF		$ -	$ -
Guardrail without Approach End Section	LF	0	$ 47.71	$ -
Guardrail Approach End Section, New ADOT Type	EA	0	$ 2,558.97	$ -
Median Fine Grading, Pre-emergent, & D.G.	SQ YD	15,381	$ 27.50	$ 422,914.60
8' Masonry Soundwall**	LF	0	$ 85.00	$ -
Concrete Soundwall**	SQ YD	0	$ 431.00	$ -
	Subtotal			$ 8,060,861.50
Removal of Existing Improvements @ 2%	Lump Sum	1	$ 161,217.00	$ 161,217.00
Mobilization/Demobilization @ 4%	Lump Sum	1	$ 322,434.00	$ 322,434.00
Traffic Control @ 3%	Lump Sum	1	$ 241,826.00	$ 241,826.00
	SUBTOTAL Construction			$ 8,786,338.50
	Contingency		20%	$ 1,757,267.70
	TOTAL			**$ 10,543,606.21**

**Calculated current costs for the 8' Masonry Soundwall and Concrete Soundwall items above were not available in the current projects and therefore they were calculated using the ADOT construction cost 2008 - 2010 projects.

***Pavement Sawcut Removed as pay item

6/18/2011

Structures

Project Name: Peoria Ave
Termini: Bullard Ave to Dysart Rd

BOX CULVERT COST CALCULATIONS

TYPE OF ROAD	BOX LENGTH (ft)	BOX DESCRIPTION	BOX WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	226	H=6'	30	6,780.00	SQ FT	$ 85.00	$576,300.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		0	0.00	SQ FT	$52.00	$0.00
							$576,300.00

* Top surface area of box.
** Includes cost of standard wing walls and bridge barrier. For special construction review unit cost with MCDOT bridge section.
*** 16 m box with approval only. Generally a non-section line, low volume location.
Cost in Red is from FY 2006 as there was not any new data available for FY 2010

BRIDGE COST CALCULATIONS

TYPE OF ROAD	BRIDGE LENGTH (ft)	DESCRIPTION	BRIDGE WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	0		89.58	0	SQ FT	$ 190.00	$0.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		94.49	0	SQ FT	$ 190.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		104.33	0	SQ FT	$ 190.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		52.49	0	SQ FT	$ 190.00	$0.00
						<100' Long	$0.00
						>=100' Long	$0.00

* Top surface area of bridge.
** Cost includes bridge railings, barriers, approach slabs, piers, and other items used in bridge construction.
Note: Show cost of channel excavation and other bridge site work on Road Construction Sheet.
*** 16 m bridge with approval only. Generally a non-section line, low volume location.

Utility Relocation

Project Name: Peoria Ave
Termini: Bullard Ave to Dysart Rd

Alternative:

Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Relocate 12 kv Wood Pole (Tangent)	EA	9.00	$5,000.00	$45,000.00
Relocate 12 kv Wood Pole (Dead-End)	EA		$7,000.00	
Relocate 69 kv Wood Pole (Tangent)	EA		$18,000.00	
Relocate 69 kv Steel Pole (Tangent)	EA		$20,000.00	
Relocate 69 kv Wood Pole (Dead-End)	EA		$38,000.00	
Relocate 69 kv Steel Pole (Dead-End)	EA		$40,000.00	
Other Poles associated w/ 69kv Power Line	EA		$8,400.00	
Railroad Crossing	EA		$650,000.00	
Irrigation(See Irrigation sheet)			$6,498,662.93	$6,498,662.93
Subtotal Construction				$6,543,662.93
Contingency			20%	$1,308,732.59
Total				$7,852,395.52

Irrigation

Project Name: Peoria Ave
Termini: Bullard Ave to Dysart Rd

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Mobilization	LS	1	$5,398.49	$5,398.49
Clearing, Grubbing and Site Clean Up	EA	1	$5,398.49	$5,398.49
Irrigation Structure w/ Gates, Medium	EA	0	$70,911.55	$0.00
Irrigation Structure w/ Gates, Large	EA		$129,596.98	
24" RGRCP	LF		$95.00	$0.00
30" & 36" RGRCP	LF	10,520	$105.00	$1,104,600.00
42" & 48" RGRCP	LF		$154.00	$0.00
54" & 60" RGRCP	LF		$230.00	$0.00
72" RGRCP	LF			$0.00
Headwall w/ Trash Rack	EA	3	$14,426.83	$43,280.50
Headwall	EA		$10,025.43	$0.00
Manhole	EA	21	$7,091.16	$149,197.91
Remove Existing Structures	LS		$30,809.85	$0.00
Concrete Lined Ditch	LF		$106.37	$0.00
Well Site Relocation	EA	6	$750,000.00	$4,500,000.00
Reclaim Water Head	EA	2	$50,000.00	$100,000.00
Catch Basin	EA			$0.00
Subtotal Construction				$5,907,875.39
Irrigation System Design			10%	$590,787.54
Total SRP Relocation Estimate				$6,498,662.93
***Note: English units used per SRP standards**				

6/18/2011

Summary

Project Name: Peoria Ave
Termini: 82+00 to 97+00 (North Side), 82+00 to 97+00 (South Side) and 110+00 to 120+00 (South Side)

2010 SUMMARY COST ESTIMATES (Current Dollars)				
COST CATEGORIES	**Factors**	**No Build**	**Alternative 1**	**Alternative 2**
Construction		$ -	$ 2,994,505.14	$ -
Design (10% TO 15%)	12%	$ -	$ 359,340.62	$ -
Construction Management	15%	$ -	$ 449,175.77	$ -
Right-of-Way		$ -	$ 290,000.00	$ -
Structures		$ -	$ -	$ -
Utility Relocation		$ -	$ 1,397,553.65	$ -
Administration (8% TO 13%)	10%	$ -	$ 299,450.51	$ -
Total		**$ -**	**$ 5,790,025.68**	**$ -**

PRELIMINARY SUMMARY COST ESTIMATES (Adjusted for Inflation)

Assumed Annual Inflation Rate = 3.50%
Assumed Number of Years = 5

Adjusted Construction Cost	$ -	$ 3,556,532.74	$ -
Design	$ -	$ 426,783.93	$ -
Construction Management	$ -	$ 533,479.91	$ -
Right-of-Way	$ -	$ 344,429.03	$ -
Structures	$ -	$ -	$ -
Utility Relocation	$ -	$ 1,659,855.33	$ -
Administration	$ -	$ 355,653.27	$ -
Adjusted Total	**$ -**	**$ 6,876,734.21**	**$ -**

6/18/2011

Road Construction

Project Name: Peoria Ave
Termini: 82+00 to 97+00 (North Side), 82+00 to 97+00 (South Side) and 110+00 to 120+00 (South Side)

Alternative:				
Item Description	**Unit**	**Quantity**	**Unit Cost**	**Total**
N.P.D.E.S.	Lump Sum	1	$ 31,858.71	$ 31,858.71
Community Relations	Allowance	1	$ 12,790.30	$ 12,790.30
Engineer's Field Office	Lump Sum	1	$ 139,708.51	$ 139,708.51
Roadway Excavation	C YD	8,889	$ 4.26	$ 37,875.21
Borrow Excavation (if anticipated)	C YD	7,500	$ 8.37	$ 62,789.54
Channel & Retention Basin Excavation	C YD	0	$ 2.88	$ -
Subgrade Preparation	SQ YD	19,589	$ 1.59	$ 31,241.88
New Asphalt Concrete Pavement (see Pavement sheet)	SQ YD	0	$ 13.85	$ -
New Rubberized Asphalt Pavement (see Pavement sheet)	SQ YD	19,589	$ 19.45	$ 380,997.41
Asphalt Rubber Overlay (see Pavement sheet)	SQ YD	0	$ 7.70	$ -
Chip Seal on AC Pavement (see Pavement sheet)	SQ YD	0	$ 2.65	$ -
Double Chip Seal on Aggregate Base (see Pavement sheet)	SQ YD	0	$ 4.90	$ -
Concrete Single Curb	LF	3,853	$ 14.42	$ 55,558.71
Concrete Curb & Gutter	LF	4,106	$ 12.36	$ 50,744.90
Concrete Sidewalk Ramp Std Det 231, Type "A"	EA	12	$ 1,522.65	$ 18,271.78
Concrete Sidewalk Std Det 230	SQ YD	2,737	$ 50.41	$ 137,984.23
Concrete Driveway with 5' Wings, Std Det 250	SQ YD	108	$ 27.28	$ 2,955.52
Traffic Signing & Striping - 2 lanes	LF	0	$ 2.41	$ -
Traffic Signing & Striping - 5 lanes	LF	0	$ 4.58	$ -
Traffic Signing & Striping - 7 lanes	LF	4,000	$ 4.85	$ 19,390.23
Traffic Signal, Full Intersection	EA	2	$ 494,973.19	$ 989,946.39
Interconnect/Traffic Signals	LF	4,000	$ 9.47	$ 37,893.90
Traffic Signal, Future "Box-in"	EA	1	$ 6,049.47	$ 6,049.47
Catch Basin	EA	2	$ 6,631.89	$ 13,263.78
Scupper	EA		$ 5,001.54	$ -
Drywell	EA		$ 41,998.26	$ -
Storm Drain System (retention basin option)	Mile		$ 816,688.61	$ -
18" CMP and smaller	LF		$ 57.51	$ -
24" CMP	LF		$ 78.02	$ -
30" CMP	LF		$ 116.44	$ -
36" CMP	LF		$ 122.02	$ -
42" CMP	LF		$ 103.53	$ -
54" CMP	LF		$ 231.91	$ -
60" CMP	LF		$ 318.29	$ -
18" & 24" RGRCP, Class III	LF	102	$ 95.00	$ 9,690.00
30" & 36" RGRCP, Class III	LF		$ 105.00	$ -
42" & 48" RGRCP, Class III	LF		$ 154.00	$ -
54" & 60" RGRCP, Class III	LF		$ 230.00	$ -
54" & 60" Storm Drain Manhole	EA	0	$ 4,137.04	$ -
Headwall (MAG details)	EA		$ 5,941.91	$ -
Irrigation Junction Box (MAG details)	EA		$ -	$ -
Concrete Slip Form Irrigation Ditch	LF		$ 52.58	$ -
Earth Irrigation Ditch/Special Drainage Ditch, 6' Top	LF		$ 4.57	$ -
Box Culvert (see Structure sheet)	LS		$ -	$ -
Irrigation Structure with Gates	EA		$ 2,789.56	$ -
Bridge < 100' (see Structure sheet)	SF		$ -	$ -
Bridge >= 100' (see Structure sheet)	SF		$ -	$ -
Guardrail without Approach End Section	LF	0	$ 47.71	$ -
Guardrail Approach End Section, New ADOT Type	EA	0	$ 2,558.97	$ -
Median Fine Grading, Pre-emergent, & D.G.	SQ YD	2,969	$ 27.50	$ 81,641.47
8' Masonry Soundwall**	LF	1,985	$ 85.00	$ 168,725.00
Concrete Soundwall**	SQ YD	0	$ 431.00	$ -
	Subtotal			$ 2,289,376.95
Removal of Existing Improvements @ 2%	Lump Sum	1	$ 45,788.00	$ 45,788.00
Mobilization/Demobilization @ 4%	Lump Sum	1	$ 91,575.00	$ 91,575.00
Traffic Control @ 3%	Lump Sum	1	$ 68,681.00	$ 68,681.00
SUBTOTAL Construction				$ 2,495,420.95
	Contingency		20%	$ 499,084.19
	TOTAL			**$ 2,994,505.14**

**Calculated current costs for the 8' Masonry Soundwall and Concrete Soundwall items above were not available in the current projects and therefore they were calculated using the ADOT construction cost 2008 - 2010 projects.

***Pavement Sawcut Removed as pay item

6/18/2011

Structures

Project Name: Peoria Ave
Termini: 82+00 to 97+00 (North Side), 82+00 to 97+00 (South Side) and 110+00 to 120+00 (South Side)

BOX CULVERT COST CALCULATIONS

TYPE OF ROAD	BOX LENGTH (ft)	BOX DESCRIPTION	BOX WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	0		0	0.00	SQ FT	$ 85.00	$0.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		0	0.00	SQ FT	$52.00	$0.00
							$0.00

* Top surface area of box.
** Includes cost of standard wing walls and bridge barrier. For special construction review unit cost with MCDOT bridge section.
*** 16 m box with approval only. Generally a non-section line, low volume location.
Cost in Red is from FY 2006 as there was not any new data available for FY 2010

BRIDGE COST CALCULATIONS

TYPE OF ROAD	BRIDGE LENGTH (ft)	DESCRIPTION	BRIDGE WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	0		89.58	0	SQ FT	$ 190.00	$0.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		94.49	0	SQ FT	$ 190.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		104.33	0	SQ FT	$ 190.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		52.49	0	SQ FT	$ 190.00	$0.00
						<100' Long	$0.00
						>=100' Long	$0.00

* Top surface area of bridge.
** Cost includes bridge railings, barriers, approach slabs, piers, and other items used in bridge construction.
Note: Show cost of channel excavation and other bridge site work on Road Construction Sheet.
*** 16 m bridge with approval only. Generally a non-section line, low volume location.

6/18/2011

Utility Relocation

Project Name: Peoria Ave
Termini: 82+00 to 97+00 (North Side), 82+00 to 97+00 (South Side) and 110+00 to 120+00 (South Side)

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Relocate 12 kv Wood Pole (Tangent)	EA		$5,000.00	
Relocate 12 kv Wood Pole (Dead-End)	EA		$7,000.00	
Relocate 69 kv Wood Pole (Tangent)	EA		$18,000.00	
Relocate 69 kv Steel Pole (Tangent)	EA		$20,000.00	
Relocate 69 kv Wood Pole (Dead-End)	EA		$38,000.00	
Relocate 69 kv Steel Pole (Dead-End)	EA		$40,000.00	
Other Poles associated w/ 69kv Power Line	EA		$8,400.00	
Railroad Crossing	EA		$650,000.00	
Irrigation (See Irrigation sheet)		[redacted]	$1,164,628.04	$1,164,628.04
Subtotal Construction				$1,164,628.04
Contingency			20%	$232,925.61
Total				$1,397,553.65

Irrigation

Project Name: Peoria Ave
Termini: 82+00 to 97+00 (North Side), 82+00 to 97+00 (South Side) and 110+00 to 120+00 (South Side)

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Mobilization	LS	1	$5,398.49	$5,398.49
Clearing, Grubbing and Site Clean Up	EA	1	$5,398.49	$5,398.49
Irrigation Structure w/ Gates, Medium	EA	0	$70,911.55	$0.00
Irrigation Structure w/ Gates, Large	EA		$129,596.98	
24" RGRCP	LF		$95.00	$0.00
30" & 36" RGRCP	LF	2,500	$105.00	$262,500.00
42" & 48" RGRCP	LF		$154.00	$0.00
54" & 60" RGRCP	LF		$230.00	$0.00
Headwall w/ Trash Rack	EA	0	$14,426.83	$0.00
Headwall	EA		$10,025.43	$0.00
Manhole	EA	5	$7,091.16	$35,455.78
Remove Existing Structures	LS		$30,809.85	$0.00
Concrete Lined Ditch	LF		$106.37	$0.00
Well Site Relocation	EA	1	$750,000.00	$750,000.00
Catch Basin	EA			$0.00
Subtotal Construction				$1,058,752.76
Irrigation System Design			10%	$105,875.28
Total SRP Relocation Estimate				$1,164,628.04
****Note: English units used per SRP standards***				

Summary

Project Name: Peoria Ave
Termini: 119+30 to 202+59

2010 SUMMARY COST ESTIMATES (Current Dollars)				
COST CATEGORIES	**Factors**	**No Build**	**Alternative 1**	**Alternative 2**
Construction		$ -	$ 6,368,131.87	$ -
Design (10% TO 15%)	12%	$ -	$ 764,175.82	$ -
Construction Management	15%	$ -	$ 955,219.78	$ -
Right-of-Way		$ -	$ 2,070,000.00	$ -
Structures		$ -	$ 516,800.00	$ -
Utility Relocation		$ -	$ 5,586,979.70	$ -
Administration (8% TO 13%)	10%	$ -	$ 636,813.19	$ -
Total		**$ -**	**$ 16,898,120.37**	**$ -**

PRELIMINARY SUMMARY COST ESTIMATES (Adjusted for Inflation)

Assumed Annual Inflation Rate = 3.50%
Assumed Number of Years = 5

Adjusted Construction Cost	$ -	$ 7,563,343.02	$ -
Design	$ -	$ 907,601.16	$ -
Construction Management	$ -	$ 1,134,501.45	$ -
Right-of-Way	$ -	$ 2,458,510.65	$ -
Structures	$ -	$ 613,796.28	$ -
Utility Relocation	$ -	$ 6,635,579.29	$ -
Administration	$ -	$ 756,334.30	$ -
Adjusted Total	**$ -**	**$ 20,069,666.16**	**$ -**

6/18/2011

Road Construction

Project Name: Peoria Ave
Termini:119+30 to 202+59

Alternative:				
Item Description	**Unit**	**Quantity**	**Unit Cost**	**Total**
N.P.D.E.S.	Lump Sum	1	$ 31,858.71	$ 31,858.71
Community Relations	Allowance	1	$ 12,790.30	$ 12,790.30
Engineer's Field Office	Lump Sum	1	$ 139,708.51	$ 139,708.51
Roadway Excavation	C YD	41,433	$ 4.26	$ 176,542.69
Borrow Excavation (if anticipated)	C YD	47,449	$ 8.37	$ 397,240.76
Channel & Retention Basin Excavation	C YD	0	$ 2.88	$ -
Subgrade Preparation	SQ YD	52,334	$ 1.59	$ 83,467.39
New Asphalt Concrete Pavement (see Pavement sheet)	SQ YD	0	$ 13.85	$ -
New Rubberized Asphalt Pavement (see Pavement sheet)	SQ YD	52,334	$ 19.45	$ 1,017,891.98
Asphalt Rubber Overlay (see Pavement sheet)	SQ YD	0	$ 7.70	$ -
Chip Seal on AC Pavement (see Pavement sheet)	SQ YD	0	$ 2.65	$ -
Double Chip Seal on Aggregate Base (see Pavement sheet)	SQ YD	0	$ 4.90	$ -
Concrete Single Curb	LF	7,839	$ 14.42	$ 113,035.22
Concrete Curb & Gutter	LF	17,069	$ 12.36	$ 210,950.99
Concrete Sidewalk Ramp Std Det 231, Type "A"	EA	20	$ 1,522.65	$ 30,452.97
Concrete Sidewalk Std Det 230	SQ YD	5,403	$ 50.41	$ 272,372.67
Concrete Driveway with 5' Wings, Std Det 250	SQ YD	181	$ 27.28	$ 4,925.87
Traffic Signing & Striping - 2 lanes	LF	0	$ 2.41	$ -
Traffic Signing & Striping - 5 lanes	LF	0	$ 4.58	$ -
Traffic Signing & Striping - 7 lanes	LF	8,330	$ 4.85	$ 40,380.15
Traffic Signal, Full Intersection	EA	3	$ 494,973.19	$ 1,484,919.58
Interconnect/Traffic Signals	LF	8,330	$ 9.47	$ 78,914.04
Traffic Signal, Future "Box-in"	EA	4	$ 6,049.47	$ 24,197.89
Catch Basin	EA	20	$ 6,631.89	$ 132,637.84
Scupper	EA		$ 5,001.54	$ -
Drywell	EA		$ 41,998.26	$ -
Storm Drain System (retention basin option)	Mile		$ 816,688.61	$ -
18" CMP and smaller	LF		$ 57.51	$ -
24" CMP	LF		$ 78.02	$ -
30" CMP	LF		$ 116.44	$ -
36" CMP	LF		$ 122.02	$ -
42" CMP	LF		$ 103.53	$ -
54" CMP	LF		$ 231.91	$ -
60" CMP	LF		$ 318.29	$ -
18" & 24" RGRCP, Class III	LF	835	$ 95.00	$ 79,325.00
30" & 36" RGRCP, Class III	LF		$ 105.00	$ -
42" & 48" RGRCP, Class III	LF		$ 154.00	$ -
54" & 60" RGRCP, Class III	LF		$ 230.00	$ -
54" & 60" Storm Drain Manhole	EA		$ 4,137.04	$ -
Headwall (MAG details)	EA		$ 5,941.91	$ -
Irrigation Junction Box (MAG details)	EA		$ -	$ -
Concrete Slip Form Irrigation Ditch	LF		$ 52.58	$ -
Earth Irrigation Ditch/Special Drainage Ditch, 6' Top	LF		$ 4.57	$ -
Box Culvert (see Structure sheet)	LS		$ 516,800.00	$ -
Irrigation Structure with Gates	EA		$ 2,789.56	$ -
Bridge < 100' (see Structure sheet)	SF		$ -	$ -
Bridge >= 100' (see Structure sheet)	SF		$ -	$ -
Guardrail without Approach End Section	LF	0	$ 47.71	$ -
Guardrail Approach End Section, New ADOT Type	EA	0	$ 2,558.97	$ -
Median Fine Grading, Pre-emergent, & D.G.	SQ YD	5,025	$ 27.50	$ 138,170.00
8' Masonry Soundwall**	LF	4,692	$ 85.00	$ 398,820.00
Concrete Soundwall**	SQ YD	0	$ 431.00	$ -
	Subtotal			$ 4,868,602.56
Removal of Existing Improvements @ 2%	Lump Sum	1	$ 97,372.00	$ 97,372.00
Mobilization/Demobilization @ 4%	Lump Sum	1	$ 194,744.00	$ 194,744.00
Traffic Control @ 3%	Lump Sum	1	$ 146,058.00	$ 146,058.00
	SUBTOTAL Construction			$ 5,306,776.56
	Contingency		20%	$ 1,061,355.31
	TOTAL			**$ 6,368,131.87**

**Calculated current costs for the 8' Masonry Soundwall and Concrete Soundwall items above were not available in the current projects and therefore they were calculated using the ADOT construction cost 2008 - 2010 projects.
***Pavement Sawcut Removed as pay item

6/18/2011

Structures

Project Name: Peoria Ave
Termini:119+30 to 202+59

BOX CULVERT COST CALCULATIONS

TYPE OF ROAD	BOX LENGTH (ft)	BOX DESCRIPTION	BOX WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	190	H=4'	32	6,080.00	SQ FT	$ 85.00	$516,800.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		0	0.00	SQ FT	$52.00	$0.00
							$516,800.00

* Top surface area of box.
** Includes cost of standard wing walls and bridge barrier. For special construction review unit cost with MCDOT bridge section.
*** 16 m box with approval only. Generally a non-section line, low volume location.
Cost in Red is from FY 2006 as there was not any new data available for FY 2010

BRIDGE COST CALCULATIONS

TYPE OF ROAD	BRIDGE LENGTH (ft)	DESCRIPTION	BRIDGE WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	0		89.58	0	SQ FT	$ 190.00	$0.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		94.49	0	SQ FT	$ 190.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		104.33	0	SQ FT	$ 190.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		52.49	0	SQ FT	$ 190.00	$0.00
						<100' Long	$0.00
						>=100' Long	$0.00

* Top surface area of bridge.
** Cost includes bridge railings, barriers, approach slabs, piers, and other items used in bridge construction.
Note: Show cost of channel excavation and other bridge site work on Road Construction Sheet.
*** 16 m bridge with approval only. Generally a non-section line, low volume location.

Utility Relocation

Project Name: Peoria Ave
Termini: 119+30 to 202+59

Alternative:

Item Description	*Unit*	*Quantity*	*Unit Cost*	*Total*
Relocate 12 kv Wood Pole (Tangent)	EA	28.00	$5,000.00	$140,000.00
Relocate 12 kv Wood Pole (Dead-End)	EA		$7,000.00	
Relocate 69 kv Wood Pole (Tangent)	EA	1	$18,000.00	$18,000.00
Relocate 69 kv Steel Pole (Tangent)	EA		$20,000.00	
Relocate 69 kv Wood Pole (Dead-End)	EA		$38,000.00	
Relocate 69 kv Steel Pole (Dead-End)	EA		$40,000.00	
Other Poles associated w/ 69kv Power Line	EA		$8,400.00	
Railroad Crossing	EA		$650,000.00	
Irrigation(See Irrigation sheet)			$4,497,816.42	$4,497,816.42
Subtotal Construction				$4,655,816.42
Contingency			20%	$931,163.28
Total				$5,586,979.70

Irrigation

Project Name: Peoria Ave
Termini: 119+30 to 202+59

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Mobilization	LS	1	$5,398.49	$5,398.49
Clearing, Grubbing and Site Clean Up	EA	1	$5,398.49	$5,398.49
Irrigation Structure w/ Gates, Medium	EA	1	$70,911.55	$70,911.55
Irrigation Structure w/ Gates, Large	EA		$129,596.98	
24" RGRCP	LF		$95.00	
30" & 36" RGRCP	LF	8,330	$105.00	$874,650.00
42" & 48" RGRCP	LF		$154.00	
54" & 60" RGRCP	LF		$230.00	
Headwall w/ Trash Rack	EA	1	$14,426.83	$14,426.83
Headwall	EA		$10,025.43	
Manhole	EA	17	$7,091.16	$118,138.65
Remove Existing Structures	LS		$30,809.85	
Concrete Lined Ditch	LF		$106.37	
Well Site Relocation	EA	4	$750,000.00	$3,000,000.00
Catch Basin	EA			
Subtotal Construction				$4,088,924.02
Irrigation System Design			10%	$408,892.40
Total SRP Relocation Estimate				$4,497,816.42
***Note: English units used per SRP standards**				

6/18/2011

Summary

Project Name: Peoria Ave
Termini: 340+00 to 385+00 (North Side) and 340+00 to 380+00 (South Side)

2010 SUMMARY COST ESTIMATES (Current Dollars)				
COST CATEGORIES	**Factors**	**No Build**	**Alternative 1**	**Alternative 2**
Construction		$ -	$ 3,951,654.73	$ -
Design (10% TO 15%)	12%	$ -	$ 474,198.57	$ -
Construction Management	15%	$ -	$ 592,748.21	$ -
Right-of-Way		$ -	$ 490,000.00	$ -
Structures		$ -	$ 132,600.00	$ -
Utility Relocation		$ -	$ 3,613,534.62	$ -
Administration (8% TO 13%)	10%	$ -	$ 395,165.47	$ -
Total		**$ -**	**$ 9,649,901.60**	**$ -**

PRELIMINARY SUMMARY COST ESTIMATES (Adjusted for Inflation)

Assumed Annual Inflation Rate = 3.50%
Assumed Number of Years = 5

Adjusted Construction Cost	$ -	$ 4,693,326.20	$ -
Design	$ -	$ 563,199.14	$ -
Construction Management	$ -	$ 703,998.93	$ -
Right-of-Way	$ -	$ 581,966.29	$ -
Structures	$ -	$ 157,487.20	$ -
Utility Relocation	$ -	$ 4,291,745.59	$ -
Administration	$ -	$ 469,332.62	$ -
Adjusted Total	**$ -**	**$ 11,461,055.98**	**$ -**

6/18/2011

Road Construction

Project Name: Peoria Ave
Termini: 340+00 to 385+00 (North Side) and 340+00 to 380+00 (South Side)

Alternative:				
Item Description	**Unit**	**Quantity**	**Unit Cost**	**Total**
N.P.D.E.S.	Lump Sum	1	$ 31,858.71	$ 31,858.71
Community Relations	Allowance	1	$ 12,790.30	$ 12,790.30
Engineer's Field Office	Lump Sum	1	$ 139,708.51	$ 139,708.51
Roadway Excavation	C YD	18,889	$ 4.26	$ 80,484.83
Borrow Excavation (if anticipated)	C YD	15,000	$ 8.37	$ 125,579.09
Channel & Retention Basin Excavation	C YD	0	$ 2.88	$ -
Subgrade Preparation	SQ YD	40,526	$ 1.59	$ 64,634.93
New Asphalt Concrete Pavement (see Pavement sheet)	SQ YD	0	$ 13.85	$ -
New Rubberized Asphalt Pavement (see Pavement sheet)	SQ YD	40,526	$ 19.45	$ 788,228.54
Asphalt Rubber Overlay (see Pavement sheet)	SQ YD	0	$ 7.70	$ -
Chip Seal on AC Pavement (see Pavement sheet)	SQ YD	0	$ 2.65	$ -
Double Chip Seal on Aggregate Base (see Pavement sheet)	SQ YD	0	$ 4.90	$ -
Concrete Single Curb	LF	7,774	$ 14.42	$ 112,097.95
Concrete Curb & Gutter	LF	8,318	$ 12.36	$ 102,799.83
Concrete Sidewalk Ramp Std Det 231, Type "A"	EA	12	$ 1,522.65	$ 18,271.78
Concrete Sidewalk Std Det 230	SQ YD	5,545	$ 50.41	$ 279,530.64
Concrete Driveway with 5' Wings, Std Det 250	SQ YD	217	$ 27.28	$ 5,911.05
Traffic Signing & Striping - 2 lanes	LF	0	$ 2.41	$ -
Traffic Signing & Striping - 5 lanes	LF	0	$ 4.58	$ -
Traffic Signing & Striping - 7 lanes	LF	8,500	$ 4.85	$ 41,204.23
Traffic Signal, Full Intersection	EA	2	$ 494,973.19	$ 989,946.39
Interconnect/Traffic Signals	LF	8,500	$ 9.47	$ 80,524.53
Traffic Signal, Future "Box-in"	EA	2	$ 6,049.47	$ 12,098.94
Catch Basin	EA		$ 6,631.89	$ -
Scupper	EA		$ 5,001.54	$ -
Drywell	EA		$ 41,998.26	$ -
Storm Drain System (retention basin option)	Mile		$ 816,688.61	$ -
18" CMP and smaller	LF		$ 57.51	$ -
24" CMP	LF		$ 78.02	$ -
30" CMP	LF		$ 116.44	$ -
36" CMP	LF		$ 122.02	$ -
42" CMP	LF		$ 103.53	$ -
54" CMP	LF		$ 231.91	$ -
60" CMP	LF		$ 318.29	$ -
18" & 24" RGRCP, Class III	LF		$ 95.00	$ -
30" & 36" RGRCP, Class III	LF		$ 105.00	$ -
42" & 48" RGRCP, Class III	LF		$ 154.00	$ -
54" & 60" RGRCP, Class III	LF		$ 230.00	$ -
54" & 60" Storm Drain Manhole	EA	0	$ 4,137.04	$ -
Headwall (MAG details)	EA		$ 5,941.91	$ -
Irrigation Junction Box (MAG details)	EA		$ -	$ -
Concrete Slip Form Irrigation Ditch	LF		$ 52.58	$ -
Earth Irrigation Ditch/Special Drainage Ditch, 6' Top	LF		$ 4.57	$ -
Box Culvert (see Structure sheet)	LS	[redacted]	$ 132,600.00	$ -
Irrigation Structure with Gates	EA		$ 2,789.56	$ -
Bridge < 100' (see Structure sheet)	SF	[redacted]	$ -	$ -
Bridge >= 100' (see Structure sheet)	SF		$ -	$ -
Guardrail without Approach End Section	LF	0	$ 47.71	$ -
Guardrail Approach End Section, New ADOT Type	EA	0	$ 2,558.97	$ -
Median Fine Grading, Pre-emergent, & D.G.	SQ YD	4,927	$ 27.50	$ 135,472.35
8' Masonry Soundwall**	LF	0	$ 85.00	$ -
Concrete Soundwall**	SQ YD	0	$ 431.00	$ -
	Subtotal			$ 3,021,142.61
Removal of Existing Improvements @ 2%	Lump Sum	1	$ 60,423.00	$ 60,423.00
Mobilization/Demobilization @ 4%	Lump Sum	1	$ 120,846.00	$ 120,846.00
Traffic Control @ 3%	Lump Sum	1	$ 90,634.00	$ 90,634.00
SUBTOTAL Construction				$ 3,293,045.61
	Contingency		20%	$ 658,609.12
	TOTAL			**$ 3,951,654.73**

**Calculated current costs for the 8' Masonry Soundwall and Concrete Soundwall items above were not available in the current projects and therefore they were calculated using the ADOT construction cost 2008 - 2010 projects.

***Pavement Sawcut Removed as pay item

6/18/2011

Structures

Project Name: Peoria Ave
Termini: 340+00 to 385+00 (North Side) and 340+00 to 380+00 (South Side)

BOX CULVERT COST CALCULATIONS

TYPE OF ROAD	BOX LENGTH (ft)	BOX DESCRIPTION	BOX WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	130	H=3'	12	1,560.00	SQ FT	$ 85.00	$132,600.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		0	0.00	SQ FT	$52.00	$0.00
							$132,600.00

* Top surface area of box.
** Includes cost of standard wing walls and bridge barrier. For special construction review unit cost with MCDOT bridge section.
*** 16 m box with approval only. Generally a non-section line, low volume location.
Cost in Red is from FY 2006 as there was not any new data available for FY 2010

BRIDGE COST CALCULATIONS

TYPE OF ROAD	BRIDGE LENGTH (ft)	DESCRIPTION	BRIDGE WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	0		89.58	0	SQ FT	$ 190.00	$0.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		94.49	0	SQ FT	$ 190.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		104.33	0	SQ FT	$ 190.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		52.49	0	SQ FT	$ 190.00	$0.00
						<100' Long	$0.00
						>=100' Long	$0.00

* Top surface area of bridge.
** Cost includes bridge railings, barriers, approach slabs, piers, and other items used in bridge construction.
Note: Show cost of channel excavation and other bridge site work on Road Construction Sheet.
*** 16 m bridge with approval only. Generally a non-section line, low volume location.

6/18/2011

Utility Relocation

Project Name: Peoria Ave
Termini: 340+00 to 385+00 (North Side) and 340+00 to 380+00 (South Side)

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Relocate 12 kv Wood Pole (Tangent)	EA		$5,000.00	
Relocate 12 kv Wood Pole (Dead-End)	EA		$7,000.00	
Relocate 69 kv Wood Pole (Tangent)	EA		$18,000.00	
Relocate 69 kv Steel Pole (Tangent)	EA		$20,000.00	
Relocate 69 kv Wood Pole (Dead-End)	EA		$38,000.00	
Relocate 69 kv Steel Pole (Dead-End)	EA		$40,000.00	
Other Poles associated w/ 69kv Power Line	EA		$8,400.00	
Railroad Crossing	EA		$650,000.00	
Irrigation (See Irrigation sheet)			$3,011,278.85	$3,011,278.85
Subtotal Construction				$3,011,278.85
Contingency			20%	$602,255.77
Total				$3,613,534.62

Irrigation

Project Name: Peoria Ave
Termini: 340+00 to 385+00 (North Side) and 340+00 to 380+00 (South Side)

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Mobilization	LS	1	$5,398.49	$5,398.49
Clearing, Grubbing and Site Clean Up	EA	1	$5,398.49	$5,398.49
Irrigation Structure w/ Gates, Medium	EA	0	$70,911.55	$0.00
Irrigation Structure w/ Gates, Large	EA		$129,596.98	
24" RGRCP	LF		$95.00	$0.00
30" & 36" RGRCP	LF	4,000	$105.00	$420,000.00
42" & 48" RGRCP	LF		$154.00	$0.00
54" & 60" RGRCP	LF		$230.00	$0.00
Headwall w/ Trash Rack	EA	0	$14,426.83	$0.00
Headwall	EA		$10,025.43	$0.00
Manhole	EA	8	$7,091.16	$56,729.24
Remove Existing Structures	LS		$30,809.85	$0.00
Concrete Lined Ditch	LF		$106.37	$0.00
Well Site Relocation	EA	3	$750,000.00	$2,250,000.00
Subtotal Construction				$2,737,526.23
Irrigation System Design			10%	$273,752.62
Total SRP Relocation Estimate				$3,011,278.85
***Note: English units used per SRP standards**				

Summary

Project Name: Peoria Ave
Termini: 395+00 to 420+00 (North Side), 395+00 to 420+00 (South Side) and 420+00 to 445+00 (North Side)

2010 SUMMARY COST ESTIMATES (Current Dollars)

COST CATEGORIES	Factors	No Build	Alternative 1	Alternative 2
Construction		$ -	$ 5,393,377.35	$ -
Design (10% TO 15%)	12%	$ -	$ 647,205.28	$ -
Construction Management	15%	$ -	$ 809,006.60	$ -
Right-of-Way		$ -	$ 620,000.00	$ -
Structures		$ -	$ 576,300.00	$ -
Utility Relocation		$ -	$ 612,597.07	$ -
Administration (8% TO 13%)	10%	$ -	$ 539,337.74	$ -
Total		**$ -**	**$ 9,197,824.04**	**$ -**

PRELIMINARY SUMMARY COST ESTIMATES (Adjusted for Inflation)

Assumed Annual Inflation Rate = 3.50%
Assumed Number of Years = 5

	No Build	Alternative 1	Alternative 2
Adjusted Construction Cost	$ -	$ 6,405,640.42	$ -
Design	$ -	$ 768,676.85	$ -
Construction Management	$ -	$ 960,846.06	$ -
Right-of-Way	$ -	$ 736,365.51	$ -
Structures	$ -	$ 684,463.62	$ -
Utility Relocation	$ -	$ 727,573.15	$ -
Administration	$ -	$ 640,564.04	$ -
Adjusted Total	**$ -**	**$ 10,924,129.65**	**$ -**

Road Construction

Project Name: Peoria Ave
Termini: 395+00 to 420+00 (North Side), 395+00 to 420+00 (South Side) and 420+00 to 445+00 (North Side)

Alternative:

Item Description	Unit	Quantity	Unit Cost	Total
N.P.D.E.S.	Lump Sum	1	$ 31,858.71	$ 31,858.71
Community Relations	Allowance	1	$ 12,790.30	$ 12,790.30
Engineer's Field Office	Lump Sum	1	$ 139,708.51	$ 139,708.51
Roadway Excavation	C YD	18,611	$ 4.26	$ 79,301.23
Borrow Excavation (if anticipated)	C YD	42,417	$ 8.37	$ 355,109.76
Channel & Retention Basin Excavation	C YD	5,378	$ 2.88	$ 15,493.47
Subgrade Preparation	SQ YD	39,151	$ 1.59	$ 62,441.93
New Asphalt Concrete Pavement (see Pavement sheet)	SQ YD	0	$ 13.85	$ -
New Rubberized Asphalt Pavement (see Pavement sheet)	SQ YD	39,151	$ 19.45	$ 761,484.79
Asphalt Rubber Overlay (see Pavement sheet)	SQ YD	0	$ 7.70	$ -
Chip Seal on AC Pavement (see Pavement sheet)	SQ YD	0	$ 2.65	$ -
Double Chip Seal on Aggregate Base (see Pavement sheet)	SQ YD	0	$ 4.90	$ -
Concrete Single Curb	LF	7,632	$ 14.42	$ 110,050.37
Concrete Curb & Gutter	LF	7,797	$ 12.36	$ 96,360.94
Concrete Sidewalk Ramp Std Det 231, Type "A"	EA	18	$ 1,522.65	$ 27,407.67
Concrete Sidewalk Std Det 230	SQ YD	5,198	$ 50.41	$ 262,022.17
Concrete Driveway with 5' Wings, Std Det 250	SQ YD	217	$ 27.28	$ 5,911.05
Traffic Signing & Striping - 2 lanes	LF	0	$ 2.41	$ -
Traffic Signing & Striping - 5 lanes	LF	0	$ 4.58	$ -
Traffic Signing & Striping - 7 lanes	LF	7,500	$ 4.85	$ 36,356.68
Traffic Signal, Full Intersection	EA	3	$ 494,973.19	$ 1,484,919.58
Interconnect/Traffic Signals	LF	7,500	$ 9.47	$ 71,051.05
Traffic Signal, Future "Box-in"	EA	2	$ 6,049.47	$ 12,098.94
Catch Basin	EA	9	$ 6,631.89	$ 59,687.03
Scupper	EA		$ 5,001.54	$ -
Drywell	EA		$ 41,998.26	$ -
Storm Drain System (retention basin option)	Mile		$ 816,688.61	$ -
18" CMP and smaller	LF		$ 57.51	$ -
24" CMP	LF		$ 78.02	$ -
30" CMP	LF		$ 116.44	$ -
36" CMP	LF		$ 122.02	$ -
42" CMP	LF		$ 103.53	$ -
54" CMP	LF		$ 231.91	$ -
60" CMP	LF		$ 318.29	$ -
18" & 24" RGRCP, Class III	LF	526	$ 95.00	$ 49,970.00
30" & 36" RGRCP, Class III	LF		$ 105.00	$ -
42" & 48" RGRCP, Class III	LF		$ 154.00	$ -
54" & 60" RGRCP, Class III	LF	48	$ 230.00	$ 11,040.00
72" RGRCP, Class III	LF	750	$ 318.29	$ 238,717.08
54" & 60" Storm Drain Manhole	EA	0	$ 4,137.04	$ -
Headwall (MAG details)	EA		$ 5,941.91	$ -
Irrigation Junction Box (MAG details)	EA		$ -	$ -
Concrete Slip Form Irrigation Ditch	LF		$ 52.58	$ -
Earth Irrigation Ditch/Special Drainage Ditch, 6' Top	LF		$ 4.57	$ -
Box Culvert (see Structure sheet)	LS		$ 576,300.00	$ -
Irrigation Structure with Gates	EA		$ 2,789.56	$ -
Bridge < 100' (see Structure sheet)	SF		$ -	$ -
Bridge >= 100' (see Structure sheet)	SF		$ -	$ -
Guardrail without Approach End Section	LF	0	$ 47.71	$ -
Guardrail Approach End Section, New ADOT Type	EA	0	$ 2,558.97	$ -
Median Fine Grading, Pre-emergent, & D.G.	SQ YD	7,259	$ 27.50	$ 199,595.87
8' Masonry Soundwall**	LF	0	$ 85.00	$ -
Concrete Soundwall**	SQ YD	0	$ 431.00	$ -
	Subtotal			$ 4,123,377.13
Removal of Existing Improvements @ 2%	Lump Sum	1	$ 82,468.00	$ 82,468.00
Mobilization/Demobilization @ 4%	Lump Sum	1	$ 164,935.00	$ 164,935.00
Traffic Control @ 3%	Lump Sum	1	$ 123,701.00	$ 123,701.00
SUBTOTAL Construction				$ 4,494,481.13
	Contingency		20%	$ 898,896.23
	TOTAL			**$ 5,393,377.35**

**Calculated current costs for the 8' Masonry Soundwall and Concrete Soundwall items above were not available in the current projects and therefore they were calculated using the ADOT construction cost 2008 - 2010 projects.
***Pavement Sawcut Removed as pay item

Structures

Project Name: Peoria Ave
Termini: 395+00 to 420+00 (North Side), 395+00 to 420+00 (South Side) and 420+00 to 445+00 (North Side)

BOX CULVERT COST CALCULATIONS

TYPE OF ROAD	BOX LENGTH (ft)	BOX DESCRIPTION	BOX WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	226	H=6'	30	6,780.00	SQ FT	$ 85.00	$576,300.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		0	0.00	SQ FT	$ 85.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		0	0.00	SQ FT	$52.00	$0.00
							$576,300.00

* Top surface area of box.
** Includes cost of standard wing walls and bridge barrier. For special construction review unit cost with MCDOT bridge section.
*** 16 m box with approval only. Generally a non-section line, low volume location.
Cost in Red is from FY 2006 as there was not any new data available for FY 2010

BRIDGE COST CALCULATIONS

TYPE OF ROAD	BRIDGE LENGTH (ft)	DESCRIPTION	BRIDGE WIDTH (ft)	TOP SFC AREA*	UNIT	COST**	TOTAL COST
URBAN MINOR ARTERIAL OR LESS (27 m or 88.58' for 5 lanes & 2 sidewalks)	0		89.58	0	SQ FT	$ 190.00	$0.00
URBAN MINOR ARTERIAL W/ BIKE LANES (28.8 m or 94.49' for 5 lanes, 2 B/L's & 2 S/W's)	0		94.49	0	SQ FT	$ 190.00	$0.00
URBAN MAJOR ARTERIAL (31.8 m or 104.33' for 7 lanes & 2 S/W's)	0		104.33	0	SQ FT	$ 190.00	$0.00
SPECIAL LOW VOLUME ROAD CONDITION*** (16 m or 52.49' for 2 lanes with shoulders)	0		52.49	0	SQ FT	$ 190.00	$0.00
						<100' Long	$0.00
						>=100' Long	$0.00

* Top surface area of bridge.
** Cost includes bridge railings, barriers, approach slabs, piers, and other items used in bridge construction.
Note: Show cost of channel excavation and other bridge site work on Road Construction Sheet.
*** 16 m bridge with approval only. Generally a non-section line, low volume location.

Utility Relocation

Project Name: Peoria Ave
Termini: 395+00 to 420+00 (North Side), 395+00 to 420+00 (South Side) and 420+00 to 445+00 (North Side)

Alternative:

Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Relocate 12 kv Wood Pole (Tangent)	EA	9.00	$5,000.00	$45,000.00
Relocate 12 kv Wood Pole (Dead-End)	EA		$7,000.00	
Relocate 69 kv Wood Pole (Tangent)	EA		$18,000.00	
Relocate 69 kv Steel Pole (Tangent)	EA		$20,000.00	
Relocate 69 kv Wood Pole (Dead-End)	EA		$38,000.00	
Relocate 69 kv Steel Pole (Dead-End)	EA		$40,000.00	
Other Poles associated w/ 69kv Power Line	EA		$8,400.00	
Railroad Crossing	EA		$650,000.00	
Irrigation (See Irrigation sheet)			$465,497.56	$465,497.56
Subtotal Construction				$510,497.56
Contingency			20%	$102,099.51
Total				$612,597.07

Irrigation

Project Name: Peoria Ave
Termini: 395+00 to 420+00 (North Side), 395+00 to 420+00 (South Side) and 420+00 to 445+00 (North Side)

Alternative:				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Total***
Mobilization	LS	1	$5,398.49	$5,398.49
Clearing, Grubbing and Site Clean Up	EA	1	$5,398.49	$5,398.49
Irrigation Structure w/ Gates, Medium	EA	0	$70,911.55	$0.00
Irrigation Structure w/ Gates, Large	EA		$129,596.98	
24" RGRCP	LF		$95.00	$0.00
30" & 36" RGRCP	LF	2,500	$105.00	$262,500.00
42" & 48" RGRCP	LF		$154.00	$0.00
54" & 60" RGRCP	LF		$230.00	$0.00
72" RGRCP	LF			$0.00
Headwall w/ Trash Rack	EA	1	$14,426.83	$14,426.83
Headwall	EA		$10,025.43	$0.00
Manhole	EA	5	$7,091.16	$35,455.78
Remove Existing Structures	LS		$30,809.85	$0.00
Concrete Lined Ditch	LF		$106.37	$0.00
Well Site Relocation	EA	0	$750,000.00	$0.00
Reclaim Water Head	EA	2	$50,000.00	$100,000.00
Catch Basin	EA			$0.00
Subtotal Construction				$423,179.60
Irrigation System Design			10%	$42,317.96
Total SRP Relocation Estimate				$465,497.56
****Note: English units used per SRP standards***				

Appendix F

Technical Memorandum No. 6: Public and Stakeholder Participation

Peoria Avenue Corridor Improvement Study: Jackrabbit Trail Parkway to Dysart Road

Technical Memorandum #6: Public and Stakeholder Participation

June 2011

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Appendices

1.0 INTRODUCTION

The Maricopa Association of Governments (MAG) prepared the Interstate 10/Hassayampa Valley Roadway Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the build out of the area west of State Route 303 (SR 303L). This long range regional transportation study identified the need for a roadway network consisting of freeways, parkways, and major arterial roads.

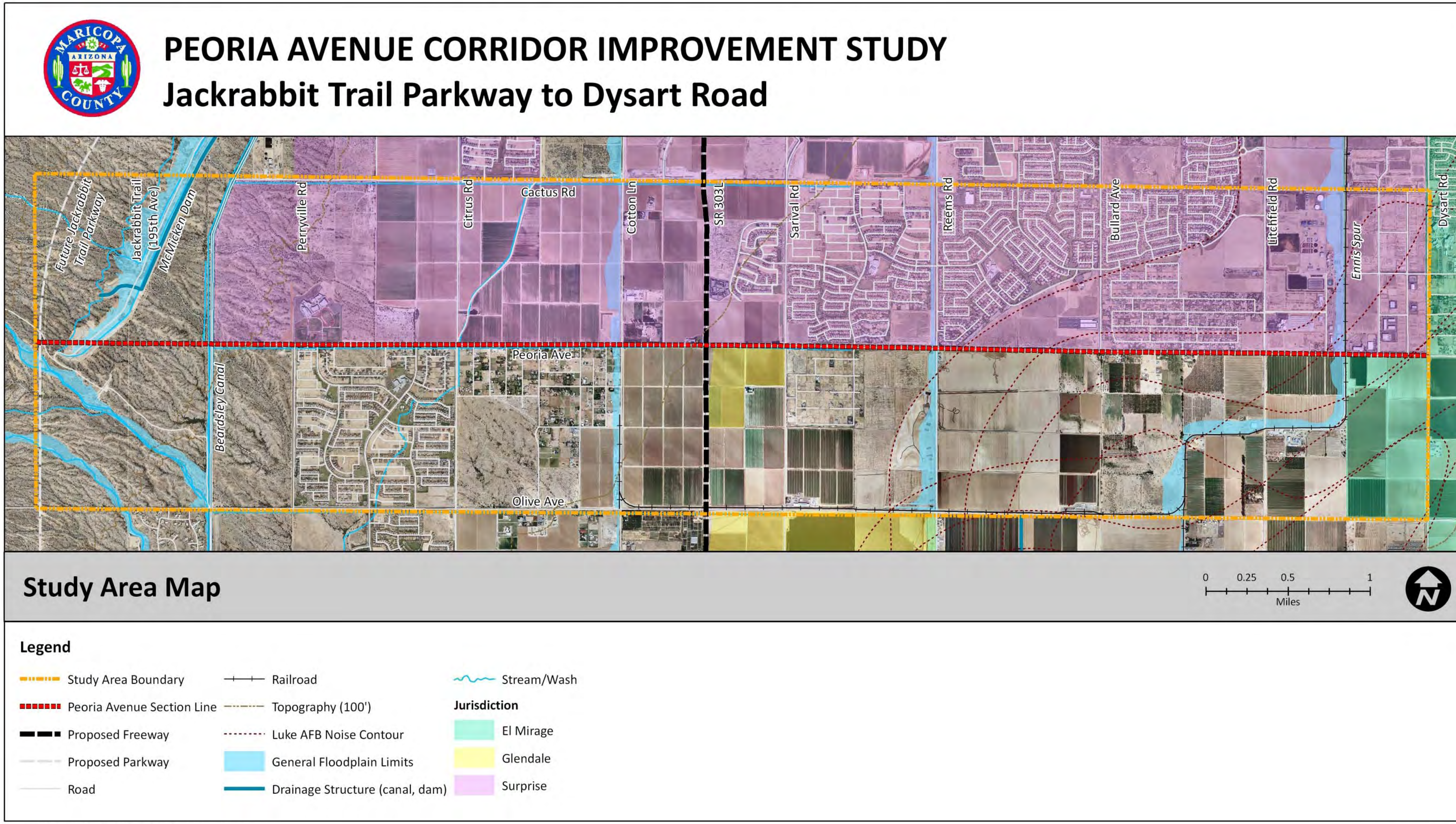
The Hassayampa Framework Study recommended an extension of Peoria Avenue west from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial from the future Jackrabbit Trail Parkway to Sarival Avenue. The study area for this project includes Peoria Avenue from the future Jackrabbit Trail Parkway alignment to Dysart Road (Peoria Avenue Corridor). The study area generally encompasses a 2-mile wide corridor centered on the existing Peoria Avenue. The study area is shown in Figure 1.

This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also develop access management guidelines, determine design standards based upon which jurisdiction anticipates annexing the roadway, and develop an implementation plan. In general, the purpose of this Corridor Improvement Study is to provide the Maricopa County Department of Transportation (MCDOT) and other jurisdictions with a future “footprint” of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

The key objectives of this Corridor Improvement Study are to:

- Define and assess strategic issues within the project study area;
- Develop and evaluate conceptual alternative alignments within the corridor study area;
- Recommend a preferred alignment;
- Develop consensus for the preferred alignment;
- Define the characteristics of the preferred alignment; and
- Develop an implementation plan.

This technical memorandum summarizes the public and stakeholder participation process, including meeting summaries for Technical Advisory Committee meetings and public open houses.



Source: Flood Control District of Maricopa County, ALRIS

September 2010

Figure 1 – Vicinity Map

2.0 PUBLIC AND STAKEHOLDER PARTICIPATION

Gaining consensus among stakeholder agencies and the public is critical to the success of this transportation study, as well as the future implementation of its recommendations to provide a long-term functional and efficient transportation corridor.

The participation of the public and stakeholder agencies aids in the development of a consistent recommendation, resolves conflicting agency requirements, facilitates ultimate regional traffic flow, and preserves the interests and rights of area residents and adjacent development.

Technical Advisory Committee

A Technical Advisory Committee (TAC) was established to solicit feedback from partnering agencies and key stakeholders at multiple stages of the corridor improvement study. Members of the TAC include: Maricopa County (Transportation, Engineering, Traffic, Planning and Development, Environmental, Cultural Resources, Parks and Recreation, Intergovernmental Relations, Real Estate, Utilities), Flood Control District of Maricopa County (FCDMC), Maricopa Association of Governments (MAG), Arizona Department of Transportation (ADOT), Arizona Game and Fish Department (AGFD), Arizona State Land Department (ASLD), Arizona Public Service (APS), City of El Mirage, City of Glendale, City of Surprise, Dysart School District, Luke Air Force Base, Maricopa Water District, and major land developers.

Five separate TAC meetings were planned over the course of the study:

- The first TAC meeting was held on August 23, 2010. The purpose of this meeting was to initiate the MCDOT Peoria Avenue Corridor Improvement Study, define the role of the TAC, gather information relative to the study needs, and share next steps with the committee. Preparations were made for the first public open house.

- The second TAC meeting was held on October 12, 2010. The meeting presented study area issues, constraints, and opportunities identified through the development of the first three technical memoranda; discussed potential alternatives and evaluation criteria; gathered additional information from TAC members to consider as the next phase of the project progressed; and shared next steps. Traffic volume information was presented to determine the corridor's ultimate typical section parameters.

- The third TAC meeting was planned for November 2010, but was cancelled and instead, information was disseminated through email to gain consensus on evaluation criteria and alternative corridor scenarios.

- The fourth TAC meeting was held on December 14, 2010. The meeting discussed progress on the alternatives development, evaluation, and preliminary recommendations; and gathered pertinent information to complete the evaluation. Planning efforts for the second public open house were discussed.

- The fifth TAC meeting was held on February 15, 2011. The meeting presented the results of the alternatives evaluation process, discussed design features of the recommended alignment, and preliminary implementation plan.

Minutes and meeting materials for all TAC meetings may be found in Appendix A.

Public Meetings

Three public meetings were held during the course of the Peoria Avenue Corridor Improvement Study, all located at Shadow Ridge High School, positioned at the western end of the study corridor. All meetings were conducted in an open house format which provided a free and open exchange of information between area residents with specific issues or questions and the project team. Study fact sheets and comment cards were distributed to all those in attendance.

- The first meeting was held for scoping purposes (September 20, 2010) to provide area residents and impacted stakeholders an opportunity to inform project team members about study area issues and local transportation needs. This meeting also provided project team members an opportunity to present and elicit feedback on the study purpose, process, and goals and objectives.

- The second meeting was held to discuss alternatives development and analysis (January 18, 2011), presenting three separate alternative alignment options in each of the nine corridor segments. Proposed roadway cross sections and the project team's preliminary evaluation were presented for public review and comment. Out of this meeting, a series of additional alignment options were requested for consideration by the public for the western portion of the study area between Cotton Lane and the future Jackrabbit Trail Parkway.

- The third meeting focused on the findings and recommendations of the Peoria Avenue Corridor Improvement Study (March 22, 2011). The alternatives, along with the recommended roadway cross section and future roadway alignment, were presented for public review and comment. Positive feedback was received on the preferred alignment and innovative solutions presented to accommodate corridor obstacles.

Meeting flyers, newspaper notices and articles, and information presented at all three public meetings may be found in Appendix B.

Appendix C contains the MCDOT *RightRoads* Program Summary of Public Involvement.

Appendix A:
Technical Advisory Committee Meeting Materials

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
MCDOT Contract No. 2010-005
Work Order No. TT005

MEETING MINUTES

Date: August 23, 2010

To: Mitch Wagner, Project Manager, MCDOT

From: Rodney Bragg, AECOM

Re: Peoria Avenue Corridor Improvement Study

Subject: August 17, 2010 TAC Meeting #1

Attendees: See attached sign-in sheet

I. Introductions
See attached sign-in sheet

II. Meeting Purpose
The purpose of this meeting is to initiate the MCDOT Peoria Avenue Corridor Improvement Study, define the role of the Technical Advisory Committee (TAC), gather information relative to the study needs, and share next steps with the committee. All meeting documents will be made available on an online FTP system.

III. Study Purpose and Objectives
The purpose of this study is to establish the facility type, number of lanes, right-of-way, and corridor alignment required to accommodate the ultimate facility classification and safely accommodate forecast travel demands for Peoria Avenue. This study will result in a future “footprint” of the corridor, implementation timeframe, and phasing of identified roadway improvements.

Study objectives include assessing the strategic issues and potential impacts of existing and proposed developments, drainage features, utilities, and environmental issues. Based on this information, the study will develop and evaluate candidate alternatives, as well as identify a preferred alignment. With a preferred alignment, specific characteristics of the corridor will be further defined and an implementation plan developed to carry out corridor improvements. Most importantly, the study aims at gaining consensus amongst partners to achieve design consistency and preserve the corridor for future implementation.

IV. Study Area

The study area extends approximately 7.5 miles, from the future Jackrabbit Trail Parkway alignment to Dysart Road, including a two-mile wide area, centered on Peoria Avenue. Multiple jurisdictions have control over the land in this area. The Peoria Avenue section line provides the boundary between the City of Surprise and City of Glendale planning areas, with portions of the corridor to the far west belonging to Maricopa County, and portions to the east belonging to the City of El Mirage. Most of the area within the Surprise and El Mirage municipal planning areas (MPAs) is incorporated, whereas only a small parcel adjacent to Peoria Avenue and SR 303L is annexed by Glendale.

White Tank Mountain Regional Park sits to the west of the study area and Luke Air Force Base to the south. McMicken Dam and the Beardsley Canal constitute two major drainage structures, both located at the western end of the study area. The SR 303L corridor will be upgraded to a freeway, with a connection to Peoria Avenue. The BNSF Ennis Spur also intersects the corridor between Litchfield and Dysart Roads.

V. Project Overview

The study is divided into two phases: Phase 1 - Study Area Assessment; and Phase 2 - Alternative Development and Evaluation. Phase 1 is currently underway, including a data collection effort and review of existing and future study area conditions. Four technical memos will be produced as part of Phase 1 (#1, 2, 3, and 7), including existing and future conditions, drainage, environmental overview, and traffic conditions. The first two TAC meetings will occur during this phase, of which this is the first, as well as the first public meeting. This phase is expected to last through the end of September.

Phase 2 will extend from October to the end of the study, approximately June 2011. This phase will include development and evaluation of candidate alternatives, the identification of a preferred alternative, and development of a corresponding implementation plan. Technical memos #4, 5, and 6 will be produced during this phase, including candidate alternatives and evaluation, preferred alignment and implementation, and public and stakeholder participation. Three TAC meetings and two public meetings will be held during this phase. Preparation and completion of draft and final reports will culminate the project.

VI. Study Process

The study process involves a three step involvement plan, which leads to the preparation of a phased implementation plan of the preferred alignment. This includes:

- Scoping and development of a stakeholder database to identify corridor issues and needs;
- Development, evaluation, and refinement of alternatives with stakeholder input; and

- Development of an implementation plan with the stakeholders whereby major design features are finalized.

VII. Study Milestones

Major milestones are as follows:

Phase 1

• Project kick-off and study initiation	July 2010
• Data collection phase	July – September 2010
• TAC meeting #1	August 17, 2010
• Public meeting #1 (scoping)	September 22, 2010 (approx.)
• TAC meeting #2	October 12, 2010

Phase 2

• TAC meeting #3	November 9, 2010
• TAC meeting #4	December 14, 2010
• Public meeting #2 (alternatives)	January 12, 2011 (approx.)
• TAC meeting #5	February 15, 2010
• Public meeting #3 (pref. alternative)	March 16, 2011 (approx.)
• Draft final report	April 2011
• Final report submission	June 2011

VIII. Technical Advisory Committee

The major roles and responsibilities of the TAC include assisting in issue identification, providing input to alternative evaluation, and previewing public meeting materials. Building consensus among TAC members is desired to develop a universal and implementable plan. Each member is asked to represent their agency and bring interests, issues, and opportunities to the table. Lastly, everyone is asked to participate in each of the planned TAC meetings.

IX. Study Area Overview

To provide a more thorough understanding of the conditions in the study area, the corridor was split into four segments. An overview of existing developments, future developments, flood control and drainage, utilities, and other notable features was provided for each segment.

Throughout the entire corridor, it is important to note that almost the entire area is privately owned. The land west of the Beardsley Canal, with exception of the McMicken Dam, is owned by the Arizona State Land Department (ASLD). The rest of the study area is owned by various private land holders. Also, the majority of the corridor today is either comprised of single-family residential homes or agriculture land uses.

<u>Segment 1</u>

The area from Jackrabbit Trail Parkway to Citrus Road contains many of the study area's most important drainage structures. The McMicken Dam is located at the far west, and the Beardsley Canal crosses the Peoria Avenue section line between Jackrabbit Trail and Perryville Road. Several washes traverse the area, draining into the dam or the floodpool upstream of the canal. Numerous wells are located along the section line and will need to be accommodated regarding future right-of-way and planning for the ultimate roadway footprint. Additionally, a series of irrigation ditches abut Peoria Avenue to the south throughout the corridor.

One major residential subdivision exists in this segment, Cortessa, located south of Peoria Avenue and east of Perryville Road. Shadow Ridge High School has been newly constructed to the north of the subdivision. The roadway dividing the high school and subdivision is the only full-width arterial cross section throughout the corridor. Conversely, the segment of Peoria Avenue between Citrus Road and Cotton Lane is the only unpaved portion of the existing roadway corridor.

Two other major developments are planned within this segment – Zanjero Trails and Prasada. Zanjero Trails is entitled for 2,551 acres with almost 10,000 dwelling units. North of Peoria Avenue, Zanjero Trails extends from the Beardsley Canal to approximately ½ mile east of Perryville Road. This subdivision sits adjacent to the planned Prasada community, actively under development further to the north and east. Adjacent to Peoria Avenue, Prasada stretches from its border with Zanjero Trails east to Cotton Lane. South of Peoria Avenue, Zanjero Trails extends from the Beardsley Canal to Perryville Road.

<u>Segment 2</u>
From Citrus Road to Sarival Road, two major infrastructure projects are planned – the SR 303L freeway, intersecting Peoria Avenue between Cotton Lane and Sarival Road; and the planned APS West Valley-North power line, adjacent to SR 303L. An existing power substation is located at Cotton Lane and Cactus Road, and a proposed substation to supplement the new transmission corridor is planned at SR 303L and Olive Avenue. Some housing currently exists in this segment, however the majority of land is agriculture with future master planned communities (Prasada and Sycamore Farms north of Peoria Avenue, Zanjero Pass and Glendale 303 south of Peoria Avenue).

Irrigation ditches and wells continue to be located within the study area, generally along the south side of Peoria Avenue.

<u>Segment 3</u>
From Sarival Road to Bullard Avenue, much of the land north of Peoria Avenue is already developed. The Luke Air Force Base noise contours extend into this portion of the study area, noticeable by the parallel boundary of residential development in Rancho Gabriela, following the furthest contour. Because of the noise impacts, little residential development is planned south of Peoria Avenue within the radius of Luke Air Force Base. Municipal planning and zoning show future industrial or mixed-use development here. Again, drainage corridors and wells are present throughout the study area.

<u>Segment 4</u>
From Bullard Avenue to Dysart Road, various pockets of existing residential and industrial development exist north of the corridor. Agriculture is predominately located south of Peoria Avenue, within the noise contours of Luke Air Force Base. Much of the industrial development is near the BNSF Ennis Spur, which intersects Peoria Avenue between Litchfield and Dysart Roads. This is currently an at-grade crossing. The Ennis Spur connects to the BNSF Phoenix Subdivision parallel to Grand Avenue to the north. Future plans may exist to extend the Ennis Spur to a

major industrial development south of the study area at Luke Air Force Base. If this occurs, the volume of trains crossing Peoria Avenue per day could increase. Train volumes and the decision to maintain an at-grade rail crossing will need to be considered as part of this project.

To summarize, some of the key issues in the study area include:

- Existing developments and right-of-way availability
- Half-street improvements
- Future development plans
- Existing and future drainage facilities
- Planned APS transmission corridor
- Ennis Spur
- Beardsley Canal
- ASLD planning
- Street classification – ultimate typical section

X. Typical Section
Peoria Avenue is categorized slightly different in each jurisdiction's functional classification plans. The 2005 City of Surprise Transportation Plan shows Peoria Avenue as a major arterial with six lanes and 130 feet of right-of-way. Surprise's updated transportation plan does not change Peoria Avenue's classification.

The City of Glendale's 2025 General Plan classifies Peoria Avenue as an A-1 arterial which includes four lanes and 110 feet of right-of-way. The city has an updated transportation plan that shows this corridor as an A-4 arterial with six lanes and 130 feet of right-of-way.

The Maricopa County 2004 Major Streets and Routes Plan classifies Peoria Avenue as an urban principal arterial with six lanes and 130 feet of right-of-way.

XI. Next Steps
Data collection will continue through Phase 1, culminating in documentation of the four working papers specified above. The first public meeting will occur in mid-September to present the existing conditions and gain public input on other issues and opportunities. The time and location of this meeting are still to be determined. Concurrently, travel demand forecasts for the study area will be under review.

XII. Open Discussion

<u>Maricopa Water District</u>
It was asked whether the results of this study would include any improvements to Cactus Road and Olive Avenue. While the study area includes both of these arterial corridors to gain a broad understanding of constraints and opportunities relative to Peoria Avenue, no improvements will be recommended for those corridors as part of this study. Other projects may be conducted to study or design these corridors.

The Maricopa Water District (MWD) has a water treatment plant on Cactus, east of the Beardsley Canal. They own property east of the canal which is currently platted for the Zanjero Trails development. A crossing of Peoria Avenue with the Beardsley

Canal will require an agreement with MWD, similar to the current crossing they are working on at Indian School Road. Several wells are located throughout the study area, as well as a canal/pipeline crossing at Peoria Avenue and Citrus Road. Impacts to these facilities will need to be coordinated with MWD.

City of Surprise
The City of Surprise is working with the Greer Ranch development, abutting Peoria Avenue to the north, between Sarival and Reems Roads, to construct their portion of a half-street on Peoria Avenue. The city has a development agreement with the community to construct this half-street, but they have not yet done so. This project will be dealing with many of the same issues (e.g., drainage, utilities, etc.) and the city hopes that coordination will occur so that Greer Ranch improvements complement this study's recommendations for Peoria Avenue. In addition to developer funding, Surprise is applying for Maricopa County Special Projects Funds for improvements to Peoria Avenue.

The Dysart Unified School District (DUSD) is working with the City of Surprise and MWD to extend Perryville north to Cactus Road, allowing Cactus Road to operate as an alternative route for school traffic, as a portion of Peoria Avenue is unpaved.

City of Glendale
The City of Glendale asked the project team to be cognizant of the travel demand impact of Northern Avenue Parkway on Peoria Avenue. Northern Avenue has long been planned as a "super-street" throughout the western metropolitan area.

The portion of Peoria Avenue that is annexed by Glendale within the study area, within a development entitled "Glendale 303" located between SR 303L and Sarival Road south of Peoria Avenue, is being asked to conform with Maricopa County and/or City of Surprise guidelines for roadway design. The City of Glendale would like to eventually turn this corridor over to another jurisdiction for maintenance responsibility.

General
The concern over ownership and maintenance of Peoria Avenue is a major factor for this study. It was expressed that one jurisdiction should have full control over the corridor to ensure consistent design, construction, and maintenance. This will likely result in an intergovernmental agreement (IGA) among Surprise, El Mirage, Glendale, and Maricopa County.

The Flood Control District of Maricopa County is planning a channel parallel to the Ennis Spur.

Because Peoria Avenue is part of the regional arterial roadway network, its connectivity to the east was questioned, as the corridor currently does not have a crossing over the Agua Fria River. As the river is outside the study area extent, no recommendations will be made regarding a potential river crossing. Travel demand will be modeled with and without a future crossing. El Mirage, however, submitted an interim crossing of the river to be included in their next Capital Improvement Plan. The city is also drafting a revised transportation plan that will limit the Peoria Avenue cross section to a 2-1-2 configuration east of Dysart Road.

Luke Air Force Base would like to be kept appraised of any proposed elevated overpasses or tall construction elements (e.g., cranes) that could impact flight patterns.

Concern was expressed regarding the one-mile unpaved section of Peoria Avenue between Citrus Road and Cotton Lane. It was suggested that CMAQ/PM 10 funds could be used for an immediate improvement project (i.e., paving for dust mitigation).

Attachments:
- Meeting Sign-In Sheet
- Meeting Agenda
- TAC Welcome Letter
- Study Area Map
- PowerPoint slides

Peoria Avenue: Jackrabbit Trail Parkway to Dysart Road, Corridor Improvement Study
TAC Sign-In Sheet

Date: Aug, 17, 2010

Initials	Name	Organization	Telephone	Postal Address	E-mail Address
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	Dewitt, Mike	APS	(602) 493-4448	P.O. Box 53933 Attn: Mail Station 4030 Phoenix 85072	michael.dewitt@aps.com
	Richards, Paul	APS	(602) 371-6186	2043 W. Cheryl Drive M.S. 3040 Phoenix 85021	Paul.Richards@aps.com
	Warnecke, Dana	AZ Game & Fish	(602) 942-3000	5000 W. Carefree Highway Phoenix, AZ 85006	dwarnecke@azgfd.gov
	Taylor, Gordon	AZ State Land Dept.	(602) 542-2647	1616 W. Adams Street Phoenix 85007	gtaylor@land.az.gov
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	Purab Adabala for Darr, Bob	City of Glendale	623-930-2926 (623) 930-2942	5800 W. Glenn Drive #315 Glendale 85301	Padabala@Glendaleaz.com rdarr@glendaleaz.com
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	Savage, Karen	City of Surprise	(623) 222-6132	16000 N. Civic Center Plaza	karen.savage@surpriseaz.gov
	Wolfley, Vern	Dysart School District	(623) 876-7052	15802 N. Parkview Place Surprise, AZ 85374	Vern.Wolfley@dysart.org
	Lokey, Burke	FCDMC	(602) 502-0867	2801 W. Durango Street Phoenix 85009	burkelokey@mail.maricopa.gov
	Dubsky, Bob	Luke Air Force Base	(623) 856-6195	56 Fighter Wing Community Initiatives 14185 W. Falcon Street Luke Air Force Base 85309	robert.dubsky@luke.af.mil
	Strow, Tim	MAG	(602) 452-5055	302 N. First Avenue Phoenix 85003	tstrow@mag.maricopa.gov
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	Cain, Chris	Maricopa Water District	(623) 546-8266	14825 W. Grand Avenue Surprise, AZ 85374	chrisc@mwdaz.com
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MWS	Sabatini, Mike	MCDOT Engineering & Planning	(602) 506-8628	2901 W. Durango Street Phoenix 85009	MikeSabatini@mail.maricopa.gov
	Wagner, Mitch	MCDOT Engineering & Planning	(602) 506-8054	2901 W. Durango Street Phoenix 85009	mitchwagner@mail.maricopa.gov
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Peoria Avenue: Jackrabbit Trail Parkway to Dysart Road, Corridor Improvement Study
TAC Sign-In Sheet

Date: Aug, 17, 2010

Initials	Name	Organization	Telephone	Postal Address	E-mail Address
	Heinrich, Chad	MCDOT Intergovernmental Relations	(602) 506-1630	2901 W. Durango Street Phoenix 85009	ChadHeinrich@mail.maricopa.gov
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	Kattan, Al	MCDOT PMO & Construction	(602) 506-4618	2901 W. Durango Street Phoenix 85009	AlKattan@mail.maricopa.gov
	Crowe, Roberta	MCDOT Public Information Office	(602) 506-8003	2901 W. Durango Street Phoenix 85009	RobertaCrowe@mail.maricopa.gov
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	Wilson, Mike	MCDOT Real Estate	(602) 506-4706	2801 W. Durango Street Phoenix 85009	mdw@mail.maricopa.gov
	Sargent, Jim	MCDOT Traffic	(602) 506-8678	2901 W. Durango Street Phoenix 85009	jamessargent@mail.maricopa.gov
	Swart, Nicolaas	MCDOT Traffic	(602) 506-0599	2901 W. Durango Street Phoenix 85009	nicolaasswart@mail.maricopa.gov
	Butch, Wayne	MCDOT Utilities	(602) 506-8603	2901 W. Durango Street Phoenix 85009	WayneButch@mail.maricopa.gov
	Nies, Ryan	MCDOT Utilities	(602) 506-8529	2901 W. Durango Street Phoenix 85009	ryannies@mail.maricopa.gov
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JOG	Guano, Javier	Andes Engineering	480-272-6258	11811 N TATUM BLVD #3031, PHX 85028	jguano@andes.us
OU	Oney Urquiza	MARICOPA WATER DISTRICT	623 546-8266	P.O. Box 900 Waddell AZ 85355	oneyu@mwdaz.com
V.V.	Veronica Valenzuela	MARICOPA WATER DISTRICT	623.546.8266	P.O. BOX 900 WADDELL, AZ 85355	veronicav@mwdaz.com
JP	Jaclyn Pfeiffer	AECom	602.337.2984	2777 E. Camelback Suite 200, Phx 85016	jaclyn.pfeiffer@aecom.com

Maricopa County
Public Works

2901 W. Durango St
Phoenix, AZ 85009
Phone: 602-506-xxxx
Fax: 602-506-xxxx
www.maricopa.gov

August 17, 2010

Subject: Peoria Avenue: Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study
Technical Advisory Committee (TAC) Kick-off Meeting

Welcome!

On behalf of the Maricopa County Department of Transportation (MCDOT), I would like to thank you for participating in today's TAC kick-off meeting and for your involvement in this important long-term planning effort. This is the first of five TAC meetings planned for the Peoria Avenue, Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study. Our goals for today's meeting are to provide an overview of the project scope and schedule; familiarize you with the corridor; identify issues and challenges that will need to be considered during the study; and gain insight into your organization's perspective and plans for the development of this corridor.

The recommended alternative must address community and aesthetic concerns and reflect present and future community development efforts, while achieving regional and local transportation network goals.

In order to meet these ambitious project expectations, your commitment to actively participate as a TAC member is vital to the project's overall success. As a TAC member, you will help develop innovative yet feasible alternatives that address our challenging study objectives, provide relevant guidance to the alternative evaluation process, and review the technical reports and plans.

The TAC is expected to meet five times during this study. Your involvement is crucial so you can effectively contribute your expertise at critical times in the project development process so that we can avoid unnecessary delays or missed opportunities.

Again, thank you for your interest and involvement in the Peoria Avenue Corridor Improvement Study. If you have any questions, please feel free to contact me at (602) 506-8054 or email me at mitchwagner@mail.maricopa.gov.

Sincerely,

Mitch Wagner

Mitch Wagner
Senior Planner

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD

MCDOT Contract No. 2010-005
Work Order No. TT005

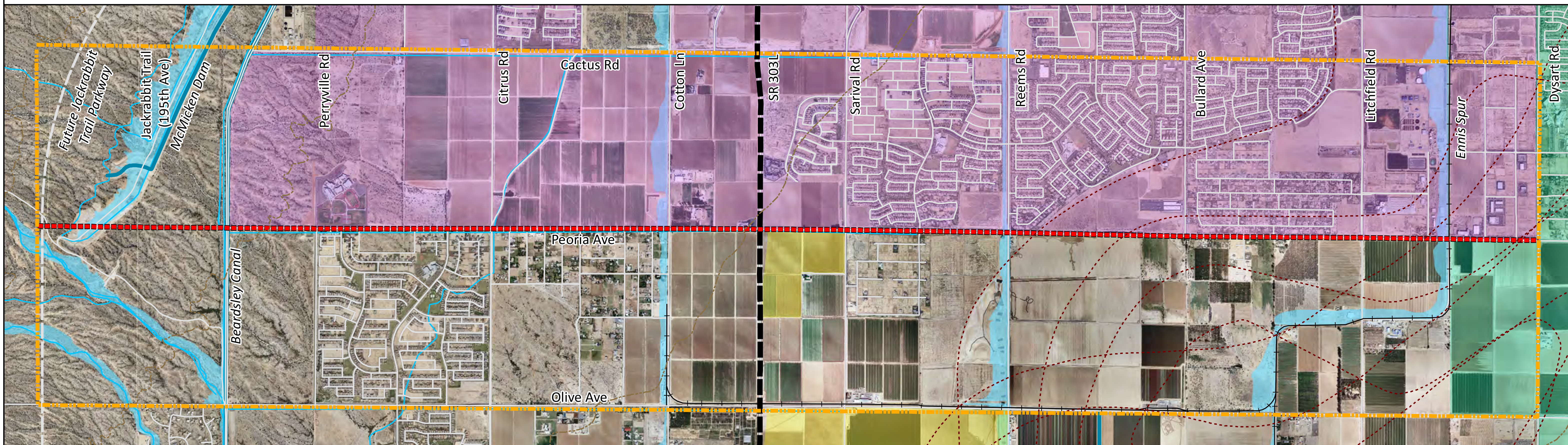
Technical Advisory Committee Meeting Agenda

August 17, 2010, 9:00 AM
Apache & Cochise Conference Rooms at MCDOT

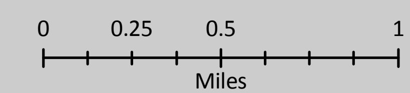
- Introductions
- Meeting Purpose
- Study Purpose & Objectives
- Project Overview and Schedule
- Study Area Overview
- Next Steps
- Open Discussion
- Adjourn

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road

DRAFT



Study Area Map



Legend

Study Area Boundary
Peoria Avenue Section Line
Proposed Freeway
Proposed Parkway
Road
Railroad
Topography (100')
Noise Contour
General Floodplain Limits
Drainage Structure (canal, dam)
Stream/Wash

Jurisdiction

El Mirage
Glendale
Surprise

Source: Flood Control District of Maricopa County, ALRIS

August 2010

Peoria Avenue
Corridor Improvement Study

Technical Advisory Committee Meeting #1
August 17, 2010




MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Meeting Agenda

- Introductions
- Meeting Purpose
- Study Purpose & Objectives
- Project Overview & Schedule
- TAC Role & Responsibilities
- Study Area Overview
- Next Steps
- Open Discussion
- Adjourn

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

AECOM

Meeting Purpose

- Initiate study
- Define TAC role
- Gather information
- Share next steps

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

MARICOPA ARIZONA COUNTY

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

AECOM

Study Purpose

- Establish the **facility type, number of lanes, right-of-way, and corridor alignment** required to safely accommodate forecast travel demands

- Provide a future **"footprint"** of the corridor, implementation timeframe & phasing of the identified roadway improvements

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

MARICOPA ARIZONA COUNTY

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

AECOM

Study Objectives

- Assess the study area for strategic issues
- Develop and evaluate conceptual alternative alignments
- Identify a Preferred Alignment
- Define characteristics of Preferred Alignment
- Develop an implementation plan
- Develop consensus

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

AECOM

Study Area

Project Overview

Phase 1 – Study Area Assessment

- Existing and future study area conditions
- Technical Memos #1, #2, #3, and #7
- TAC Meetings #1 and #2
- Public Meeting #1

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study
AECOM

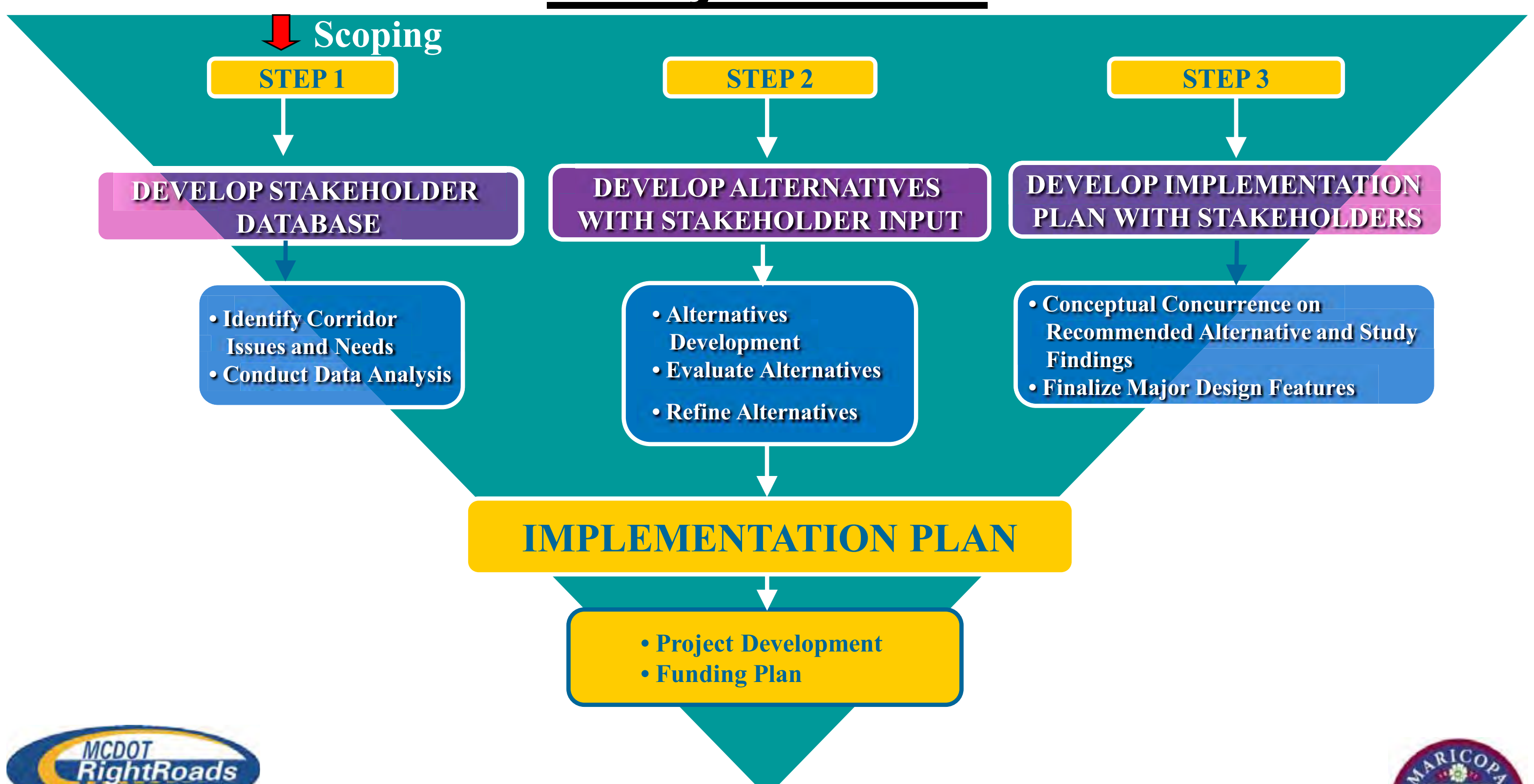
Project Overview

Phase 2 – Alternative Development & Evaluation

- Conceptual alternatives
- Alternative evaluation
- Preferred Alternative
- Implementation plan
- Technical Memos #4, #5, and #6
- TAC Meetings #3, #4, and #5
- Public Meetings #2 and #3
- Draft and Final Reports

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Study Process



Study Milestones

• Project Kick-off & Study Initiation	July 2010
• Data Collection Phase	July - Sept 2010
• TAC Meeting #1	August 17, 2010
• Public Meeting #1 (Scoping)	Sept 22, 2010
• TAC Meeting #2	Oct 12, 2010
• Alternatives Development & Evaluation Phase	Oct 2010 – Jan 2011

Continued…

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

Study Milestones Contd.

• TAC Meeting #3	Nov 9, 2010
• TAC Meeting #4	Dec 14, 2010
• Public Meeting #2 (Alternatives)	Jan 12, 2011
• TAC Meeting #5	Feb 15, 2011
• Public Meeting #3 (Pref. Alt.)	March 16, 2011
• Draft Final Report	April 2011
• Final Report Submission	June 2011

The Right System The Right Time The Right Cost

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

Technical Advisory Committee (TAC)

- Assist in issue identification
- Provide input to alternative evaluation
- Preview public meeting materials
- Build consensus
- Represent your agency/interests
- Participate in TAC meetings

The Right System The Right Time The Right Cost

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Peoria Avenue Corridor Improvement Study

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Study Area Overview

- Existing developments
- Future developments
- Flood control and drainage
- Utilities
- Other

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The Right System The Right Time The Right Cost

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Peoria Avenue Corridor Improvement Study

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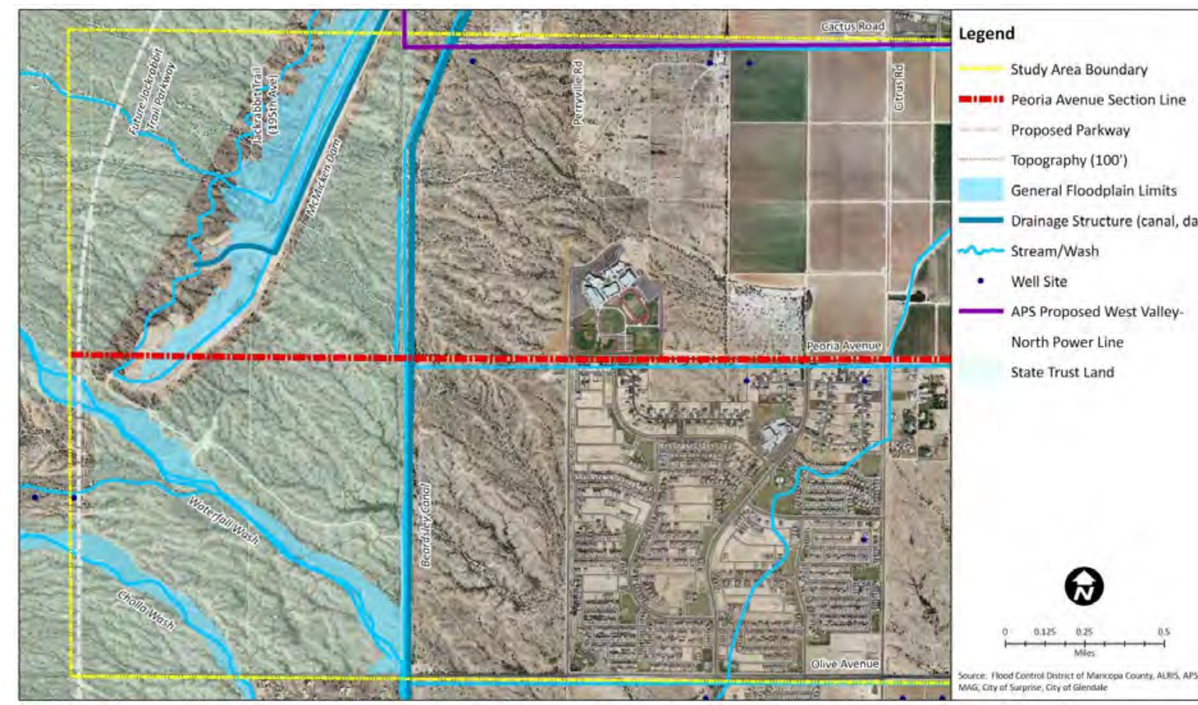
Segment 1: *Jackrabbit Trail Parkway to Citrus Road*



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The Right System The Right Time The Right Cost

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Peoria Avenue Corridor Improvement Study

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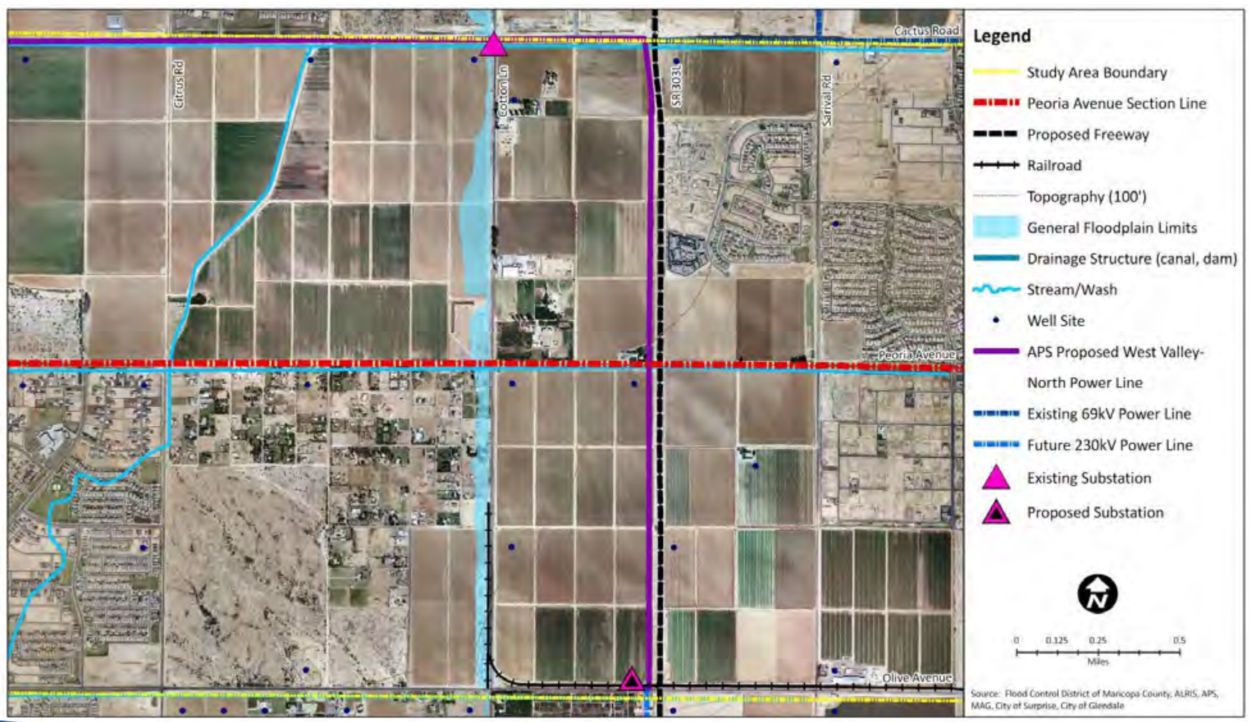
Segment 2: *Citrus Road to Sarival Road*



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Peoria Avenue Corridor Improvement Study

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Segment 3: *Sarival Road to Bullard Avenue*

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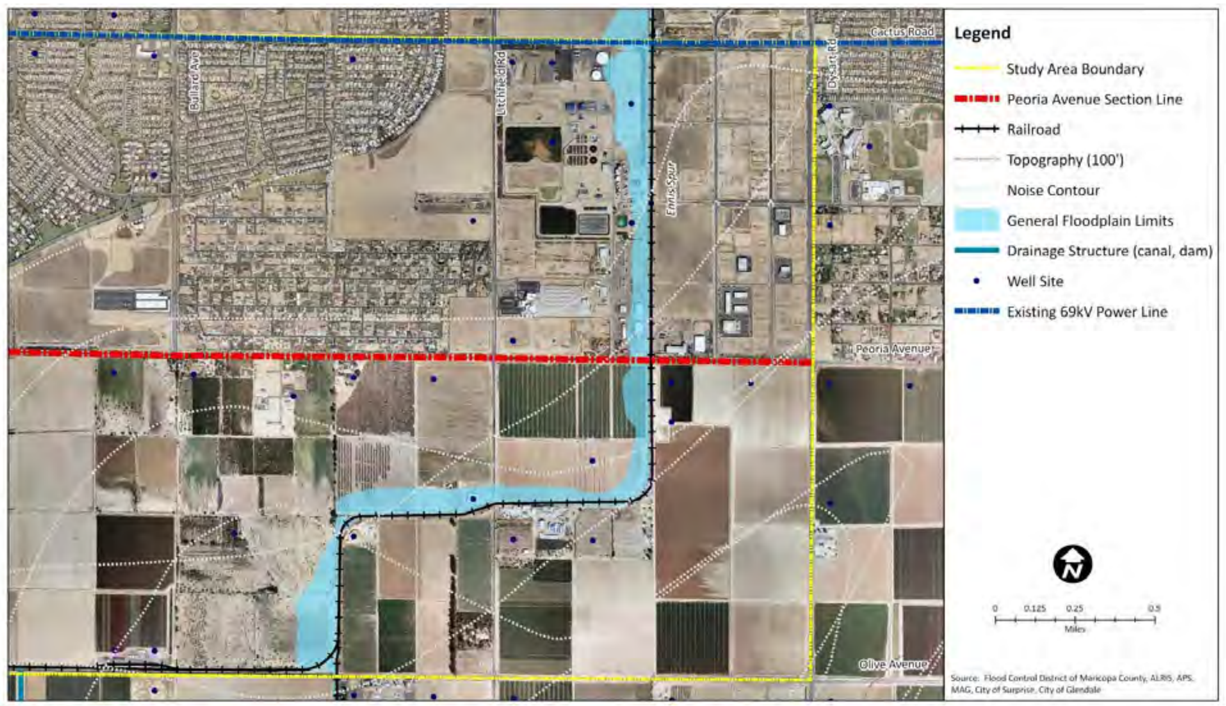
Segment 4: *Bullard Avenue to Dysart Road*



Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study
AECOM

Key Issues

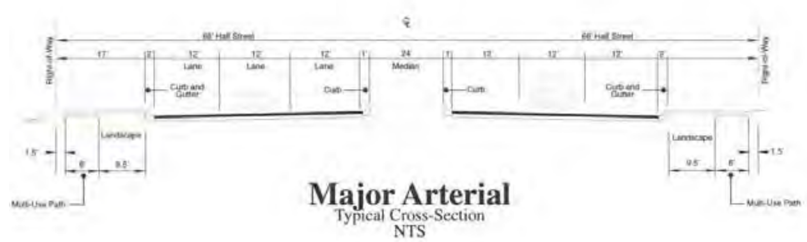
- Existing developments/land uses (R/W availability)
- Half-street improvements
- Future development
- Existing and future drainage facilities
- APS corridor
- Ennis Spur & Beardsley Canal
- Arizona State Land Department planning
- Street classification - ultimate typical section

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

Typical Section

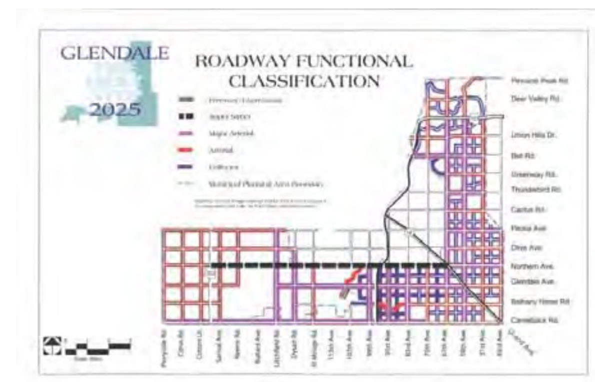


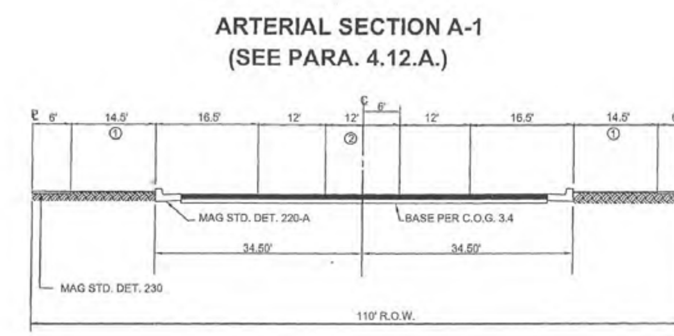
- City of Surprise Transportation Plan, 2005
- City of Surprise Major Arterial
- 6 lanes in 136’ R/W

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

Typical Section

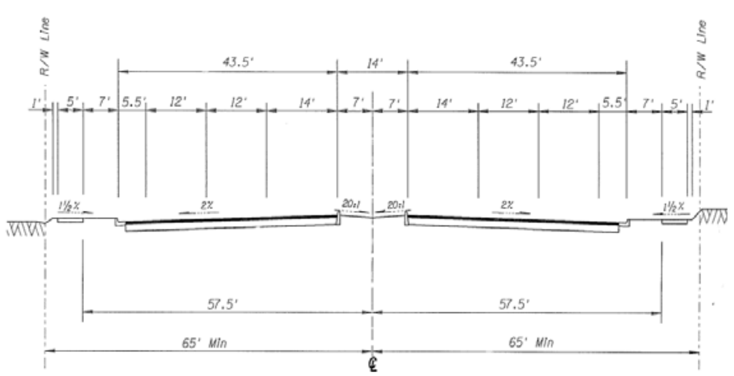




- City of Glendale 2025 General Plan
- City of Glendale Arterial
- 4 lanes in 110’ R/W

Typical Section

- MCDOT Major Streets and Routes Plan, 2004
- Urban Principal Arterial
- 6 lanes in 130' R/W



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Next Steps

- Public meeting
- Travel demand model review
- Existing and future conditions documentation

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Public Meeting Information

Public Meeting #1 - Scoping

Date: Wednesday, Sept 22, 2010

Time & Location TBD

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Open Discussion

- Study area issues, constraints, & opportunities
- Stakeholder expectations
- Stakeholder involvement

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Peoria Avenue Corridor Improvement Study

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Next TAC Meeting

October 12, 2010

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
MCDOT Contract No. 2010-005
Work Order No. TT005

MEETING MINUTES

Date:	October 19, 2010
To:	Mitch Wagner, Project Manager, MCDOT
From:	Jackie Pfieffer, AECOM
Re:	Peoria Avenue Corridor Improvement Study
Subject:	October 12, 2010 TAC Meeting #2
Attendees:	See attached sign-in sheet

I. Introductions
See attached sign-in sheet

II. Meeting Purpose
The purpose of this meeting it to update the TAC on the project status; present study area issues, constraints, and opportunities (ICO) learned through the development of the first three technical memoranda; discuss potential alternatives and evaluation criteria; gather additional information from TAC members to consider as the next phase of the project progresses; and share the next steps. All meeting documents will be made available on the online FTP system.

III. Study Purpose and Objectives
The purpose of this study is to establish the facility type, number of lanes, right-of-way, and corridor alignment required to accommodate the ultimate facility classification and safely accommodate forecast travel demands for Peoria Avenue. This study will result in a future "footprint" of the corridor, implementation timeframe, and phasing of identified roadway improvements.

Study objectives include assessing the strategic issues and potential impacts by existing and proposed developments, drainage features, utilities, and environmental issues. Based on this information, the study will develop and evaluate conceptual alternative alignments, as well as identify a preferred alignment. With a preferred alignment, specific characteristics of the corridor will be further defined and an implementation plan developed to carry out corridor improvements. Most importantly, the study aims at gaining consensus amongst partners to achieve design consistency and preserve the corridor for future implementation.

IV. Study Area

The study area extends approximately 7.5 miles, from the future Jackrabbit Trail Parkway alignment to Dysart Road, including a two-mile wide area, centered on Peoria Avenue. Multiple jurisdictions have control over the land in this area. The Peoria Avenue section line provides the boundary between the City of Surprise and City of Glendale planning areas, with portions of the corridor to the far west belonging to Maricopa County, and portions to the east belonging to the City of El Mirage. Most of the area within the Surprise and El Mirage municipal planning areas (MPAs) is incorporated, whereas only a small parcel adjacent to Peoria Avenue and SR 303L is annexed by Glendale.

White Tank Mountain Regional Park sits to the west of the study area and Luke Air Force Base to the south. McMicken Dam and the Beardsley Canal constitute two major drainage structures, both located at the western end of the study area. The SR 303L corridor will be upgraded to a freeway, with a connection to Peoria Avenue. The BNSF Ennis Spur also intersects the corridor between Litchfield and Dysart Roads.

V. Study Process

The study process involves a three step involvement plan, which leads to the preparation of a phased implementation plan of the selected alternative. This includes:

- Step 1: Scoping and development of a stakeholder database to identify corridor issues and needs;
- Step 2: Development, evaluation, and refinement of alternatives with stakeholder input; and
- Step 3: Development of an implementation plan with the stakeholders whereby major design features are finalized.

Currently, the project is moving from step 1 to step 2.

VI. Study Milestones

Major milestones are as follows:

Phase 1

• Project kick-off and study initiation	July 2010 (completed)
• Data collection phase	July – September 2010 (completed)
• TAC meeting #1	August 17, 2010 (completed)
• Public meeting #1 (scoping)	September 20, 2010 (completed)
• TAC meeting #2	October 12, 2010

Phase 2

• TAC meeting #3	November 9, 2010
• TAC meeting #4	December 14, 2010
• Public meeting #2 (alternatives)	January 12, 2011 (approx.)
• TAC meeting #5	February 15, 2010
• Public meeting #3 (pref. alternative)	March 16, 2011 (approx.)
• Draft final report	April 2011
• Final report submission	June 2011

VII. Public Meeting Summary

The project's first public meeting was held on September 20, 2010 at Shadow Ridge High School in an open house format. Approximately 60 people were in attendance. Participants shared mixed reactions to the study, particularly pertaining to the one-mile unpaved segment between Citrus Road and Cotton Lane. Some residents were under the impression that no improvements would ever be made in this area and would like to see that remain the case; others wanted to know how soon the road could be paved to mitigate the dust issues caused by increased traffic on this segment. Some members of the community indicated that they had been misled by realtors regarding future improvements to Peoria Avenue. Overall, most participants were pleased to receive more information on the study purpose and schedule.

VIII. Study Area ICO Overview

To provide a more thorough understanding of the conditions in the study area, the corridor was split into four segments. The following discussion built on a general study area overview presented at the first TAC meeting by noting specific ICOs that could impact the development of corridor alternatives. These ICOs can generally be categorized as: roadway, major utility, drainage, topography, land ownership, existing development, future development, or growth area-related.

Throughout the entire corridor, several half-streets or segments with significant roadway improvements are constructed. The development of alternatives will seek to maximize use of these improvements to reduce reconstruction in the future. Most of the utility considerations are corridor-wide and not restricted to a particular segment. For example, many well sites are located throughout the study area, particularly adjacent to the south side of Peoria Avenue. As major pieces of infrastructure, their locations will need to be considered to develop the ultimate alignment of Peoria Avenue. Additionally, several above ground power lines are located on both sides of the roadway, as well as underground city water and sewer lines, natural gas lines, and telephone lines.

Segment 1

This segment extends from the Jackrabbit Trail Parkway alignment to Citrus Road. Much of the land west of the Beardsley Canal is owned by the Arizona State Land Department (ASLD). The project team met with ASLD on Friday, October 8, 2010 to better understand ongoing planning efforts in this area. ASLD developed a conceptual master plan for this parcel, known as the Westside Study Area, which includes varying residential densities and pockets of commercial development within the Peoria Avenue study area. This conceptual master plan was not adopted by the State Land Commissioner. However, a portion of the State Lands are also located in the Surprise municipal planning area, which classifies the future land use as low-density residential development.

One major residential subdivision exists in this segment, Cortessa, located south of Peoria Avenue and east of Perryville Road. Shadow Ridge High School has been newly constructed to the north of the subdivision. The roadway dividing the high school and subdivision is the only full-width arterial cross section throughout the corridor.

Two other major developments are planned within this segment – Zanjero Trails and Prasada. Zanjero Trails spans Peoria Avenue between the Beardsley Canal and Perryville Road. The preliminary plat for Zanjero Trails shows 136' of right-of-way (R/W) centered on the section line for an extension of Peoria Avenue to the west.

The planned Prasada community is located north of Peoria Avenue, stretching from its border with Zanjero Trails east to Cotton Lane. The master plan illustrates this portion of the community to be primarily residential development. The street pattern shows a connection of Citrus Road into Prasada at the current Citrus Road alignment, then transitioning into an internal curvilinear street pattern.

Segment 1 includes several major drainage facilities, including the Beardsley Canal, McMicken Dam, and various washes. The McMicken Dam and Waterfall Wash both cross the Peoria Avenue section line within a half-mile of each other and will need to be taken into consideration when determining the ultimate alignment of a Peoria Avenue extension and its intersection with Jackrabbit Trail Parkway.

Segment 2

Between Citrus Road and Cotton Lane, Peoria Avenue is currently unpaved. The area to the north is part of the Prasada community; the area to the south is comprised of individual large-lot homes. Right-of-way dedications within this one-mile segment are unclear. This segment is not operated or maintained by the county.

The construction to upgrade SR 303L to a freeway is expected to begin late 2010/early 2011, with corridor completion two to three years later. ADOT has planned a full diamond interchange on the Peoria Avenue section line, with the freeway crossing above the roadway corridor. The development of alternatives will need to connect to this interchange.

In addition, major commercial/employment land uses are planned along the freeway corridor. Glendale 303, the only portion of land annexed into the City of Glendale within the study area, abuts SR 303L on the east, south of Peoria Avenue. Prasada has three major commercial centers planned north of Cactus, centered on SR 303L – an automall, power center, and urban village.

Some housing currently exists in this segment, however the majority of land is agriculture with future master planned communities (Prasada and Sycamore Farms).

From a drainage perspective, west of SR 303L, the land drains south into Peoria Avenue. Depending on the order of improvements, any drainage-related issues could be taken care of with the construction of Prasada. If the roadway

improvements commence first, additional drainage solutions will be required. An existing drainage channel is located along the west side of Cotton Lane.

The Flood Control District for Maricopa County (FCDMC) previously completed the Loop 303 Area Drainage Master Plan. The plan identified a future channel along the west side of SR 303L. This channel will be completed with the construction of the SR 303L freeway corridor and will likely alleviate the flooding along Peoria Avenue in this area.

Segment 3

From Sarival Road to Bullard Avenue, much of the land north of Peoria Avenue is already developed in a series of residential master planned communities. Any future development in this segment will be shaped by the noise contours from Luke Air Force Base, noticeable already by the boundary of residential development in Rancho Gabriela, following the noise contour. Because of the noise impacts, little residential development is planned south of Peoria Avenue within the radius of Luke Air Force Base.

Greer Ranch has dedicated 55' of R/W and has constructed some improvements, however the full half-street is not built and still lacks curb and gutter and sidewalk. The City of Surprise is coordinating Peoria Avenue roadway improvements with the homebuilder. Just south of Greer Ranch, Twelve Oaks Estates has dedicated 65' of R/W. Curb and gutter and sidewalk are installed. Drainage channels exist on both sides of Peoria Avenue through this area. To the east of Greer Ranch, Rancho Gabriela has dedicated 65' of R/W, and again, the half-street is not fully constructed.

Segment 4

From Bullard Avenue to Dysart Road, one residential community exists and three industrial communities are in varying phases of the development process. Copper Canyon Ranch, located between Bullard Avenue and Litchfield Road has dedicated 55' of R/W. Curb, gutter, and sidewalk is installed, however the full half-street does not exist. Existing private home development is present to the south of Peoria Avenue.

The industrial developments between Litchfield and Dysart Roads include: Desert Cove Commercial (68' R/W dedicated north of Peoria Avenue), Skyway Business Park (67.5' R/W dedicated north of Peoria Avenue), and John F. Long Industrial Complex (40' R/W dedicated south of Peoria Avenue). The BNSF Ennis Spur bisects these developments. The intersection of Peoria Avenue and the Ennis Spur is currently an at-grade crossing. The Ennis Spur connects to the BNSF Phoenix Subdivision parallel to Grand Avenue to the north. Future plans may exist to extend the Ennis Spur to a major industrial development south of the study area at Luke Air Force Base. If this occurs, the volume of trains crossing Peoria Avenue per day could increase. Train volumes and the decision to maintain an at-grade rail crossing will need to be considered as part of this project. If a grade separation is proposed in the future, intersection design and construction phasing needs to comply with Luke Air Force Base height restrictions.

FCDMC has plans for a future drainage channel along the Ennis Spur. Channels currently exist parallel to Litchfield Road and Peoria Avenue, but there is no outfall where these intersect. Drainage improvements may be warranted in the future.

Generally speaking, all existing drainage channels were not constructed to handle build out conditions in the study area and therefore an issue may arise regarding their ability to handle increased runoff due to pavement drainage in the future.
To summarize, some of the key constraints in the study area include:

- Existing developments and R/W availability
- Half-street improvements
- Future development plans
- Existing and future drainage facilities
- SR 303L traffic interchange
- Major utilities

IX. Traffic Volume Information and Ultimate Typical Section

The MAG 2031 travel demand model shows that only a four-lane facility will be warranted on Peoria Avenue by 2030. This model takes into consideration socioeconomic considerations and planned transportation improvements. The 2031 model specifically accounts for a Peoria Avenue crossing of the Agua Fria River. An intersection analysis will be conducted to estimate lane configurations for 2030.

Although the model notes the required four-lane facility in 2030, this does not account for full build out conditions. Therefore the jurisdictions within the study area have agreed to maintain Peoria Avenue's functional classification designation as a principal arterial, which includes six lanes at build out. This will include retaining a minimum of 140' R/W throughout the corridor, with a wider footprint envisioned between Cotton Lane and Sarival Road to account for increased traffic and turning movements required at the of SR 303L traffic interchange. Major intersections throughout the corridor may also be planned for wider R/W footprints to accommodate dual lefts, and right turn lanes on all intersection legs.

X. Potential Corridor Alternatives

The development and evaluation of alternatives will generally occur in one-mile corridor segments. The segmentation of the corridor is expected to better accommodate the existing checkerboard development pattern and varying degree of roadway improvements currently constructed. Alternatives will include an ultimate footprint symmetric about the section line, slightly shifted to the north, or slightly shifted to the south.

XI. Potential Evaluation Criteria

The project team has drafted up a series of potential evaluation criteria to apply to the alternatives, when developed. This includes criteria that will be measured both qualitatively and quantitatively. Major criteria categories include:

- R/W considerations
- Compatibility with existing developments
- Compatibility with planned future developments
- Compatibility with existing and planned roadway improvements
- Engineering complexity and constructability
- Public acceptability
- Local agency support
- Drainage/flood control considerations

- Utility considerations
- Environmental considerations

The project team has requested that each TAC member review the preliminary evaluation criteria and respond with any comments or questions by October 22, 2010.

XII. Next Steps

TAC members should have received access to Technical Memoranda 1 and 3, via the project FTP site. Technical Memorandum 2 will be available later today; the committee will be notified via email. Please submit all comments to Mitch Wagner and/or Rodney Bragg by October 22, 2010. Please provide any comments on the potential evaluation criteria by the same deadline.

A draft of Technical Memorandum 7 will be circulated later this month. With these four documents complete, the project will move into the next phase, which includes alternatives development and evaluation. The TAC will have an opportunity to review and comment on the alternatives before the next public meeting in January.

XIII. Open Discussion

The City of Glendale requested the project team to set up a meeting with the Planning and Transportation Engineering departments in the near future to discuss municipal roadway design standards. These standards should be considered as part of the development of alternatives (e.g., City of Glendale does not allow retention facilities as part of the roadway R/W).

Both Glendale and El Mirage do not see a need for the project team to brief their City Councils on the project's progress. City staff will take care of providing these updates.

The City of El Mirage, while only having jurisdiction over the southern portion of the far eastern half-mile of Peoria Avenue, does not see the corridor as a six lane roadway in the future. They envision the corridor through their community including five lanes maximum, mostly due to the lack of an Agua Fria river crossing. It was suggested that the alternatives may want to show a transition to a narrower footprint east of Dysart Road. The City is okay with maintaining the required 140' R/W associated with a principal arterial in the study area; however they do not intend to preserve such a wide footprint to the east of the study boundary.

There are several Maricopa Water District well sites within the study area. These will need to be considered when developing and evaluating alternatives. Additionally, there are height restrictions associated with the proximity of Luke Air Force Base. This will be particularly important with regard to a potential grade separation at the Ennis Spur, street lighting, and traffic signals.

Attachments:

- Meeting Sign-In Sheet
- Meeting Agenda
- PowerPoint Slides
- Draft Evaluation Criteria

Peoria Avenue: Jackrabbit Trail Parkway to Dysart Road, Corridor Improvement Study
TAC Sign-In Sheet

Date: Oct. 12, 2010

Initials	Name	Organization	Telephone	Postal Address	E-mail Address
	Beasley, Steve	ADOT VPM	(602) 712-7645	1611 W. Jackson, MD EM01 Phoenix, AZ 85007	sbeasley@azdot.gov
	Mathew, Velvet	ADOT VPM	(602) 712-3062	1611 W. Jackson, MD EM01 Phoenix, AZ 85007	vmathew@azdot.gov
	Dewitt, Mike	APS	(602) 493-4448	P.O. Box 53933 Attn: Mail Station 4030 Phoenix 85072	michael.dewitt@aps.com
	Richards, Paul	APS	(602) 371-6186	2043 W. Cheryl Drive M.S. 3040 Phoenix 85021	Paul.Richards@aps.com
	Warnecke, Dana	AZ Game & Fish	(602) 942-3000	5000 W. Carefree Highway Phoenix, AZ 85006	dwarnecke@azgfd.gov
	Taylor, Gordon	AZ State Land Dept.	(602) 542-2647	1616 W. Adams Street Phoenix 85007	gtaylor@land.az.gov
	Calvert, Lance	City of El Mirage	(623) 876-2971	12145 NW Grand Avenue El Mirage, AZ 85335	lcalvert@cityofelmirage.org
PAD	Adabala, Purab	City of Glendale	(623) 930-2926	5800 W. Glenn Drive #315 Glendale 85301	padabala@glendaleaz.com
CL	Lemka, Chris	City of Glendale	(623) 930-2940	5800 W. Glenn Drive #315 Glendale 85301	clemka@glendaleaz.com
	Mascia, Nick	City of Surprise	(623) 222-6140	16000 N. Civic Center Plaza Surprise, AZ 85374	nicholas.mascia@surpriseaz.gov
	Savage, Karen	City of Surprise	(623) 222-6132	16000 N. Civic Center Plaza	karen.savage@surpriseaz.gov
	Wolfley, Vern	Dysart School District	(623) 876-7052	15802 N. Parkview Place Surprise, AZ 85374	Vern.Wolfley@dysart.org
	Lokey, Burke	FCDMC	(602) 502-0867	2801 W. Durango Street Phoenix 85009	burkelokey@mail.maricopa.gov
	Dubsky, Bob	Luke Air Force Base	(623) 856-6195	56 Fighter Wing Community Initiatives 14185 W. Falcon Street Luke Air Force Base 85309	robert.dubsky@luke.af.mil
	Strow, Tim	MAG	(602) 452-5055	302 N. First Avenue Phoenix 85003	tstrow@mag.maricopa.gov
	Holm, Matt	Maricopa County P&D	(602) 506-7182	501 N. 44th Street Phoenix 85008	MatthewHolm@mail.maricopa.gov
	Coover, Chris	Maricopa County Parks & Recreation	(602) 506-8719	234 N. Central Avenue, Suite 6400 Phoenix 85004	ccoover@mail.maricopa.gov
OU	Urquiza, Oney	Maricopa Water District	(623) 546-8266	PO Box 900 Waddell, AZ 85355	oneyu@mwdaz.com
	Valenzuela, Veronica	Maricopa Water District	(623) 546-8266	PO Box 900 Waddell, AZ 85355	veronicav@mwdaz.com
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	Oliver, Tim	MCDOT Engineering & Planning	(602) 506-3994	2901 W. Durango Street Phoenix 85009	TimOliver@mail.maricopa.gov
	Wagner, Mitch	MCDOT Engineering & Planning	(602) 506-8054	2901 W. Durango Street Phoenix 85009	mitchwagner@mail.maricopa.gov
	Pinto, Joe	MCDOT Environmental	(602) 506-8068	2901 W. Durango Street Phoenix 85009	joepinto@mail.maricopa.gov
	Kogl, Michele	MCDOT Engineering & Planning	(602) 506-8799	2902 W. Durango Street Phoenix 85009	Michele Kogl - MCDOTX
	Crowe, Roberta	MCDOT Public Information Office	(602) 506-8003	2901 W. Durango Street Phoenix 85009	RobertaCrowe@mail.maricopa.gov
	Pasciak, Gary	MCDOT Engineering & Planning	(602) 506-8790	2902 W. Durango Street Phoenix 85009	Gary Pasciak - MCDOTX

Peoria Avenue: Jackrabbit Trail Parkway to Dysart Road, Corridor Improvement Study
TAC Sign-In Sheet

Date: Oct. 12, 2010

Initials	Name	Organization	Telephone	Postal Address	E-mail Address
	Scott, Gary	MCDOT Real Estate	(602) 506-4638	2801 W. Durango Street Phoenix 85009	GaryScott@mail.maricopa.gov
	Wilson, Mike	MCDOT Real Estate	(602) 506-4706	2801 W. Durango Street Phoenix 85009	mdw@mail.maricopa.gov
	Sargent, Jim	MCDOT Traffic	(602) 506-8678	2901 W. Durango Street Phoenix 85009	jamessargent@mail.maricopa.gov
	Swart, Nicolaas	MCDOT Traffic	(602) 506-0599	2901 W. Durango Street Phoenix 85009	nicolaasswart@mail.maricopa.gov
	Butch, Wayne	MCDOT Utilities	(602) 506-8603	2901 W. Durango Street Phoenix 85009	WayneButch@mail.maricopa.gov
	Davidson, Hugh	MCDOT Cultural Resources	(602) 506-8082	2901 W. Durango Street Phoenix 85009	HughDavidson@mail.maricopa.gov
	Sabatini, Mike	MCDOT Engineering & Planning	(602) 506-8628	2901 W. Durango Street Phoenix 85009	MikeSabatini@mail.maricopa.gov
	Heinrich, Chad	MCDOT Intergovernmental Relations	(602) 506-1630	2901 W. Durango Street Phoenix 85009	ChadHeinrich@mail.maricopa.gov
	Morast, John	MCDOT Operations & Maintainance	(602) 506-5419	2901 W. Durango Street Phoenix 85009	johnmorast@mail.maricopa.gov
	Kattan, Al	MCDOT PMO & Construction	(602) 506-4618	2801 W. Durango Street Phoenix 85009	AlKattan@mail.maricopa.gov
	Nies, Ryan	MCDOT Utilities	(602) 506-8529	2901 W. Durango Street Phoenix 85009	ryannies@mail.maricopa.gov
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	Maguire, David	Land Solutions Inc.	(602) 841-1945	2051 W. Northern Avenue, Suite 102 Phoenix 85021	dmaguire@landsolutionsinc.com
TS	SIEGLITZ, TROY	AECOM	602 3372674	2777 E. CAMELBACK #LOO PHOENIX, AZ 85016	troy.sieglitz@aecom.com
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MW	MITCH WAGNER	MCDOT			
JG	JORGE GASTELUM	CITY OF EL MIRAGE	623 876-2476	12145 NW GRAND EL MIRAGE, 85335	jgastelum@cityofelmirage.org

City of El Mirage
Public Works

Jorge Gastelum, P.E.
CIP Engineer

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
MCDOT Contract No. 2010-005
Work Order No. TT005

Technical Advisory Committee Meeting Agenda

October 12, 2010, 9:00 AM

- Introductions
- Meeting Purpose
- Project Status Update
- Overview of Study Area Issues, Constraints, & Opportunities
- Traffic Volume Data & Corridor Traffic Analysis
- Potential Alternative Alignments
- Potential Evaluation Criteria
- Next Steps
- Open Discussion
- Adjourn

Peoria Avenue
Corridor Improvement Study

Technical Advisory Committee Meeting #2
October 12, 2010




MCDOT RightRoads PROGRAM
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Meeting Agenda

- Introductions
- Meeting Purpose
- Project Status Update
- Overview of Study Area Issues, Constraints, & Opportunities (ICOs)
- Traffic Volume Data & Corridor Traffic Analysis

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Meeting Agenda

- Potential Alternative Alignments & Evaluation Criteria
- Next Steps
- Open Discussion
- Adjourn

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Meeting Purpose

- Update on project status
- Identify initial Study Area ICOs
- Discuss potential alternatives & evaluation criteria
- Gather information
- Share next steps

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Study Purpose

- Establish the **facility type, number of lanes, right-of-way, and corridor alignment** required to safely accommodate forecast travel demands

- Provide a future **"footprint"** of the corridor, implementation timeframe & phasing of the identified roadway improvements

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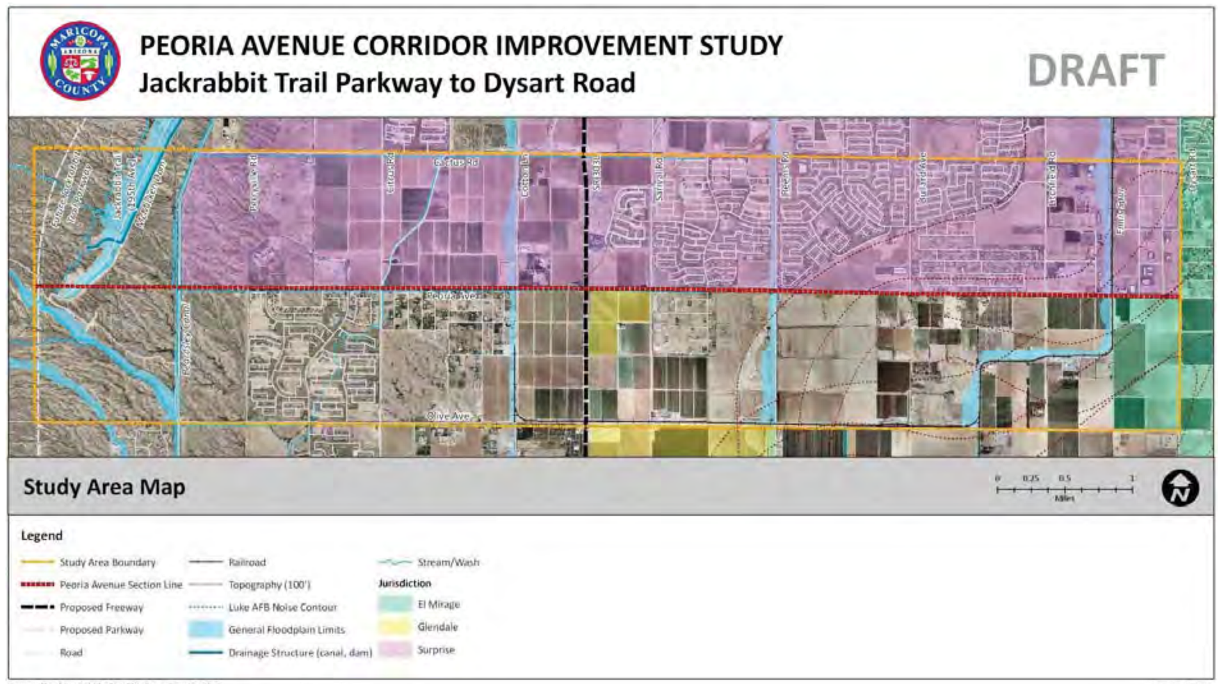
Study Area



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Study Process

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Peoria Avenue Corridor Improvement Study

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Study Milestones

• Project Kick-off & Study Initiation	*July 2010*
• Data Collection Phase	*July - Sept 2010*
• TAC Meeting #1	*August 17, 2010*
• Public Meeting #1 (Scoping)	*Sept 20, 2010*
• TAC Meeting #2	Oct 12, 2010
• Alternatives Development & Evaluation Phase	Oct 2010 – Jan 2011

Continued…

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Peoria Avenue Corridor Improvement Study

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Study Milestones Contd.

• TAC Meeting #3	Nov 9, 2010
• TAC Meeting #4	Dec 14, 2010
• Public Meeting #2 (Alternatives)	Jan 12, 2011
• TAC Meeting #5	Feb 15, 2011
• Public Meeting #3 (Pref. Alt.)	March 16, 2011
• Draft Final Report	April 2011
• Final Report Submission	June 2011

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Public Meeting Summary

- Public Scoping Meeting
- Held Sept. 20 at Shadow Ridge High School
- Approx. 60 people attended

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Study Area ICO Overview

- Roadway
- Major Utility
- Drainage
- Topography
- Land ownership
- Existing developments
- Future developments
- Growth areas

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Peoria Avenue Corridor Improvement Study

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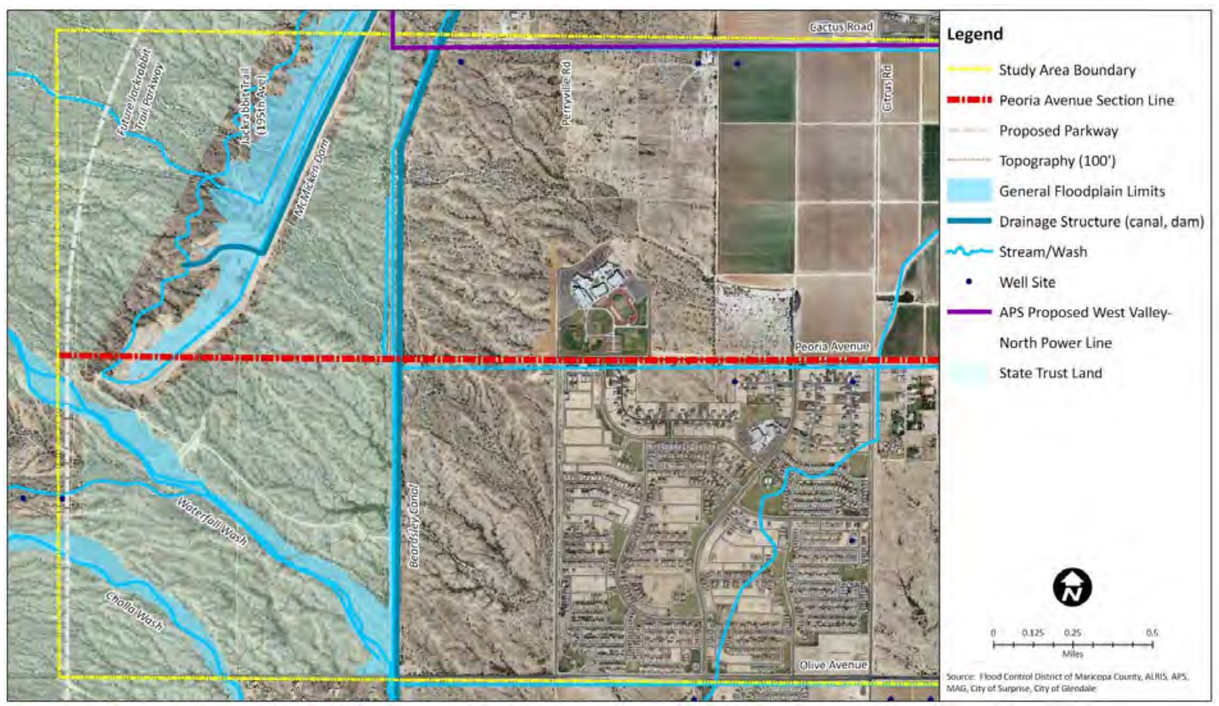
Segment 1: *Jackrabbit Trail Parkway to Citrus Road*



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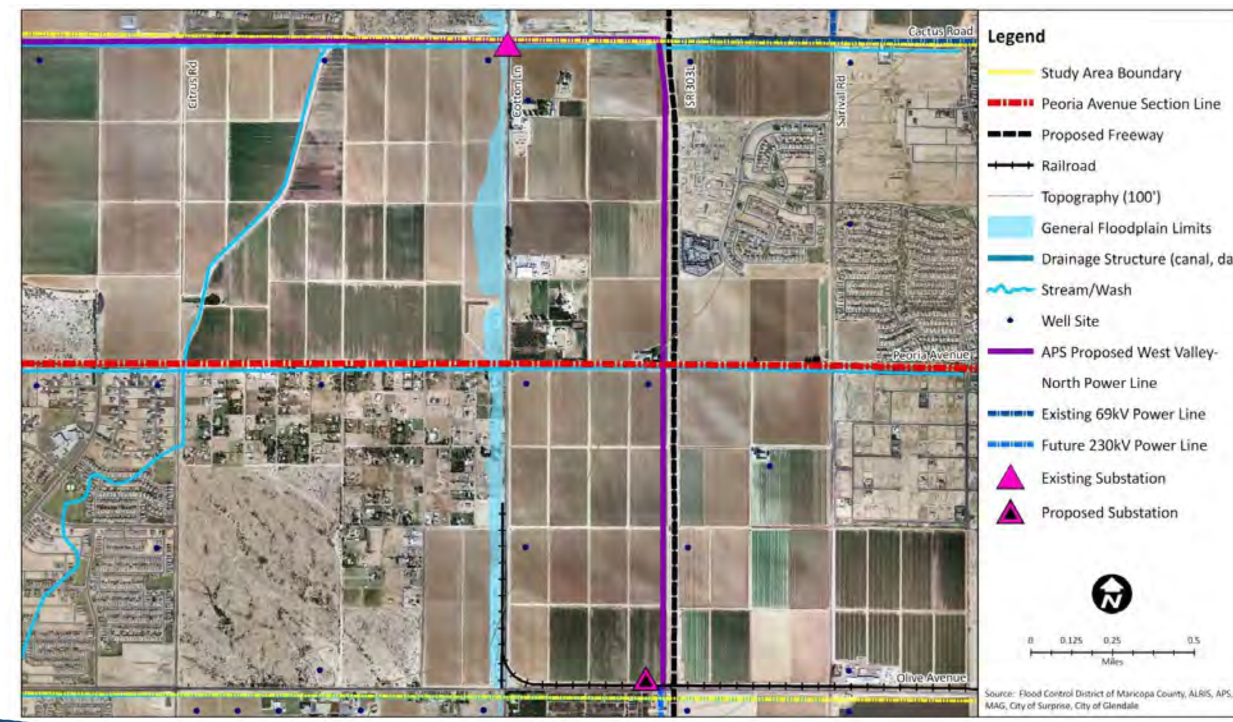
Segment 2: *Citrus Road to Sarival Road*



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Segment 3: *Sarival Road to Bullard Avenue*

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Segment 4: *Bullard Avenue to Dysart Road*

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Summary of Key Constraints

- Existing developments/land uses (R/W availability)
- Half-street improvements
- Future development
- Existing and future drainage facilities
- SR 303L TI
- Major utilities

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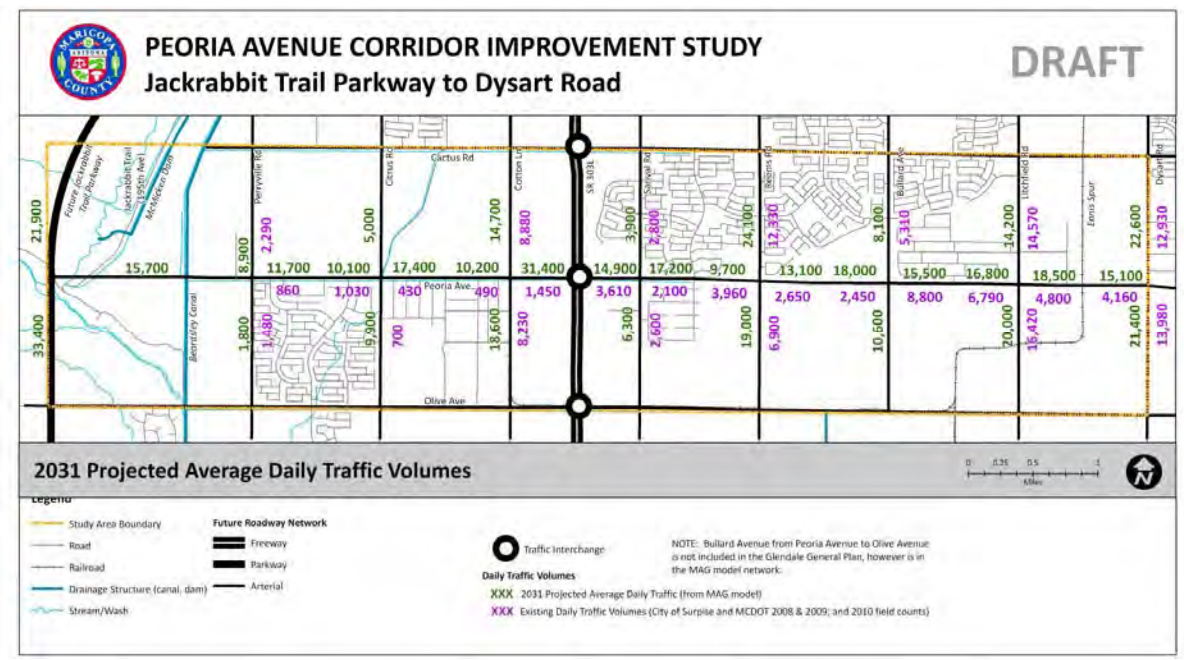
Traffic Volumes



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Traffic Information

- 4-Lane facility warranted by 2030 based on MAG model
- Intersection analysis to estimate lane requirements for 2030
- Accommodate ultimate facility

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Ultimate Typical Section

- City of Surprise, City of Glendale, MAG, and Maricopa County all identify 6-Lane Arterial
- Corridor planning based on 6 lanes in 140' R/W (min.)
- Wider footprint between Cotton Lane and Sarival Road
- Major intersections to accommodate dual lefts and right-turn lanes on all legs

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Potential Corridor Alternatives

- Evaluation generally by 1-mile segments
- Symmetric about section line
- Slight shift to south
- Slight shift to north

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Potential Evaluation Criteria

- Right-of-way Considerations
- Compatibility w/ Existing Developments
- Compatibility w/ Future Developments
- Compatibility w/ Existing & Future Roadway Improvements
- Engineering Complexity & Constructability
- Public Acceptance
- Local Agency Support

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Potential Evaluation Criteria

- Drainage/Flood Control Considerations
- Environmental Considerations
- Utility Considerations

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Next Steps

- TAC comments on Draft TM #1, 2, & 3 due on October 22nd
- Distribute Draft TM #7
- Finalize TM #1, 2, & 3
- Develop evaluation criteria & alternatives
- Conduct evaluation

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Open Discussion

- Study area issues, constraints, & opportunities
- Traffic volumes and analysis
- Alternatives & evaluation criteria
- Other stakeholder concerns

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Next TAC Meeting

November 9, 2010

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Draft Evaluation Criteria

Criteria Title	Criteria Description	Criteria Performance Measure
Right-of-way Considerations	An assessment of the amount and value of the right-of-way that would need to be acquired for corridor alternatives in relation to other alternatives under consideration for the segment.	Quantitative assessment of acres or square feet of acquisition
		Qualitative assessment of potential cost
Compatibility with Existing Developments	An estimate of the potential effect of proposed corridor alternatives on the existing developments most directly affected. Key considerations include the proximity to existing developments and potential displacements.	Qualitative assessment of compatibility
Compatibility with Planned Future Developments	An estimate of the potential effect of the corridor alternatives on planned developments and/or land that is currently under the jurisdiction of the Arizona State Land Department. Key considerations include compatibility with approved master plans and/or preliminary and final plats.	Qualitative assessment of compatibility
Compatibility with Existing and Planned Roadway Improvements	An assessment of the compatibility of the corridor alternatives with the existing and planned roadway improvements.	Qualitative assessment of compatibility
Engineering Complexity and Constructability	A general assessment of engineering complications, exclusive of cost considerations, which could arise from construction of the roadway. Key considerations include roadway geometry, permitting requirements, construction staging, etc.	Qualitative assessment of complexity and constructability
Public Acceptability	Estimated community support for and acceptance of the corridor alternative, based on input from municipal staff, stakeholders, homeowner associations, and the public.	Qualitative assessment of acceptability
Local Agency Support	Estimated local agency (city) support for and acceptance of the corridor alternative, based on input from municipal staff.	Qualitative assessment of acceptability
Drainage/Flood Control Considerations	An estimate of potential impacts from the proposed corridor alternatives to both existing FCDMC facilities as well as to future improvements.	Qualitative assessment of potential impacts
Environmental Considerations	An assessment of social, ecological, and cultural environment in the study area.	Qualitative assessment of potential impacts to socioeconomic environment
		Qualitative assessment of potential impacts to physical and natural environment
		Qualitative assessment of potential impacts to cultural resources
Utility Considerations	Estimate of potential impacts from the proposed corridor alternatives to both existing and planned future utility facilities such as the MWD canals, wells, reclaimed water delivery headers, and overhead lines.	Quantitative assessment of potential impacts

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
MCDOT Contract No. 2010-005
Work Order No. TT005

MEETING MINUTES

Date: December 17, 2010

To: Mitch Wagner, Project Manager, MCDOT

From: Rodney Bragg, AECOM

Re: Peoria Avenue Corridor Improvement Study

Subject: December 14, 2010 TAC Meeting #4

Attendees: See attached sign-in sheet

I. Introductions
See attached sign-in sheet

II. Meeting Purpose
The purpose of this meeting was to provide an update on the project status; discuss the alternatives development, evaluation, and preliminary recommendations; and gather information to complete the evaluation.

III. Study Purpose and Objectives
The purpose of this study is to establish the facility type, number of lanes, right-of-way, and corridor alignment required to accommodate the ultimate facility classification and safely accommodate forecast travel demands for Peoria Avenue. This study will result in a future "footprint" of the corridor, implementation timeframe, and phasing of identified roadway improvements.

Study objectives include assessing the strategic issues and potential impacts by existing and proposed developments, drainage features, utilities, and environmental issues. Based on this information, the study will develop and evaluate conceptual alternative alignments, as well as identify a preferred alignment. With a preferred alignment, specific characteristics of the corridor will be further defined and an implementation plan developed to carry out corridor improvements. Most importantly, the study aims at gaining consensus amongst partners to achieve design consistency and preserve the corridor for future implementation.

IV. Study Area

The study area extends approximately 7.5 miles, from the future Jackrabbit Trail Parkway alignment to Dysart Road, including a two-mile wide area, centered on Peoria Avenue. Multiple jurisdictions have control over the land in this area. The Peoria Avenue section line provides the boundary between the City of Surprise and City of Glendale planning areas, with portions of the corridor to the far west belonging to Maricopa County, and portions to the east belonging to the City of El Mirage. Most of the area within the Surprise and El Mirage municipal planning areas (MPAs) is incorporated, whereas only a small parcel adjacent to Peoria Avenue and SR 303L is annexed by Glendale.

White Tank Mountain Regional Park sits to the west of the study area and Luke Air Force Base to the south. McMicken Dam and the Beardsley Canal constitute two major drainage structures, both located at the western end of the study area. The SR 303L corridor will be upgraded to a freeway, with a connection to Peoria Avenue. The BNSF Ennis Spur also intersects the corridor between Litchfield and Dysart Roads.

V. Study Process

The study process involves a three step involvement plan, which leads to the preparation of a phased implementation plan of the selected alternative. This includes:

- Scoping and development of a stakeholder database to identify corridor issues and needs;
- Development, evaluation, and refinement of alternatives with stakeholder input; and
- Development of an implementation plan with the stakeholders whereby major design features are finalized.

VI. Study Milestones

Major milestones are as follows:

Phase 1

• Project kick-off and study initiation	July 2010 (completed)
• Data collection phase	July – September 2010 (completed)
• TAC meeting #1	August 17, 2010 (completed)
• Public meeting #1 (scoping)	September 20, 2010 (completed)
• TAC meeting #2	October 12, 2010 (completed)

Phase 2

• TAC meeting #3	November 9, 2010 (cancelled)
• TAC meeting #4	December 14, 2010
• Public meeting #2 (alternatives)	January 18, 2011
• TAC meeting #5	February 15, 2010
• Public meeting #3 (pref. alternative)	March 16, 2011 (approx.)
• Draft final report	April 2011
• Final report submission	June 2011

VII. Draft Tech Memo #7

Draft Tech Memo #7 is available on the FTP site for review and comment. TAC comments were previously requested by December 17th. It includes a review of existing and future traffic conditions with an analysis horizon year of 2030. The MAG 2030 travel demand model shows that a four-lane facility will be warranted on Peoria Avenue by 2030, therefore a sensitivity analysis was conducted to determine what conditions imply that six lanes are not warranted by 2030 and when a six-lane facility may be required.

Although the MAG model demand warrants a four-lane facility in 2030, this does not account for full build out conditions. The City of Surprise, City of Glendale, and MCDOT all categorize Peoria Avenue as a principal arterial and have agreed to maintain the corridor's functional classification designation which includes six travel lanes. For planning purposes, a minimum of 140' R/W will be used throughout the corridor, with a wider footprint envisioned between Cotton Lane and Sarival Road to account for increased traffic and turning movements required near the SR 303L traffic interchange. Major intersections throughout the corridor will also be planned for wider R/W footprints to accommodate dual lefts and separate right turn lanes on all intersection legs.

VIII. Alternatives Development and Evaluation

<u>Evaluation Criteria</u>

Ten evaluation criteria were drafted by the Project Team and reviewed by the TAC for use in the alternatives evaluation. This includes criteria that can be measured both qualitatively and quantitatively. Criteria categories include (full list of criteria and descriptions in attachments):

- R/W considerations (including both square footage of R/W takes and estimated order of magnitude R/W costs)
- Compatibility with existing developments
- Compatibility with planned future developments
- Compatibility with existing and planned roadway improvements
- Engineering complexity and constructability
- Public acceptability
- Local agency support
- Drainage/flood control considerations
- Utility considerations
- Environmental considerations (including consideration of socioeconomic, physical/natural, and cultural resources)

<u>Alignment Alternatives</u>

Three alternative alignments were considered for the Peoria Avenue corridor. Alternative 1 includes widening the corridor symmetrically to the section line, attempting to balance impacts to both sides of the corridor. Alternative 2 includes widening the corridor to the south, maintaining the northern R/W boundary and therefore only impacting land to the south. Alternative 3 includes widening the corridor to the north, maintaining the southern R/W boundary and therefore only impacting land to the north.

Because the existing R/W throughout the corridor differs due to varying dedications, the degree of shifting to the north or south changes (detailed listing of alternative alignments and R/W shifts in attachments). Because Peoria Avenue does not yet exist through Segments 1 and 2, and due to different constraints, a lesser number of alternatives were considered.

Evaluation Process

The corridor was divided into nine segments for the evaluation process:

1. Jackrabbit Trail Parkway to Beardsley Canal
2. Beardsley Canal to Perryville Road
3. Perryville Road to Citrus Road
4. Citrus Road to Cotton Lane
5. Cotton Lane to Sarival Road
6. Sarival Road to Reems Road
7. Reems Road to Bullard Avenue
8. Bullard Avenue to Litchfield Road
9. Litchfield Road to Dysart Road

The Project Team (composed of a multidisciplinary consultant group) conducted the evaluation which determined a preliminary recommendation for the corridor alignment. Two measures were left blank during this evaluation, public acceptability and local agency support, due to required input from the general public and the TAC. The TAC is requested to review the alternatives and the consultant team's preliminary evaluation and provide input on (1) TAC member's preferred alternative by segment, and (2) any other comments regarding preliminary evaluation, by December 24, 2010. Public input will be gathered at the January 2011 public meeting.

Evaluation Highlights

Through the evaluation process, some segments contained constraints and/or opportunities that clearly favored one alternative (Segments 2, 4, 6, 8). Once those alignment recommendations were established, those conditions assisted in determining the recommended alternative for the adjacent segments (Segments 3, 5, 7, 9). The following evaluation highlights are presented out of numerical order to illustrate this process.

Segment 2: Beardsley Canal to Perryville Road

The Zanjero Trails master planned community is planned on both sides of Peoria Avenue. Their preliminary plat dedicates 136 feet of R/W for Peoria Avenue, centered on the section line. Because Zanjero Trails is expected to move forward with this plat configuration in the future, the section line option (Alternative 1) was decided to be the only practical alternative. Because this segment only has one alternative, no evaluation was conducted.

Segment 4: Citrus Road to Cotton Lane

Maricopa County does not have any R/W recorded in this segment, therefore the full width, regardless of alternative, will require R/W negotiations. Key factors for this segment focus on existing and planned land uses. To the north, the Prasada community is planned, although no preliminary plat yet exists. To the south, Peoria Avenue is lined with existing large-lot, single-family houses that front the roadway

corridor and often have driveways that access Peoria Avenue. In addition, two sets of irrigation canals run parallel to Peoria Avenue to the south. Because of the more imminent constraint that the existing land uses pose, the recommendation favored Alternative 3, shifting to the north to minimize impacts to the existing land uses to the south.

Segment 6: Sarival Road to Reems Road

Existing residential development and related drainage facilities are located on both sides of Peoria Avenue through Segment 6. In an effort to balance the impacts to both sides of the corridor, Alternative 1 (symmetrical on section line) was recommended.

Segment 8: Bullard Avenue to Litchfield Road

Like Segment 6, Segment 8 contains existing residential development on both sides of the corridor. To the north there is a newer residential subdivision that includes a small landscaped buffer between the R/W and property lines. To the south, individual large-lot, single-family homes front Peoria Avenue but are significantly offset from the roadway. Recommending Alternative 1 (symmetrical on section line) was seen to best balance the impacts to existing development.

Segments 2, 4, 6, and 8 provided the context which influenced the recommendation for the adjacent segments. Oftentimes, two or even all three alternatives in the following segments scored very closely, with one alternative not presenting a clear advantage over another. In these cases, connectivity with the adjacent segments helped determine the most practical solution. Likewise, transition areas were strategically placed throughout these segments to avoid certain constraints or maximize the use of other opportunities to form a seamless connection of segments. Because of the relative equality of the impacts of the different alternatives, if conditions change in the future (e.g., wells removed, advanced development plats, etc.), the recommendations for the following segments could be reviewed and changed to reflect current conditions.

Segment 3: Perryville Road to Citrus Road

Existing and planned developments, as well as existing and planned roadway improvements were the key factors for Segment 3. To the north, Shadow Ridge High School is built at the west end. A portion of the remaining land is platted through Zanjero Trails and preliminarily planned as part of the Prasada community. To the south, the Cortessa subdivision is constructed, as well as several irrigation facilities and wells. On the west end, between Cortessa and the high school, is the corridor's only full width constructed street section. In an effort to maximize use of this full width street, which is built symmetrically on the section line, Alternative 1 was recommended. This supports a connection to Segment 2 to the west, which is also recommended to be located symmetrically to the section line. To the east, Segment 4 is recommended to shift north. Because of the constraint the existing development on the south side of the corridor poses in Segment 4, the transition area from the section line to a northerly shift is recommended to occur in the eastern portion of Segment 3.

Segment 5: Cotton Lane to Sarival Road
The key determinant in Segment 5 is ADOT's final design for SR 303L, which includes a traffic interchange at Peoria Avenue, centered on the section line. Very little development exists today through this segment. As both SR 303L requires a section line alignment and Segment 6 recommended a section line alignment, the recommendation for Segment 5 is to move forward with Alternative 1 (symmetrical on section line). Because of the constraint the existing development on the south side of the corridor poses in Segment 4, the transition area from the section line to a northerly shift is recommended to occur in the western portion of Segment 5, slightly impacting an existing development to the north, although not impacting any structures.

Segment 7: Reems Road to Bullard Avenue
Because of the noise contours associated with Luke Air Force Base, the majority of the corridor is undeveloped, with the exception of approximately four houses that back up to Peoria Avenue on the west end. However, the presence of these houses skews the evaluation away from an option that impacts the north side of the corridor. The south side of the corridor, however, contains irrigation facilities and well sites. The adjacent links, Segments 6 and 8, recommend section line alignments. In an effort to both reduce impact to the drainage facilities as well as the existing development, and also connect to the adjacent segments, the recommendation for this segment includes a northerly shift in the center of the segment to avoid the irrigation facilities and well sites, with the corridor transition areas back to the section line at the east and west ends, avoiding impact to the existing development. If corridor conditions change in the future, such as the removal of the irrigation facilities on the south side or new development on the north side, this recommendation could be reconsidered to recommend a section line alignment.

Segment 9: Litchfield Road to Dysart Road
Segment 9 contains no existing or platted development to the south. To the north of Peoria Avenue, existing land uses are adjacent to the Ennis Spur in the middle of the corridor. Development is planned and platted to the east and west. Half-streets have been constructed on the north side throughout, however with no constant centerline offset. Therefore, the corridor's constructed half street varies with differing amounts of R/W. To minimize impacts to existing land uses, the recommendation for this segment includes a southerly shift in the alignment with transition areas to connect back to the section line on the east and west ends. Like Segment 7, if corridor conditions change in the future (e.g., existing land uses are redeveloped), consideration could be given to maintaining a section line alignment.

Segment 1 is unique because no roadway or existing development is currently present and no development plans are imminent. Only two alternatives were practical for this section – Alternative 1, alignment symmetrical along the section line, and Alternative 2, which does not follow the other widening guidelines. Alternative 2 in this segment dips south to miss the flood basin south of the truncated McMicken Dam.

Segment 1: Jackrabbit Trail Parkway to Beardsley Canal
Drainage impacts and local agency support (specifically the Flood Control District of Maricopa County [FCDMC]) are the two key determining factors. After the Project Team's evaluation, Alternative 1, which travels through the flood basin, was seen to

have the least drainage impacts, as Alternative 2 would cross numerous washes – Waterfall Wash potentially including a substantial crossing. The recommendation for Segment 1 is to move forward with Alternative 1, predicated upon consensus from FCDMC that it is less impactful to cross the basin than to cross a number of natural washes. By recommending a section line alignment, this also maximizes the ability for larger tracts of developable land in the future, to be auctioned by the Arizona State Land Department (ASLD). Currently, ASLD has a general master plan for the land, but no formal planning will be documented until a developer assumes responsibility. In addition, Alternative 1 would provide better intersection spacing along the future Jackrabbit Trail Parkway.

IX. Next Steps

Key milestones and next steps include:

- Tech Memos #1, 2, and 3 will be distributed in final form shortly.
- TAC comments on Draft Tech Memo #7 are due December 17th.
- TAC comments on alternatives evaluation and local agency support are due December 24th.
- Project Team will submit Pre-Draft Tech Memo #4 during the first week of January.
- Second public open house will be conducted January 18th.
- Next TAC meeting is scheduled for February 15th.

Attachments:

- Meeting Sign-In Sheet
- Meeting Agenda
- Power Point Slides
- Evaluation Criteria and Descriptions
- Alternative Alignment Descriptions
- Draft Evaluation Matrix
- Recommended Alignment Map

Peoria Avenue: Jackrabbit Trail Parkway to Dysart Road, Corridor Improvement Study
TAC Sign-In Sheet

Date: Dec. 14, 2010

Initials	Name	Organization	Telephone	Postal Address	E-mail Address
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Peoria Avenue: Jackrabbit Trail Parkway to Dysart Road, Corridor Improvement Study
TAC Sign-In Sheet

Date: Dec. 14, 2010

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PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
MCDOT Contract No. 2010-005
Work Order No. TT005

Technical Advisory Committee Meeting Agenda

December 14, 2010, 9:00 AM

- Introductions
- Meeting Purpose
- Project Status Update
- Overview of Draft Tech Memo #7
- Overview of Alternative Development & Evaluation
- Next Steps
- Open Discussion
- Adjourn

Peoria Avenue Corridor Improvement Study

Technical Advisory Committee Meeting #4
December 14, 2010

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

AECOM

Meeting Agenda

- Introductions
- Meeting Purpose
- Project Status Update
- Overview of Tech Memo #7
- Overview of Alternative Development and Evaluation

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Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

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Meeting Agenda

- Next Steps
- Open Discussion
- Adjourn

MCDOT RightRoads PROGRAM

The Right System The Right Time The Right Cost

Meeting Purpose

- Update on project status
- Discuss alternative development & evaluation
- Gather information
- Share next steps

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study
AECOM

Study Purpose

- Establish the **facility type, number of lanes, right-of-way, and corridor alignment** required to safely accommodate forecast travel demands

- Provide a future **"footprint"** of the corridor, implementation timeframe & phasing of the identified roadway improvements

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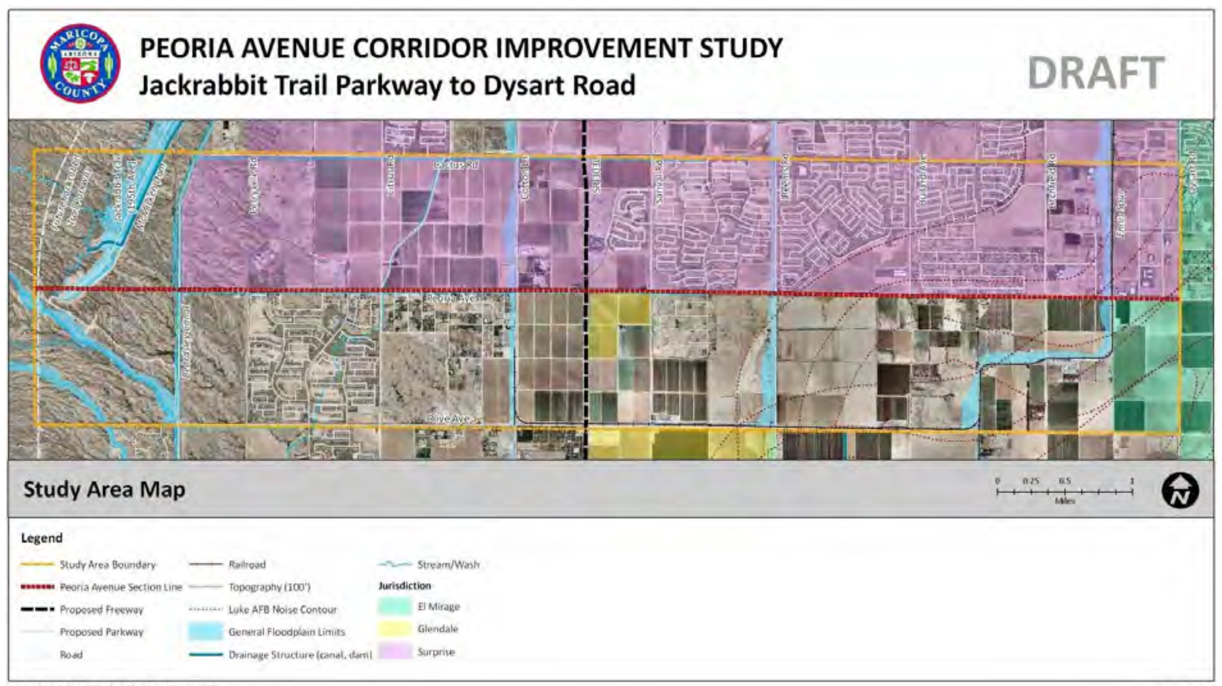
Study Area



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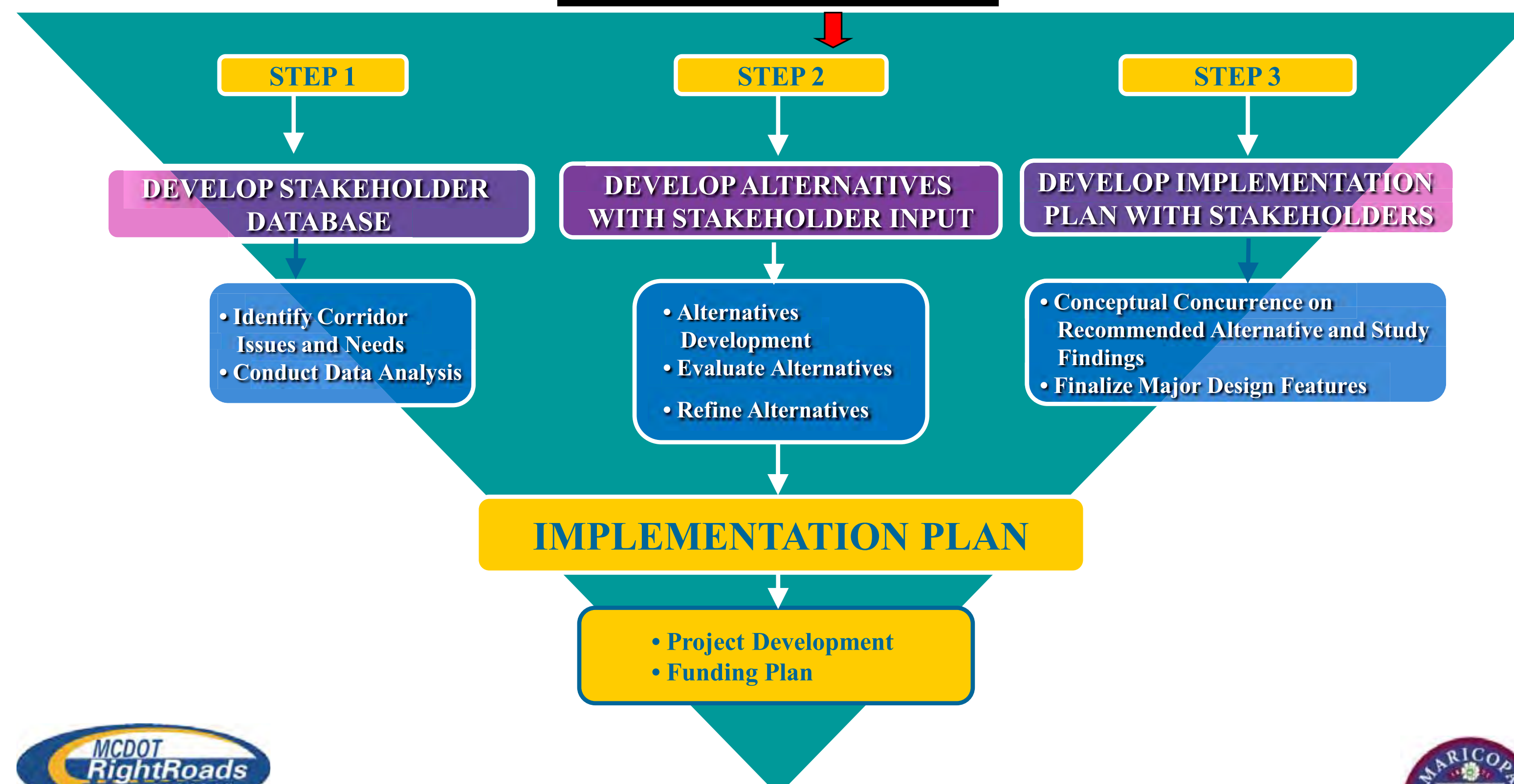
Study Process



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Study Milestones

• Project Kick-off & Study Initiation	*July 2010*
• Data Collection Phase	*July - Sept 2010*
• TAC Meeting #1	*August 17, 2010*
• Public Meeting #1 (Scoping)	*Sept 20, 2010*
• TAC Meeting #2	*Oct 12, 2010*
• Alternatives Development & Evaluation Phase	Oct 2010 – Jan 2011

Continued…

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Study Milestones Contd.

• TAC Meeting #3	*Nov 9, 2010*
• TAC Meeting #4	Dec 14, 2010
• Public Meeting #2 (Alternatives)	Jan 12, 2011
• TAC Meeting #5	Feb 15, 2011
• Public Meeting #3 (Pref. Alt.)	March 16, 2011
• Draft Final Report	April 2011
• Final Report Submission	June 2011

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Draft Tech Memo #7

- Existing traffic conditions
- Future traffic conditions
  - Roadway classification & ultimate typical section
- Traffic analysis
  - 2030 horizon year
  - Sensitivity analysis
- Crash data

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Ultimate Typical Section

- City of Surprise, City of Glendale, MAG, and Maricopa County all identify 6-Lane Arterial
- Corridor planning based on 6 lanes in 140' R/W (min.)
- Wider footprint between Cotton Lane and Sarival Road
- Major intersections to accommodate dual lefts and right-turn lanes on all legs

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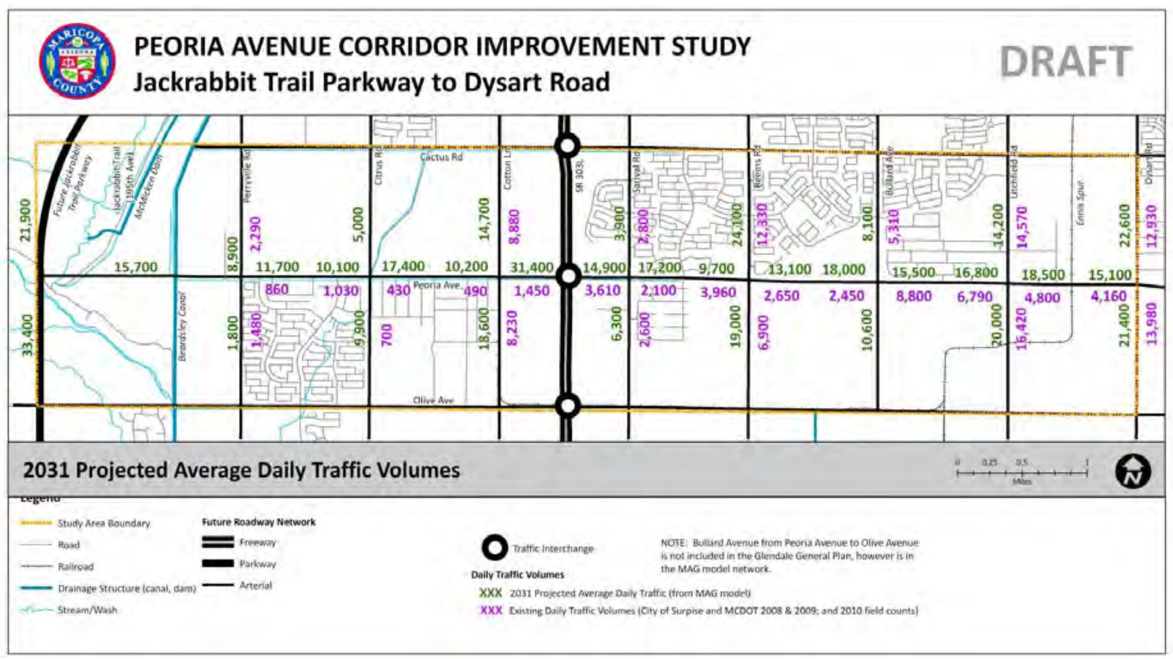
Traffic Volumes



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Traffic Information

- 4-Lane facility warranted by 2030 based on MAG model
- Intersection analysis to estimate lane requirements for 2030
- Accommodate ultimate facility

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Evaluation Criteria

- Right-of-way Considerations
- Compatibility w/ Existing Developments
- Compatibility w/ Future Developments
- Compatibility w/ Existing & Future Roadway Improvements
- Engineering Complexity & Constructability
- Public Acceptance
- Local Agency Support

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Evaluation Criteria

- Drainage/Flood Control Considerations
- Environmental Considerations
- Utility Considerations

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Overview of Alignment Alternatives

- Jackrabbit Trail Pkwy to Beardsley Canal
- Beardsley Canal to Perryville Road
- Perryville Road to Citrus Road
- Citrus Road to Cotton Lane
- Cotton Lane to Sarival Road
- Sarival Road to Reems Road
- Reems Road to Bullard Avenue
- Bullard Avenue to Litchfield Road
- Litchfield Road to Dysart Road

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Overview of Evaluation Process

- Consultant team evaluation – Preliminary Recommendation
- TAC feedback
  - Plan sheets available on FTP site
  - Feedback due by December 24th
- Public feedback

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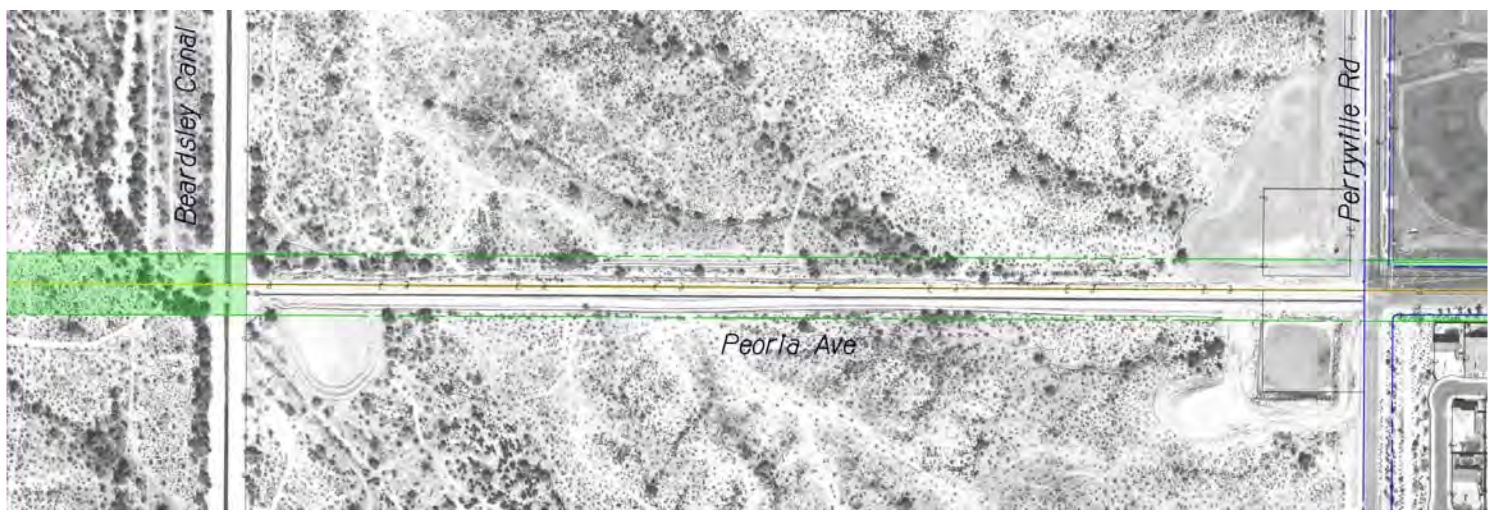
Segment 2: *Beardsley Canal to Perryville Road*



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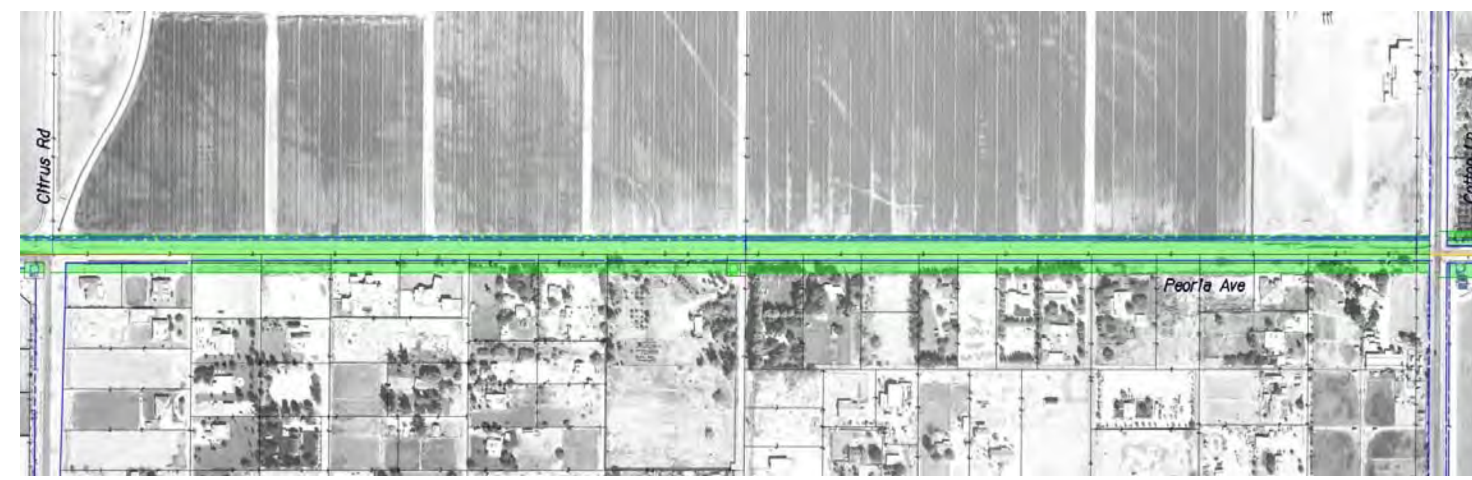
Segment 4: *Citrus Road to Cotton Lane*



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Segment 6: *Sarival Road to Reems Road*

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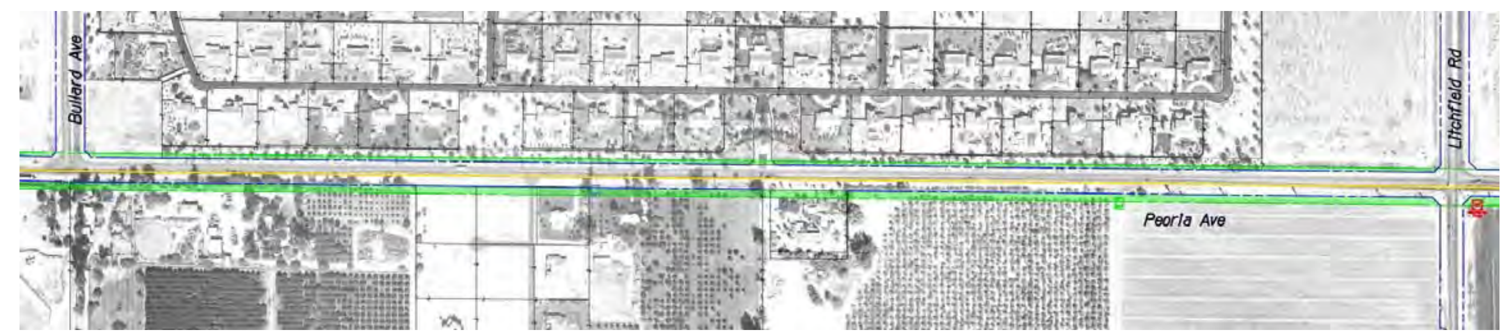
Segment 8: *Bullard Avenue to Litchfield Road*



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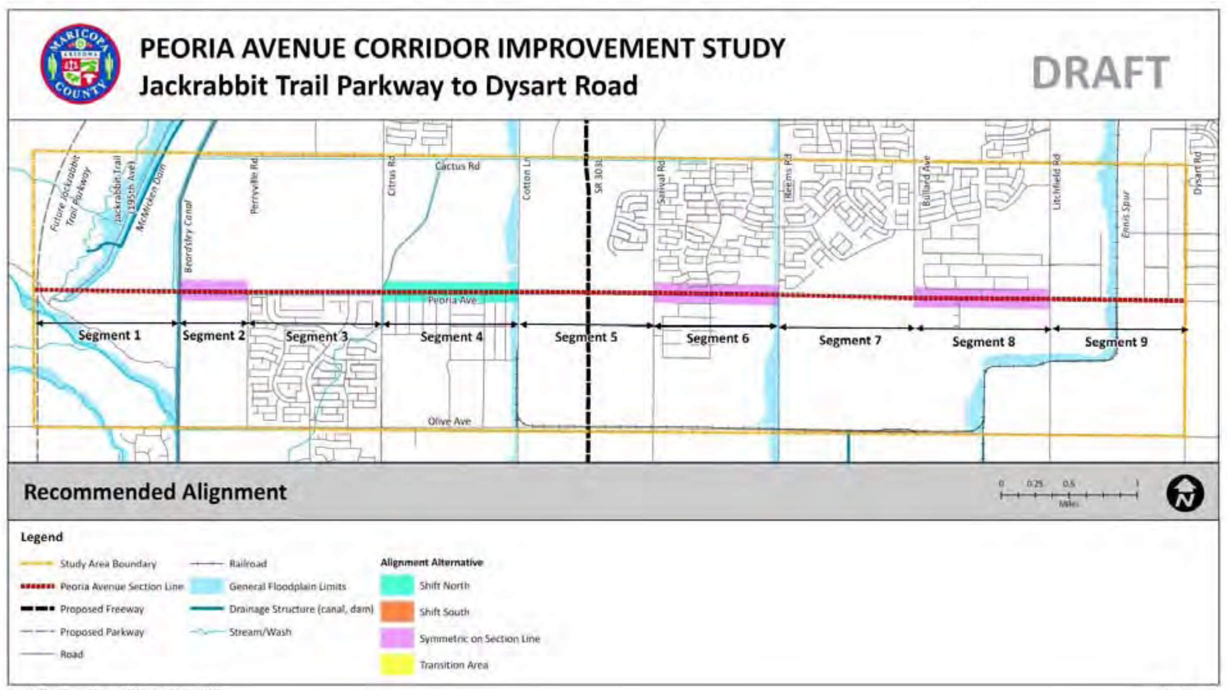
Recommended Alignment



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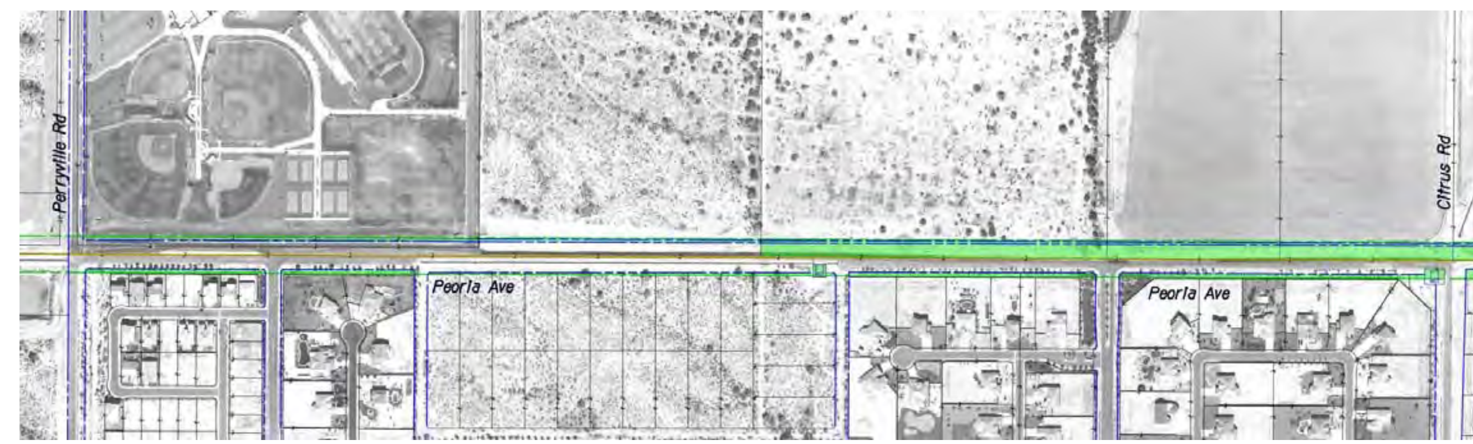
Segment 3: *Perryville Road to Citrus Road*



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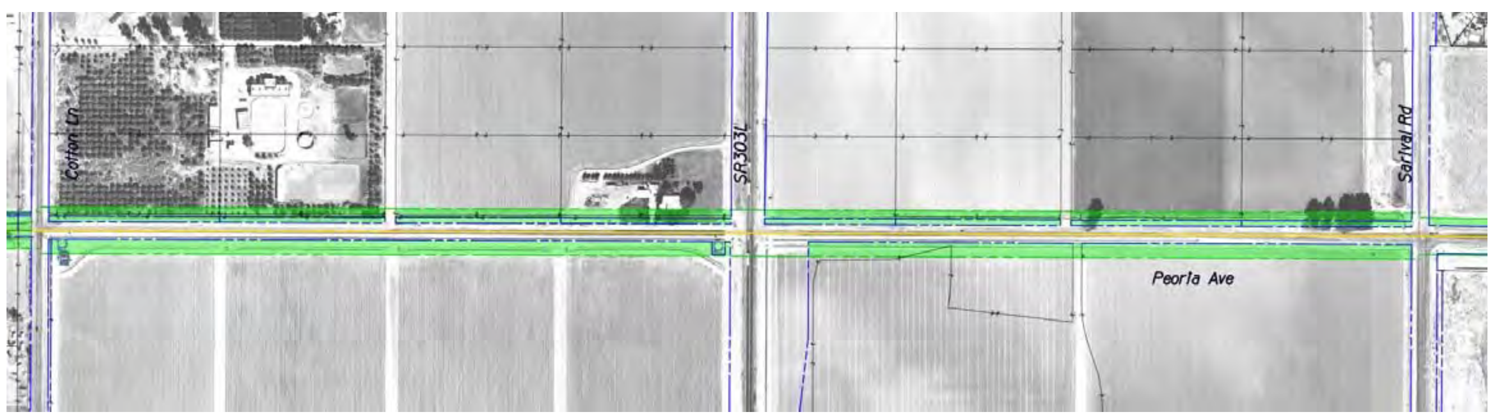
Segment 5: *Cotton Lane to Sarival Road*



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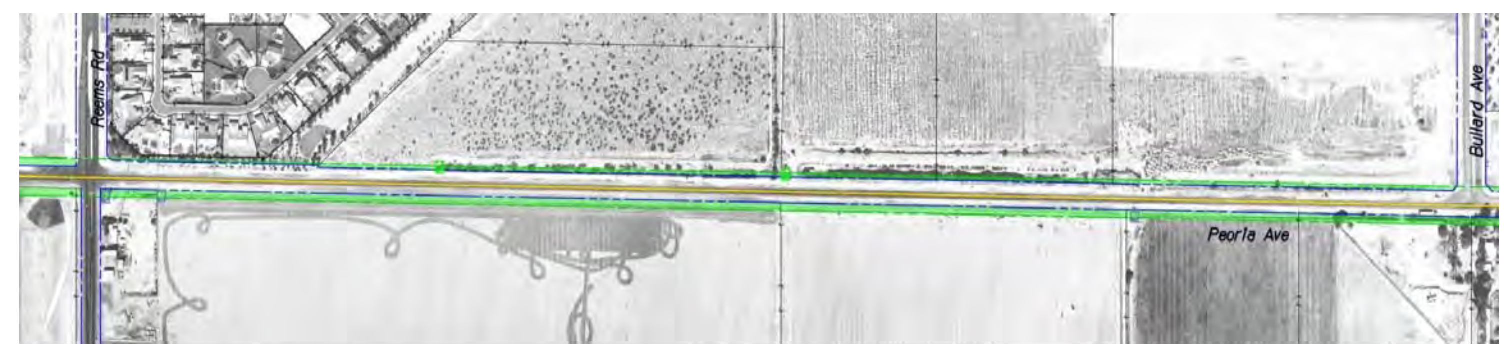
Segment 7: *Reems Road to Bullard Avenue*



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Segment 9: *Litchfield Road to Dysart Road*

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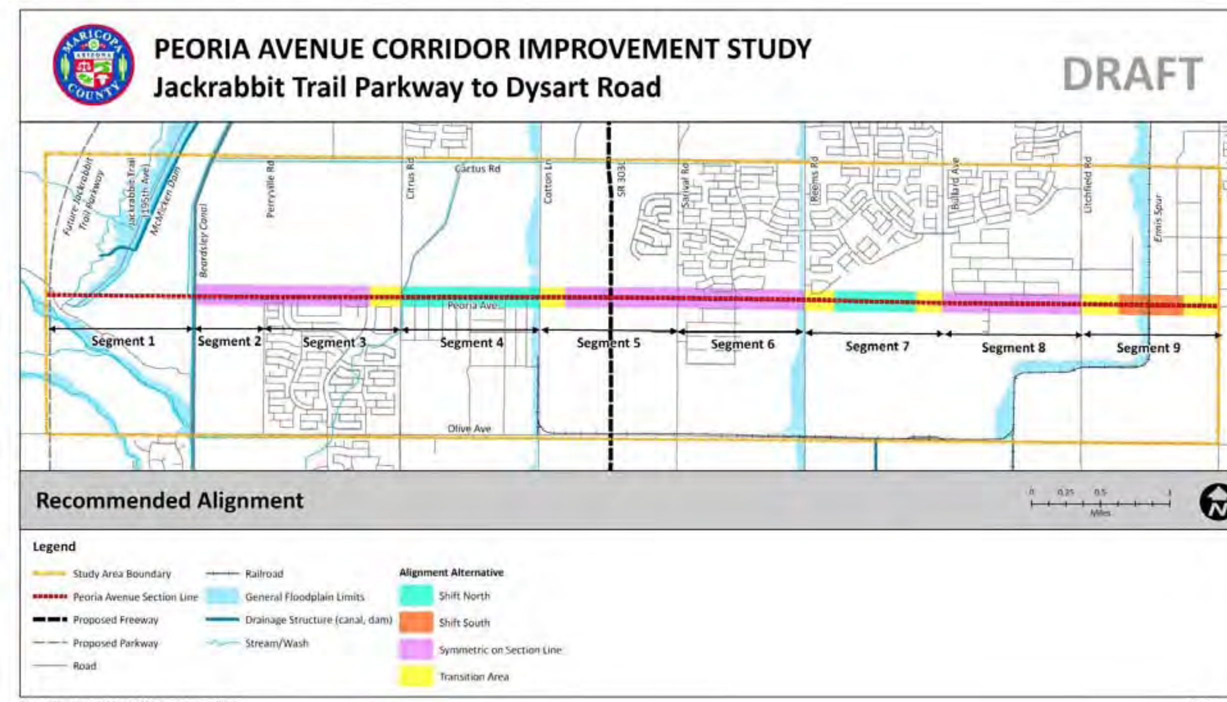
Recommended Alignment



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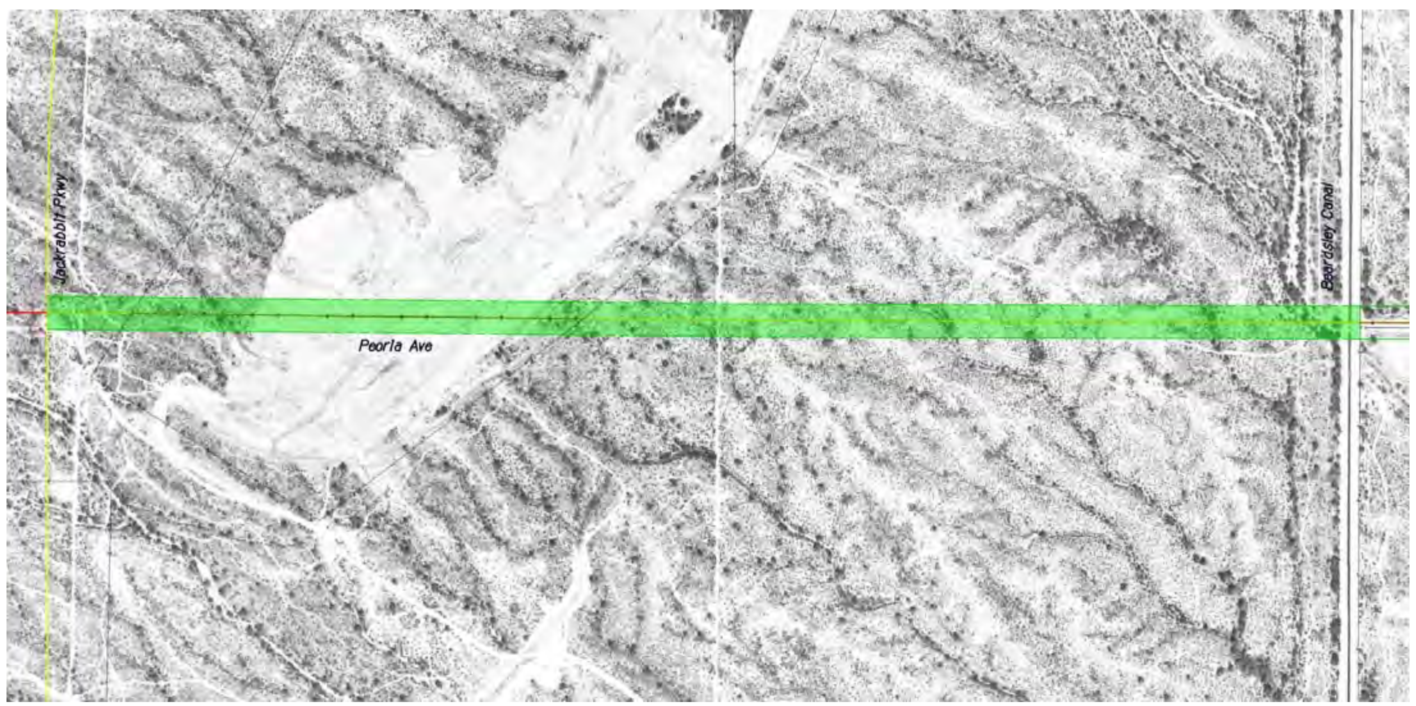
<u>Segment 1: *Jackrabbit Trail Parkway to Beardsley Canal*</u>



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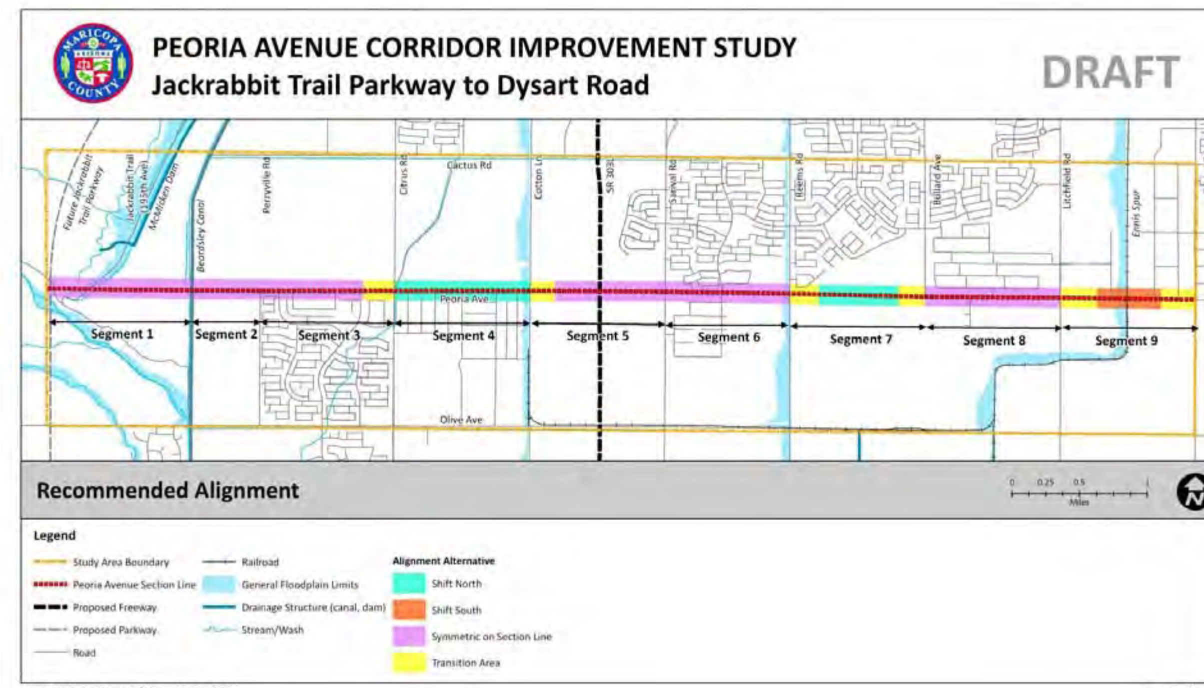
<u>Recommended Alignment</u>



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Next Steps

- Distribute Final TM #1, 2, and 3
- TAC comments on Draft TM #7 due on December 17th
- TAC comments on alternative evaluation due December 24th
- Submit Draft TM #4 during 1st week of January
- Conduct public open house #2 in January

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Open Discussion

- Study area issues, constraints, & opportunities
- Traffic volumes and analysis
- Alternatives & evaluation process
- Other stakeholder concerns

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Next TAC Meeting

February 15, 2011

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Evaluation Criteria

Criteria Title	Criteria Description	Criteria Performance Measure
Right-of-way Considerations	An assessment of the amount and value of the right-of-way that would need to be acquired for corridor alternatives in relation to other alternatives under consideration for the segment.	Quantitative assessment of acres or square feet of acquisition Qualitative assessment of potential cost
Compatibility with Existing Developments	An estimate of the potential effect of proposed corridor alternatives on the existing developments most directly affected. Key considerations include the proximity to existing developments and potential displacements.	Qualitative assessment of compatibility
Compatibility with Planned Future Developments	An estimate of the potential effect of the corridor alternatives on planned developments and/or land that is currently under the jurisdiction of the Arizona State Land Department. Key considerations include compatibility with approved master plans and/or preliminary and final plats.	Qualitative assessment of compatibility
Compatibility with Existing and Planned Roadway Improvements	An assessment of the compatibility of the corridor alternatives with the existing and planned roadway improvements.	Qualitative assessment of compatibility
Engineering Complexity and Constructability	A general assessment of engineering complications, exclusive of cost considerations, which could arise from construction of the roadway. Key considerations include roadway geometry, permitting requirements, construction staging, etc.	Qualitative assessment of complexity and constructability
Public Acceptability	Estimated community support for and acceptance of the corridor alternative, based on input from municipal staff, stakeholders, homeowner associations, and the public.	Qualitative assessment of acceptability
Local Agency Support	Estimated local agency (city) support for and acceptance of the corridor alternative, based on input from municipal staff.	Qualitative assessment of acceptability
Drainage/Flood Control Considerations	An estimate of potential impacts from the proposed corridor alternatives to both existing FCDMC facilities as well as to future improvements.	Qualitative assessment of potential impacts
Environmental Considerations	An assessment of social, ecological, and cultural environment in the study area.	Qualitative assessment of potential impacts to socioeconomic environment Qualitative assessment of potential impacts to physical and natural environment Qualitative assessment of potential impacts to cultural resources
Utility Considerations	Estimate of potential impacts from the proposed corridor alternatives to both existing and planned future utility facilities such as the MWD canals, wells, reclaimed water delivery headers, and overhead lines.	Quantitative assessment of potential impacts

Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road
Alternative Alignment Descriptions

Jackrabbit Pkwy to Beardsley Canal		
Alt #1	Centerline on Section Line	Goes through basin & floodpool
Alt #2	South of reconstructed McMicken Dam	Goes south of floodpool
Beardsley Canal to Perryville Rd		
Alt #1	Centerline on Section Line	Matches Zanjero Trails Preliminary Plat
Perryville Rd to Citrus Rd		
Alt #1	Centerline on Section Line	140' wide corridor requires acquisition on both sides
Alt #2	Centerline shifted 5' south of Section Line	Holds planned dedicated R/W along north side
Alt #3	Centerline shifted 15' north of Section Line	Holds existing south R/W line
Citrus Rd to Cotton Ln		
Alt #1	Centerline on Section Line	140' wide corridor requires acquisition on both sides
Alt #2	Centerline shifted 5' south of Section Line	Holds planned dedicated R/W along north side
Alt #3	Centerline shifted 37' north of Section Line	Places south R/W line approx. 10' south of ditch & allows room for potential frontage road
Cotton Ln to Sarival Rd		
Alt #1	Centerline on Section Line	176' wide corridor requires acquisition on both sides
Alt #2	Centerline shifted 55' south of Section Line	Holds existing north R/W line
Alt #3	Centerline shifted 55' north of Section Line	Holds existing south R/W line
Sarival Rd to Reems Rd		
Alt #1	Centerline on Section Line	140' wide corridor requires acquisition on both sides
Alt #2	Centerline shifted 15' south of Section Line	Holds existing north R/W line along developed areas
Alt #3	Centerline shifted 5' north of Section Line	Holds existing south R/W line along developed areas
Reems Rd to Bullard Ave		
Alt #1	Centerline on Section Line	140' wide corridor requires acquisition on both sides
Alt #2	Centerline shifted 5' south of Section Line	Holds existing north R/W line along developed areas
Alt #3	Centerline shifted 30' north of Section Line	Holds existing south R/W line
Bullard Ave to Litchfield Rd		
Alt #1	Centerline on Section Line	140' wide corridor requires acquisition on both sides
Alt #2	Centerline shifted 15' south of Section Line	Holds existing north R/W line
Alt #3	Centerline shifted 30' north of Section Line	Holds existing south R/W line
Litchfield Rd to Dysart Rd		
Alt #1	Centerline on Section Line	140' wide corridor requires acquisition on both sides
Alt #2	Centerline shift south of Section Line [varies from 2' (west end) to 37' (middle) to 2' (east end)]	Holds existing north R/W line
Alt #3	Centerline shift north of Section Line [varies from 37' (west end) to 30' (east end)]	Holds existing south R/W line

Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

DRAFT EVALUATION MATRIX

Criteria		Segment 1: Jackrabbit Trail to Beardsley Canal	
		Alternative 1 (on section line)	**Alternative 2 (shift to south)**
Right-of-way Considerations		◒ 779k SF	● 825k SF
		◒	● Higher cost due to additional length
Compatibility with Existing Developments		○ No existing development	○ No existing development
Compatibility with Planned Future Developments		○ Most compatible with future ASLD plans	◒
Compatibility with Existing and Planned Roadway Improvements		○ Facilitates 1-mile intersection spacing along Jackrabbit Parkway	◒
Engineering Complexity & Constructability		◒	● Numerous wash and floodplain crossing
Public Acceptability			
Local Agency Support			
Drainage/Flood Control Considerations		◒	● Numerous wash and floodplain crossing
Environmental Considerations	Socioeconomic	○ No known impacts	○ No known impacts
	Physical & Natural	◒	● Greatest impact to wash corridors and floodplains
	Cultural	● Impacts to Beardsley Canal	● Impacts to Beardsley Canal
Utility Considerations		○ No known impacts	○ No known impacts
Recommendations		Recommended Alignment-likely lower cost; minimizes natural wash crossings; better intersection spacing along Jackrabbit Trail	

○ – Lowest impact/best performance ◒ - Moderate impact/moderate performance ● - Highest impact/worst performance

DRAFT EVALUATION MATRIX

Criteria		Segment 3: Perryville Road to Citrus Road		
		Alternative 1 (on section line)	Alternative 2 (shift 5' south)	Alternative 3 (shift 15' north)
Right-of-way Considerations		◒ 295k SF	◒ 293k SF	● 309k SF
		◒	◒	◒
Compatibility with Existing Developments		◒ Moderate impact to existing land uses	◒ Moderate impact to existing land uses	○ Least impact to existing land uses
Compatibility with Planned Future Developments		◒ Moderate impact to planned land uses	◒ Moderate impact to planned land uses	● Least compatible with future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible with existing street improvements	◒	●
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		○ Minimal impact	○ Minimal impact	◒ Slight impact to existing drainage channel to the north
Environmental Considerations	Socioeconomic	◒ Slight impact to land; no impact to public access or structures	◒ Slight impact to land; no impact to public access or structures	◒ Slight impact to land; no impact to public access or structures
	Physical & Natural	◒ Some impact to farmland	◒ Some impact to farmland	◒ Some impact to farmland
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch
Utility Considerations		◒ 1600 ft lined irrigation ditch, 7 power poles, 2 well sites	◒ 1600 ft lined irrigation ditch, 7 power poles, 2 well sites	◒ 1600 ft lined irrigation ditch, 7 power poles, 2 well sites
Recommendations		Recommended Alignment with transition at east end – most compatible with existing improvements and developments		

○ – Lowest impact/best performance ◒ - Moderate impact/moderate performance ● - Highest impact/worst performance

Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

DRAFT EVALUATION MATRIX

Criteria		Segment 4: Citrus Road to Cotton Lane		
		Alternative 1 (on section line)	Alternative 2 (shift 5' south)	Alternative 3 (shift 37' north)
Right-of-way Considerations		◒ 716k SF	◒ 716k SF	◒ 718k SF
		◒	● Higher cost likely to south	○
Compatibility with Existing Developments		◒ Balances impacts	● Greatest impact to most properties	○ No known impacts
Compatibility with Planned Future Developments		◒ Balances impacts	○ No new planned development to south	● All planned development to the north
Compatibility with Existing and Planned Roadway Improvements		○ Half-street constructed at Citrus	◒	◒
Engineering Complexity & Constructability		◒ Access fronting Peoria Ave	◒ Access fronting Peoria Ave	○ Opportunity for frontage road
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		◒ No existing drainage infrastructure constructed; must continue channel from the west	◒ No existing drainage infrastructure constructed; must continue channel from the west	◒ No existing drainage infrastructure constructed; must continue channel from the west
Environmental Considerations	Socioeconomic	● Impacts to private property	● Impacts to private property	○ No known impacts
	Physical & Natural	◒ Balances impacts	◒ Balances impacts	● Impacts to farmland
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch
Utility Considerations		● 1 well site; 5200 ft lined irrigation ditch; 20 power poles	● 1 well site; 5200 ft lined irrigation ditch; 20 power poles	◒ 5200 ft lined irrigation ditch; 20 power poles
Recommendations				Recommended Alignment – minimizes impacts to existing land uses to south

○ – Lowest impact/best performance ◒ - Moderate impact/moderate performance ● - Highest impact/worst performance

DRAFT EVALUATION MATRIX

Criteria		Segment 5: Cotton Lane to Sarival Road		
		Alternative 1 (on section line)	Alternative 2 (shift 55' south)	Alternative 3 (shift 55' north)
Right-of-way Considerations		● 543k SF	◒ 453k SF	◒ 457k SF
		◒	○ Lower cost to south	● Highest cost to north
Compatibility with Existing Developments		◒ Balances impacts	○ No known impacts	● Impacts property to the north
Compatibility with Planned Future Developments		○ Least impact to all properties	◒ Balances impacts	● Greatest impact to most properties
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible w/ ADOT's plans for SR303L interchange	◒	◒
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		○ Minimal impacts	○ Minimal impacts	○ Minimal impacts
Environmental Considerations	Socioeconomic	◒ Minor impacts to existing land uses	◒ Minor impacts to existing land uses	◒ Minor impacts to existing land uses
	Physical & Natural	◒ Minor impacts to farmlands	◒ Minor impacts to farmlands	◒ Minor impacts to farmlands
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	○ No known impacts
Utility Considerations		● 2 well sites; 4300 ft lined irrigation ditch; 14 power poles	● 2 well sites; 4300 ft lined irrigation ditch; 6 power poles	○ 8 power poles
Recommendations		Recommended Alignment w/ transition at west end - compatible with SR303 & transition at west end will minimize impacts to wells		

○ – Lowest impact/best performance ◒ - Moderate impact/moderate performance ● - Highest impact/worst performance

Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

DRAFT EVALUATION MATRIX

Criteria		Segment 6: Sarival Road to Reems Road		
		Alternative 1 (on section line)	Alternative 2 (shift 15' south)	Alternative 3 (shift 5' north)
Right-of-way Considerations		◒ 182k SF	◒ 182k SF	◒ 182k SF
		◒	○	● Greatest impact to existing and planned developments in right-of-way
Compatibility with Existing Developments		○ Balances impacts to both sides	◒ Minor impacts to south side	◒ Minor impacts to north side
Compatibility with Planned Future Developments		◒ Minor impact to future development to north	○ No known future development to south	● Impacts future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible with existing street and Reems Rd intersection	● Not compatible with existing street and Reems Rd intersection	◒ Not compatible with existing street but more compatible than #2 with Reems Rd intersection
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		○ Least impact to existing drainage facilities	◒ Minor impacts to existing drainage facilities	◒ Minor impacts to existing drainage facilities
Environmental Considerations	Socioeconomic	○ Minimal impact	○ Minimal impact	○ Minimal impact
	Physical & Natural	○ Minimal impact	○ Minimal impact	○ Minimal impact
	Cultural	○ No known impact	○ No known impact	○ No known impact
Utility Considerations		○ No known impacts to irrigation or power lines	◒ Potential relocation of underground irrigation facilities	○ No known impacts to irrigation or power lines
Recommendations		Recommended Alignment – balances impacts and scores best in drainage and existing development compatibility		

○ – Lowest impact/best performance ◒ - Moderate impact/moderate performance ● - Highest impact/worst performance

DRAFT EVALUATION MATRIX

Criteria		Segment 7: Reems Road to Bullard Ave		
		Alternative 1 (on section line)	Alternative 2 (shift 5' south)	Alternative 3 (shift 30' north)
Right-of-way Considerations		◒ 227k SF	◒ 227k SF	◒ 224k SF
		◒	◒	● Higher cost likely to north; encroachment into residential lots
Compatibility with Existing Developments		◒ Balances impacts	◒ Balances impacts	● All existing development to the north
Compatibility with Planned Future Developments		◒ Balances impacts to both sides	○ No future development plans to the south	● All future development plans to the north
Compatibility with Existing and Planned Roadway Improvements		○ Reems Road improved to full street section; centered on section line	◒	◒
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		○ No known impacts	○ No known impacts	○ No known impacts
Environmental Considerations	Socioeconomic	◒ Impacts to agriculture	◒ Impacts to agriculture	● Impacts to private property
	Physical & Natural	● Potential impact to farms and habitat	● Potential impact to farms and habitat	◒ Potential impact to habitat
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	○ No known impacts
Utility Considerations		● 5 well sites; 4500 ft lined irrigation ditch; 16 power poles	◒ 5 well sites; 4500 ft lined irrigation ditch	○ 3 well sites; 16 power poles
Recommendations				Recommended Alignment with transition at west end and east end. Would minimize impacts to irrigation facilities. Low scores due to impacts at west end.

○ – Lowest impact/best performance ◒ - Moderate impact/moderate performance ● - Highest impact/worst performance

Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

DRAFT EVALUATION MATRIX

Criteria		Segment 8: Bullard Ave to Litchfield Rd		
		Alternative 1 (on section line)	Alternative 2 (shift 15' south)	Alternative 3 (shift 30' north)
Right-of-way Considerations		◒ 235k SF	◒ 235k SF	◒ 233k SF
		◒	● Highest cost likely to south	○
Compatibility with Existing Developments		◒ Balances impacts	● Impacts land uses to south	● Impacts land uses to north
Compatibility with Planned Future Developments		◒ Minor impacts to future development	○ No future development to south	● Impacts to future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Litchfield and Bullard intersections fully improved; centered on section line	◒	●
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		◒ Minor impacts to existing drainage facilities	○ Least impacts to existing drainage facilities	● Most impacts to existing drainage facilities (channel and box culverts)
Environmental Considerations	Socioeconomic	◒ Balanced impacts	● Impacts to private property lots	○ No known impacts
	Physical & Natural	◒ Balanced impacts	● Greatest impact to farmland and potential habitat areas	○ No known impacts
	Cultural	○ No known impacts	○ No known impacts	○ No known impacts
Utility Considerations		◒ 2 well sites	● 4 well sites	○ No well sites impacted
Recommendations		Recommended Alignment – balances impacts and scores better than #3 in drainage and existing development compatibility		

○ – Lowest impact/best performance ◒ - Moderate impact/moderate performance ● - Highest impact/worst performance

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road

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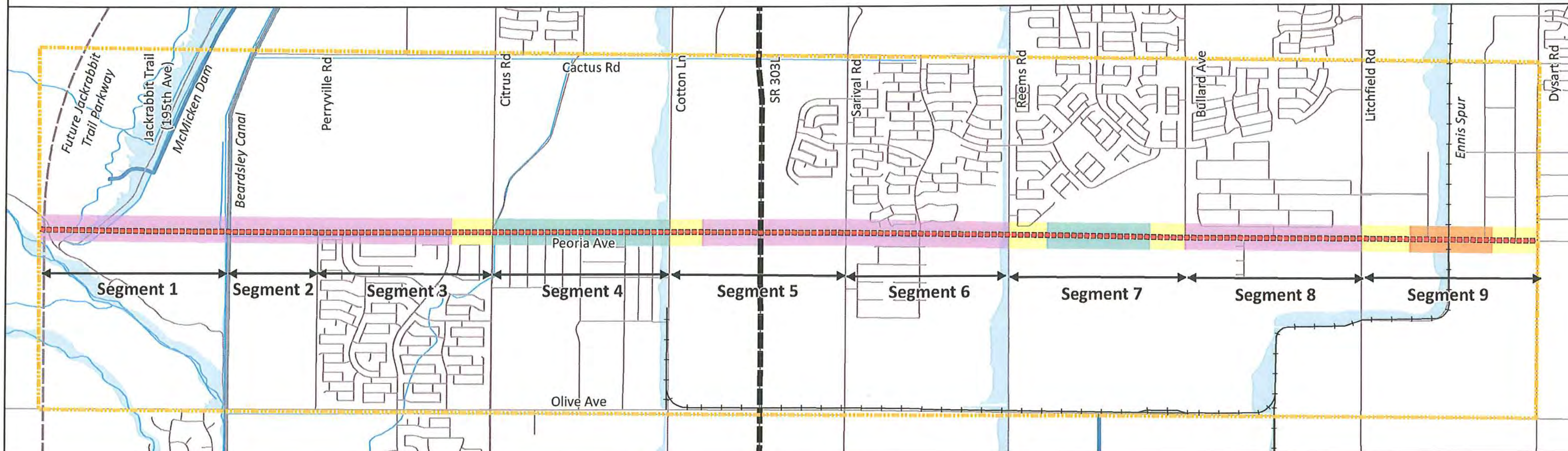

Recommended Alignment

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Miles

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Legend

- Study Area Boundary
- Peoria Avenue Section Line
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Alignment Alternative

- Shift North
- Shift South
- Symmetric on Section Line
- Transition Area

Source: Flood Control District of Maricopa County, ALRIS

December 2010

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
MCDOT Contract No. 2010-005
Work Order No. TT005

MEETING MINUTES

Date: February 17, 2011

To: Mitch Wagner, Project Manager, MCDOT

From: Rodney Bragg, AECOM

Re: Peoria Avenue Corridor Improvement Study

Subject: February 15, 2011 TAC Meeting #5

Attendees: See attached sign-in sheet

I. Introductions
See attached sign-in sheet

II. Meeting Purpose
The purpose of this meeting was to provide an update on the project status; discuss the alternatives evaluation process, design features of the recommended alignment, and preliminary implementation plan; discuss the next steps in the study; and to gather input/feedback from the TAC.

III. Study Purpose and Objectives
The purpose of this study is to establish the facility type, number of lanes, right-of-way, and corridor alignment required to accommodate the ultimate facility classification and safely accommodate forecast travel demands for Peoria Avenue. This study will result in a future "footprint" of the corridor, implementation timeframe, and phasing of identified roadway improvements.

Study objectives include assessing the strategic issues and potential impacts by existing and proposed developments, drainage features, utilities, and environmental issues. Based on this information, the study will develop and evaluate conceptual alternative alignments, as well as identify a preferred alignment. With a preferred alignment, specific characteristics of the corridor will be further defined and an implementation plan developed to carry out corridor improvements. Most

importantly, the study aims at gaining consensus amongst partners to achieve design consistency and preserve the corridor for future implementation.

IV. Study Area
The study area extends approximately 7.5 miles, from the future Jackrabbit Trail Parkway alignment to Dysart Road, including a two-mile wide area, centered on Peoria Avenue. Multiple jurisdictions have control over the land in this area. The Peoria Avenue section line provides the boundary between the City of Surprise and City of Glendale planning areas, with portions of the corridor to the far west belonging to Maricopa County, and portions to the east belonging to the City of El Mirage. Most of the area within the Surprise and El Mirage municipal planning areas (MPAs) is incorporated, whereas only a small parcel adjacent to Peoria Avenue and SR 303L is annexed by Glendale.

White Tank Mountain Regional Park sits to the west of the study area and Luke Air Force Base to the south. McMicken Dam and the Beardsley Canal constitute two major drainage structures, both located at the western end of the study area. The SR 303L corridor will be upgraded to a freeway, with a connection to Peoria Avenue. The BNSF Ennis Spur also intersects the corridor between Litchfield and Dysart Roads.

V. Study Process
The study process involves a three step involvement plan, which leads to the preparation of a phased implementation plan of the selected alternative. This includes:

1. Scoping and development of a stakeholder database to identify corridor issues and needs;
2. Development, evaluation, and refinement of alternatives with stakeholder input; and
3. Development of an implementation plan with the stakeholders whereby major design features are finalized.

VI. Study Milestones
Major milestones are as follows:

Phase 1

• Project kick-off and study initiation	July 2010 (completed)
• Data collection phase	July – September 2010 (completed)
• TAC meeting #1	August 17, 2010 (completed)
• Public meeting #1 (scoping)	September 20, 2010 (completed)
• TAC meeting #2	October 12, 2010 (completed)

Phase 2

• TAC meeting #3	November 9, 2010 (cancelled)
• TAC meeting #4	December 14, 2010 (completed)
• Public meeting #2 (alternatives)	January 12, 2011 (completed)
• TAC meeting #5	February 15, 2010
• Public meeting #3 (pref. alternative)	March 16, 2011
• Draft final report	April 2011

- Final report submission June 2011

VII. Technical Memorandums

Study technical memorandums and their status are as follows:

1. Existing and Future Corridor Conditions - completed
2. Environmental Overview - completed
3. Drainage Overview - completed
4. Candidate Alternative Alignments and Evaluation - draft distributed for review
5. Preferred Alignment - draft anticipated in March
6. Public and Stakeholder Participation - draft anticipated in April
7. Traffic Analysis - completed

VIII. Alternatives Evaluation Process

The alternatives evaluation process began with the Project Team (composed of a multidisciplinary consultant group) conducting the first round evaluation, which determined a preliminary recommendation for the corridor alignment. This was followed by a series of stakeholder meetings to refine the evaluation and recommendation, and to gain agency and public input and comments as follows:

- TAC #4 and follow-up comments (December 2010)
- Public Open House (January 2011)
- FCDMC meeting (January 2011)
- City of Surprise meeting (January 2011)
- TAC #5 (February 2011)
- Prasada/City of Surprise meeting (TBD)

<u>Alternative Alignment Options</u>

Approximately 30 people were in attendance at the January 2011 Public Open House, of which the majority were residents of or interested in the one-mile section between Citrus Road and Cotton Lane. Most attendees were interested in seeing Peoria Avenue paved in this segment, to aid in dust mitigation. However, they were not interested in any additional capacity improvements that might increase traffic along the corridor. Therefore, attendees at the public meeting suggested an alternative alignment of Peoria Avenue that would shift the roadway approximately one-half mile to the north, west of Cotton Lane, continuing west to an intersection with Perryville Road. As a terminus at Perryville Road does not provide connectivity to the western end of the study area, the Project Team developed a series of options to complete the suggested realignment, attempting to provide corridor continuity (illustrated in handout map entitled "West Peoria Avenue Alignment Options"). These options include:

- Option A (blue): Continue the northern shift to the west on the half-mile alignment.
- Option B (green): Continue to the west, but swing to the south to connect back to the Peoria Avenue section line to provide a connection to Jackrabbit Trail Parkway.
- Option C (yellow): Provide a continuation of the existing Peoria Avenue to the west along the Peoria Avenue section line, beginning at Perryville Road. This option would result in offset intersections located one-half mile apart.

- Option D (red + yellow): Modify Option C to provide a connection from the new Peoria Avenue to the old Peoria Avenue through the Prasada community.

While all of the abovementioned options would shift the corridor to the north, away from existing land uses, they each cause separate impacts to the corridor.

- The shared link (shifted half-mile north within the Citrus to Cotton segment) could disrupt existing plans for the Prasada and Zanjero Trails communities.
- Option A requires crossing McMicken Dam to provide the through connection to Jackrabbit Trail Parkway, which may be seen as a fatal flaw by FCDMC.
- Option B could have significant impacts on the Zanjero Trails development, which already has a preliminary plat on file.
- Option C does not provide a continuous east-west facility, and will require the half-mile segment of Perryville Road north of Peoria Avenue to serve as a connector between the two facilities.
- Option D, like Option C, does not provide a continuous east-west facility, although it requires fewer intersection turn movements. In the future, however, the operational capacity at the intersection may not be sufficient.

IX. Recommended Alignment

While the recommended alignment has changed slightly from what was presented at the fourth TAC meeting due to subsequent stakeholder meetings, it is generally very similar. The "Recommended Alignment" map in the meeting handouts illustrates this by segment, with the purple shading representing improvements symmetric about the section line, turquoise shading representing an alignment shift to the north, orange shading representing an alignment shift to the south, and yellow shading representing transition areas to form a continuous alignment. A summary of the recommendations follow. Please note that a continuous Peoria Avenue section line alignment is still recommended west of Cotton Lane, despite alternative alignment options explored for the west portion of the corridor.

- Segment 1, Jackrabbit Trail Parkway to the Beardsley Canal: Symmetric about section line.
- Segment 2, Beardsley Canal to Perryville Road: Symmetric about section line.
- Segment 3, Perryville Road to Citrus Road: Symmetric about section line, with transition area near Citrus Road to a shift north.
- Segment 4, Citrus Road to Cotton Lane: Shift north.
- Segment 5, Cotton Lane to Sarival Road: Transition area at Cotton Lane to shift back to section line alignment.
- Segment 6, Sarival Road to Reems Road: Symmetric about section line.
- Segment 7, Reems Road to Bullard Avenue: Symmetric about section line adjacent to existing development at Rancho Gabriela; slight shift north in the middle of the segment to avoid an existing well site on the south side of Peoria Avenue; transition west of Bullard Avenue to shift back to a section line alignment.
- Segment 8, Bullard Avenue to Litchfield Road: Symmetric about section line.

- Segment 9, Litchfield Road to Dysart Road: Transition from section line alignment at both segment ends; shift south in the center of the segment to avoid existing development to the north.

X. Recommended Design Features

The following des ign fe ature dis cussions w ill b e ex plored in m ore de tail by the Project Team, but the initial concepts were identified to solicit stakeholder feedback.

<u>Typical Section</u>
The City of Surprise, City of Glendale, MAG, and Maricopa County all identify Peoria Avenue as a six -lane arterial roadway. Cor ridor planning has been based on a 6-lane roadway with 140 feet of right-of-way (R/W), as this is the widest R/W footprint of all the participating jurisdictions and because Peoria Avenue forms the boundary between multiple entities. The existing R/W in the corridor is not consistent however, varying between 33 feet of R/W in undeveloped areas to 55- to 68-foot dedications in developed se gments. Additionally, the o nly location wi th an exi sting full w idth roadway is just east of Perryville Road, and the R/W width does not conform to any jurisdiction's R/W standards (no room for bicycle lane or shoulder, narrow median).

Because of the lack of corridor R/W consistency, and varying requirements of each jurisdiction, the Project Team recommends using Maricopa County's principal arterial typical section (130 feet R/W) as the minimum R/W for future improvements. This is similar to the City of Glendale's requirements, but slightly narrower than Surprise's. It is the best match to the existing R/W dedications and could be slightly varied to retrofit existing sections.

This typical section, illustrated in the handout materials, includes 43.5-foot curb-to-curb travel widths with a 14-foot median. This leaves 14.5 feet between the roadway curb and R/W boundary on each side – a buffer zone which could be reduced slightly to accommodate improvements in existing developed corridor segments.

<u>Access Control – Driveway Spacing</u>
The City of Surprise requires the greatest spacing between driveways (200 to 300 feet); the City of Glendale requires the least spacing (150 feet); and Maricopa County requires either 165 feet or 300 feet – depending on the traffic volume. The Project Team recommends using the county's standards, as they are the most moderate and flexible. As Pe oria Av enue is generally planned f or adj acent res idential development, there will not likely be man y n ew driveways c onstructed along the corridor, minimizing potential conflicts.

<u>Other Access Control Techniques</u>
Additional ac cess control t echniques th at ar e r ecommended al ong th e cor ridor include:

- No on-street parking
- Raised median
- Full median breaks at quarter-mile spacing
- Frontage road (south side) between Citrus Road and Cotton Lane

<u>Drainage</u>
The ultimate vision for Peoria Avenue is to retain and continue the drainage channel on the north side of the corridor, with future outfalls to the SR 303L, Reems, and Ennis channels. The corridor will not have storm drain trunk lines. The roadway drainage will be conveyed to the northern channel and appropriate outfall locations. Drainage im provements w ill b e im plemented as development occurs on the north side of the corridor, although interim improvements may be required at spot locations to remedy existing issues (e.g., Litchfield Road and Sarival Road intersections with Peoria Avenue).

XI. Implementation Plan

The implementation plan developed as part of this project is intended to be used to preserve corridor R/W, as construction of improvements will not likely be completed in the near-term, b ut r ather by developers as the cor ridor bui lds o ut. H owever, interim improvements may need to be constructed to ensure corridor functionality. Therefore, the implementation plan (map in handout materials) splits up the corridor according to implementation responsibilities, which generally follow a similar phasing plan.

The colored shading represents:

- Turquoise: Improvements currently programmed or planned
- Purple: Future improvements by developer
- Orange: Future mid-term improvements by city/county
- Yellow: Future long-term improvements by city/county

<u>0-5 Years</u>
The turquoise-shaded improvements will likely occur in the near-term, within the next five years. These two areas include: (1) improvements at the SR 303L interchange to be completed by ADOT when SR 303L is upgraded to a freeway facility, and (2) completion of the north half street between Sarival and Reems Roads that was not constructed when the Copper Canyon Ranch community was developed. Although shaded orange as a mid-term improvement to be completed by the city/county, two other i mprovements elements m ay need to be ex pedited to respond to existing issues: (1) acquire R/W and construct a two-lane roadway between Citrus Road and Cotton L ane, an d (2) construct dr ainage im provements at Litchfield an d Sar ival Roads.

<u>5-15 Years</u>
Generally, the remainder of the orange segments (those to be implemented by the city/county), fall into the mi d-term ti meframe for i mplementation a nd would be required to pr ovide a 4-l ane facility by the 2025-2030 ti meframe. M any of these improvement ar eas are c urrently built out an d not envisioned to redevelop before 2030. These include:

- South half-street and frontage road between Citrus Road and Cotton Lane
- Cotton Lane intersection (R/W acquisition required to implement the connection from the segment to the west – s hifted north. Th e ci ty/county would likely need to be involved, as this requires coordination with an existing landowner)

- Reems Road intersection
- South half-street between Bullard Avenue and Litchfield Road (existing residential development)
- North half-street near Ennis Spur (existing commercial development)

Assuming completion of the segments to be implemented by development, along with the completion of these improvements within the next 15 years, a continuous 4-lane facility (at a minimum) would be provided by the 2025-2030 timeframe.

More than 15 Years
The yellow-shaded improvements are long-term efforts to bring conformity to the corridor or widen to the ultimate 6-lane footprint. Areas where these improvements could occur, with participating by the city/county, include:

- Perryville Road to Citrus Road
- Sarival Road to Reems Road
- Bullard Road to Litchfield Road
- Litchfield Road to Dysart Road

XII. Next Steps

Key milestones and next steps include:

- TAC comments on Technical Memorandum #4 due on February 25, 2011.
- Draft Technical Memorandum #5 to be distributed in March.
- Third public open house will be conducted in March.
- Draft final report to be distributed in April.

XIII. Discussion

Issues raised regarding the alternate alignment options for the west portion of the corridor include:

- An element of the Maricopa County trail system exists parallel to McMicken Dam. Choosing an alternate alignment option that crosses this trail could raise 6(f) issues if federal funds were used to construct the trail.
- The FCDMC will coordinate with the dam safety division regarding the feasibility of considering an alignment option which crosses over McMicken Dam.

During the discussion of the implementation plan, it was noted that the map should be changed to reflect a piece of land owned by the City of Phoenix on the south side of the corridor between Litchfield Road and the Ennis Spur. Currently, the implementation plan is shaded purple, indicating that a developer will likely improve this half-street. In actuality, the City plans to maintain this segment as permanent open space to protect Luke Air Force Base. Therefore, any required improvements will likely be taken on by the city/county, and therefore the shading should be changed to orange.

Feedback from the TAC was requested on the realignment options at the west end, the design features (typical section, access control, and drainage), and the implementation plan.

Attachments:

- Meeting Sign-In Sheet
- Meeting Agenda
- Power Point Slides
- Recommended Alternative Typical Section
- West Peoria Avenue Alignment Options map
- Recommended Alignment map
- Implementation Plan map

Peoria Avenue: Jackrabbit Trail Parkway to Dysart Road, Corridor Improvement Study
TAC Sign-In Sheet

Date: Feb. 15, 2011

Initials	Name	Organization	Telephone	Postal Address	E-mail Address
	Beasley, Steve	ADOT VPM	(602) 712-7645	1611 W. Jackson, MD EM01 Phoenix, AZ 85007	sbeasley@azdot.gov
	Mathew, Velvet	ADOT VPM	(602) 712-3062	1611 W. Jackson, MD EM01 Phoenix, AZ 85007	vmathew@azdot.gov
	Dewitt, Mike	APS	(602) 493-4448	P.O. Box 53933 Attn: Mail Station 4030 Phoenix 85072	michael.dewitt@aps.com
	Richards, Paul	APS	(602) 371-6186	2043 W. Cheryl Drive M.S. 3040 Phoenix 85021	Paul.Richards@aps.com
	Warnecke, Dana	AZ Game & Fish	(602) 942-3000	5000 W. Carefree Highway Phoenix, AZ 85006	dwarnecke@azgfd.gov
	Taylor, Gordon	AZ State Land Dept.	(602) 542-2647	1616 W. Adams Street Phoenix 85007	gtaylor@land.az.gov
	Calvert, Lance	City of El Mirage	(623) 876-2971	12145 NW Grand Avenue El Mirage, AZ 85335	lcalvert@cityofelmirage.org
PA	Adabala, Purab	City of Glendale	(623) 930-2926	5800 W. Glenn Drive #315 Glendale 85301	padabala@glendaleaz.com
	Lemka, Chris	City of Glendale	(623) 930-2940	5800 W. Glenn Drive #315 Glendale 85301	clemka@glendaleaz.com
	Mascia, Nick	City of Surprise	(623) 222-6140	16000 N. Civic Center Plaza Surprise, AZ 85374	nicholas.mascia@surpriseaz.gov
KSS	Savage, Karen	City of Surprise	(623) 222-6132	16000 N. Civic Center Plaza	karen.savage@surpriseaz.gov
	Wolfley, Vern	Dysart School District	(623) 876-7052	15802 N. Parkview Place Surprise, AZ 85374	Vern.Wolfley@dysart.org
BL	Lokey, Burke	FCDMC	(602) 502-0867	2801 W. Durango Street Phoenix 85009	burkelokey@mail.maricopa.gov
	Dubsky, Bob	Luke Air Force Base	(623) 856-6195	56 Fighter Wing Community Initiatives 14185 W. Falcon Street Luke Air Force Base 85309	robert.dubsky@luke.af.mil
	Strow, Tim	MAG	(602) 452-5055	302 N. First Avenue Phoenix 85003	tstrow@mag.maricopa.gov
	Holm, Matt	Maricopa County P&D	(602) 506-7162	501 N. 44th Street Phoenix 85008	MatthewHolm@mail.maricopa.gov
	Coover, Chris	Maricopa County Parks & Recreation	(602) 506-8719	234 N. Central Avenue, Suite 6400 Phoenix 85004	ccoover@mail.maricopa.gov
	Urguiza, Oney	Maricopa Water District	(623) 546-8266	PO Box 900 Waddell, AZ 85355	oneyu@mwdaz.com
	Valenzuela, Veronica	Maricopa Water District	(623) 546-8266	PO Box 900 Waddell, AZ 85355	veronicav@mwdaz.com
	Lacey, Denise	MCDOT Engineering & Planning	(602) 506-6172	2901 W. Durango Street Phoenix 85009	deniselacey@mail.maricopa.gov
	Oliver, Tim	MCDOT Engineering & Planning	(602) 506-3994	2901 W. Durango Street Phoenix 85009	TimOliver@mail.maricopa.gov
MW	Wagner, Mitch	MCDOT Engineering & Planning	(602) 506-8054	2901 W. Durango Street Phoenix 85009	mitchwagner@mail.maricopa.gov
	Pinto, Joe	MCDOT Environmental	(602) 506-8068	2901 W. Durango Street Phoenix 85009	joepinto@mail.maricopa.gov
	Kogl, Michele	MCDOT Engineering & Planning	(602) 506-8799	2902 W. Durango Street Phoenix 85009	Michele Kogl - MCDOTX
	Crowe, Roberta	MCDOT Public Information Office	(602) 506-8003	2901 W. Durango Street Phoenix 85009	RobertaCrowe@mail.maricopa.gov
	Pasciak, Gary	MCDOT Engineering & Planning	(602) 506-8790	2902 W. Durango Street Phoenix 85009	Gary Pasciak - MCDOTX

Peoria Avenue: Jackrabbit Trail Parkway to Dysart Road, Corridor Improvement Study
TAC Sign-In Sheet

Date: Feb. 15, 2011

Initials	Name	Organization	Telephone	Postal Address	E-mail Address
	Scott, Gary	MCDOT Real Estate	(602) 506-4638	2801 W. Durango Street Phoenix 85009	GaryScott@mail.maricopa.gov
	Wilson, Mike	MCDOT Real Estate	(602) 506-4706	2801 W. Durango Street Phoenix 85009	mdw@mail.maricopa.gov
[illegible]	Sargent, Jim	MCDOT Traffic	(602) 506-8878	2901 W. Durango Street Phoenix 85009	jamessargent@mail.maricopa.gov
	Swart, Nicolaas	MCDOT Traffic	(602) 506-0599	2901 W. Durango Street Phoenix 85009	nicolaasswart@mail.maricopa.gov
	Butch, Wayne	MCDOT Utilities	(602) 506-8603	2901 W. Durango Street Phoenix 85009	WayneButch@mail.maricopa.gov
HD	Davidson, Hugh	MCDOT Cultural Resources	(602) 506-8082	2901 W. Durango Street Phoenix 85009	HughDavidson@mail.maricopa.gov
	Sabatini, Mike	MCDOT Engineering & Planning	(602) 506-8628	2901 W. Durango Street Phoenix 85009	MikeSabatini@mail.maricopa.gov
	Heinrich, Chad	MCDOT Intergovernmental Relations	(602) 506-1630	2901 W. Durango Street Phoenix 85009	ChadHeinrich@mail.maricopa.gov
	Morast, John	MCDOT Operations & Maintainance	(602) 506-5419	2901 W. Durango Street Phoenix 85009	johnmorast@mail.maricopa.gov
	Kattan, Al	MCDOT PMO & Construction	(602) 506-4618	2901 W. Durango Street Phoenix 85009	AlKattan@mail.maricopa.gov
RN	Nies, Ryan	MCDOT Utilities	(602) 506-8529	2901 W. Durango Street Phoenix 85009	ryannies@mail.maricopa.gov
	Askew-Rossi, Brooke	GPE Management Services	(480) 423-7910	7201 E. Camelback Road, Suite 250 Scottsdale, AZ 85251	Baskew-rossi@gpe1.com
	Maguire, David	Land Solutions Inc.	(602) 841-1945	2051 W. Northern Avenue, Suite 102 Phoenix 85021	dmaguire@landsolutionsinc.com
RCB	Bragg, Rodney	AECOM	(602) 337-2617	2777 E. Camelback Rd, Suite 200, Phoenix AZ 85016	rodney.bragg@aecom.com
JP	Pfeiffer, Jackie	AECOM	(602) 337-2584	2777 E. Camelback Rd, Suite 200, Phoenix AZ 85016	jaclyn.pfeiffer@aecom.com
JCG	Guana, Javier	Andes Engineering	(480) 272-6258	11811 N. Tatum Blvd, Suite 3031, Phoenix, AZ 85028	jguana@andes.us

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
JACKRABBIT TRAIL PARKWAY TO DYSART ROAD
MCDOT Contract No. 2010-005
Work Order No. TT005

Technical Advisory Committee Meeting Agenda

February 15, 2011, 9:00 AM

- Introductions
- Meeting Purpose
- Project Status Update
- Overview of Alternative Evaluation
- Recommended Alignment
- Recommended Design Features
- Implementation Plan
- Next Steps
- Open Discussion
- Adjourn

Peoria Avenue Corridor Improvement Study

Technical Advisory Committee Meeting #5
February 15, 2011

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

AECOM

Meeting Agenda

- Introductions
- Meeting Purpose
- Project Status Update
- Overview of Alternative Evaluation
- Recommended Alignment
- Recommended Design Features

MCDOT RightRoads PROGRAM

The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

AECOM

Meeting Agenda

- Implementation Plan
- Next Steps
- Open Discussion
- Adjourn

MCDOT RightRoads PROGRAM

The Right System The Right Time The Right Cost

Meeting Purpose

- Update on project status
- Discuss alternative evaluation
- Discuss design features
- Discuss implementation plan
- Gather information
- Share next steps

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study
AECOM

Study Purpose

- Establish the **facility type, number of lanes, right-of-way, and corridor alignment** required to safely accommodate forecast travel demands

- Provide a future **“footprint”** of the corridor, implementation timeframe & phasing of the identified roadway improvements

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

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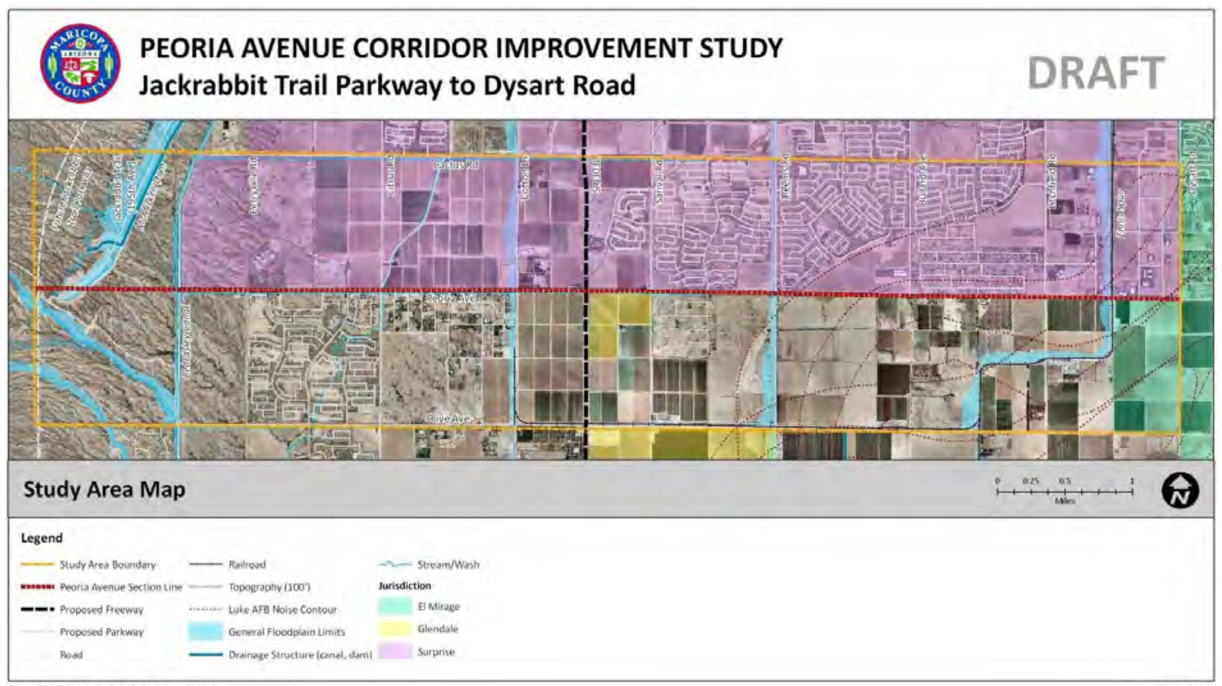
Study Area



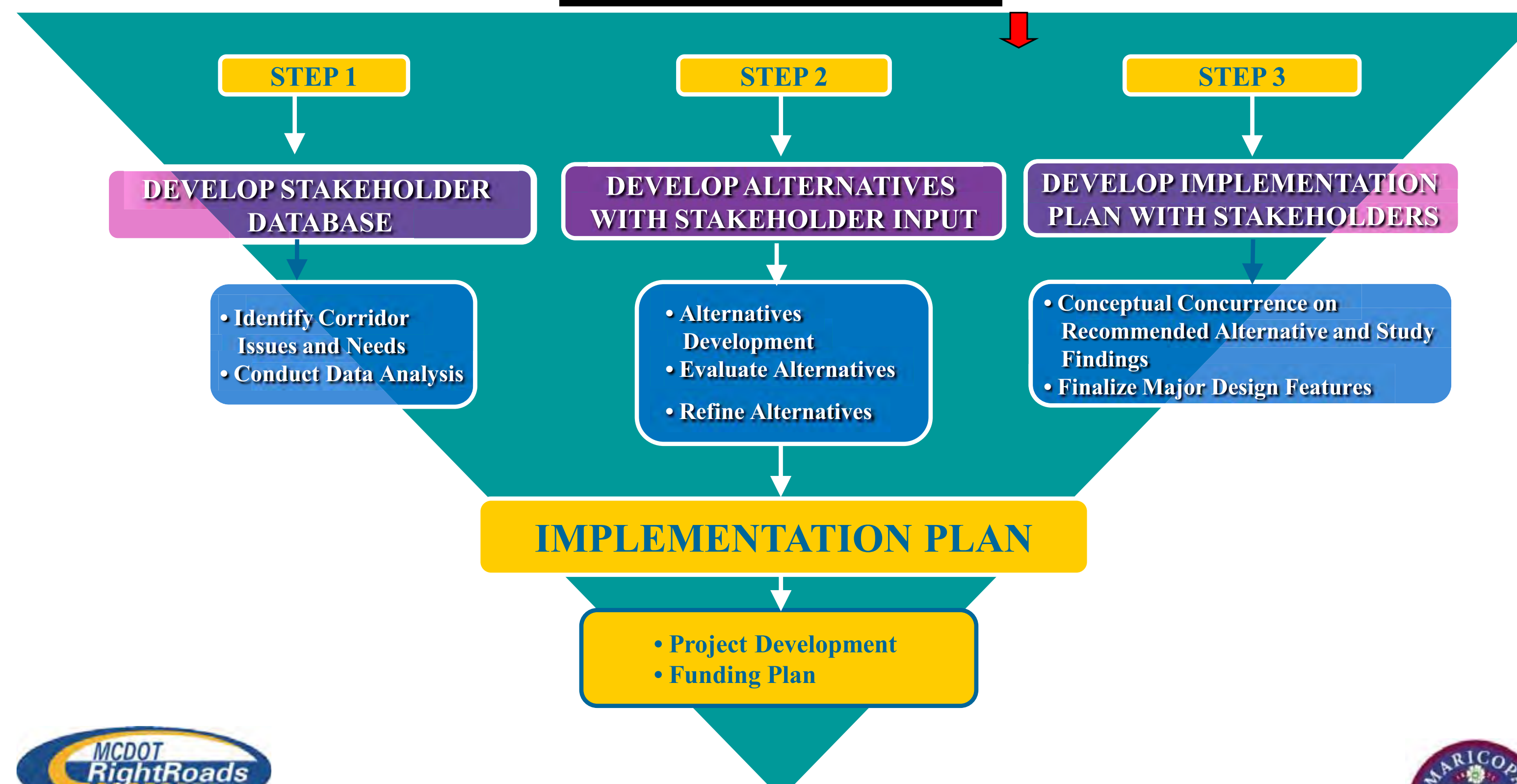
MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

AECOM

Study Process



MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

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Study Milestones

• Project Kick-off & Study Initiation	*July 2010*
• Data Collection Phase	*July - Sept 2010*
• TAC Meeting #1	*August 17, 2010*
• Public Meeting #1 (Scoping)	*Sept 20, 2010*
• TAC Meeting #2	*Oct 12, 2010*
• Alternatives Development & Evaluation Phase	*Oct 2010 – Jan 2011*

Continued…

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The Right System The Right Time The Right Cost

MARICOPA ARIZONA COUNTY

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

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Study Milestones Contd.

• TAC Meeting #3	*Nov 9, 2010*
• TAC Meeting #4	*Dec 14, 2010*
• Public Meeting #2 (Alternatives)	*Jan 18, 2011*
• TAC Meeting #5	Feb 15, 2011
• Public Meeting #3 (Pref. Alt.)	March 16, 2011
• Draft Final Report	April 2011
• Final Report Submission	June 2011

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

MARICOPA ARIZONA COUNTY

Technical Memorandums

1. Existing & Future Corridor Conditions - *completed*
2. Environmental Overview - *completed*
3. Drainage Overview - *completed*
4. Candidate Alternative Alignments & Evaluation – *draft distributed for review*
5. Preferred Alignment
6. Public & Stakeholder Participation
7. Traffic Analysis - *completed*

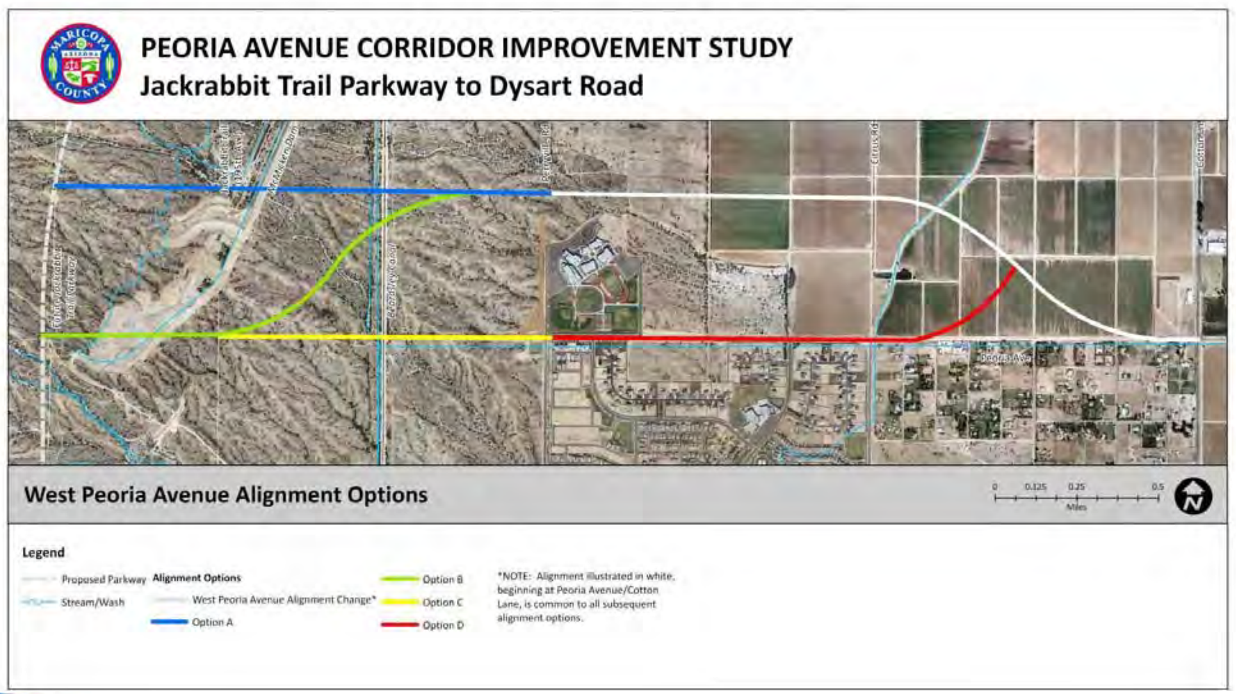
Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

Alternative Evaluation Process

- TAC Meeting #4 – Dec. 2010
- TAC comments due in Dec. 2010
- Public Meeting – Jan. 2011
- FCDMC Meeting – Jan. 2011
- City of Surprise Meeting – Jan. 2011
- TAC Meeting #5 – Feb. 2011
- Prasada/City of Surprise Meeting - TBD

The Right System The Right Time The Right Cost

Jackrabbit Trail to Cotton Lane



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Jackrabbit Trail to Cotton Lane

- All options would shift corridor to north, away from existing land uses
- Options A & B would have substantial impacts to the planned Zanjero Trails and Prasada developments
- Option A would cross McMicken Dam
- Option C (with offset intersections) would not provide route continuity
- Option D would likely experience operational issues due to heavy turn movements at intersection between realigned Peoria Ave and existing Peoria Ave

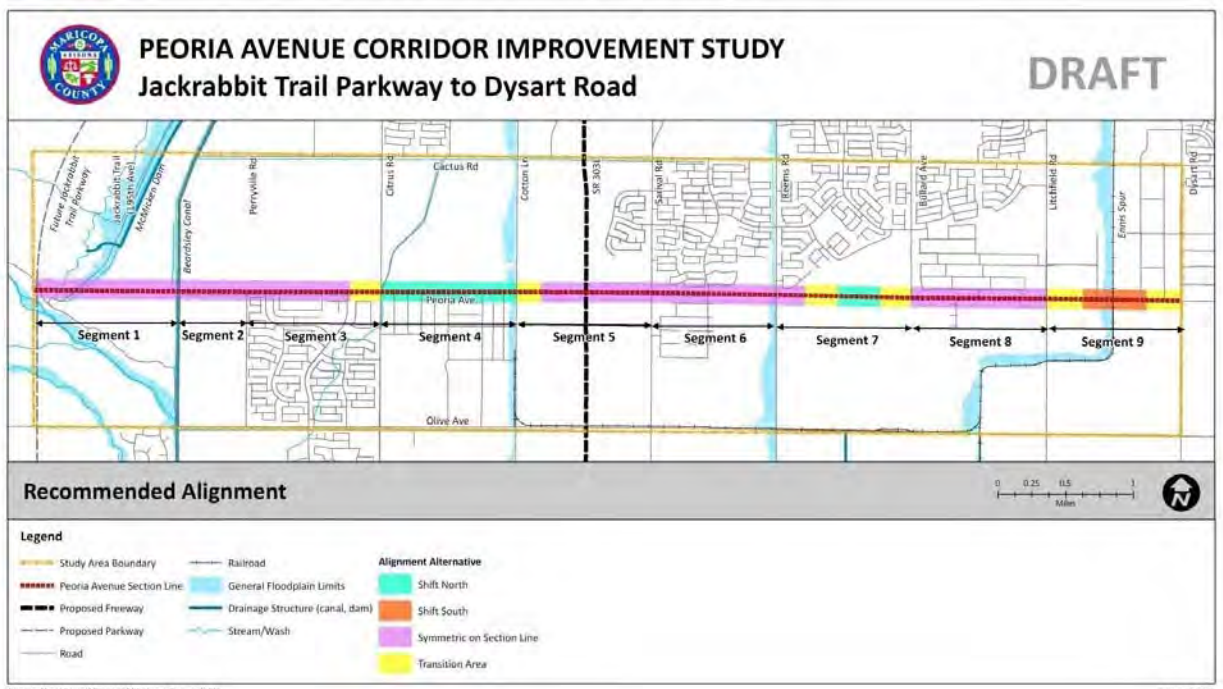
MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

AECOM

Recommended Alignment



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Peoria Avenue Corridor Improvement Study

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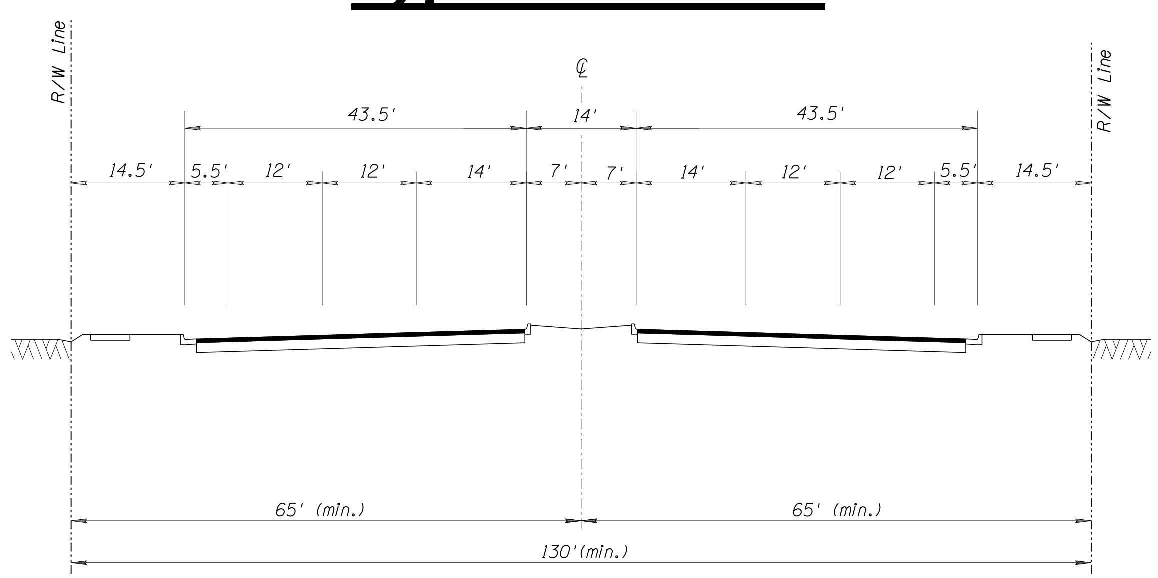
Recommended Alternative *Typical Section*

- City of Surprise, City of Glendale, MAG, and Maricopa County all identify 6-Lane Arterial
- Corridor planning based on 6 lanes in 140' R/W
- Boundary between agencies
- Existing R/W varies
- Existing Peoria Ave section east of Perryville Rd

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Recommended Alternative
Typical Section



Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study
AECOM

Recommended Alternative
Access Control – Driveway Spacing

- Boundary between agencies
- City of Surprise – most conservative
- City of Glendale – least conservative
- MCDOT - moderate
- Recommendation - MCDOT

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

AECOM

Recommended Alternative
Other Access Control Techniques

- No on-street parking
- Raised median
- Full median breaks at ¼ mile spacing
- Frontage road (south side) from Citrus Road to Cotton Lane

MCDOT RightRoads PROGRAM

The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

Peoria Avenue Corridor Improvement Study

AECOM

Recommended Alternative
Drainage

- Ultimate vision – channel along north side outfall to SR 303L, Reems, and Ennis channels
- No storm drain trunk line(s)
- Implemented as development occurs on north side
- Interim improvements at Litchfield Rd and Sarival Rd

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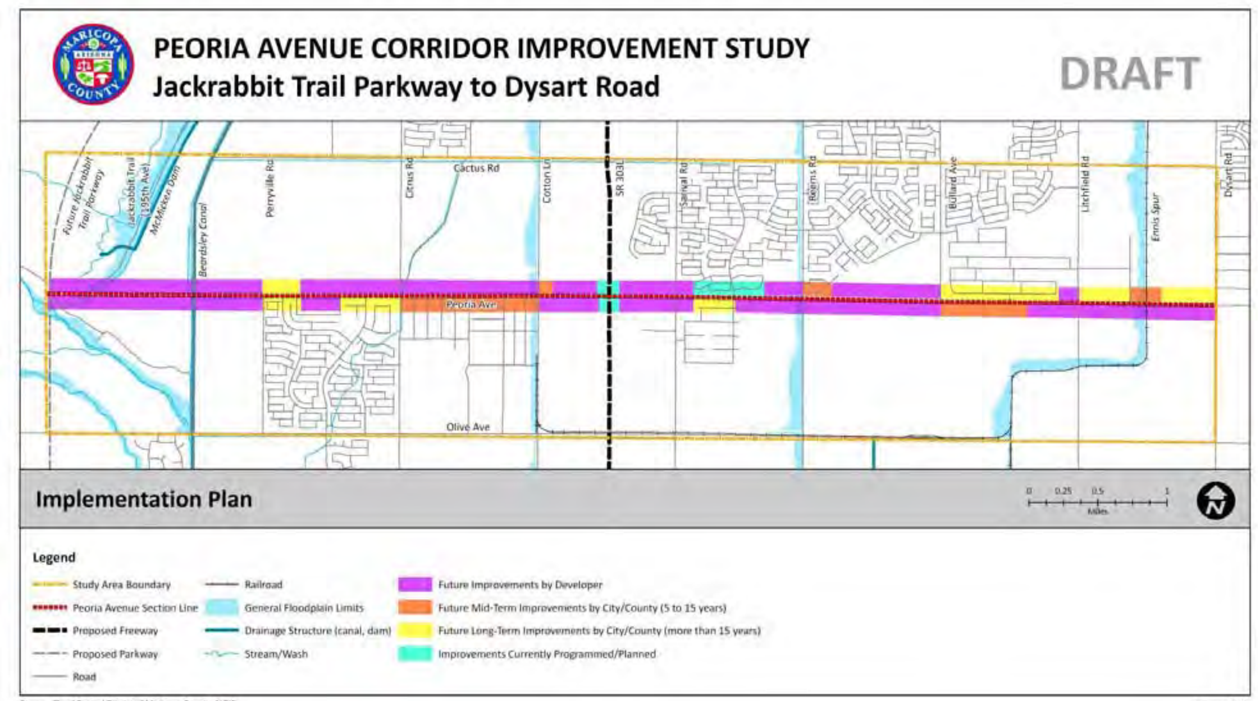
The Right System The Right Time The Right Cost

Implementation Plan

- Majority of improvements by developers, as development occurs
- Coordination with developers to preserve R/W corridor

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

Implementation Plan



The Right System The Right Time The Right Cost

Implementation Plan

0 – 5 years

- Complete planned/programmed improvements
- Acquire R/W and construct 2-lane roadway between Citrus Rd and Cotton Ln
- Drainage improvements at Litchfield Rd & Sarival Rd

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study
AECOM

Implementation Plan

5 – 15 years

- South half-street and frontage road between Citrus Road and Cotton Lane
- Cotton Lane intersection
- Reems Road intersection
- South half-street between Bullard Ave and Litchfield Rd
- North half-street near Ennis Spur

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The Right System The Right Time The Right Cost

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

AECOM

Implementation Plan

> 15 years

- Perryville Rd to Citrus Rd
- Sarival Rd to Reems Rd
- Bullard Rd to Litchfield Rd
- Litchfield Rd to Dysart Rd

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study

AECOM

Next Steps

- TAC comments on Draft TM #4 due on February 25th
- Distribute Draft TM #5 in March
- Conduct public open house #3 in March
- Distribute Draft Report in April

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost

Open Discussion

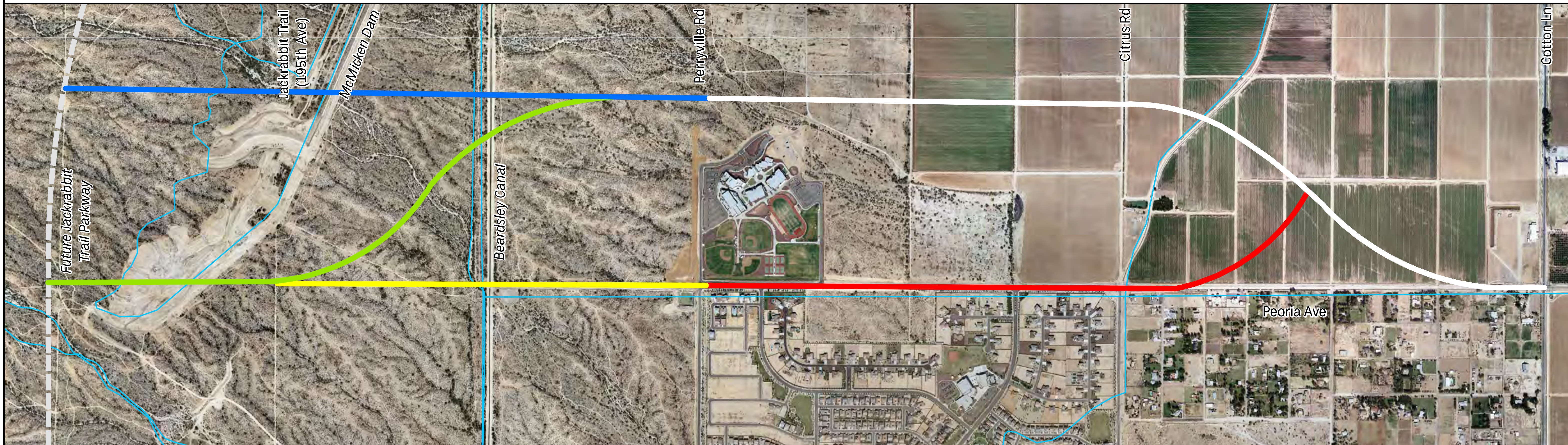
- Alternatives & evaluation process
- Recommended alignment
- Recommended typical section & access control
- Implementation plan
- Other stakeholder concerns

Maricopa County Department of Transportation
Peoria Avenue Corridor Improvement Study
AECOM

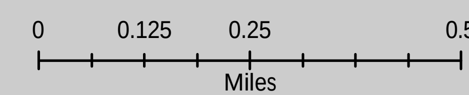
Next TAC Meeting

MCDOT RightRoads PROGRAM
The Right System The Right Time The Right Cost
MARICOPA ARIZONA COUNTY

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road



West Peoria Avenue Alignment Options



Legend

- Proposed Parkway
- Stream/Wash

Alignment Options

- West Peoria Avenue Alignment Change*
- Option A
- Option B
- Option C
- Option D

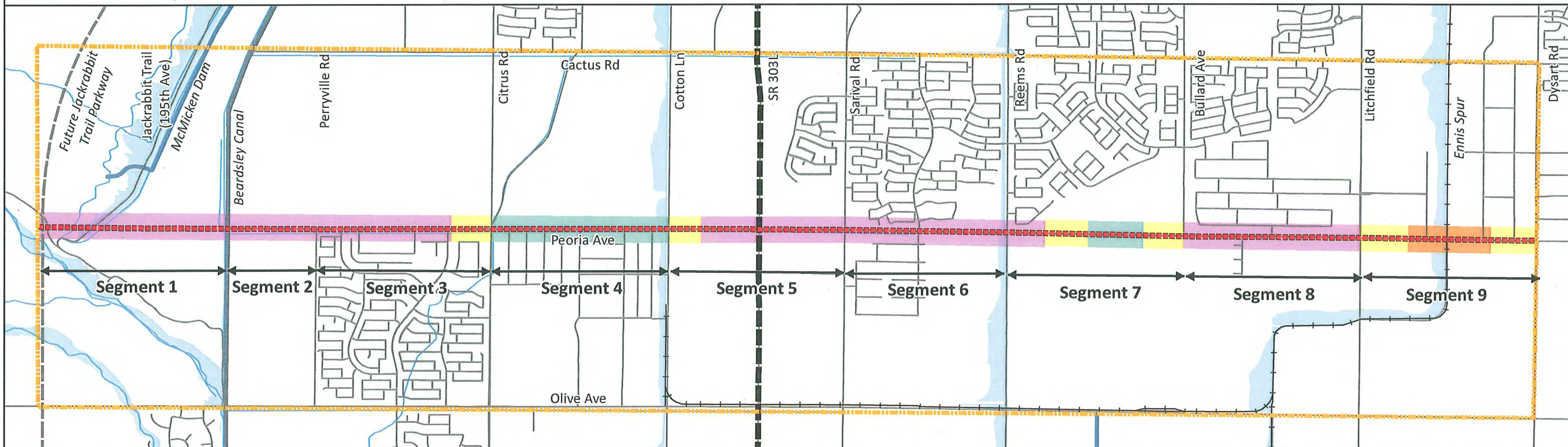
*NOTE: Alignment illustrated in white, beginning at Peoria Avenue/Cotton Lane, is common to all subsequent alignment options.

Source: Flood Control District of Maricopa County, ALRIS

Feburary 2011

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road

DRAFT



Recommended Alignment

0 0.25 0.5 1
Miles

N

Legend

- Study Area Boundary
- Peoria Avenue Section Line
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Alignment Alternative

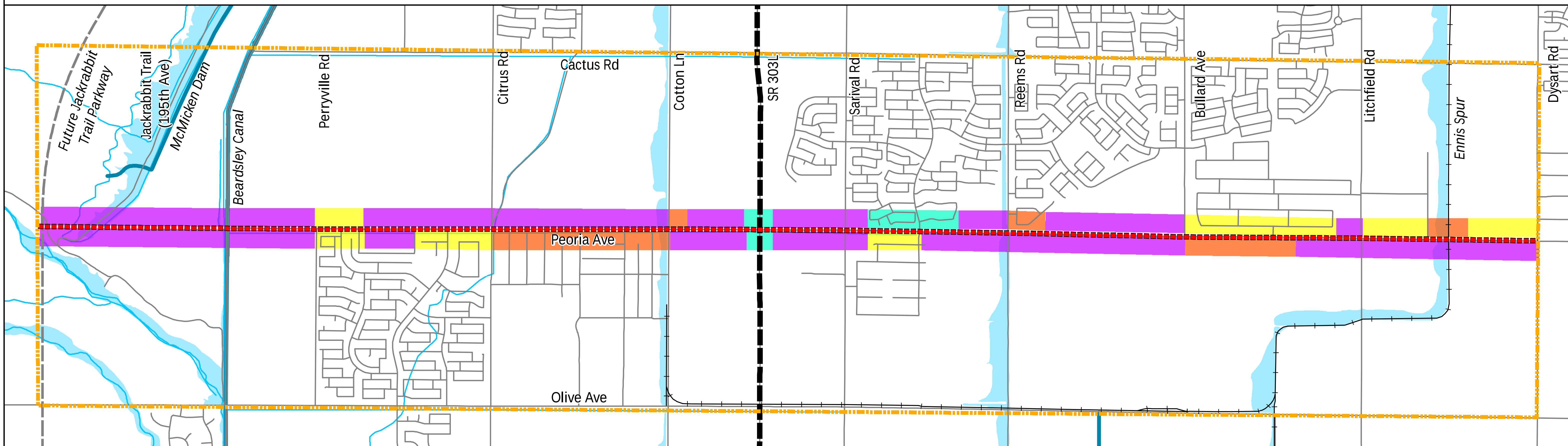
- Shift North
- Shift South
- Symmetric on Section Line
- Transition Area

Source: Flood Control District of Maricopa County, ALRIS

February 2011

PEORIA AVENUE CORRIDOR IMPROVEMENT STUDY
Jackrabbit Trail Parkway to Dysart Road

DRAFT



Implementation Plan

0 0.25 0.5 1
Miles

Legend

- Study Area Boundary
- Peoria Avenue Section Line
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash
- Future Improvements by Developer
- Future Mid-Term Improvements by City/County (5 to 15 years)
- Future Long-Term Improvements by City/County (more than 15 years)
- Improvements Currently Programmed/Planned

Source: Flood Control District of Maricopa County, ALRIS

February 2011

Appendix B:
Public Meeting Materials

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

We Need Your Input
Peoria Avenue
Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Public "Scoping" Meeting

The Maricopa County Department of Transportation's (MCDOT) ***RightRoads* Program**, is conducting the first in a series of three public open house meetings to gather community input about potential improvements along an eight-mile section of Peoria Avenue from Jackrabbit Trail Parkway to Dysart Road. The goal of this study is to identify and establish the future roadway type, alignment, number of lanes and right-of-way requirements along the Peoria Avenue corridor to safely accommodate future traffic demand.

Stop by anytime between 5:00 and 7:00 p.m. to speak with MCDOT project team members. For more information, contact Mitch Wagner at (602) 506-8054 write to Wagner at: MCDOT, 2901 W. Durango Street, Phoenix, AZ 85009, or e-mail at: mitchwagner@mail.maricopa.gov or contact Roberta Crowe, Public Information Officer at (602) 506-8003.

Public Open House

Monday, September 20, 2010
5:00 p.m. to 7:00 p.m.

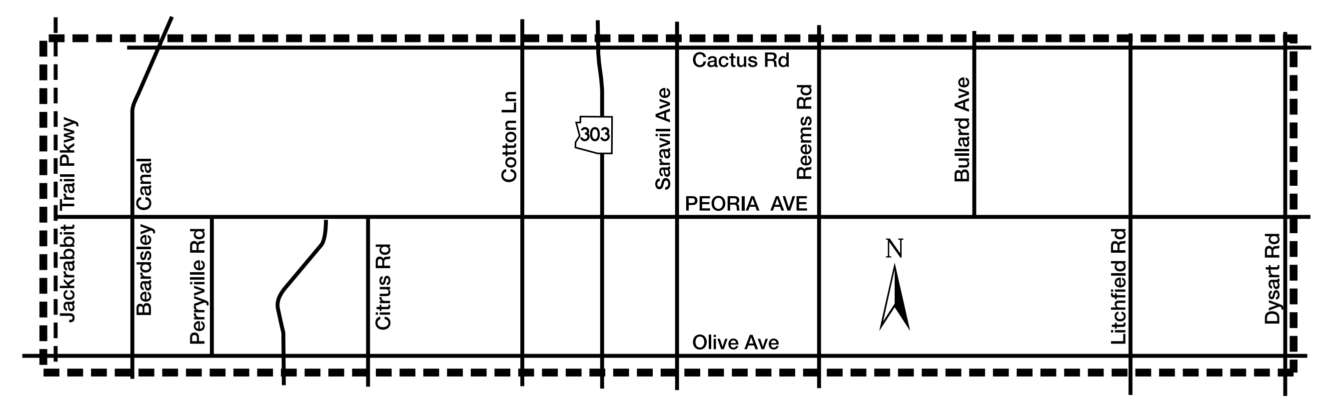
Shadow Ridge High School

10909 N. Perryville Road
Surprise, AZ 85388
(at Peoria Avenue and Perryville Road)

Reasonable accommodations may be made available for people with disabilities with a minimum 72-hour notice. For more information on such accommodations, contact Roberta Crowe at (602) 506-8003.

Si desea recibir esta información en Español, favor llame (480) 350-9288.

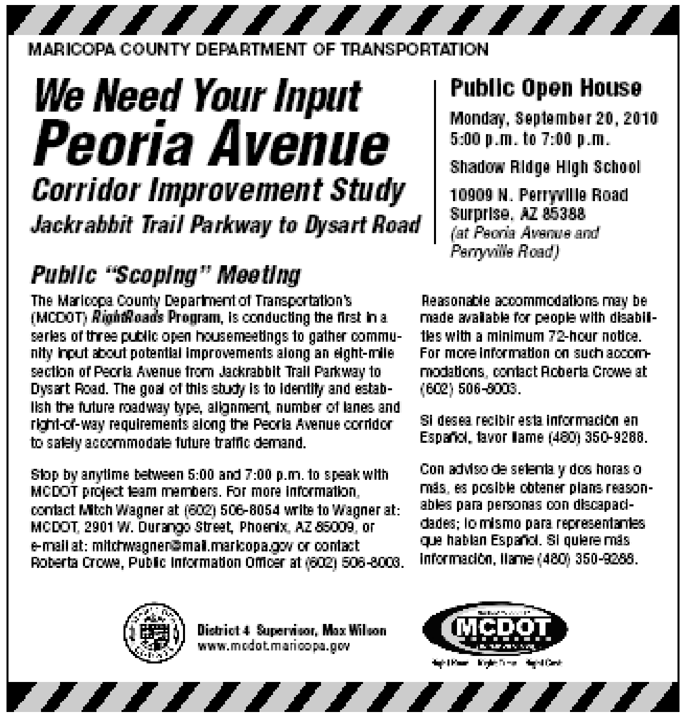
Con adviso de setenta y dos horas o más, es posible obtener plans reasonables para personas con discapacidades; lo mismo para representantes que hablan Español. Si quiere más información, llame (480) 350-9288.



District 4 Supervisor, Max Wilson
www.mcdot.maricopa.gov

MARICOPA COUNTY MCDOT TRANSPORTATION
Right Road Right Time Right Cost

Scoping Phase Public Input Meeting
Newspaper Advertisement


MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

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District 4 Supervisor, Max Wilson
www.mcdot.maricopa.gov

MCDOT

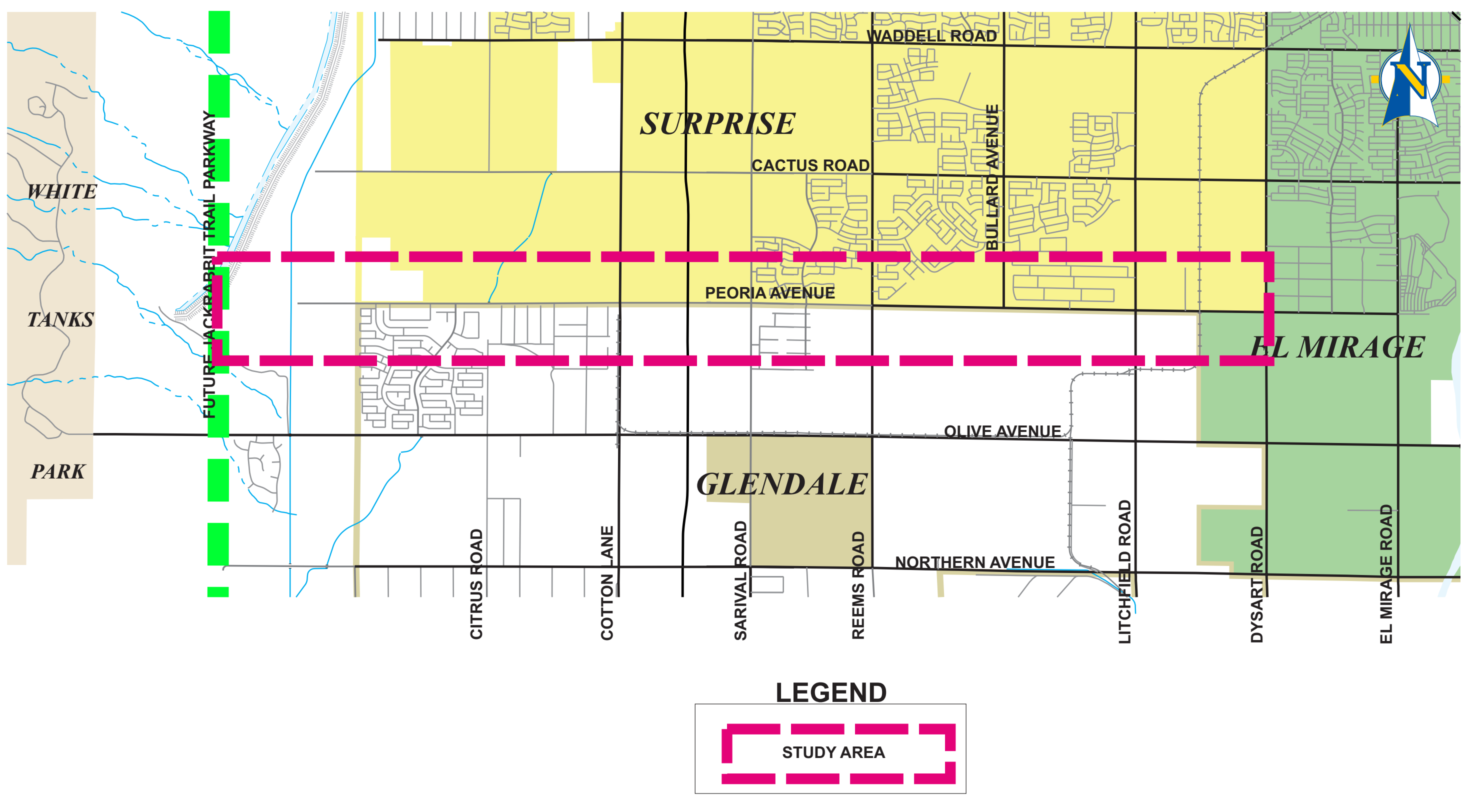
- Arizona Republic
- Buckeye Valley News
- Surprise Independent
- West Valley View

Public Involvement

Gaining consensus among the agencies and the public is critical to the success of the study and implementation of its recommendations to provide a safe and efficient roadway for the long term. A total of three public input meetings are planned during the course of the study process. The first public meeting will be held to inform the public of the objectives of the study and provide area residents and other stakeholders with an opportunity to inform project team members about the study area issues and local transportation needs. This meeting will also provide the public an opportunity to provide feedback on the study purpose, goals, and objectives.

The second (#2) public input meeting will be held to provide the results of the issues and constraints identification process, review candidate alignment evaluation criteria, present the conceptual alternative alignments, and gather input that will assist in the further development and evaluation of the candidate alternatives and the selection of the preferred alignment.

The third public input meeting will present the results of the candidate alternative evaluation process, present the preferred alignment, and gather input for use in the development of the final report. Your input during each phase of the study process is very important and a vital component of study development.



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PEORIA AVENUE

Jack Rabbit Trail Parkway to Dysart Road

MARICOPA COUNTY MCDOT TRANSPORTATION

Right Road Right Time Right Cost

"Scoping Phase"

Maricopa County Department of Transportation **September 20, 2010**

Background

The Peoria Avenue Corridor Improvement Study (Jackrabbit Trail Parkway to Dysart Road) is one of a series of long-range transportation planning studies being conducted by the Maricopa County Department of Transportation (MCDOT). The City of Surprise, City of Glendale, City of El Mirage, and Maricopa County transportation plans all include Peoria Avenue as a future arterial roadway from Jackrabbit Trail Parkway to Dysart Road. The Maricopa Association of Governments (MAG) recently prepared the Interstate 10/Hassayampa Valley Transportation Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the build out of the area west of SR Loop 303. This long range regional transportation study identified the need for future roadway network consisting of freeways, parkways, and major arterial roads.

The MAG Hassayampa Framework Study recommended an extension of Peoria Avenue westward from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial roadway from the future Jackrabbit Trail Parkway to Sarival Avenue.

This study will identify the preferred alignment and "footprint" for the future Peoria Avenue between Jackrabbit Trail Parkway and Dysart Road and will facilitate future roadway implementation by developers and local jurisdictions, providing a cohesive transportation corridor, compatible with the City of Surprise, City of Glendale, City of El Mirage, Maricopa County, and MAG transportation plans.

Corridor Description

The Peoria Avenue Corridor study area includes the segment of Peoria Avenue between the future Jackrabbit Trail Parkway alignment and Dysart Road. The study area generally encompasses a two-mile wide corridor centered on the existing Peoria Avenue alignment.

Today's Peoria Avenue generally consists of a two-lane roadway (one travel lane in each direction). Half-street improvements have been constructed along the north side of Peoria Avenue adjacent to developments such as Shadow Ridge High School, Greer Ranch subdivision, Copper Canyon Ranch subdivision and Skyway Business Park. Improvements on the south side of Peoria Avenue have been constructed adjacent to the Cortessa subdivision. The only full-width roadway section of Peoria Avenue is located immediately east of Perryville Road between Cortessa and Shadow Ridge High School.

The BNSF Railway operates a north-south railroad spur (Ennis Spur) that crosses Peoria Avenue between Litchfield and Dysart Roads. SR Loop 303 crosses the Peoria Avenue Corridor between Cotton Lane and Sarival Road.

The majority of the land in the study area is privately owned, with the exception of the westernmost limit (west of Beardsley Canal) which is owned by the Arizona State Land Department (ASLD). The majority of the existing land use is categorized as vacant (undeveloped) or agricultural. Several residential subdivisions are built or under development, which include three elementary schools, one middle school, and one high school. In several locations, existing homes not associated with large master-planned communities, are located adjacent to Peoria Avenue. Small clusters of industrial and commercial development are scattered throughout the eastern end of the study area.

Based on the City of Surprise, City of Glendale, and City of El Mirage future land use planning, a majority of the vacant and agricultural land within the study area is envisioned to be converted to single-family residential housing and mixed-use developments in the future. It is anticipated that commercial and industrial development will expand, but remain scattered throughout the study area.

Study Need

Today's land development and existing travel demands in the Peoria Avenue Corridor do not warrant a major new east/west high capacity roadway in the near-term; however, plans are underway to convert much of the rural and low density residential lands within the corridor to more intense land uses that will generate significantly more traffic. The "build-out" forecast for future land development and resulting travel demand warrant a

For more information, contact Mitch Wagner at (602) 506-8054 or write to him at:
MCDOT, 2901 W. Durango Street, Phoenix, AZ 85009, or e-mail at: MitchWagner@mail.maricopa.gov.

MCDOT

major east/west high capacity roadway in the long term.

To help make future roadway construction economically feasible, the planning process needs to begin now to identify and protect long-term public right-of-way needs for the future roadway under ultimate "build-out" conditions.

Study Goals & Objectives

This corridor study is the first step in the planning process and its primary goal is to aid the affected agencies and jurisdictions in defining and protecting sufficient right-of-way for a continuous future Peoria Avenue Corridor that will safely accommodate projected travel demand. In general, the purpose of this Corridor Improvement Study is to provide MCDOT and our partner jurisdictions with a future "footprint" of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

To accomplish this, the main focus of this study is to investigate, map, and analyze corridor constraints and opportunities to arrive at a recommended corridor alignment. This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also determine design standards based upon future roadway jurisdiction (anticipated roadway annexation) and an implementation or construction phasing plan.

The key objectives of this Corridor Improvement Study are to:

- Define and assess the strategic issues within the project study area
- Develop and evaluate conceptual alternative alignments within the corridor study area
- Recommend a preferred alignment
- Define the characteristics of the preferred alignment
- Develop consensus for the preferred alignment
- Develop an implementation (recommended construction phasing) plan

Study Approach

The Peoria Avenue Corridor Improvement Study is carried out in two phases, a planning phase and an engineering phase.

Planning Phase

During the Planning Phase, general background information regarding the corridor is gathered and documented in reports that will lead to well-founded recommendations for improvements and longer-term needs along Peoria Avenue. During the Planning Phase, meetings are conducted with affected jurisdictions, agencies, stakeholders, and the impacted public to form a broad consensus of the overall needs and vision of the corridor.

Based on identified needs, conceptual alternatives are developed and candidate alternatives are then evaluated for technical and environmental feasibility, public acceptability, and economic viability.

Engineering Phase

The Engineering Phase of the study begins following the selection of a preferred alternative. Preliminary engineering design plans, right-of-way requirements, and estimated construction costs will be prepared for long-term roadway design features. Priorities for roadway construction phasing along with policies and guidelines to preserve the intended regional function of the road are developed.

Preliminary plans and cost estimates will be presented during the final "Study Findings and Recommendations" (March 2011) public meeting to present the preferred (recommended) design alternative for Peoria Avenue.

Evaluation Criteria

Potential evaluation criteria used to compare the alternatives could include:

- Compatibility with Existing/Planned Development
- Transportation System Continuity
- Drainage Impacts
- Irrigation Impacts
- Building/Property Impacts
- Cultural/Archaeological Impacts
- Wildlife Impacts
- Utility Impacts
- Public Acceptability
- Cost

Study Stakeholders

Arizona Department of Transportation (ADOT)
Arizona Game and Fish Department
Arizona State Land Department
BNSF Railway
Flood Control District of Maricopa County (FCDMC)
Maricopa Association of Governments (MAG)
Maricopa County Department of Transportation (MCDOT)
Maricopa County Environmental Services
Maricopa County Parks Department
Maricopa County Planning and Development
Maricopa Water District
City of Surprise
City of Glendale
City of El Mirage
Dysart Unified School District
Major Utility Providers
Land Developments
Impacted residents, businesses and property owners

Preliminary Key Issues and Challenges

Early in the study process, a preliminary list of study issues and potential challenges is compiled. This list expands as the study progresses and input is obtained from public participation.

- Establish future connections of Peoria Avenue to planned roadways such as Jackrabbit Trail Parkway
- Account for future planned connection to SR Loop 303
- Evaluation of drainage structures across major washes, canals and channels
- Evaluation of crossing of the BNSF Railroad
- Maintain functional integrity of roadway through constrained areas
- Maximize use of existing roadway improvements along corridor to reduce costs
- Identify ultimate alignment and access management strategies
- Consideration of environmental

Study Schedule

Project Kick-off & Study Initiation	July 2010
PHASE I: Data Collection/Issues Identification	July - September 2010
Public Input Meeting #1 (Scoping Phase)	September 20, 2010
PHASE II: Alternative Development and Evaluation	October 2010 - January 2011
Public Input Meeting #2 (Alternatives Analysis Phase)	January 2011
Public Input Meeting #3 (Study Findings & Recommendations Phase)	March 2011
Study Completion/Final Report Submitted	June 2011

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MARICOPA COUNTY
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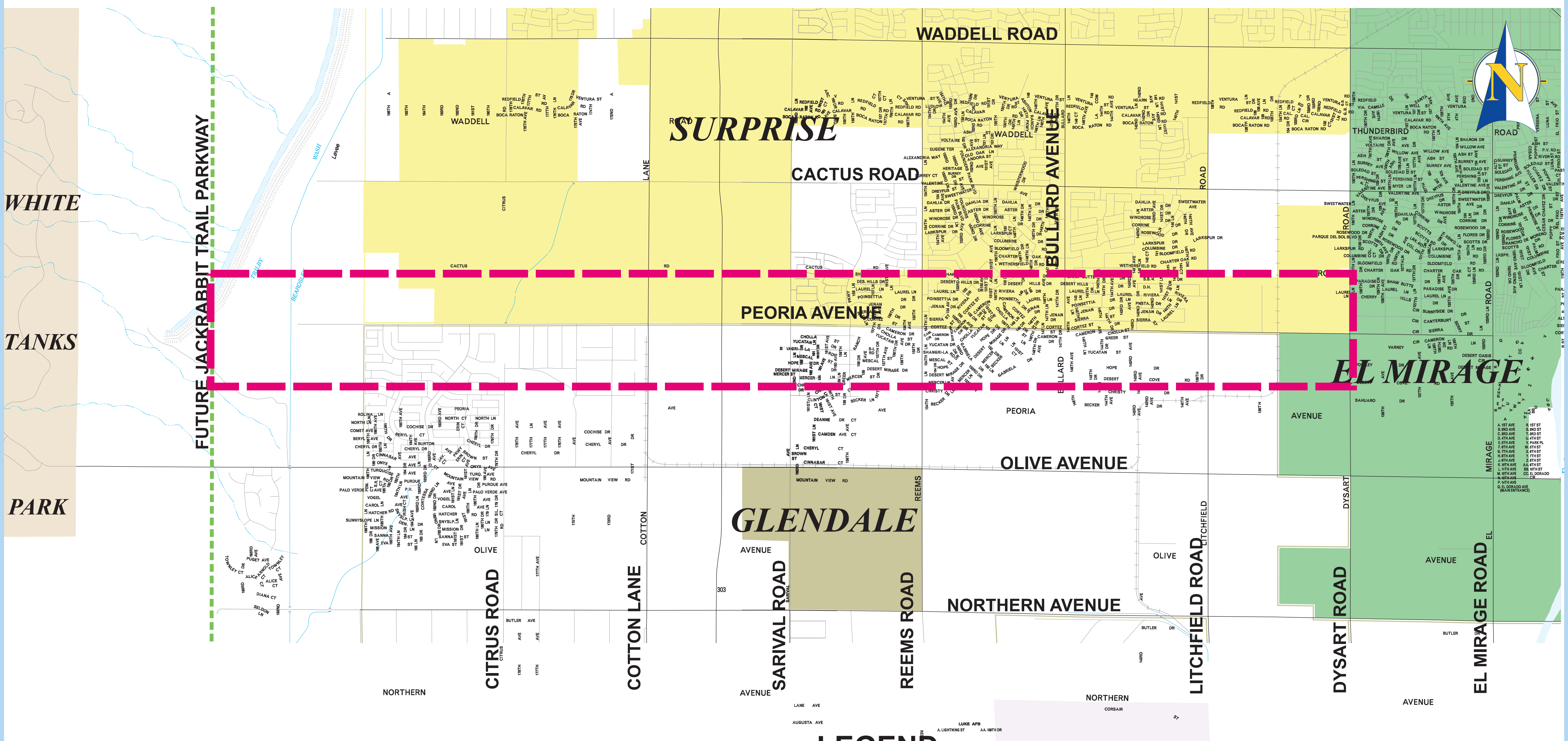
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road

Corridor Improvement Study



LEGEND

STUDY AREA

9-20-2010

Maricopa County
Department of Transportation

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

KEY STUDY OBJECTIVES

- Define and assess the strategic issues within the project study area
- Develop and evaluate conceptual alternative alignments within the corridor study area
- Recommend a preferred alignment
- Define the characteristics of the preferred alignment
- Develop consensus for the preferred alignment
- Develop an implementation (recommended construction phasing) plan

STUDY NEED

- Address regional and local growth and development within study area
- (3.5 million population projected at build-out between Wickenburg and Gila Bend -- MAG I-8/I-10 Hidden Valley and I-10/Hassayampa Valley Transportation Framework studies)
- Preserve sufficient public right-of-way for a high capacity east/west transportation corridor
- Ensure future roadway compatibility with existing/future land uses and environmental conditions
- Identify potential connectivity issues with other future planned roadways and freeways

9-20-2010

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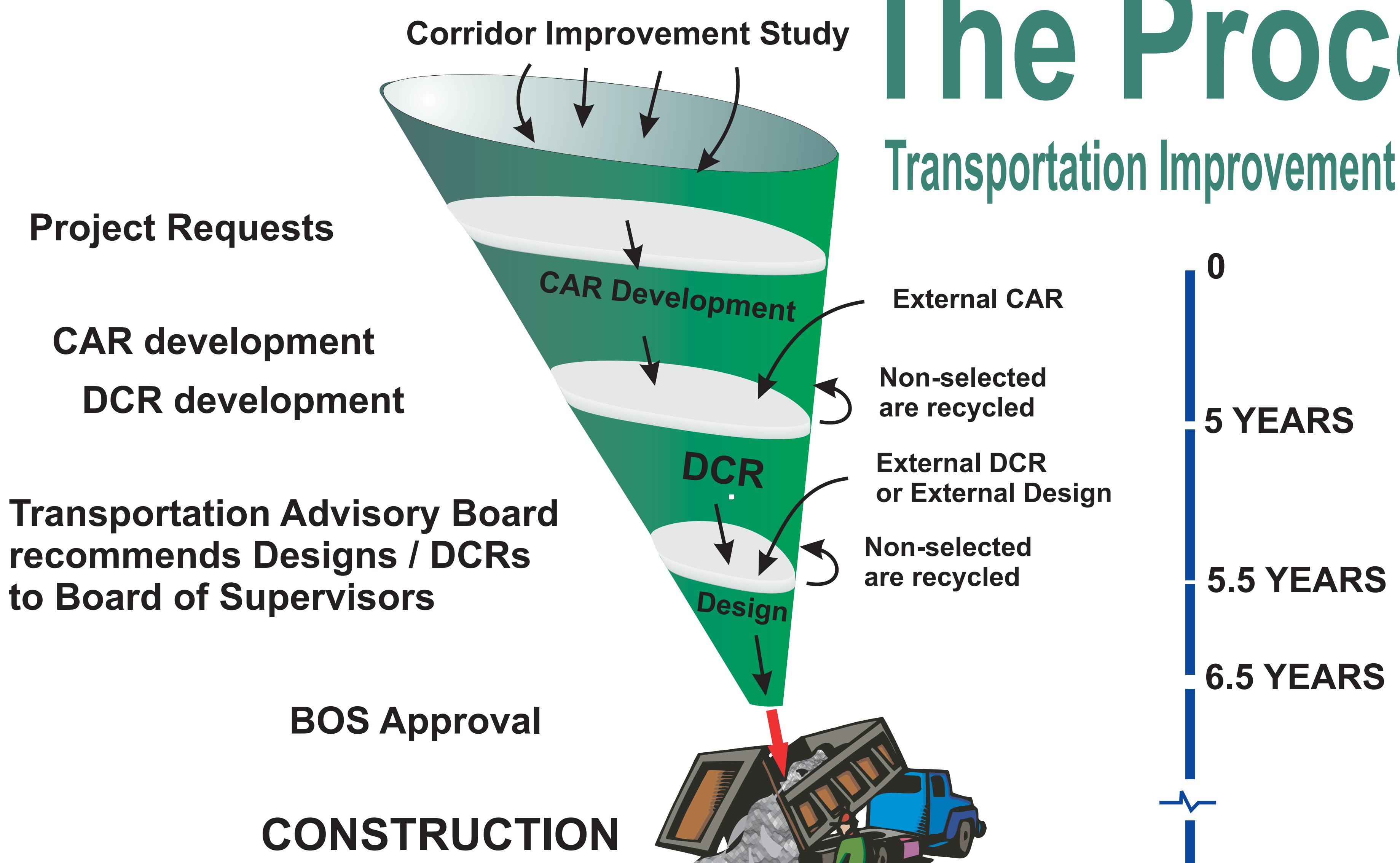
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road

Corridor Improvement Study

The Process

Transportation Improvement Program



CAR = Candidate Assessment Report
DCR = Design Concept Report
BOS = Board of Supervisors

9-20-2010

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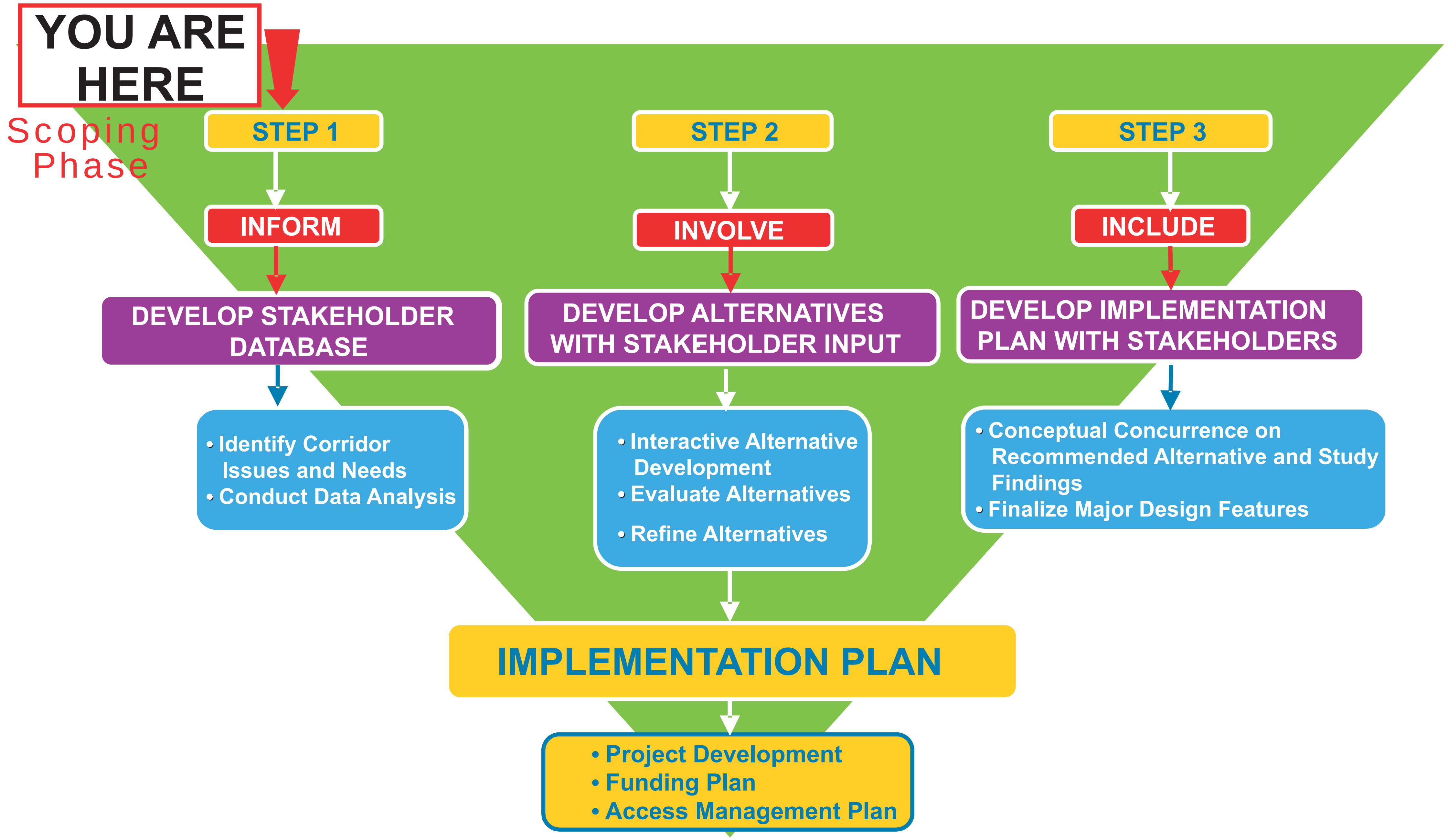
PEORIA AVENUE
Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

Interactive Study Process



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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

Study Schedule

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Public Input Meeting #3 (Study Findings & Recommendations Phase)	March 2011
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9-20-2010

Maricopa County
Department of Transportation

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

STUDY STAKEHOLDERS

- Arizona Department of Transportation (ADOT)
- Arizona Game and Fish Department
- Arizona State Land Department
- Burlington Northern Santa Fe Railway (BNSF)
- Flood Control District of Maricopa County (FCDMC)
- Maricopa Association of Governments (MAG)
- Maricopa County Department of Transportation (MCDOT)
- Maricopa County Environmental Services
- Maricopa County Parks Department
- Maricopa County Planning and Development
- Maricopa Water District
- City of Surprise
- City of Glendale
- City of El Mirage
- Dysart School District
- Major Utility Providers
- Land Developments
- Affected Businesses, Property Owners and Residents

9-20-2010

MARICOPA COUNTY MCDOT TRANSPORTATION
Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

EVALUATION CRITERIA

Potential evaluation criteria used to compare the alternatives could include:

- **Compatibility with Existing/Planned Development**
- **Transportation System Continuity**
- **Drainage Impacts**
- **Irrigation Impacts**
- **Building/Property Impacts**
- **Cultural/Archaeological Impacts**
- **Wildlife Impacts**
- **Utility Impacts**
- **Public Acceptability**
- **Cost**

PRELIMINARY KEY ISSUES AND CHALLENGES

Early in the study process, a preliminary list of study issues and potential challenges is compiled. This list expands as the study progresses and input is obtained from public participation.

- **Establish future connections of Peoria Avenue to planned roadways such as Jackrabbit Trail Parkway**
- **Account for future planned connection to SR Loop 303**
- **Evaluation of drainage structures across major washes, canals and channels**
- **Evaluation of crossing of the BNSF Railroad**
- **Maintain functional integrity of roadway through constrained areas**
- **Maximize use of existing roadway improvements along corridor to reduce costs**
- **Identify ultimate alignment and access management strategies**
- **Consideration of environmental constraints**

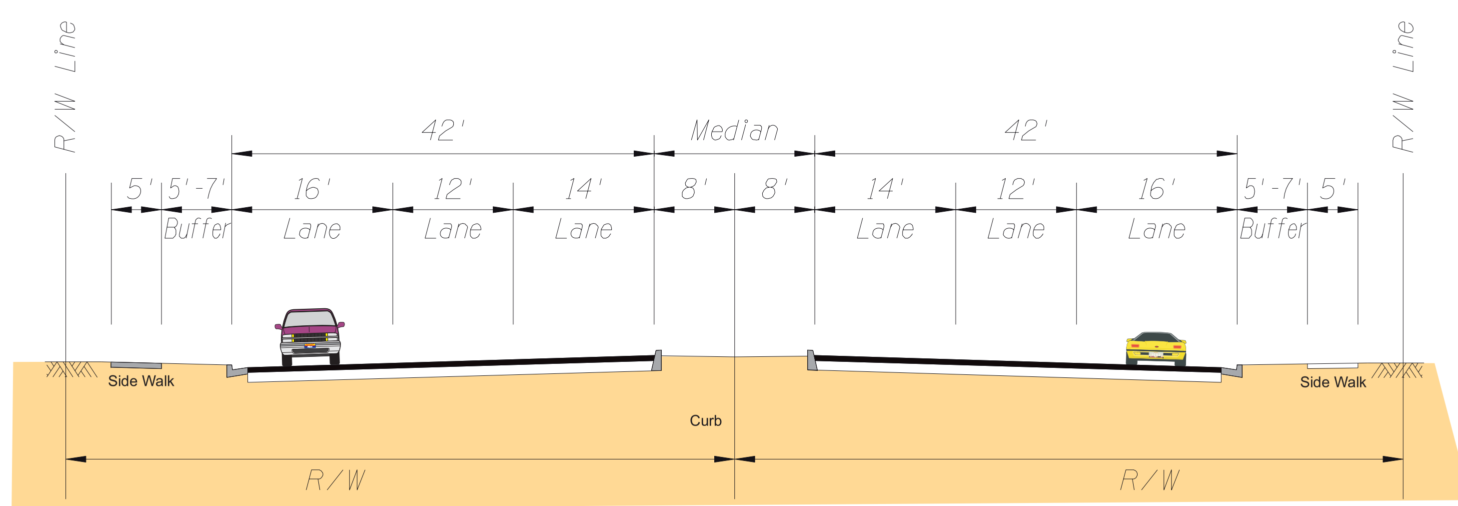
9-20-2010

PEORIA AVENUE

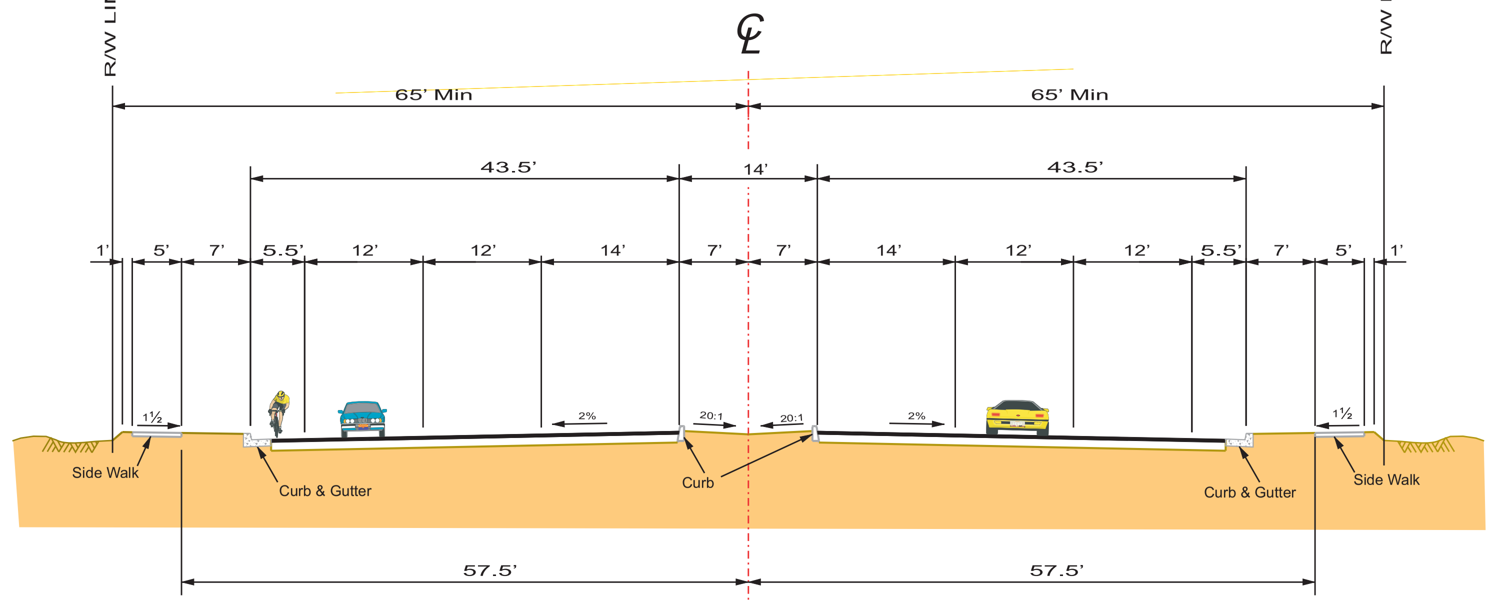
Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

Right Road Right Time Right Cost

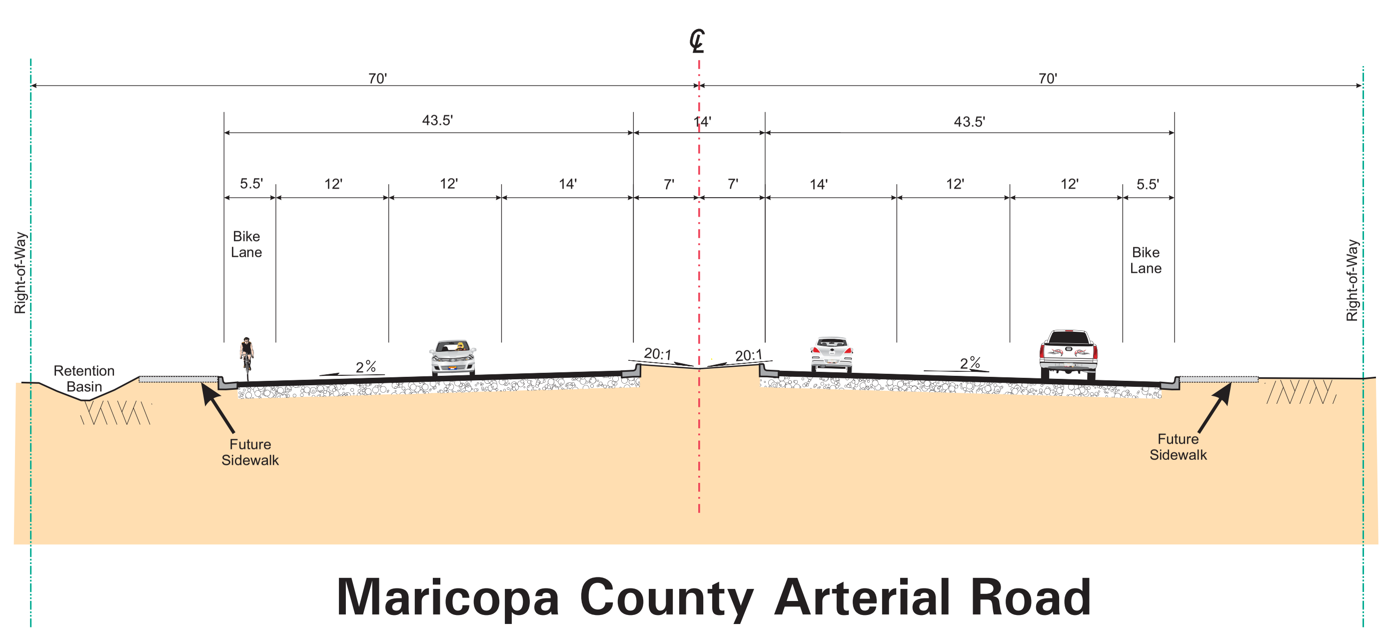
ROADWAY CROSS SECTIONS



City of El Mirage Arterial Road



City of Surprise Arterial Road



Maricopa County Arterial Road

Maricopa County Department of Transportation

AECOM

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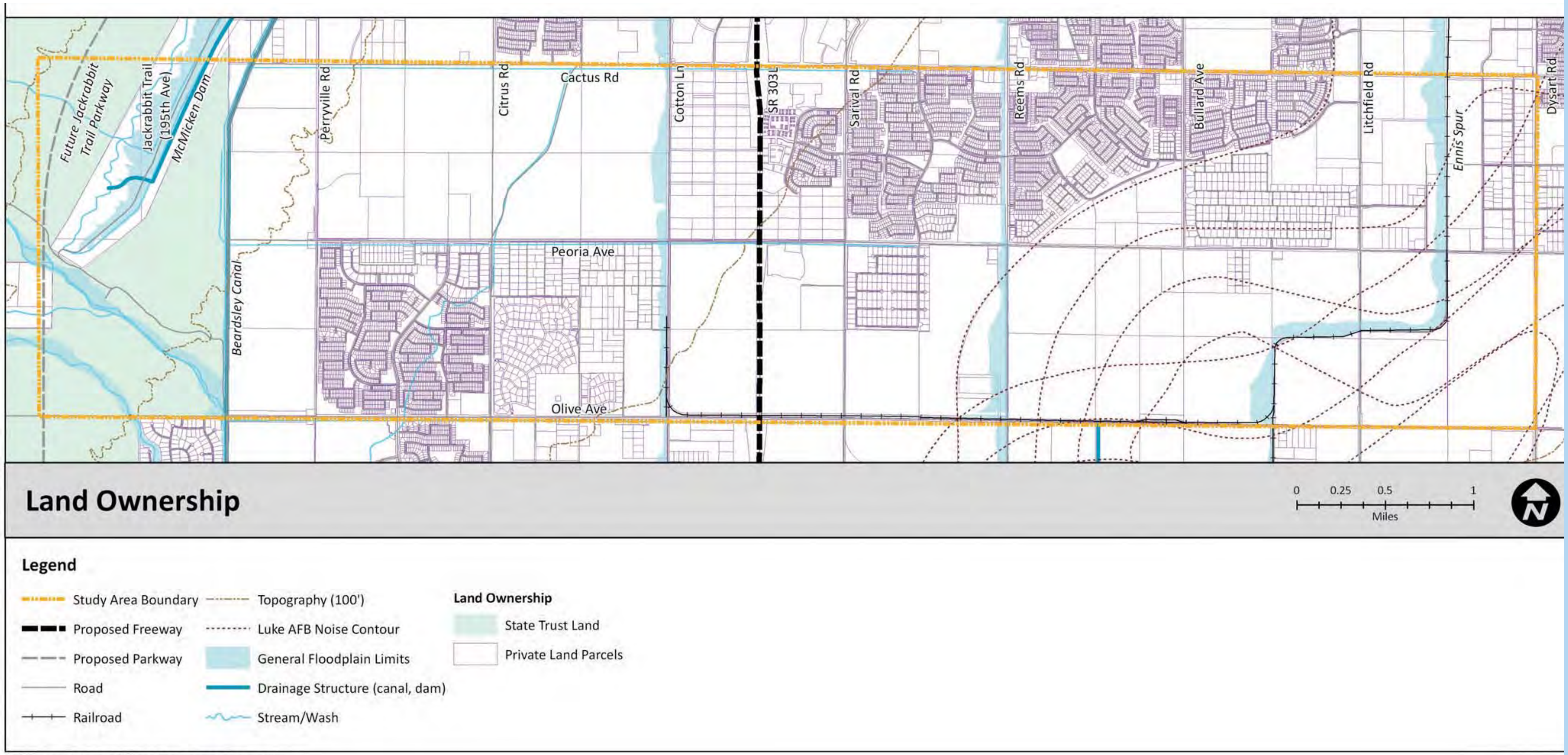
Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

LAND OWNERSHIP



Source: Flood Control District of Maricopa County, ALRIS

9-20-2010

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Department of Transportation

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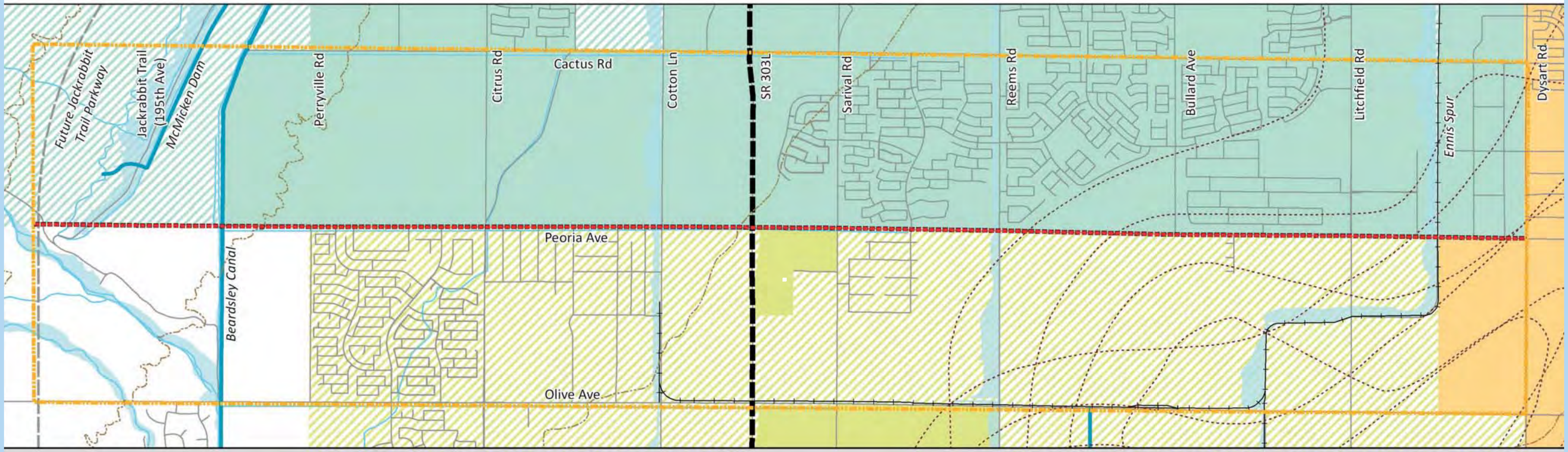
TRANSPORTATION

Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

MUNICIPAL PLANNING AREAS AND INCORPORATED AREAS



Municipal Planning Areas and Incorporated Areas

0 0.25 0.5 1
Miles

Legend

- Study Area Boundary
- Peoria Avenue Section Line
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Muncipal Planning Area
- El Mirage
- Glendale
- Surprise

Incorporated Areas
- El Mirage
- Glendale
- Surprise

Source: Flood Control District of Maricopa County, ALRIS

9-20-2010

Maricopa County
Department of Transportation

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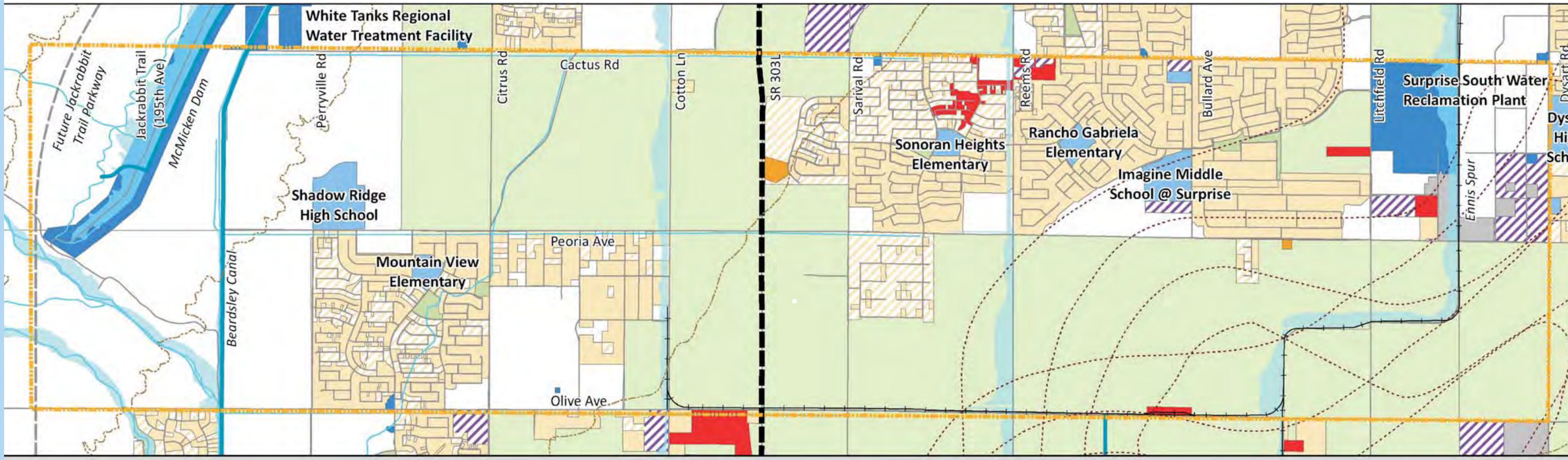
MCDOT

MARICOPA COUNTY
MCDOT
TRANSPORTATION
Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

EXISTING LAND USE



Existing Land Use

0 0.25 0.5 1
Miles

N

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Existing Land Use

- Single-Family Residential
- Multi-Family Residential
- Developing Residential
- Commercial
- Employment
- Developing Employment
- Public Facility
- Institutional
- Industrial
- Open Space
- Agriculture
- Vacant

ource: Flood Control District of Maricopa County, ALRIS, MAG

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Jackrabbit Trail Parkway to Dysart Road
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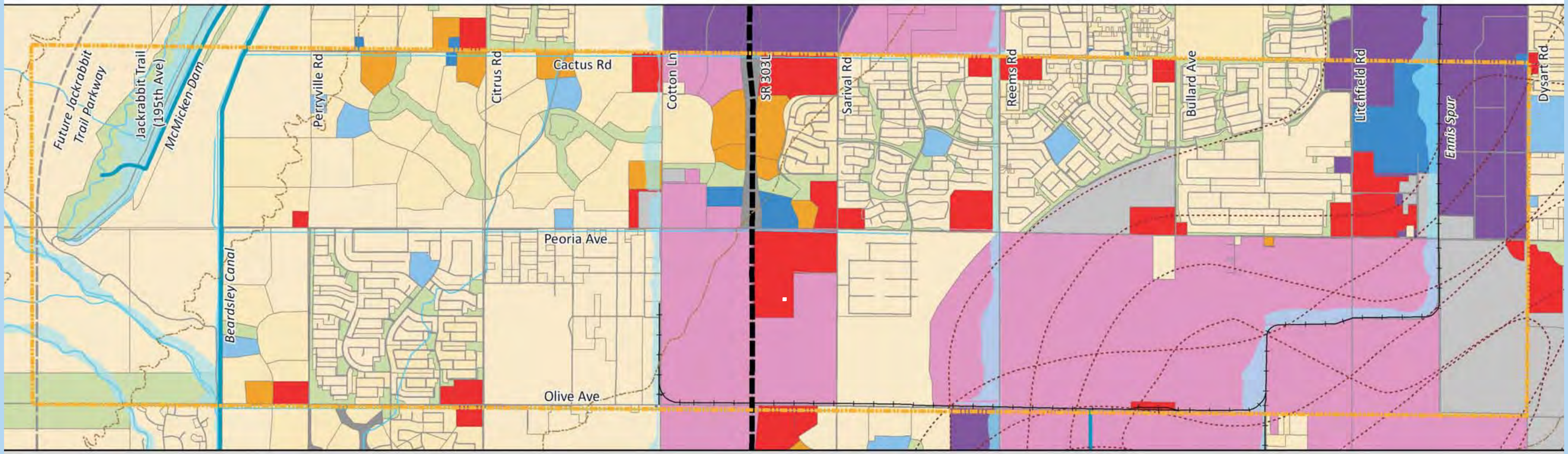
FUTURE LAND USE



Future Land Use

0 0.25 0.5 1
Miles

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Future Land Use

- Single-Family Residential
- Multi-Family Residential
- Mixed Use
- Commercial
- Employment
- Institutional
- Public Facility
- Industrial
- Open Space

Source: Flood Control District of Maricopa County, ALRIS, MAG

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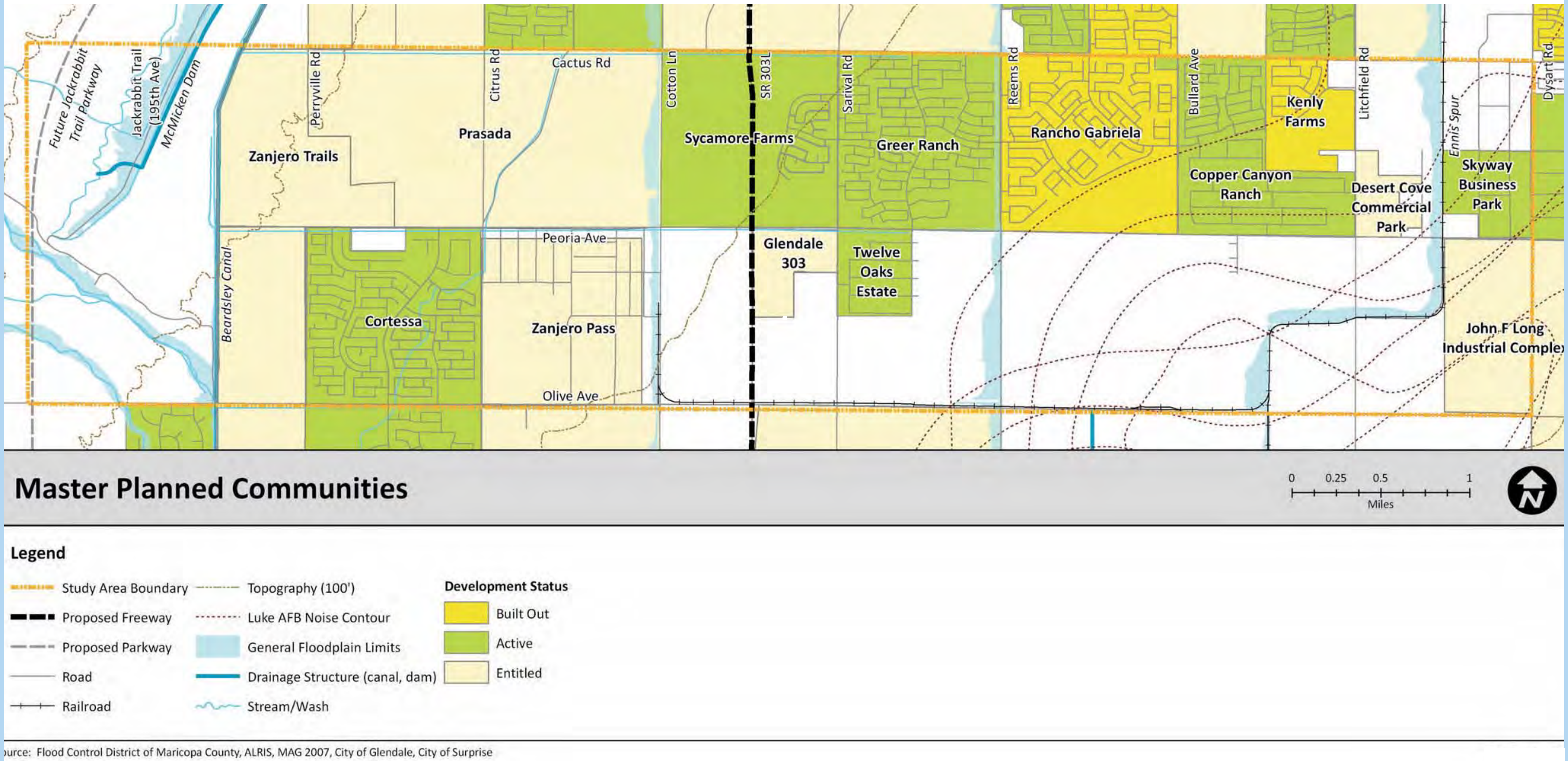
Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

MASTER PLANNED COMMUNITIES



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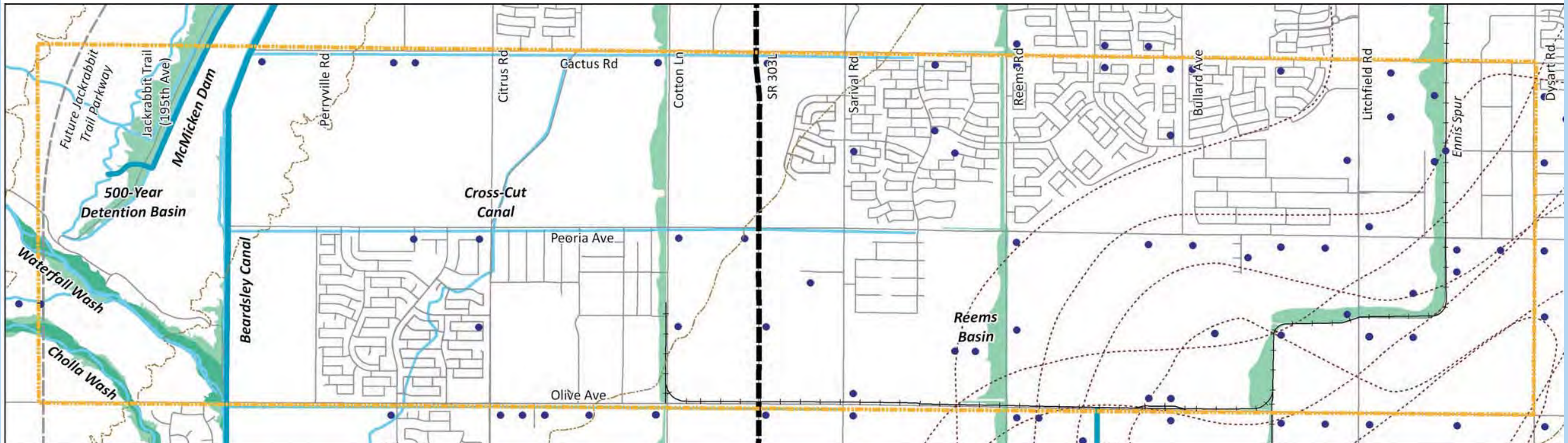
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

DRAINAGE



Major Drainage Features

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- Drainage Structure (canal, dam)
- Stream/Wash
- Well

Floodplain

- 100-year floodplain
- Floodway

Source: Flood Control District of Maricopa County, ALRIS

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Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

2031 PROJECTED AVERAGE DAILY TRAFFIC VOLUMES

2031 Projected Average Daily Traffic Volumes

0 0.25 0.5 1
Miles

N

Legend

- Study Area Boundary
- Road
- Railroad
- Drainage Structure (canal, dam)
- Stream/Wash

Future Roadway Network

- Freeway
- Parkway
- Arterial

Traffic Interchange

Daily Traffic Volumes

XXX 2031 Projected Average Daily Traffic (from MAG model)

XXX Existing Daily Traffic Volumes (City of Surpise and MCDOT 2008 & 2009; and 2010 field counts)

NOTE: Bullard Avenue from Peoria Avenue to Olive Avenue is not included in the Glendale General Plan, however is in the MAG model network.

Source: Flood Control District of Maricopa County, ALRIS, MAG Travel Demand Model

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

RECREATION AND TRAILS

Recreation and Trails

0 0.25 0.5 1
Miles

Legend

- Study Area Boundary
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash
- Community Parks

Maricopa County Trail System

- Existing Trail
- Future Trail

urce: Flood Control District of Maricopa County, ALRIS

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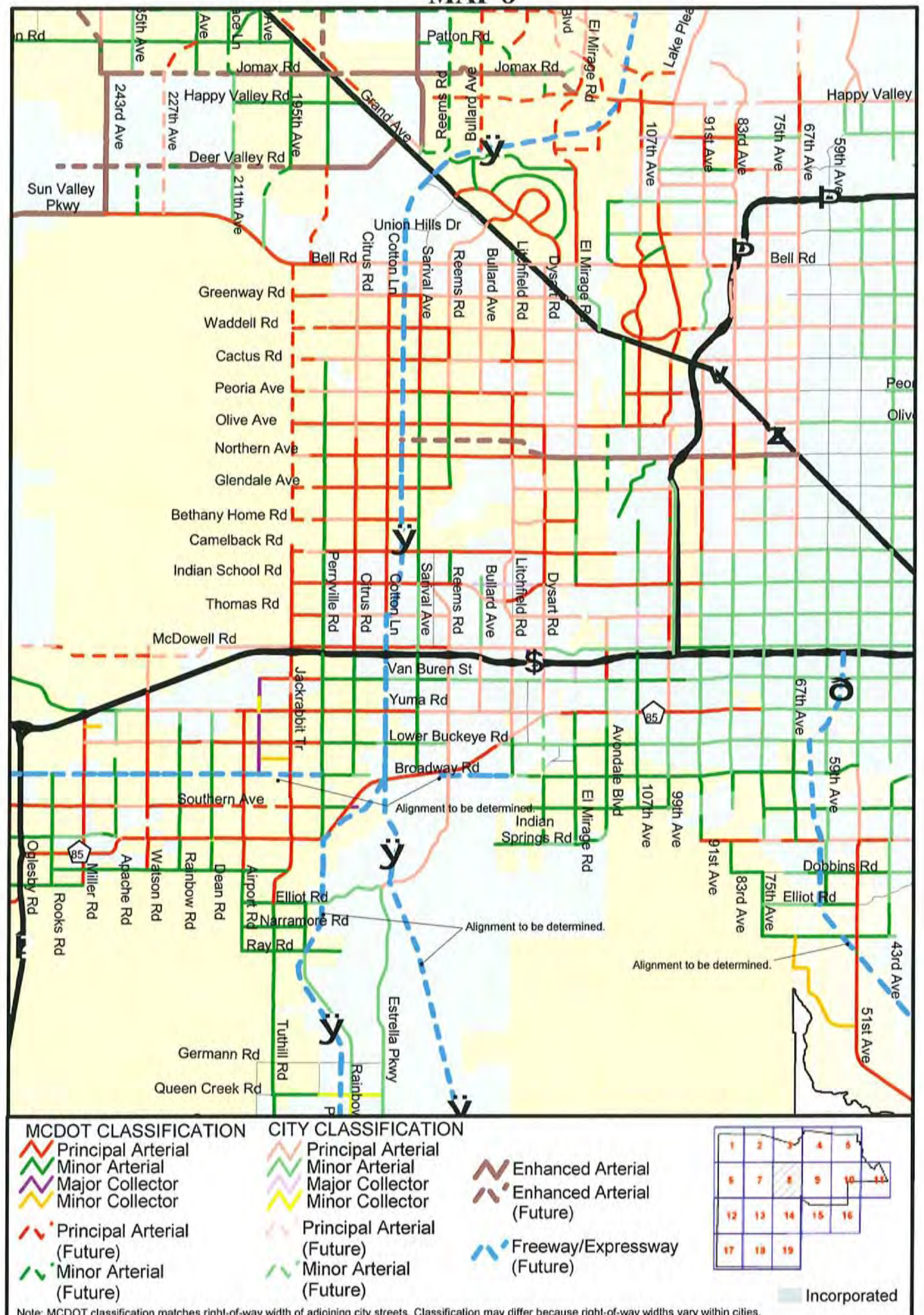
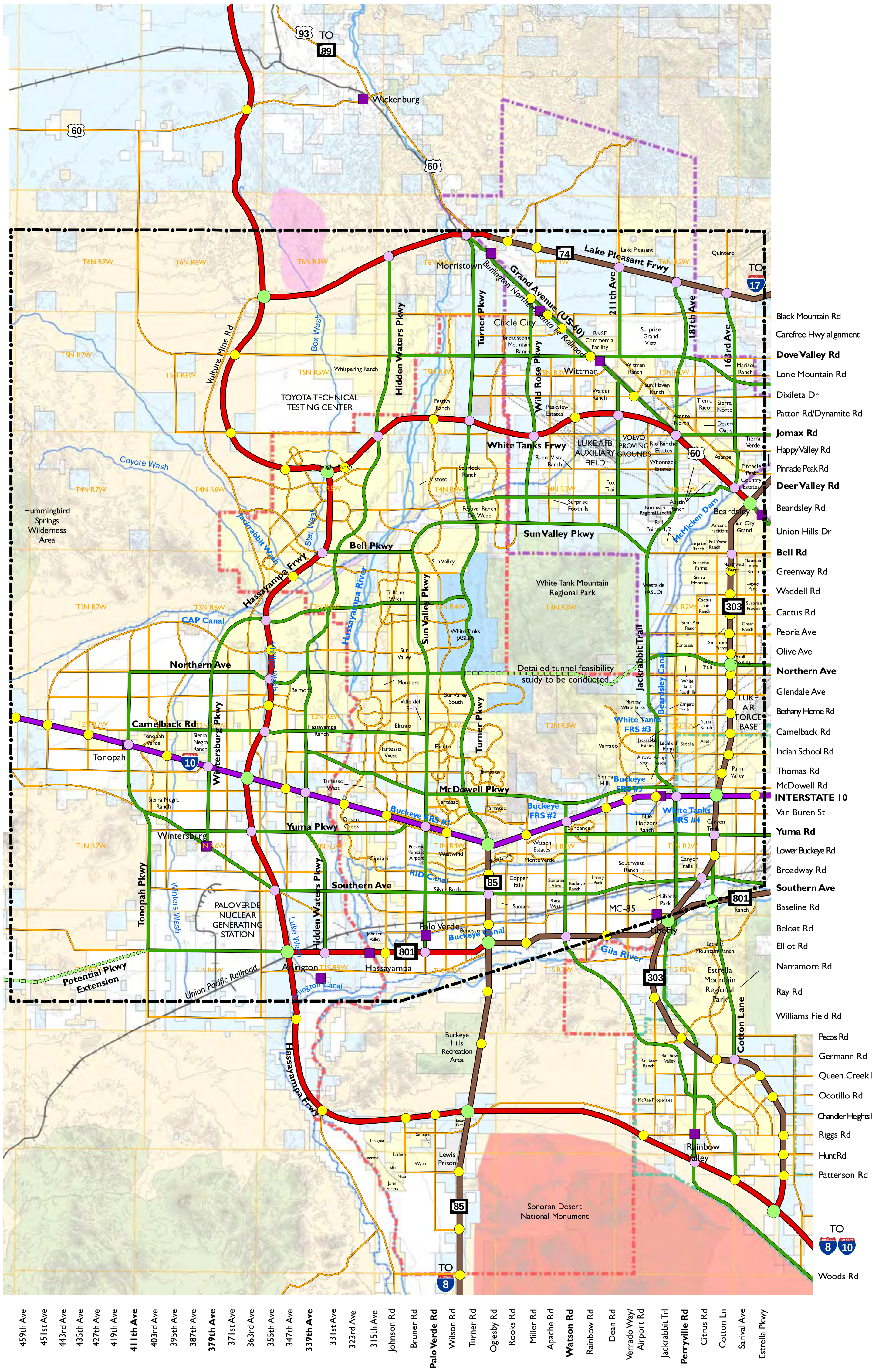
MAP 8


Patton Rd
Jomax Rd
Happy Valley Rd
Happy Valley
Deer Valley Rd
Sun Valley Pkwy
Grand Ave
243rd Ave
227th Ave
211th Ave
195th Ave
Reems Rd
Bullard Ave
El Mirage Rd
Lake Pleasant
107th Ave
91st Ave
83rd Ave
75th Ave
67th Ave
59th Ave
Union Hills Dr
Bell Rd
Citrus Rd
Cotton Ln
Sarival Ave
Litchfield Rd
Dysart Rd
Greenway Rd
Waddell Rd
Cactus Rd
Peoria Ave
Olive Ave
Northern Ave
Glendale Ave
Bethany Home Rd
Camelback Rd
Indian School Rd
Thomas Rd
McDowell Rd
Perryville Rd
Van Buren St
Yuma Rd
Lower Buckeye Rd
Broadway Rd
Southern Ave
Jackrabbit Tr
Alignment to be determined.
Indian Springs Rd
Avondale Blvd
99th Ave
Dobbins Rd
Elliot Rd
Narramore Rd
Ray Rd
Oglesby Rd
Rooks Rd
Miller Rd
Apache Rd
Watson Rd
Rainbow Rd
Dean Rd
Airport Rd
Estrella Pkwy
Tuthill Rd
Germann Rd
Queen Creek Rd
43rd Ave
51st Ave
85
MCDOT CLASSIFICATION
Principal Arterial
Minor Arterial
Major Collector
Minor Collector
Principal Arterial (Future)
Minor Arterial (Future)
CITY CLASSIFICATION
Principal Arterial
Minor Arterial
Major Collector
Minor Collector
Principal Arterial (Future)
Minor Arterial (Future)
Enhanced Arterial
Enhanced Arterial (Future)
Freeway/Expressway (Future)
Incorporated
Note: MCDOT classification matches right-of-way width of adjoining city streets. Classification may differ because right-of-way widths vary within cities.



TRANSPORTATION FRAMEWORK RECOMMENDATION

Legend

- Study Area Boundary
- Railroads
- Roads
- Rivers/Washes
- Canals
- Unincorporated Communities
- Township/Range
- Noise Contours
- Topography (100' contours)
- Proposed Service Traffic Interchanges
- Proposed Parkway Traffic Interchanges
- Proposed System Interchanges
- Planned Developments
- BLM Raptor Protection Zone
- State Land Development Master Plan
- National Monument
- Wilderness Area

Land Ownership

- BLM
- State Land
- Regional Parks
- Military
- Bureau of Reclamation

Planning Areas

- Buckeye
- Glendale
- Goodyear
- Surprise

Proposed Roadway Network

- Improvements to Existing Freeways
- Future Regional Transportation Plan (RTP) Freeways (Prop 400)
- New Freeway Proposals
- New Parkway Proposals
- New Parkway Alternatives
- Future Major Arterial Network

Notes

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

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

Locations of proposed freeway interchanges and the use of parallel roads connecting to freeways are preliminary and subject to review and approval of the FHWA and ADOT.

Arterial river crossings are conceptual to demonstrate the number of crossing needed to support development. Final locations and number will be determined in engineering and water resource studies.

Locations of proposed roadway facilities south of the study area are subject to refinement in the I-8 and I-10/Hidden Valley Roadway Framework Study to be completed in 2008, and roadways north to be planned in the New River Roadway Framework Study, schedule to be determined.

Olive Avenue traffic interchange on SR-303L to be a half-diamond.

0 5 Miles

7-1

Interstate 10/Hassayampa Valley Transportation Framework Study

MARICOPA ASSOCIATION of GOVERNMENTS

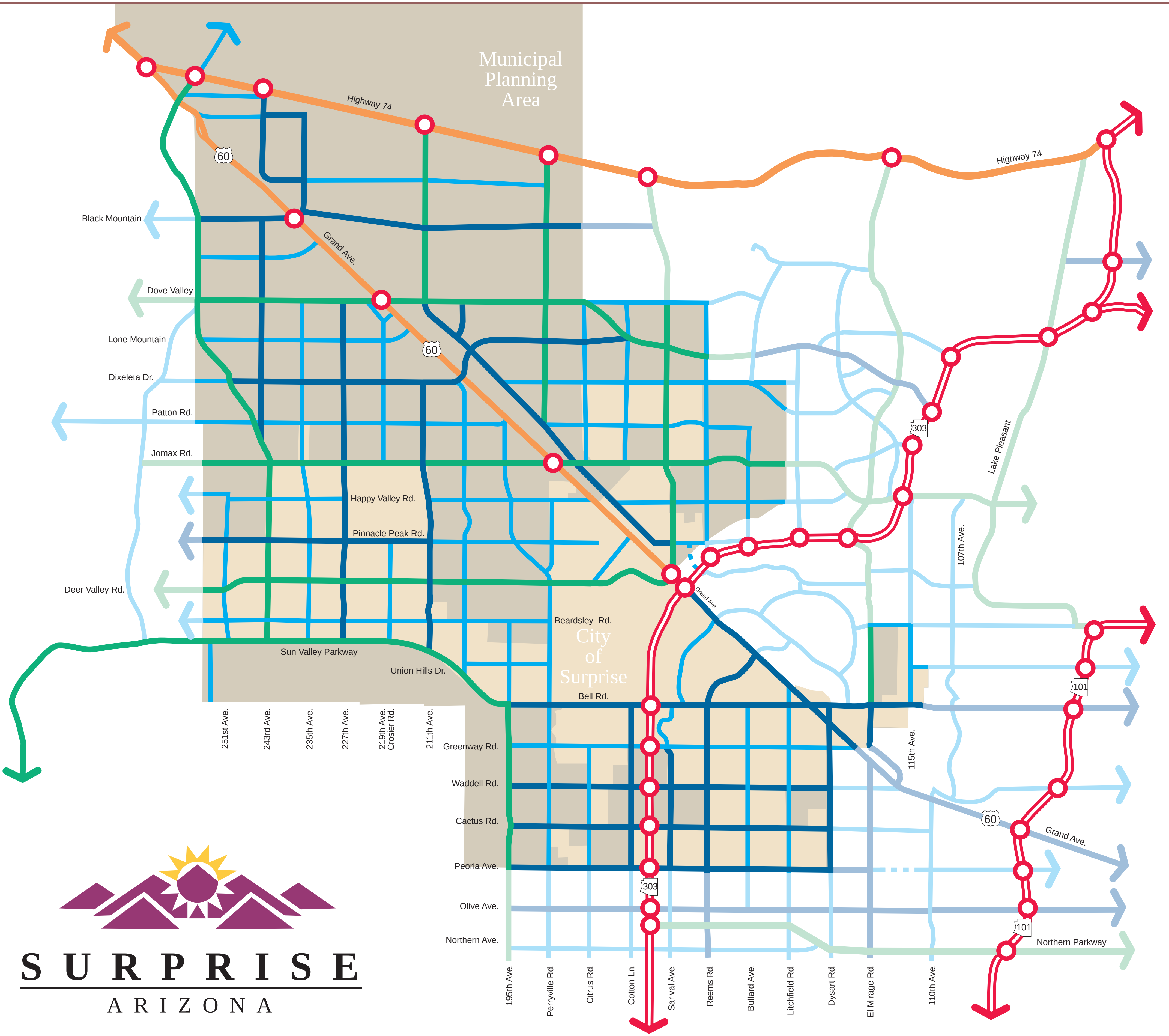
February 22, 2008

Roadway Plan

Roadway Classification

- Freeway
- Expressway
- Parkway
- Major Arterial
- Minor Arterial
- Interchange

City Boundary | Municipal Planning Area

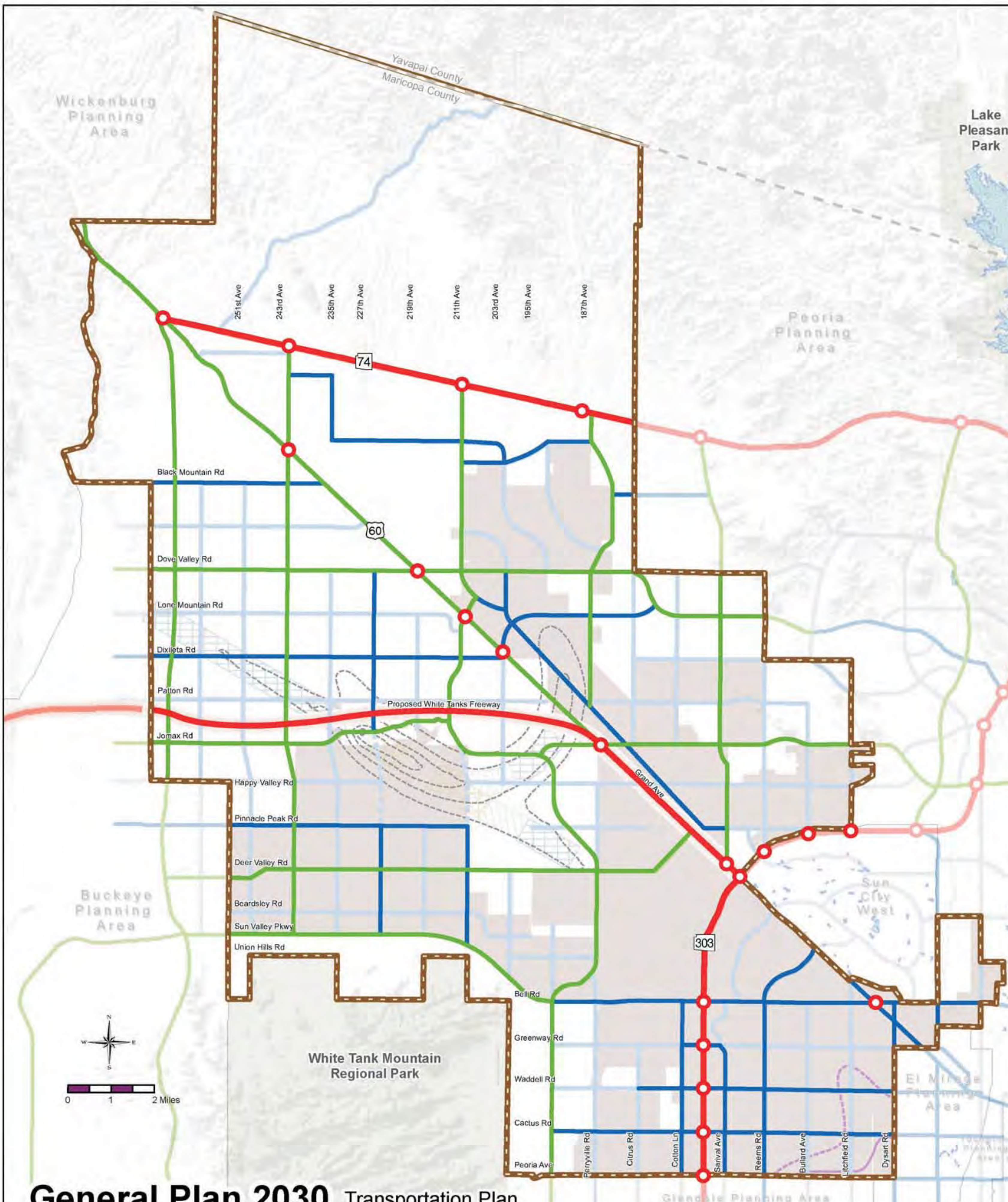


SURPRISE
ARIZONA

NORTH

0 Mile 1 Mile 2 Mile 3 Mile 4 Mile 5 Mile 6 Mile
Scale in Miles

4-1
FIGURE



General Plan 2030 Transportation Plan

Roadway Functional Classification

- Freeway
- Parkway
- Major Arterial
- Minor Arterial
- Interchanges

Transportation Corridor Preservation

These road segments are shown for Transportation Corridor Preservation only. Luke AFB will review and must concur with any improvements made. Transportation Corridors through Ford Motor Company's Proving Grounds shall remain conceptual until such time that the use ceases to exist

Map Features

60 US Highway
303 State Freeway
74 State Highway

Boundaries
City Limits
Planning Area
County

Noise Contours
Aux 1 F-16
Luke AFB 1992

APZ's
APZ I
APZ II
CLEAR ZONE

Map 3.1A - Transportation

Map prepared by the City of Surprise: January, 2010
Adopted by City Council: July 24, 2008
Amended by City Council: July 22, 2010

SURPRISE ARIZONA

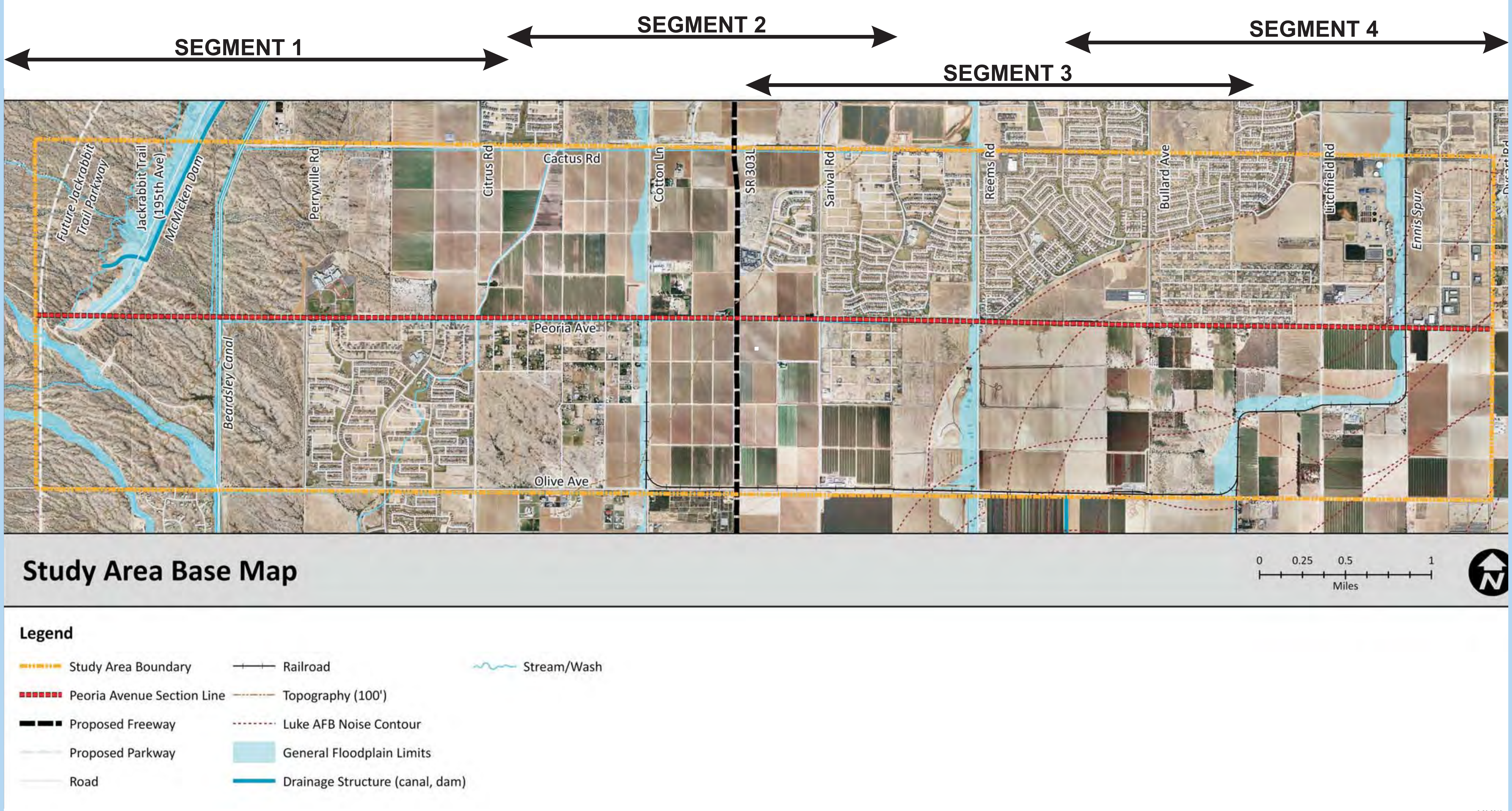
MARICOPA COUNTY MCDOT TRANSPORTATION

Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

BASE MAP



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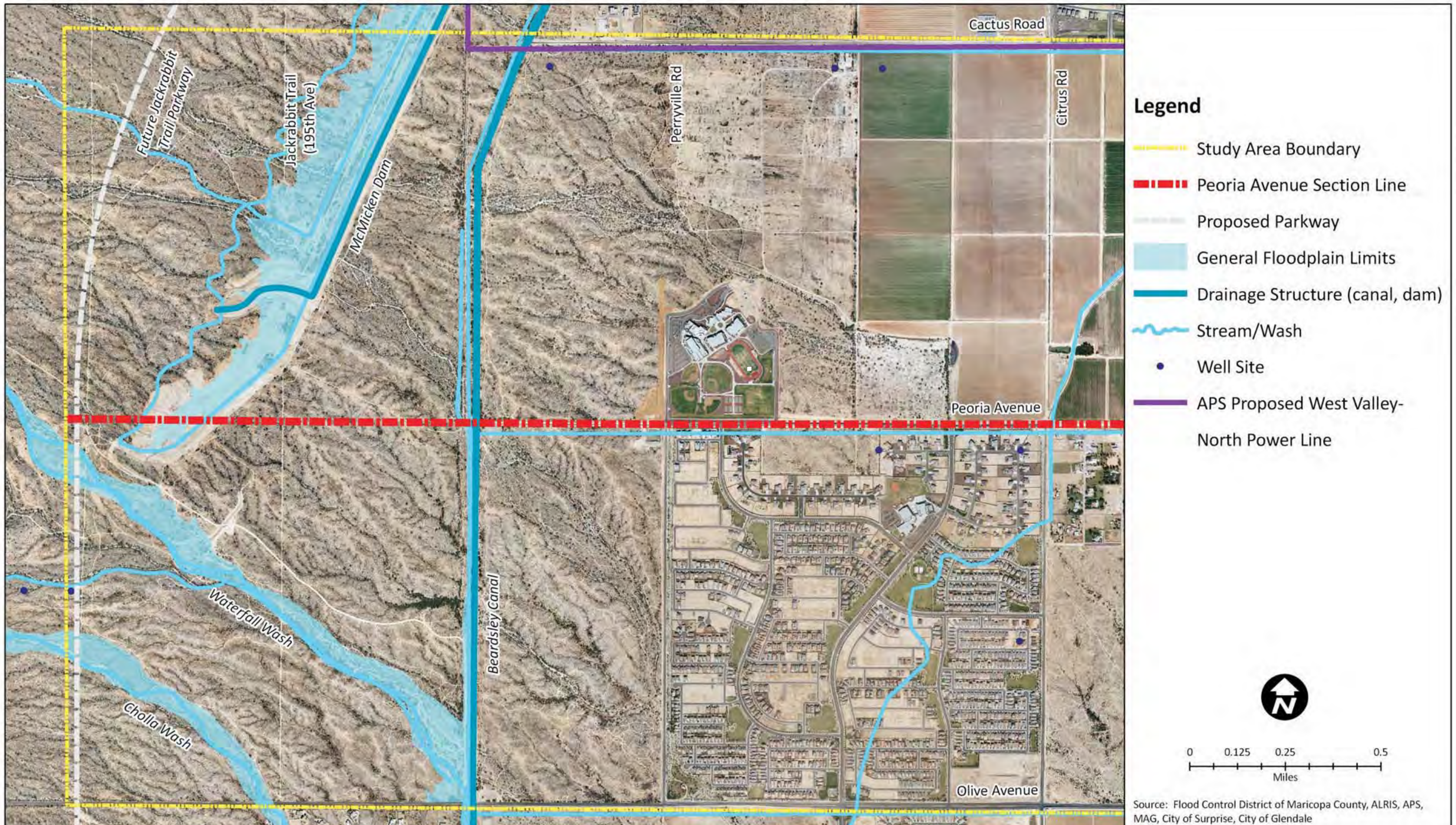
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

SEGMENT 1



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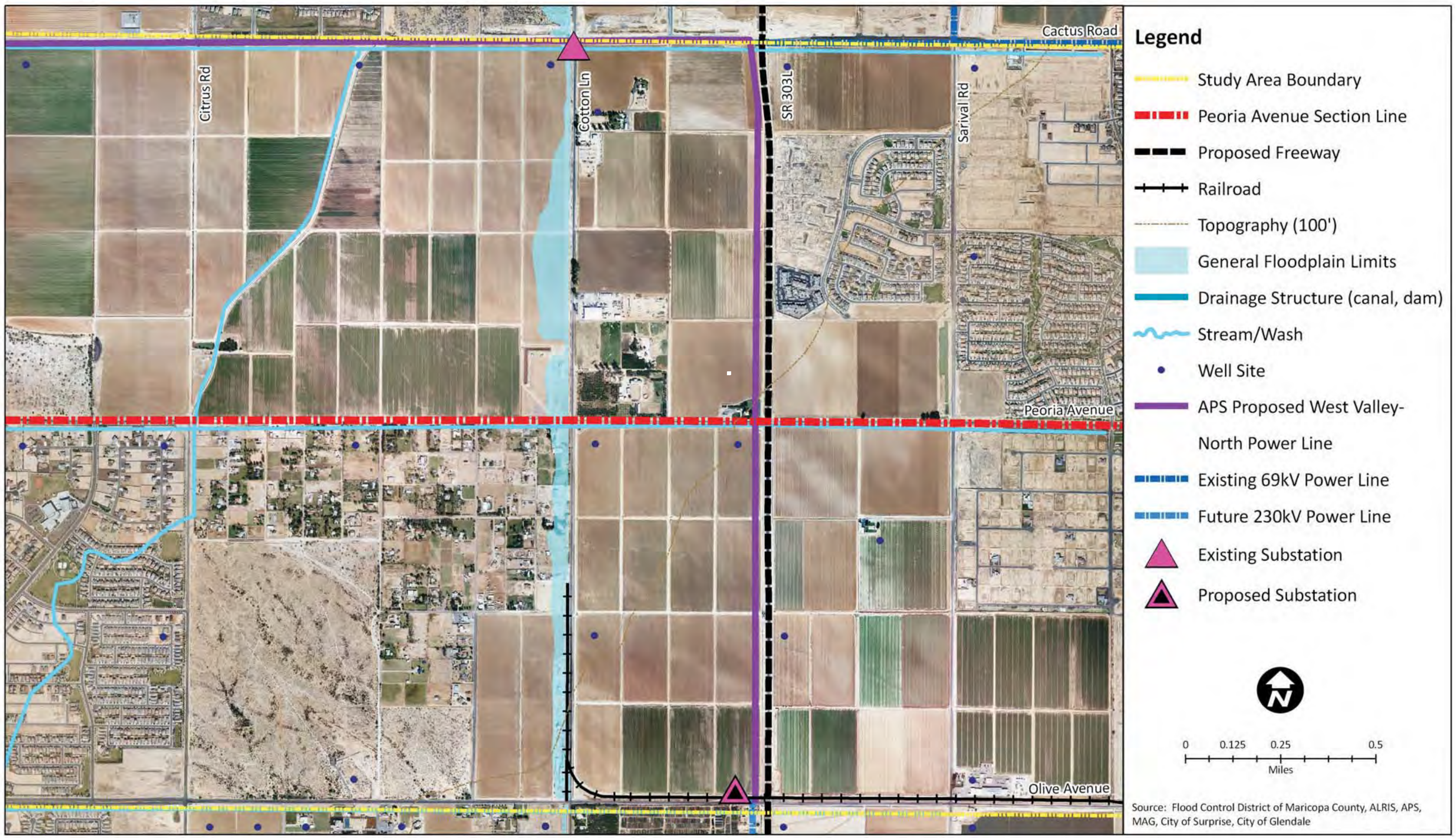
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

SEGMENT 2



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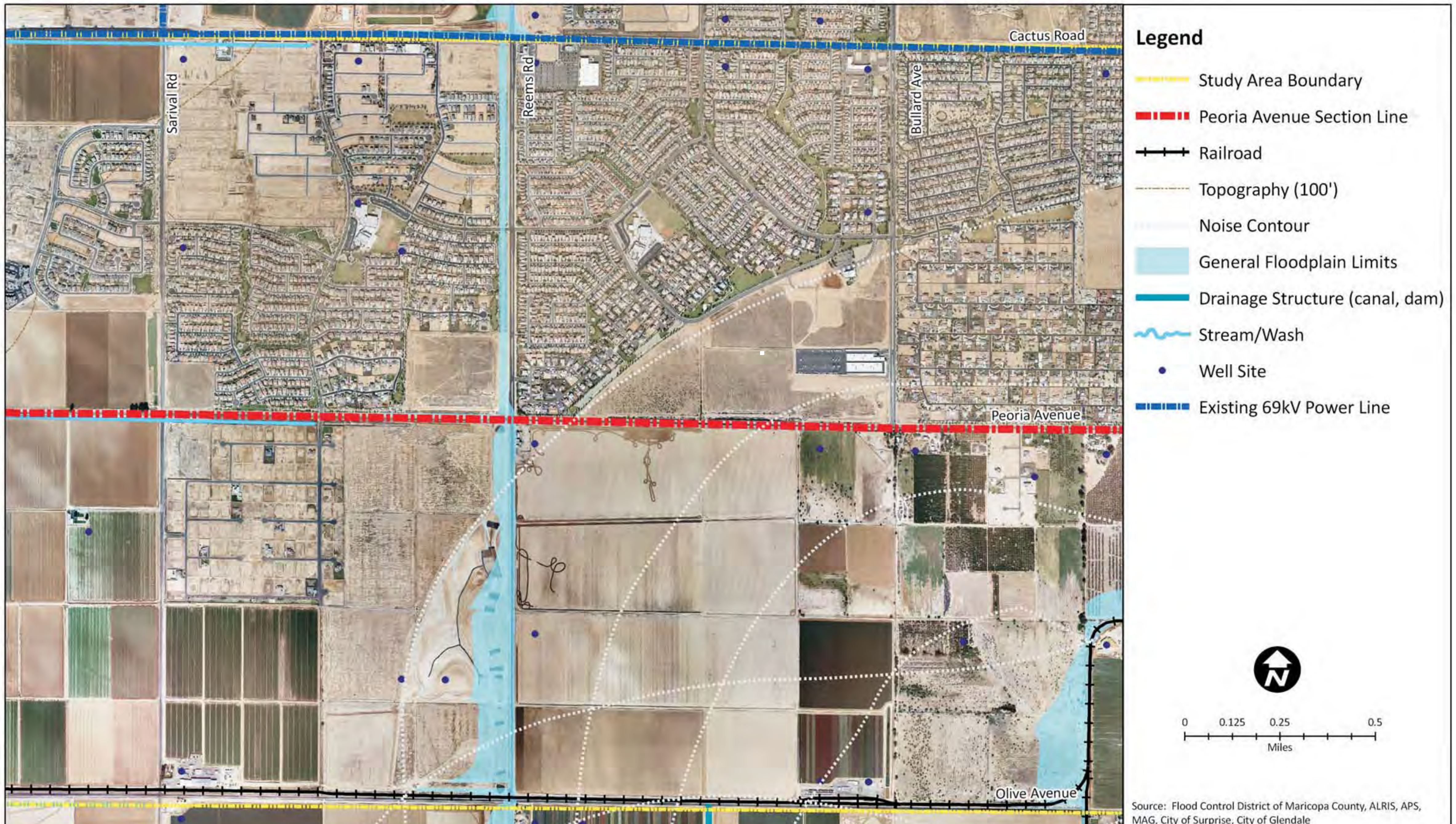
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

SEGMENT 3



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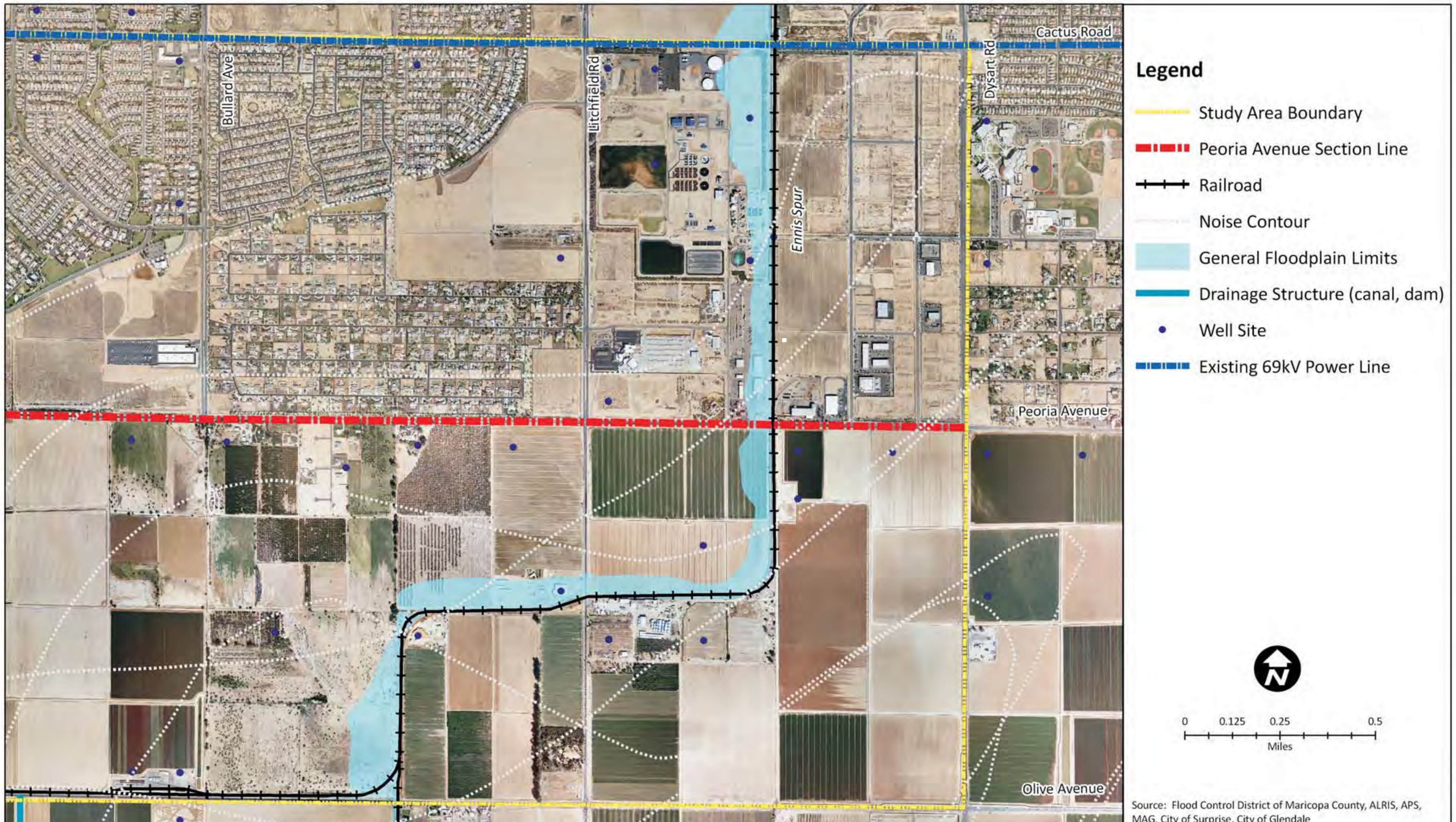
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

SEGMENT 4



9-20-2010

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MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

We Need Your Input
Peoria Avenue
Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Public Open House

Tuesday, January 18, 2011
5:00 p.m. to 7:00 p.m.

Shadow Ridge High School

10909 N. Perryville Road
Surprise, AZ 85388
(On Perryville Road just north of Peoria Avenue)

"Alternative Analysis" Phase Public Input Meeting

The Maricopa County Department of Transportation's (MCDOT) ***RightRoads* Program**, is conducting the second in a series of three public open house meetings to gather community input about potential improvements along an eight-mile section of Peoria Avenue between Jackrabbit Trail Parkway and Dysart Road. The study goal is to identify and establish the future roadway type, alignment and right-of-way requirements along the Peoria Avenue corridor to safely address forecast travel demands and to accommodate the future six-lane major arterial roadway as identified in the Surprise, Glendale, MCDOT and MAG (Maricopa Association of Governments) long range transportation plans.

This second (Alternatives Analysis Phase) public input meeting will provide area residents and other impacted study stakeholders with an opportunity to inform study team members about study area issues and local transportation needs. This meeting will also serve to elicit feedback regarding the study's purpose, goals and objectives. Alternatives for proposed roadway cross sections, alternative alignments, and an evaluation of each conceptual alternative will be presented for public review and comment. Study information, maps and exhibits will be available for viewing during the meeting.

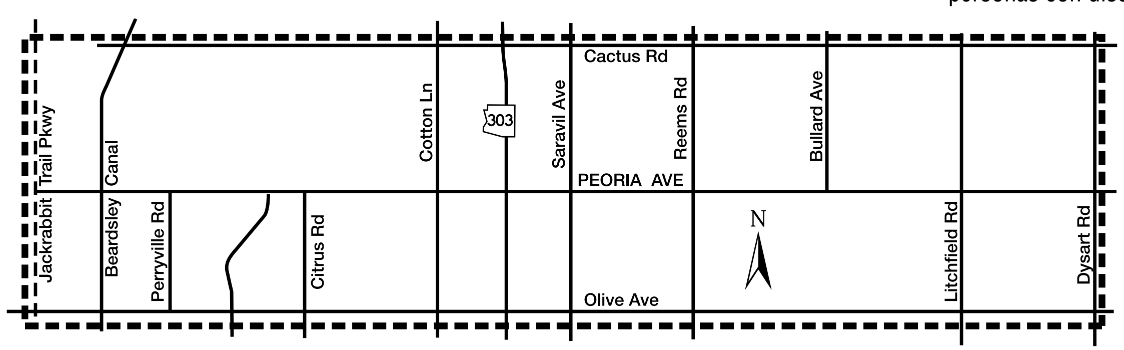
Stop by anytime between 5:00 and 7:00 p.m. to speak with MCDOT project team members. For more information, contact Mitch Wagner at (602) 506-8054 write to Wagner at: MCDOT, 2901 W. Durango Street, Phoenix, AZ 85009, or e-mail at: mitchwagner@mail.maricopa.gov or contact Roberta Crowe, Public Information Officer at **(602) 506-8003**, robertacrowe@mail.maricopa.gov.

The Peoria Avenue Corridor Improvement Study is one of several long range transportation planning studies currently being conducted by MCDOT on future West Valley roadways identified in the recently completed Maricopa Association of Governments (MAG) I-8/I-10 Hidden Valley Transportation Framework and Interstate 10/Hassayampa Roadway Framework Studies.

Reasonable accommodations may be made available for people with disabilities with a minimum 72-hour notice. For more information on such accommodations, contact Roberta Crowe at (602) 506-8003.

Si desea recibir esta información en Español, favor llame (480) 350-9288.

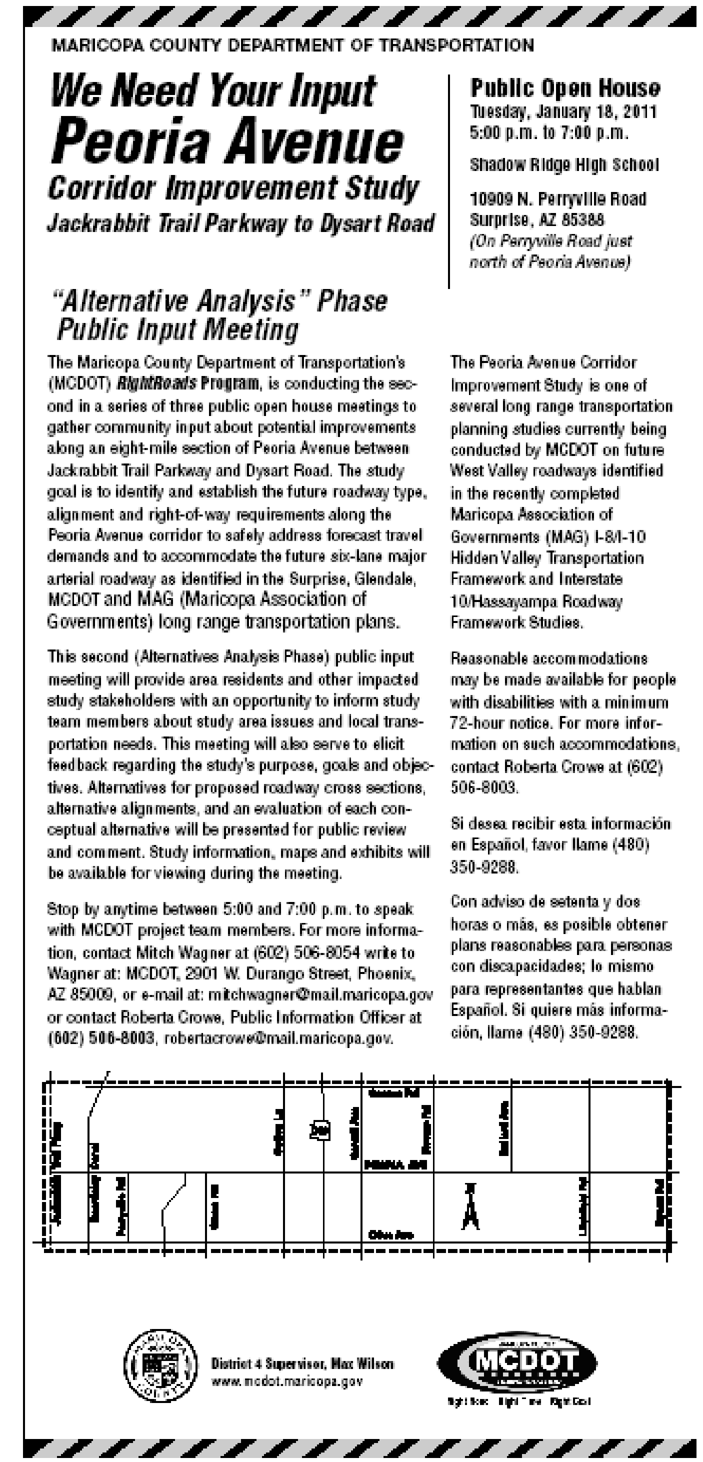
Con adviso de setenta y dos horas o más, es posible obtener plans reasonables para personas con discapacidades; lo mismo para representantes que hablan Español. Si quiere más información, llame (480) 350-9288.



District 4 Supervisor, Max Wilson
www.mcdot.maricopa.gov

MARICOPA COUNTY MCDOT TRANSPORTATION
Right Road Right Time Right Cost

Alternatives Analysis Phase Public Input Meeting
Newspaper Advertisement



- Arizona Republic
- Buckeye Valley News
- Surprise Independent
- West Valley View

PEORIA AVENUE

Corridor Improvement Study

Jack Rabbit Trail Parkway to Dysart Road

MARICOPA COUNTY MCDOT TRANSPORTATION

Right Road Right Time Right Cost

"Alternative Analysis Phase"

Maricopa County Department of Transportation January 18, 2011

Background

The Peoria Avenue Corridor Improvement Study (Jackrabbit Trail Parkway to Dysart Road) is one of a series of long-range transportation planning studies being conducted by the Maricopa County Department of Transportation (MCDOT). The City of Surprise, City of Glendale, City of El Mirage, and Maricopa County transportation plans all identify Peoria Avenue as a future arterial roadway from Jackrabbit Trail Parkway to Dysart Road. The Maricopa Association of Governments (MAG) recently prepared the Interstate 10/Hassayampa Valley Transportation Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the build out of the area west of SR Loop 303. This long range regional transportation study identified the need for future roadway network consisting of freeways, parkways, and major arterial roads.

The MAG Hassayampa Framework Study recommended an extension of Peoria Avenue westward from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial roadway from the future Jackrabbit Trail Parkway to Sarival Avenue.

This study will identify the preferred alignment and "footprint" for the future Peoria Avenue between Jackrabbit Trail Parkway and Dysart Road and will facilitate future roadway implementation by developers and local jurisdictions, providing a cohesive transportation corridor, compatible with the City of Surprise, City of Glendale, City of El Mirage, Maricopa County, and MAG transportation plans.

Corridor Description

The Peoria Avenue Corridor study area includes the segment of Peoria Avenue between the future Jackrabbit Trail Parkway alignment and Dysart Road. The study area generally encompasses a two-mile wide corridor centered on the existing Peoria Avenue alignment.

Today's Peoria Avenue generally consists of a two-lane roadway (one travel lane in each direction). Half-street improvements have been constructed along the north side of Peoria Avenue adjacent to developments such as Shadow Ridge High School, Greer Ranch subdivision, Copper Canyon Ranch subdivision and Skyway Business Park. Improvements on the south side of Peoria Avenue have been constructed adjacent to the Cortessa subdivision. The only full-width roadway section of Peoria Avenue is located immediately east of Perryville Road between Cortessa and Shadow Ridge High School.

The BNSF Railway operates a north-south railroad spur (Ennis Spur) that crosses Peoria Avenue between Litchfield and Dysart Roads. SR Loop 303 crosses the Peoria Avenue Corridor between Cotton Lane and Sarival Road.

The majority of the land in the study area is privately owned, with the exception of the westernmost limit (west of Beardsley Canal) which is owned by the Arizona State Land Department (ASLD). The majority of the existing land use is categorized as vacant (undeveloped) or agricultural. Several residential subdivisions are built or under development, which include three elementary schools, one middle school, and one high school. In several locations, existing homes not associated with large master-planned communities, are located adjacent to Peoria Avenue. Small clusters of industrial and commercial development are scattered throughout the eastern end of the study area.

Based on the City of Surprise, City of Glendale, and City of El Mirage future land use planning, a majority of the vacant and agricultural land within the study area is envisioned to be converted to single-family residential housing and mixed-use developments in the future. It is anticipated that commercial and industrial development will expand, but remain scattered throughout the study area.

Study Need

Today's land development and existing travel demands in the Peoria Avenue Corridor do not warrant a major east/west arterial roadway in the near-term; however, plans are underway to convert much of the rural and low density residential lands within the corridor to more intense land uses that will generate significantly more

For more information, contact Mitch Wagner at (602) 506-8054 or write to him at:
MCDOT, 2901 W. Durango Street, Phoenix, AZ 85009, or e-mail at: MitchWagner@mail.maricopa.gov.

traffic. The "build-out" forecast for future land development and resulting travel demand warrant a major east/west arterial roadway in the long term.

To help make future roadway construction economically feasible, the planning process needs to begin now to identify and protect long-term public right-of-way needs for the future roadway under ultimate "build-out" conditions.

Study Goals & Objectives

This corridor study is the first step in the planning process and its primary goal is to aid the affected agencies and jurisdictions in defining and protecting sufficient right-of-way for a continuous future Peoria Avenue Corridor that will safely accommodate projected travel demand and to accommodate the future six-lane major arterial roadway as identified in the Surprise, Glendale, MCDOT and MAG long range transportation plans. In general, the purpose of this Corridor Improvement Study is to provide MCDOT and our partner jurisdictions with a future "footprint" of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

To accomplish this, the main focus of this study is to investigate, map, and analyze corridor constraints and opportunities to arrive at a recommended corridor alignment. This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also determine design standards based upon future roadway jurisdiction (anticipated roadway annexation) and an implementation or construction phasing plan.

The key objectives of this Corridor Improvement Study are to:

- Define and assess the strategic issues within the project study area
- Develop and evaluate conceptual alternative alignments
- within the corridor study area
- Recommend a preferred alignment
- Define the characteristics of the preferred alignment
  Develop consensus for the preferred alignment
  Develop an implementation (recommended construction phasing) plan

Study Approach

The Peoria Avenue Corridor Improvement Study is carried out in two phases, a planning phase and an engineering phase.

Planning Phase
During the Planning Phase, general background information regarding the corridor is gathered and documented in reports that will lead to well-founded recommendations for improvements and longer-term needs along Peoria Avenue. During the Planning Phase, meetings are conducted with affected jurisdictions, agencies, stakeholders, and the impacted public to form a broad consensus of the overall needs and vision of the corridor.

Based on identified needs, conceptual alternatives are developed and candidate alternatives are then evaluated for technical and environmental feasibility, public acceptability, and economic viability.

Engineering Phase
The Engineering Phase of the study begins following the selection of a preferred alternative. Preliminary engineering design plans, right-of-way requirements, and estimated construction costs will be prepared for long-term roadway design features. Priorities for roadway construction phasing along with policies and guidelines to preserve the intended regional function of the road are developed.

Preliminary plans and cost estimates will be presented during the final "Study Findings and Recommendations" (March 2011) public meeting to present the preferred (recommended) design alternative for Peoria Avenue.

Study Stakeholders

- Arizona Department of Transportation (ADOT)
- Arizona Game and Fish Department
- Arizona State Land Department
- BNSF Railway
- Flood Control District of Maricopa County (FCDMC)
- Maricopa Association of Governments (MAG)
- Maricopa County Department of Transportation (MCDOT)
- Maricopa County Environmental Services
- Maricopa County Parks Department
- Maricopa County Planning and Development
- Maricopa Water District
- City of Surprise
- City of Glendale
- City of El Mirage
- Dysart Unified School District
- Major Utility Providers
- Land Developments
- Impacted residents, businesses and property owners

Preliminary Key Issues and Challenges

Early in the study process, a preliminary list of study issues and potential challenges is compiled. This list expands as the study progresses and input is obtained from public participation.

- Establish future connections of Peoria Avenue to planned roadways such as Jackrabbit Trail Parkway
- Account for future planned connection to SR Loop 303
- Evaluation of drainage structures across major washes, canals and channels
- Evaluation of crossing of the BNSF Railroad
- Maintain functional integrity of roadway through constrained areas
- Maximize use of existing roadway improvements along corridor to reduce costs
- Identify ultimate alignment and access management strategies
- Consideration of environmental constraints

Study Schedule

Project Kick-off & Study Initiation	July 2010
PHASE I: Data Collection/Issues Identification	July - September 2010
Public Input Meeting #1 (Scoping Phase)	**September 20, 2010**
PHASE II: Alternative Development and Evaluation	October 2010 - January 2011
Public Input Meeting #2 (Alternatives Analysis Phase)	**January 18, 2011**
Public Input Meeting #3 (Study Findings & Recommendations Phase.)	**March 2011**
Study Completion/Final Report Submitted	June 2011

Alternative Development & Evaluation

After completion of the inventory of existing and future conditions, the study team developed the following evaluation criteria to help determine the optimum alignment for the future Peoria Avenue corridor:

- Right-of-way impacts
- Compatibility with existing developments
- Compatibility with planned future developments
- Compatibility with existing and planned roadway improvements
- Engineering complexity and constructability
- Public acceptance
- Local agency support
- Drainage/flood control considerations
- Utility considerations
- Environmental considerations

Based on the findings of the Phase 1"fatal flaw" evaluation of Conceptual Alternatives and input received from the public and Technical Advisory Committee, Candidate Alternatives will be advanced to undergo the more in-depth Phase 2 evaluation. For the purposes of this evaluation, the Peoria Avenue corridor was split into nine segments. Up to three alternative alignments are being considered for each segment of the Peoria Avenue corridor. Alternative 1 includes widening the corridor symmetric to the section line, attempting to balance impacts to both sides of the corridor. Alternative 2 includes widening the corridor to the south, maintaining the northern right-of-way boundary. Alternative 3 includes widening the corridor to the north, maintaining the southern right-of-way boundary.

Based on the current evaluation (pending public and agency feedback), the following alternatives are being recommended to be carried forward as candidate alternatives:

Segment 1 (Jackrabbit Trail Parkway to Beardsley Canal):
- Alternative 1 - new corridor along section line

Segment 2 (Beardsley Canal to Perryville Road):
- Alternative 1 - new corridor along the section line

Segment 3 (Perryville Road to Citrus Road):
- Alternative 1 - widen symmetric along the section line

Segment 4 (Citrus Road to Cotton Lane):
- Alternative 1 - widen symmetric along section line
- Alternative 3 - shift north

Segment 5 (Cotton Lane to Sarival Road):
- Alternative 1 - widen symmetric along the section line

Segment 6 (Sarival Road to Reems Road):
- Alternative 1 - widen symmetric along the section line

Segment 7 (Reems Road to Bullard Avenue):
- Alternative 1 - widen symmetric along section line
- Alternative 3 - shift north

Segment 8 (Bullard Avenue to Litchfield Road):
- Alternative 1 - widen symmetric along the section line

Segment 9 (Litchfield Road to Dysart Road):
- Alternative 2 - shift south

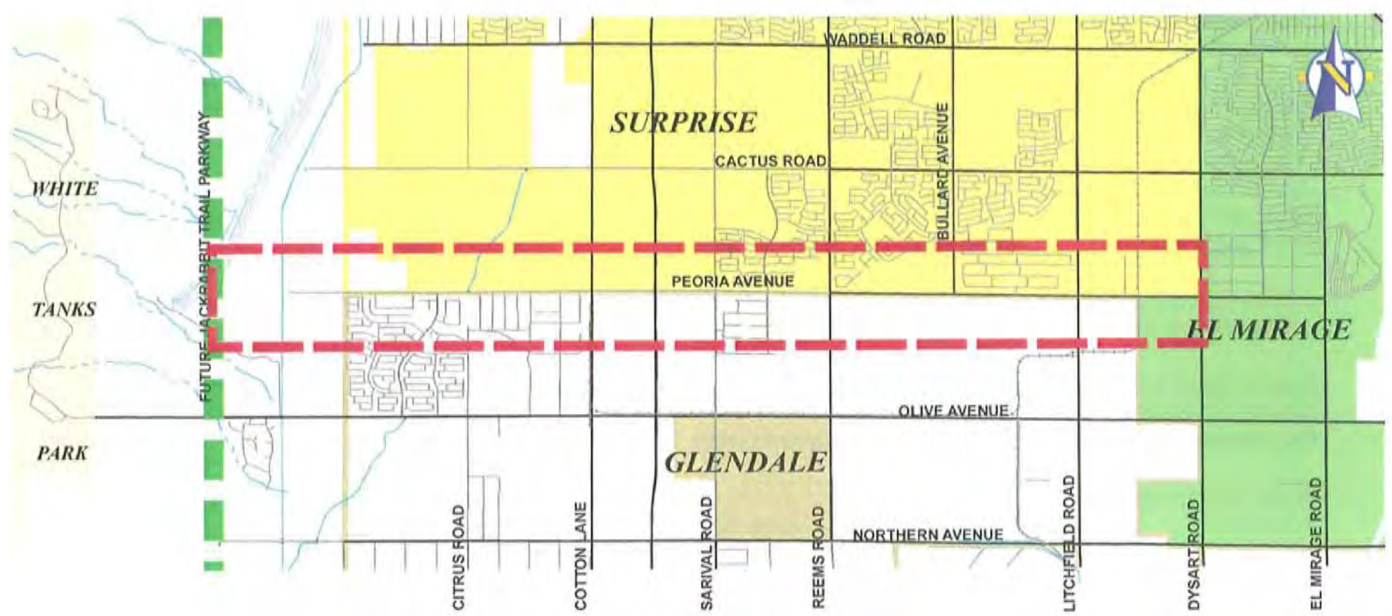
The findings of the Candidate Alternative evaluation will result in the recommendation of a Preferred Alignment for the future Peoria Avenue corridor that will serve as a guide for future land development and planning efforts.

Public Involvement

Gaining consensus among the jurisdictional agencies and the public is critical to the success of the study and implementation of its recommendations to provide a safe and efficient roadway for the long term. A total of three public input meetings are planned during the course of the study process. The first public input meeting (September 20, 2010) was held during the data collection and Scoping Phase to inform the public of the objectives of the study and provide area residents and other stakeholders with an opportunity to inform project team members about study area issues and local transportation needs. This meeting also provided the public an opportunity to provide feedback on the study purpose, goals, and objectives.

The second public input meeting (January 18, 2011) is conducted during the Alternatives Analysis Phase. This meeting serves to provide the results of the issues and constraints identification process and reviews the candidate alignment evaluation criteria. This meeting also presents the conceptual alternative alignments, and gathers more public feedback to assist further development and evaluation of the advanced Candidate Alternatives, leading to the study's primary objective, the selection of a Preferred Alignment.

The third and final public input meeting will be held during the Findings and Recommendations Phase of the study (March 2011). This meeting will review the results of the Candidate Alternative evaluation process, present the Preferred Alignment, and gather additional public input and feedback for use in the development of the final report. Public participation and feedback during each phase of the study process is very important and a vital component of study development.



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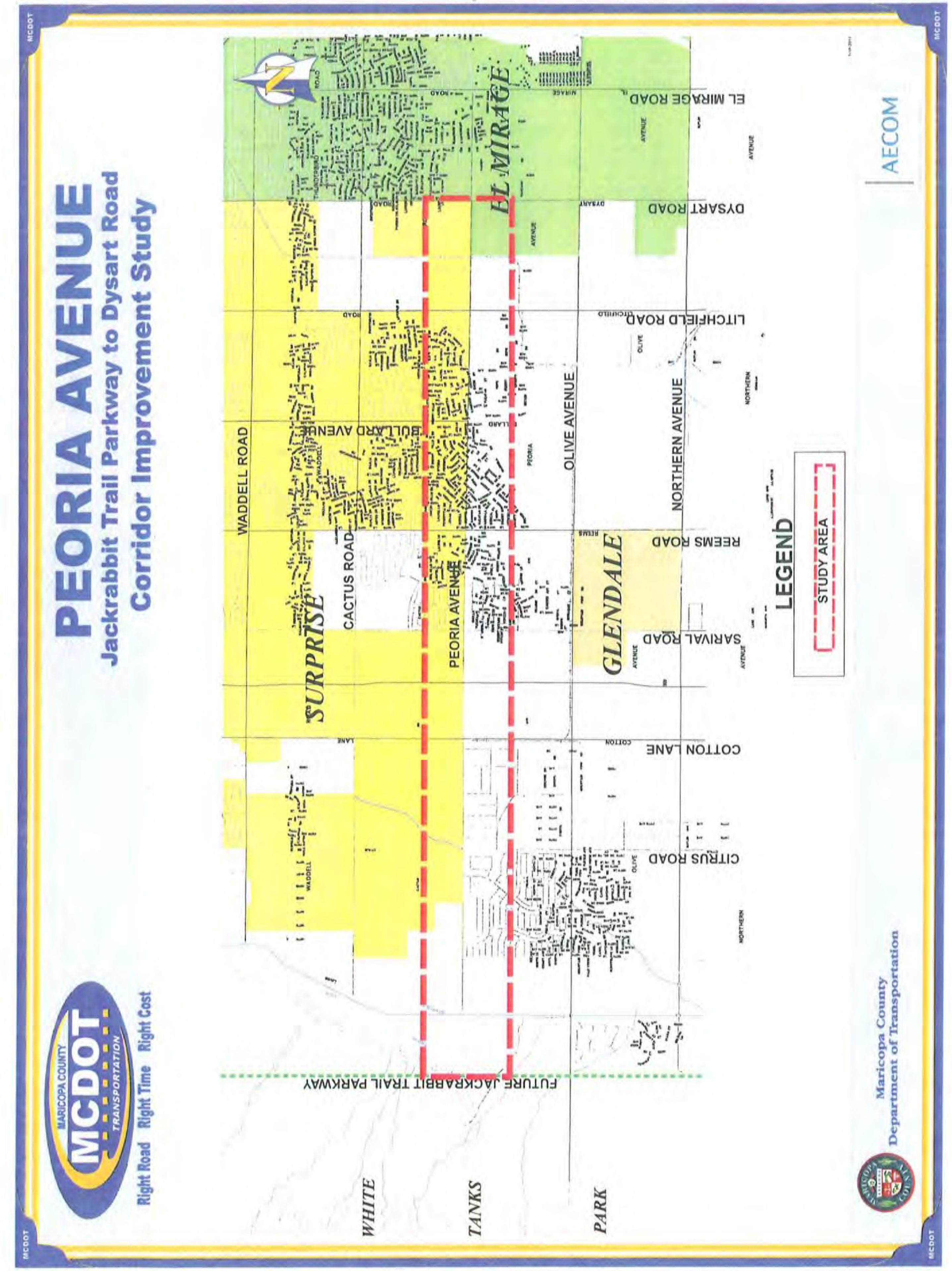

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

KEY STUDY OBJECTIVES

- Define and assess the strategic issues within the project study area
- Develop and evaluate conceptual alternative alignments within the corridor study area
- Recommend a preferred alignment
- Define the characteristics of the preferred alignment
- Develop consensus for the preferred alignment
- Develop an implementation (recommended construction phasing) plan

STUDY NEED

- Address regional and local growth and development within study area (3.5 million population projected at build-out between Wickenburg and Gila Bend -- MAG I-8/I-10 Hidden Valley and I-10/Hassayampa Valley Transportation Framework studies)
- Preserve sufficient public right-of-way for an east/west transportation corridor
- Ensure future roadway compatibility with existing/future land uses and environmental conditions
- Identify potential connectivity issues with other future planned roadways and freeways

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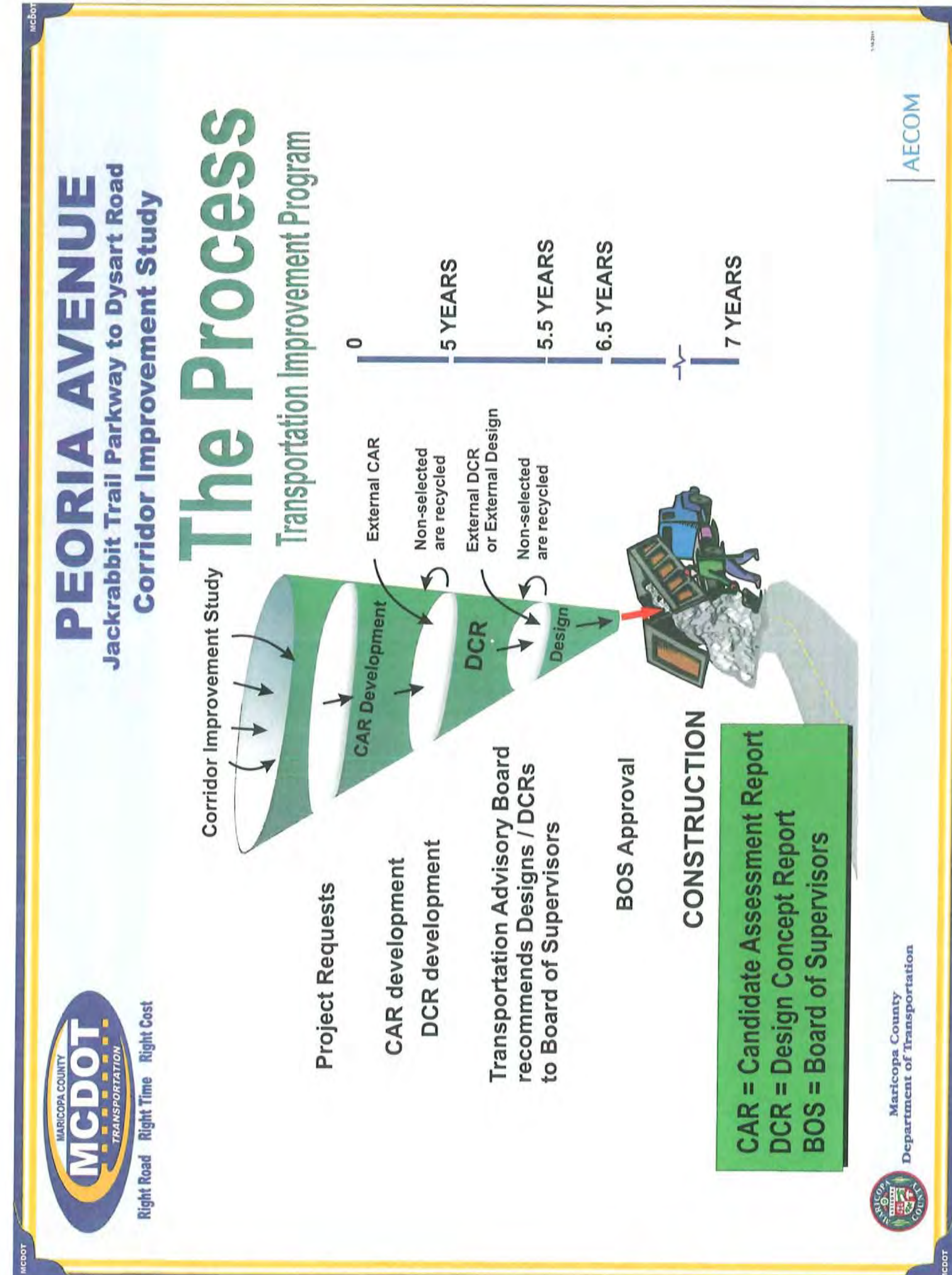

PEORIA AVENUE
Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

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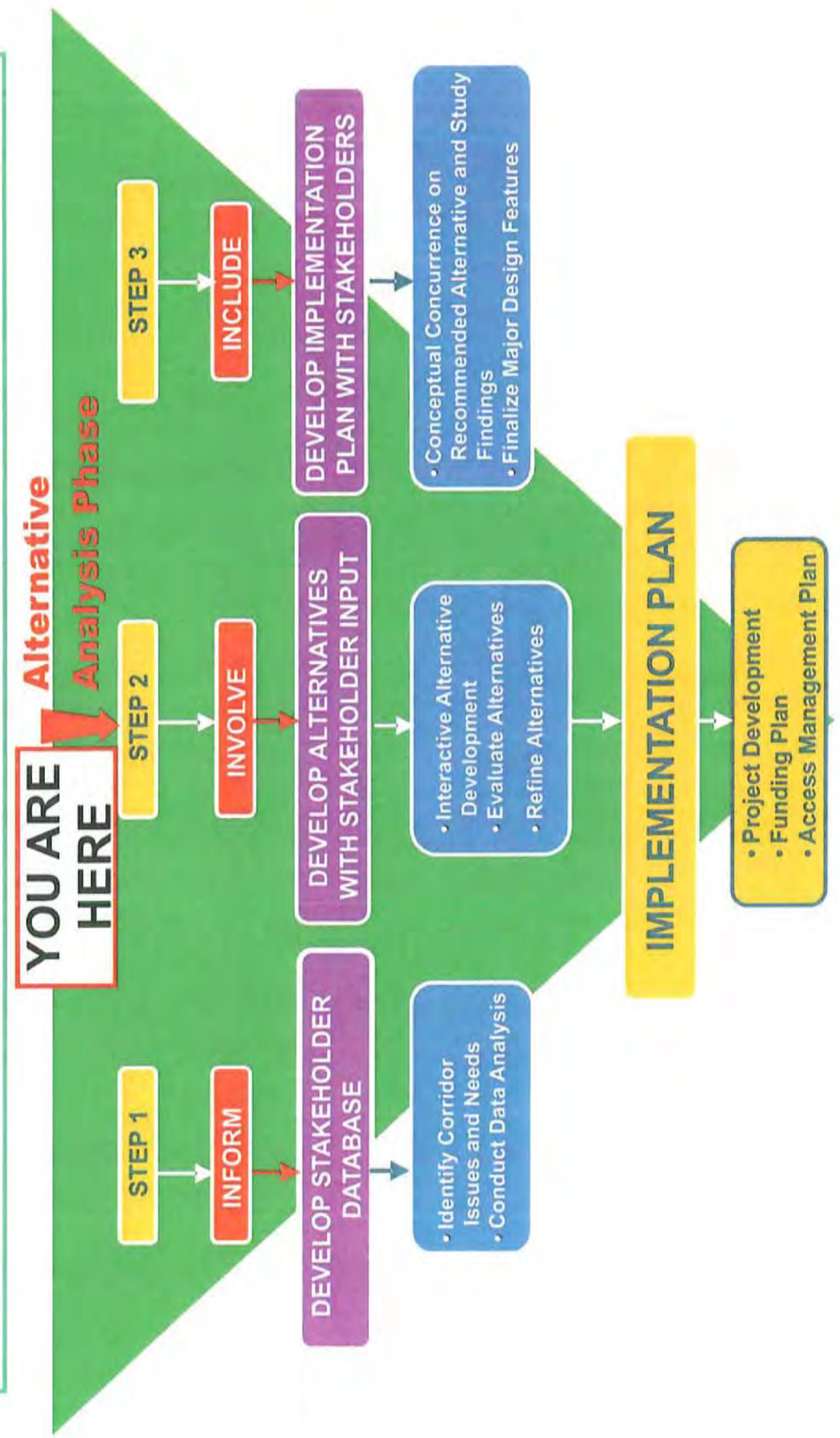
Interactive Study Process



PEORIA AVENUE
Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

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Study Schedule

Project Kick-off & Study Initiation	July 2010
PHASE I:	
Data Collection/Issues Identification	July - September 2010
Public Input Meeting #1 (Scoping Phase)	September 20, 2010
PHASE II:	
Alternative Development and Evaluation	October 2010 - January 2011
Public Input Meeting #2 (Alternatives Analysis Phase)	January 18, 2011
Public Input Meeting #3 (Study Findings & Recommendations Phase)	March 2011
Study Completion/Final Report Submitted	June 2011

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

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STUDY STAKEHOLDERS

- Arizona Department of Transportation (ADOT)
- Arizona Game and Fish Department
- Arizona State Land Department
- Burlington Northern Santa Fe Railway (BNSF)
- Flood Control District of Maricopa County (FCDMC)
- Maricopa Association of Governments (MAG)
- Maricopa County Department of Transportation (MCDOT)
- Maricopa County Environmental Services
- Maricopa County Parks Department
- Maricopa County Planning and Development
- Maricopa Water District
- City of Surprise
- City of Glendale
- City of El Mirage
- Dysart School District
- Major Utility Providers
- Land Developments
- Affected Businesses, Property Owners and Residents

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

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EVALUATION CRITERIA

- Right-of-way impacts
- Compatibility with existing developments
- Compatibility with planned future developments
- Compatibility with existing and planned roadway improvements
- Engineering complexity and constructability
- Public acceptance
- Local agency support
- Drainage/flood control considerations
- Utility considerations
- Environmental considerations

PRELIMINARY KEY ISSUES AND CHALLENGES

Early in the study process, a preliminary list of study issues and potential challenges is compiled. This list expands as the study progresses and input is obtained from public participation.

- Establish future connections of Peoria Avenue to planned roadways such as Jackrabbit Trail Parkway
- Account for future planned connection to SR Loop 303
- Evaluation of drainage structures across major washes, canals and channels
- Evaluation of crossing of the BNSF Railroad
- Maintain functional integrity of roadway through constrained areas
- Maximize use of existing roadway improvements along corridor to reduce costs
- Identify ultimate alignment and access management strategies
- Consideration of environmental constraints

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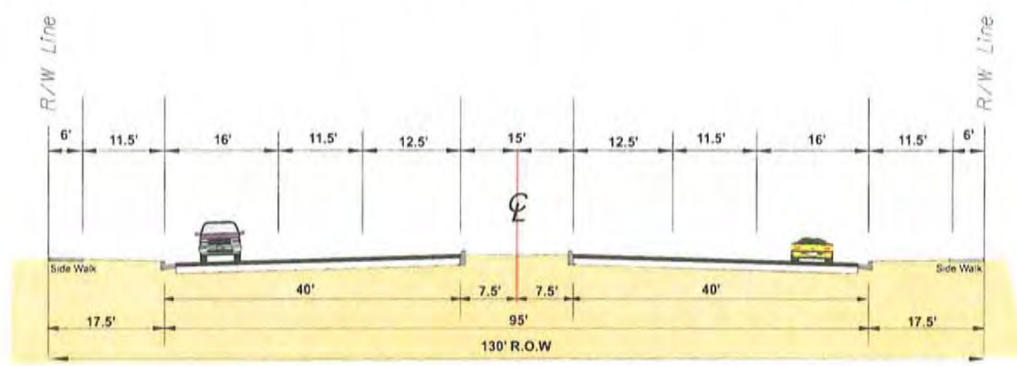
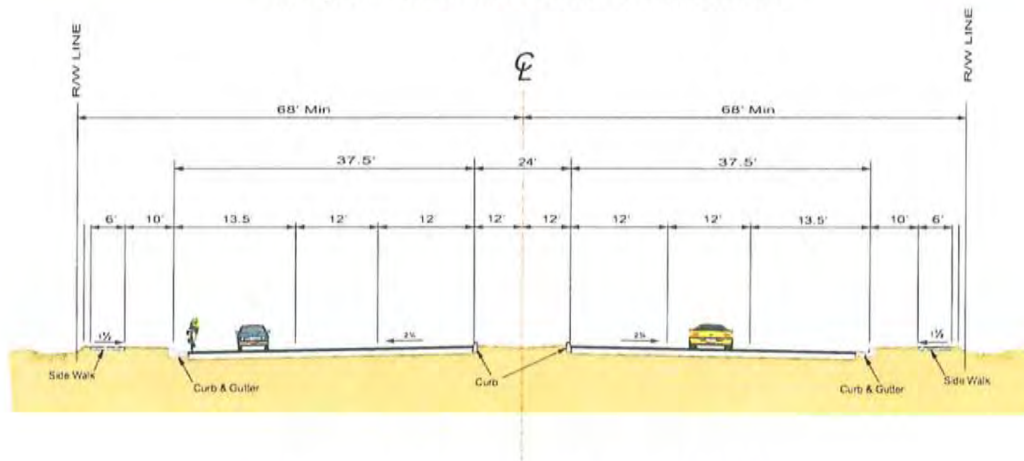
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

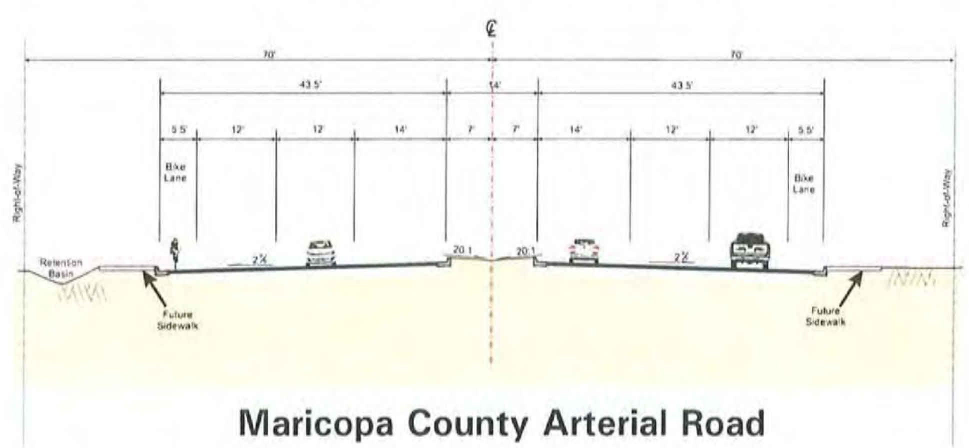
ROADWAY CROSS SECTIONS



City of Glendale Arterial Road



City of Surprise Arterial Road



Maricopa County Arterial Road

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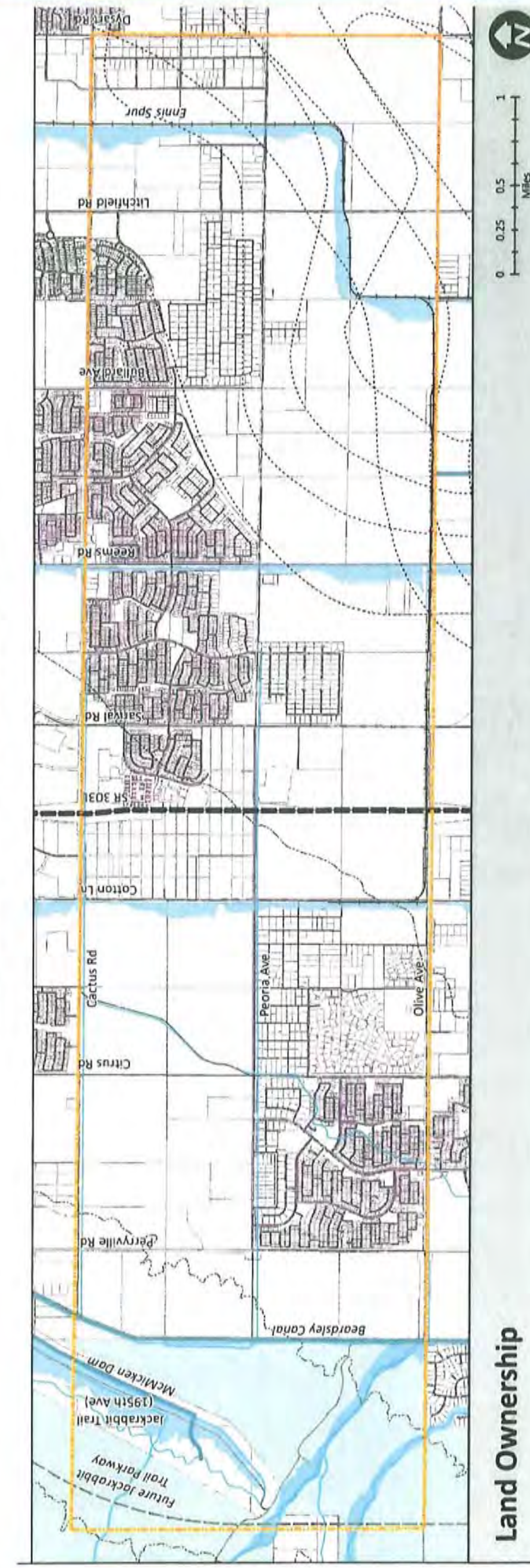
Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

LAND OWNERSHIP



Land Ownership

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Land Ownership

- State Trust Land
- Private Land Parcels

Source: Flood Control District of Maricopa County, ALRIS

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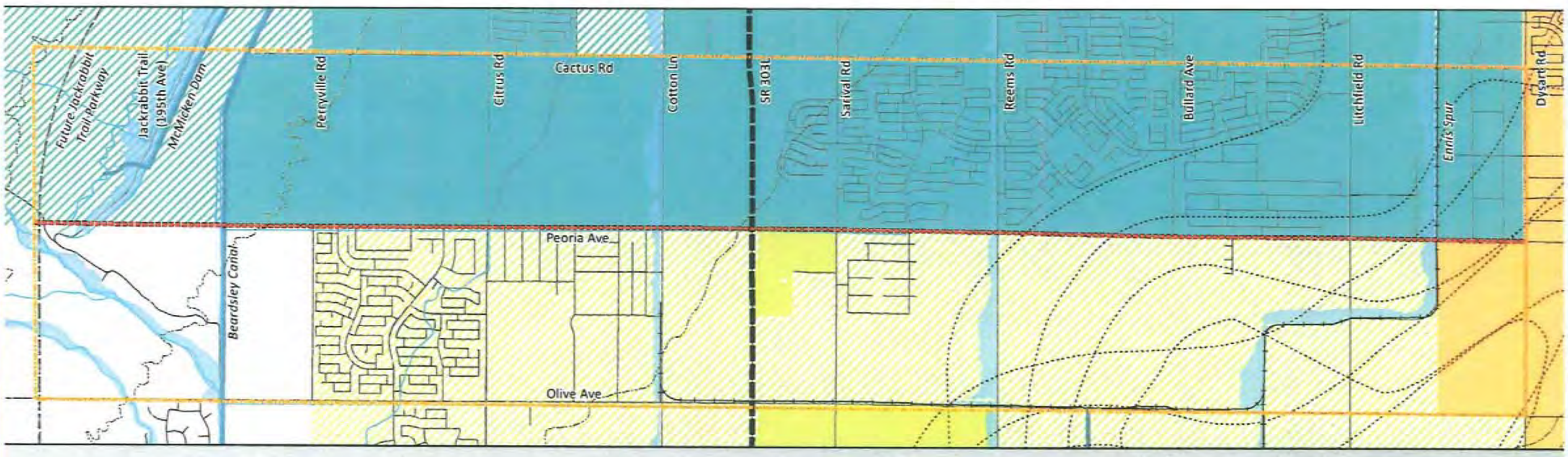
Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

MUNICIPAL PLANNING AREAS AND INCORPORATED AREAS



Municipal Planning Areas and Incorporated Areas

0 0.25 0.5 1 Miles

Legend

- Study Area Boundary
- Peoria Avenue Section Line
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Muncipal Planning Area	Incorporated Areas
El Mirage	El Mirage
Glendale	Glendale
Surprise	Surprise

Source: Flood Control District of Maricopa County, ALRIS

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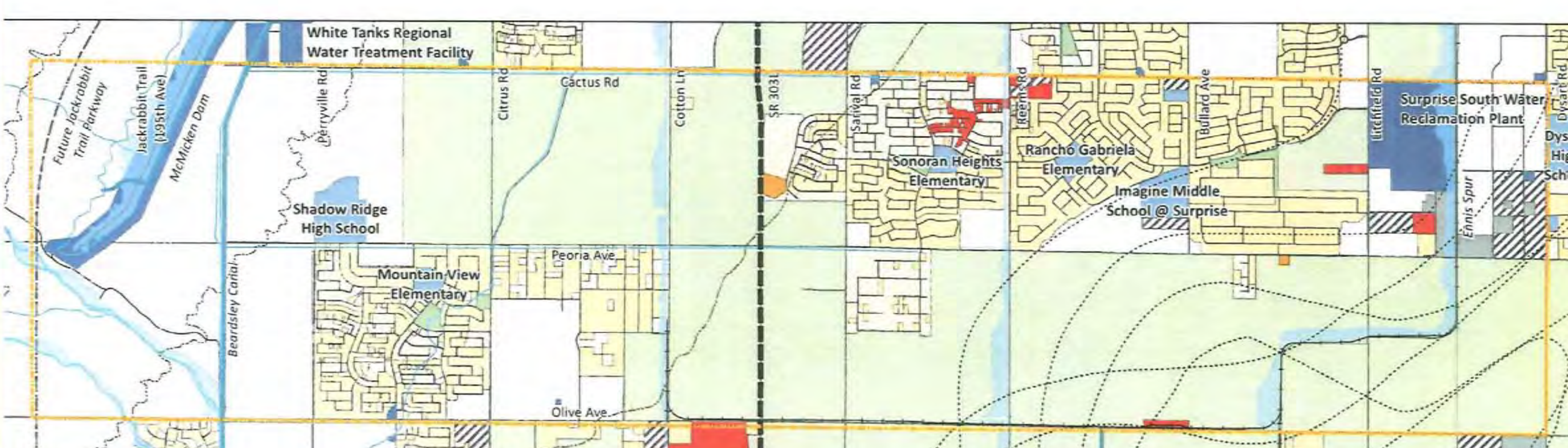
Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

EXISTING LAND USE



Existing Land Use

0 0.25 0.5 1 Miles

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Existing Land Use

- Single-Family Residential
- Multi-Family Residential
- Developing Residential
- Commercial
- Employment
- Developing Employment
- Public Facility
- Institutional
- Industrial
- Open Space
- Agriculture
- Vacant

Source: Flood Control District of Maricopa County, ALRIS, MAG

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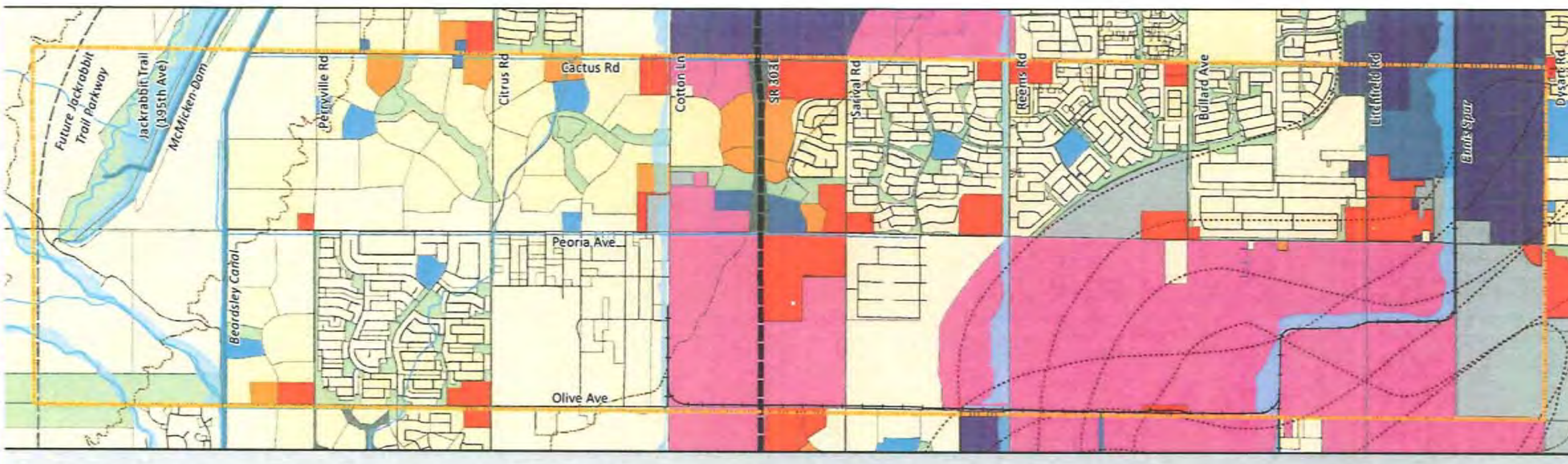
Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

FUTURE LAND USE



Future Land Use

0 0.25 0.5 1 Miles

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Future Land Use

- Single-Family Residential
- Multi-Family Residential
- Mixed Use
- Commercial
- Employment
- Institutional
- Public Facility
- Industrial
- Open Space

ource: Flood Control District of Maricopa County, ALRIS, MAG

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

MASTER PLANNED COMMUNITIES

Master Planned Communities

0 0.25 0.5 1 Miles

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Development Status

- Built Out
- Active
- Entitled

Source: Flood Control District of Maricopa County, ALRIS, MAG 2007, City of Glendale, City of Surprise

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Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

DRAINAGE

Major Drainage Features

0 0.25 0.5 1 Miles

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- Drainage Structure (canal, dam)
- Stream/Wash
- Well

Floodplain

- 100-year floodplain
- Floodway

Source: Flood Control District of Maricopa County, ALRIS

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

AVERAGE DAILY TRAFFIC VOLUMES

2031 Projected Average Daily Traffic Volumes

0 0.25 0.5 1 Miles

Legend

- Study Area Boundary
- Road
- Railroad
- Drainage Structure (canal, dam)
- Stream/Wash

Future Roadway Network

- Freeway
- Parkway
- Arterial

Traffic Interchange

Daily Traffic Volumes

XXX 2031 Projected Average Daily Traffic (from MAG model)

XXX Existing Daily Traffic Volumes (City of Surprise and MCDOT 2008 & 2009; and 2010 field counts)

NOTE: Bullard Avenue from Peoria Avenue to Olive Avenue is not included in the Glendale General Plan, however is in the MAG model network.

Source: Flood Control District of Maricopa County, ALRIS, MAG Travel Demand Model

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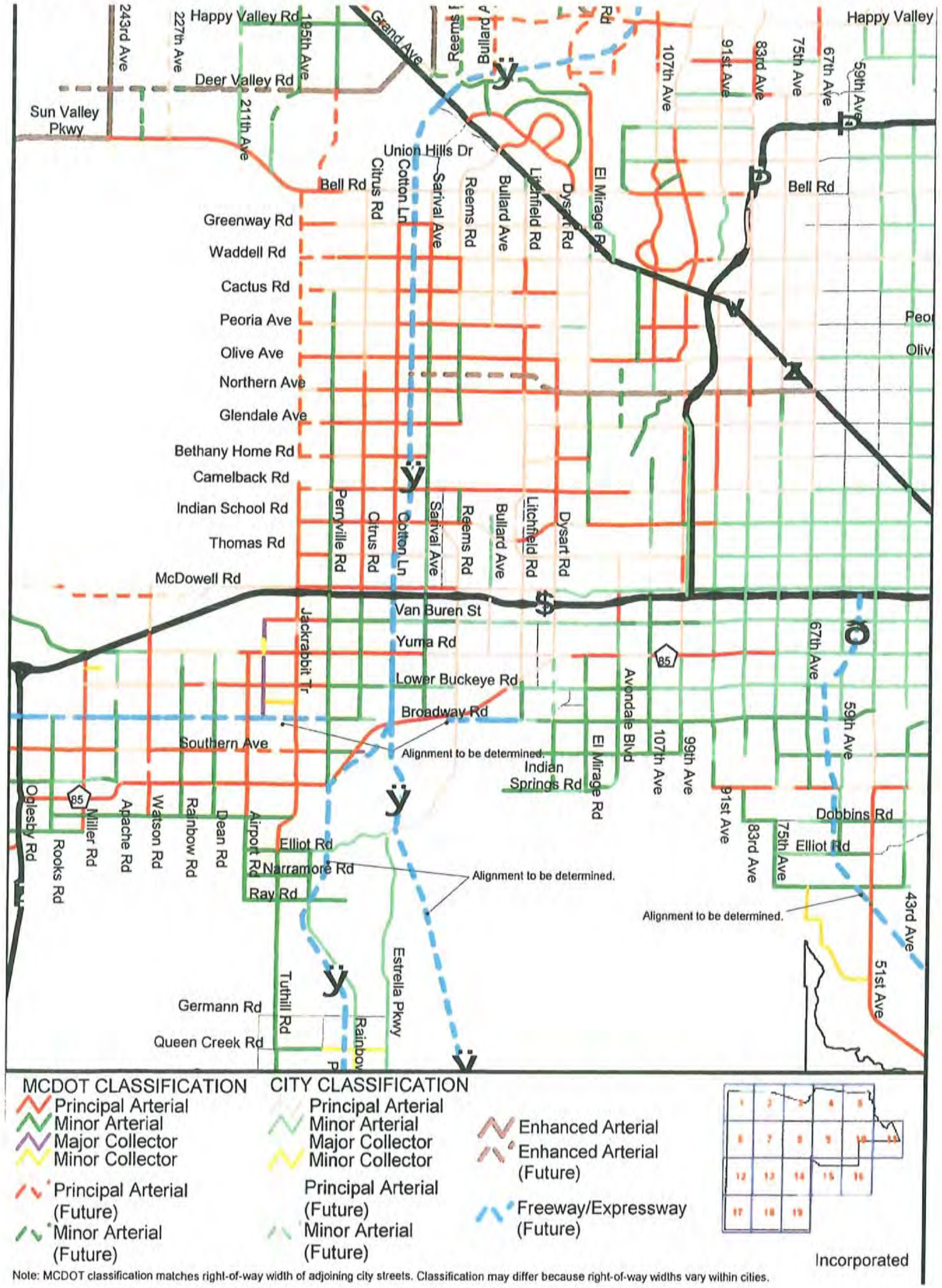
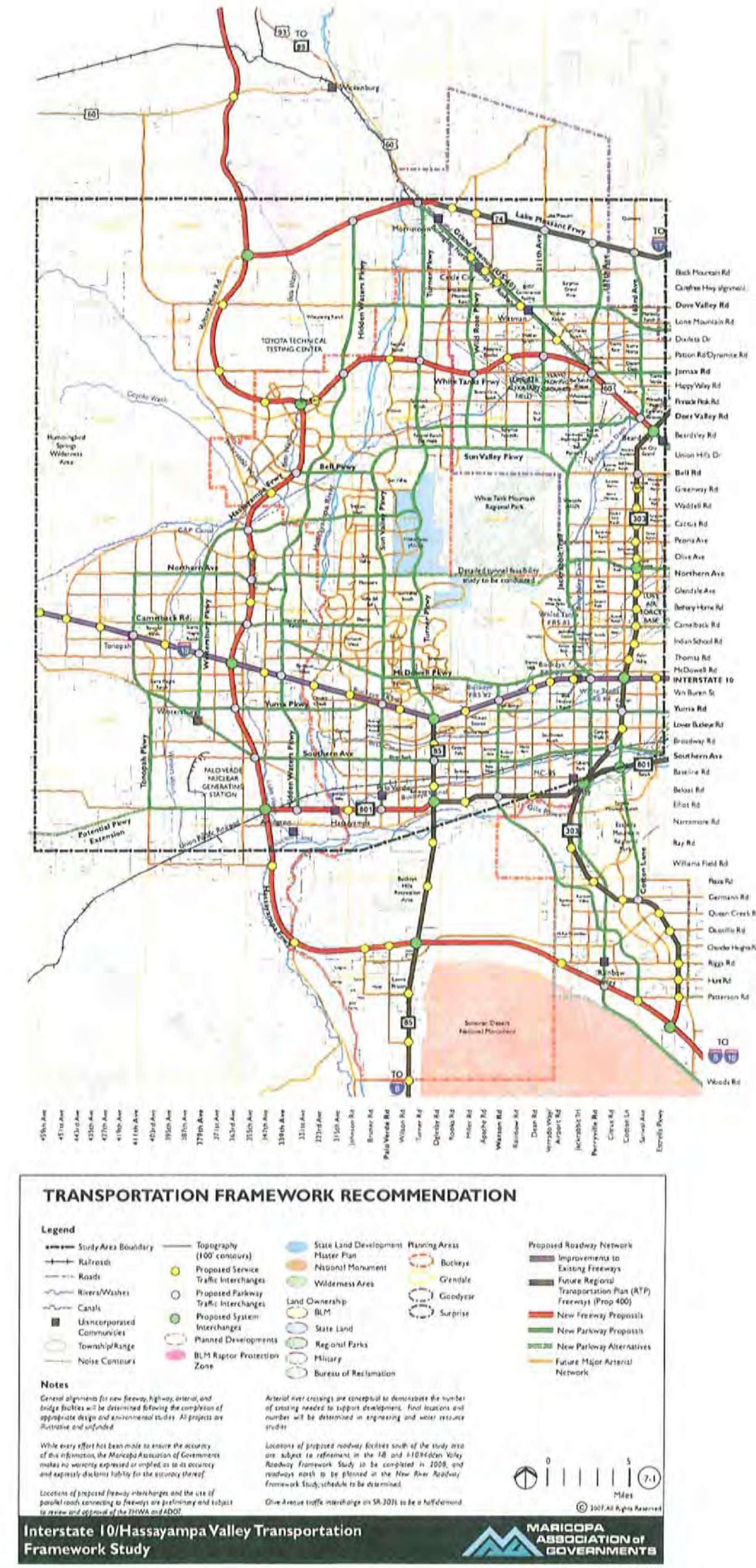
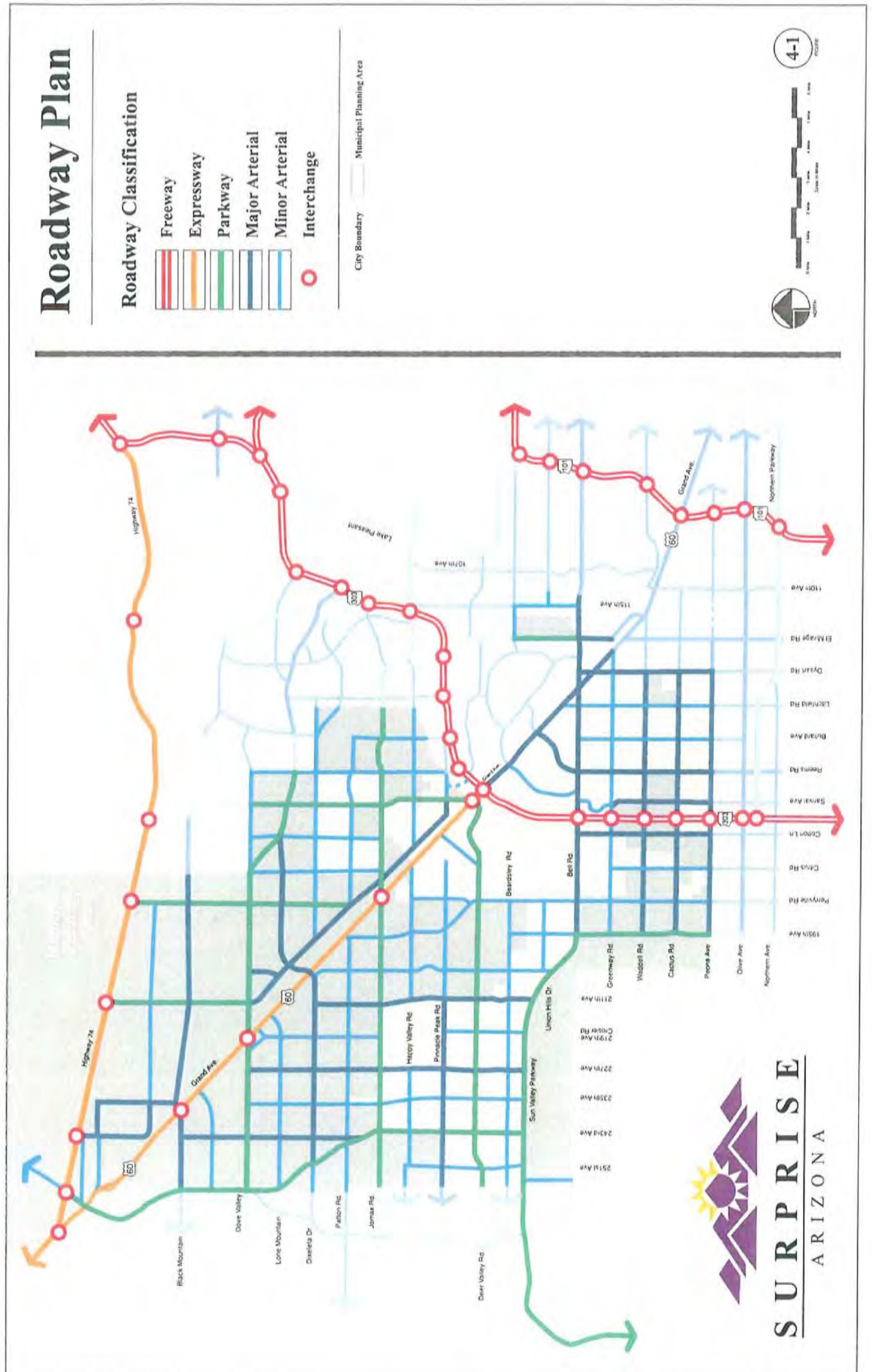
MCDOT Roadway Classification

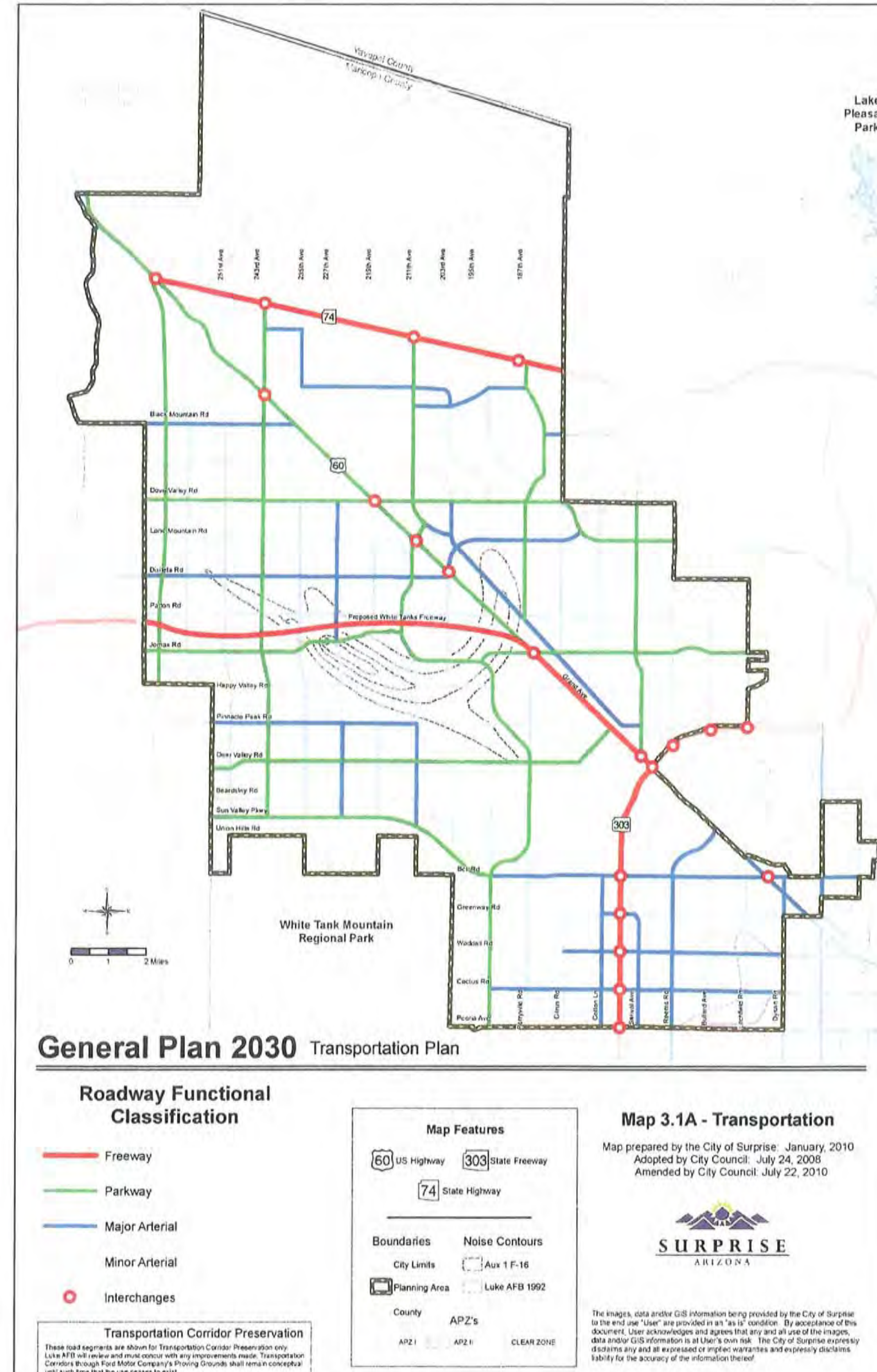


Note: MCDOT classification matches right-of-way width of adjoining city streets. Classification may differ because right-of-way widths vary within cities.





Roadway Plan
Roadway Classification
Freeway
Expressway
Parkway
Major Arterial
Minor Arterial
Interchange
City Boundary
Municipal Planning Area
4-1
SURPRISE
ARIZONA



Lake Pleasant Park
White Tank Mountain Regional Park
General Plan 2030 Transportation Plan
Roadway Functional Classification
Freeway
Parkway
Major Arterial
Minor Arterial
Interchanges
Transportation Corridor Preservation
These road segments are shown for Transportation Corridor Preservation only. Luke AFB will review and must concur with any improvements made. Transportation Corridors through Ford Motor Company's Proving Grounds shall remain conceptual until such time that the use ceases to exist.
Map Features
60 US Highway
303 State Freeway
74 State Highway
Boundaries
City Limits
Planning Area
County
Noise Contours
Aux 1 F-16
Luke AFB 1992
APZ's
APZ I
APZ II
CLEAR ZONE
Map 3.1A - Transportation
Map prepared by the City of Surprise: January, 2010
Adopted by City Council: July 24, 2008
Amended by City Council: July 22, 2010
SURPRISE
ARIZONA
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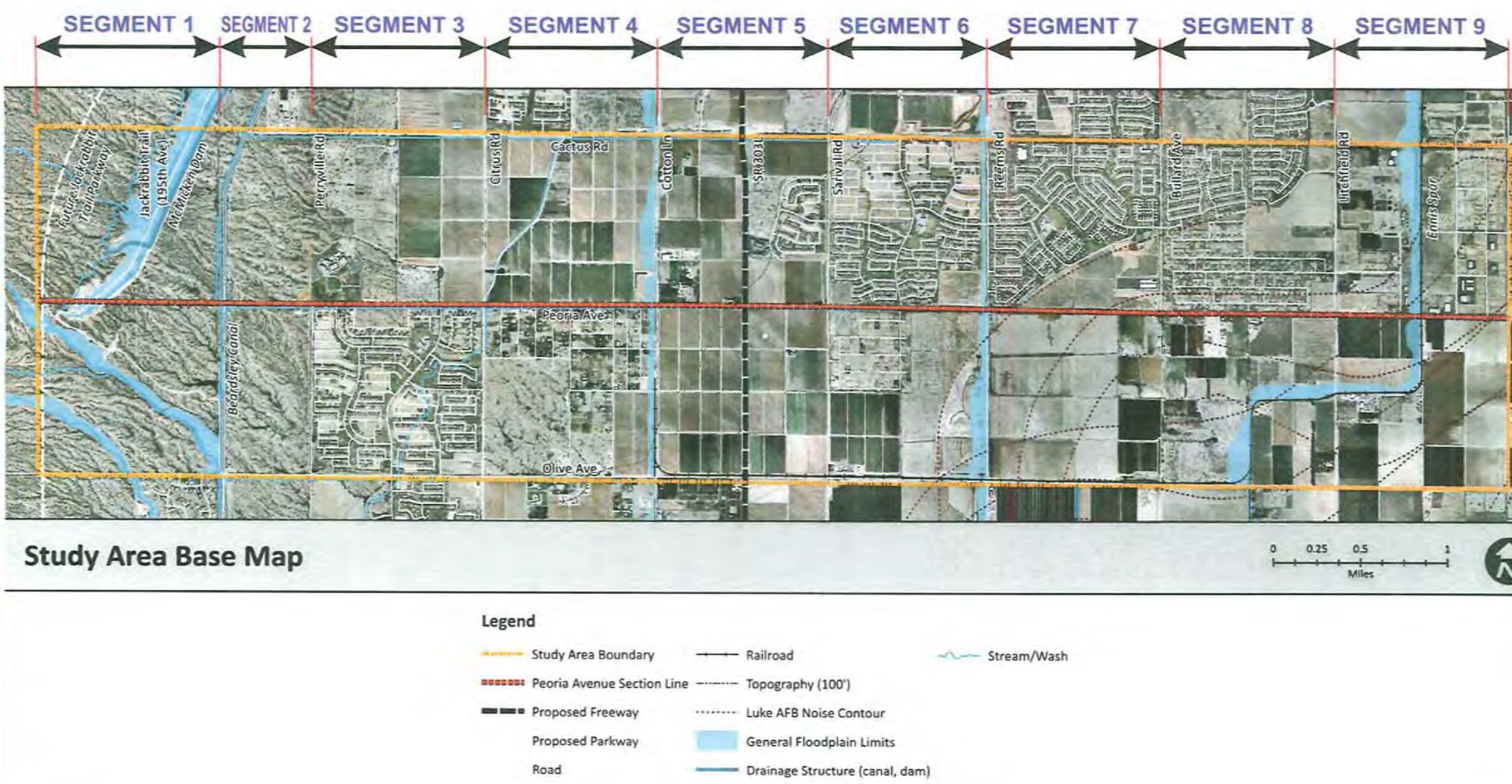
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

BASE MAP



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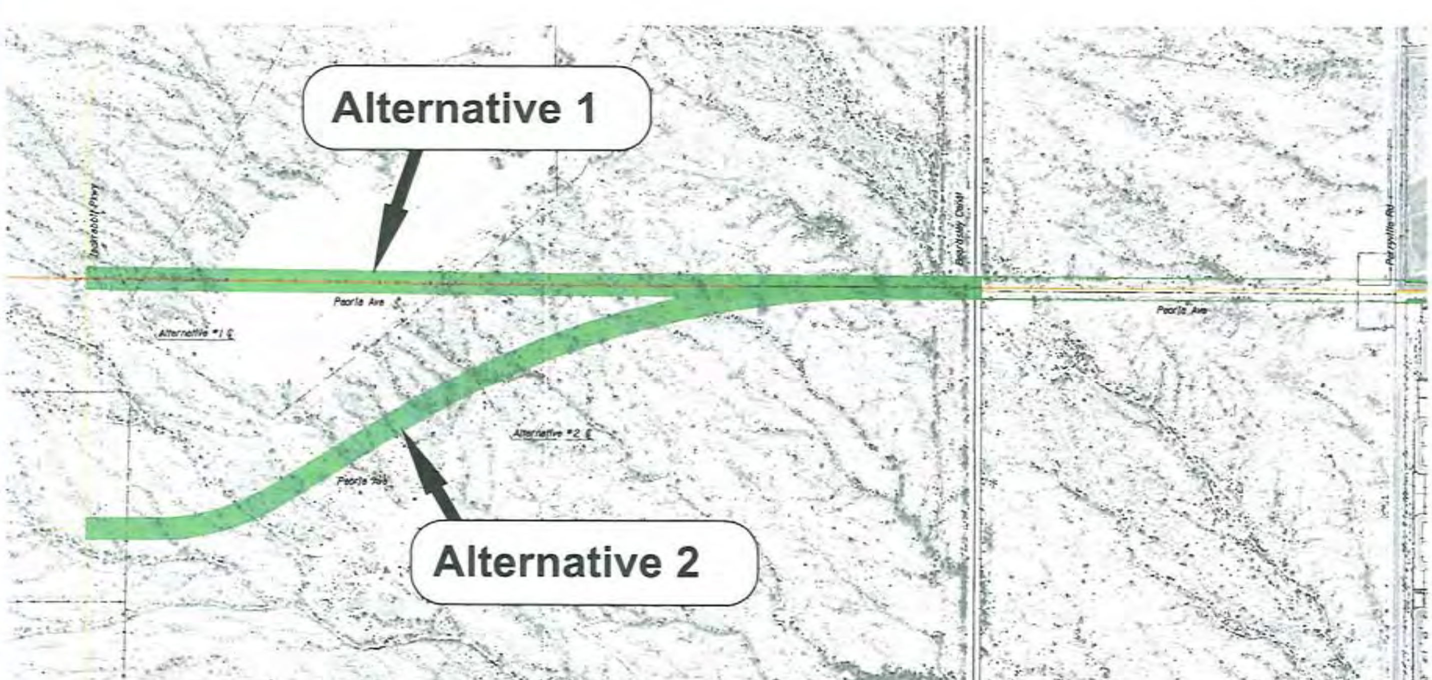
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study



SEGMENT 1:

Jackrabbit Pkwy to Perryville Road

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- Well
- Abandoned Well
- Reclaimed Water Delivery Header

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

Segment 1: Jackrabbit Trail to Beardsley Canal

Criteria		Advanced Candidate Alternative: Alternative 1 (on section line)		Alternative 2 (shift to south)	
Right-of-way Considerations		◒	779k SF	●	825k SF
		◒		●	Higher cost due to additional length
Compatibility with Existing Developments		○	No existing development	○	No existing development
Compatibility with Planned Future Developments		○	Likely to provide more developable land near intersection	◒	
Compatibility with Existing and Planned Roadway Improvements		○	Facilitates 1-mile intersection spacing along Jackrabbit Parkway	◒	
Engineering Complexity & Constructability		◒		●	Numerous wash and floodplain crossing
Public Acceptability					
Local Agency Support					
Drainage/Flood Control Considerations		◒		●	Numerous wash and floodplain crossing
Environmental Considerations	Socioeconomic	○	No known impacts	○	No known impacts
	Physical & Natural	◒		●	Greatest impact to wash corridors and floodplains
	Cultural	●	Impacts to Beardsley Canal	●	Impacts to Beardsley Canal
Utility Considerations		○	No known impacts	○	No known impacts

Segment 3: Perryville Road to Citrus Road

Criteria		Advanced Candidate Alternative: Alternative 1 (on section line)		Alternative 2 (shift 5' south)		Alternative 3 (shift 15' north)	
Right-of-way Considerations		◒	295k SF	◒	293k SF	●	309k SF
		◒		◒		◒	
Compatibility with Existing Developments		◒	Moderate impact to existing land uses	◒	Moderate impact to existing land uses	○	Least impact to existing land uses
Compatibility with Planned Future Developments		◒	Moderate impact to planned land uses	◒	Moderate impact to planned land uses	●	Least compatible with future development to north
Compatibility with Existing and Planned Roadway Improvements		○	Most compatible with existing street improvements	◒		●	
Engineering Complexity & Constructability		○		○		○	
Public Acceptability							
Local Agency Support							
Drainage/Flood Control Considerations		○	Minimal impact	○	Minimal impact	◒	Slight impact to existing drainage channel to the north
Environmental Considerations	Socioeconomic	◒	Slight impact to land; no impact to public access or structures	◒	Slight impact to land; no impact to public access or structures	◒	Slight impact to land; no impact to public access or structures
	Physical & Natural	◒	Some impact to farmland	◒	Some impact to farmland	◒	Some impact to farmland
	Cultural	◒	Impacts to irrigation ditch	◒	Impacts to irrigation ditch	◒	Impacts to irrigation ditch
Utility Considerations		◒	1600 ft lined irrigation ditch, 7 power poles, 2 well sites	◒	1600 ft lined irrigation ditch, 7 power poles, 2 well sites	◒	1600 ft lined irrigation ditch, 7 power poles, 2 well sites

○ Lowest impact/best performance

◒ Moderate impact/moderate performance

● Highest impact/worst performance

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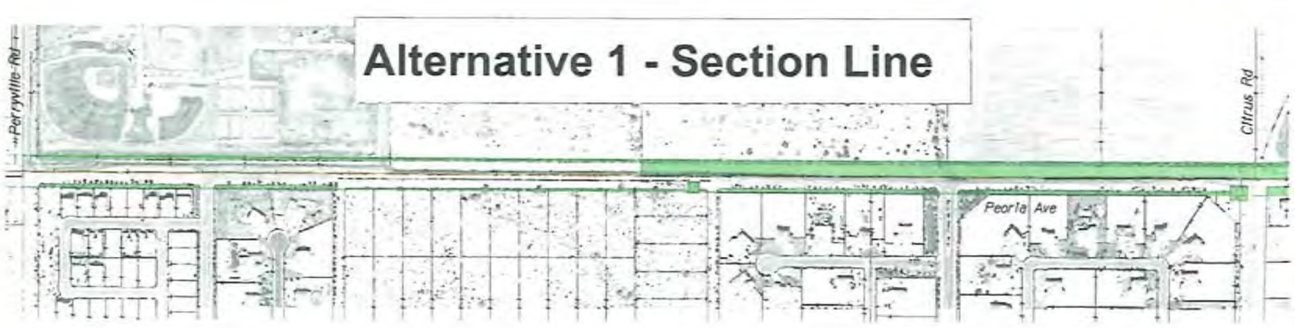
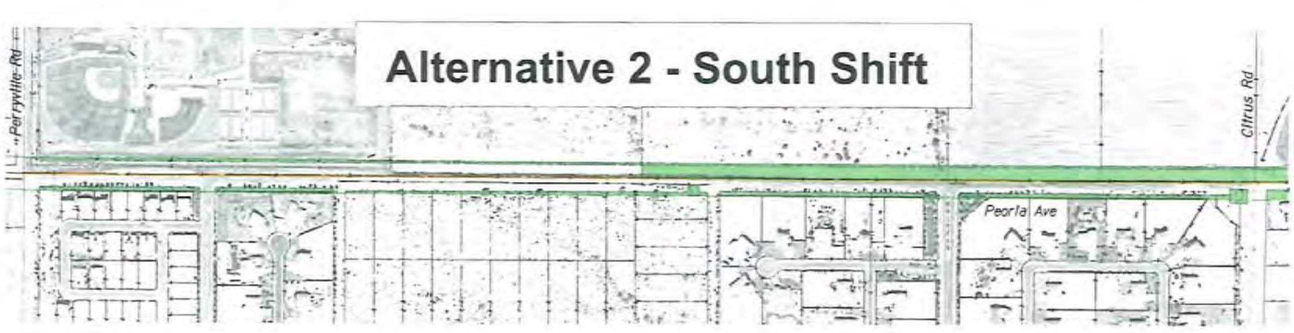
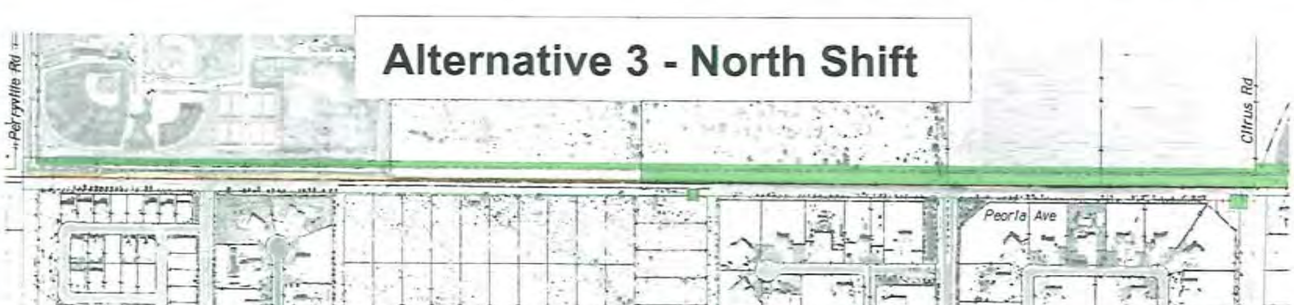
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study







SEGMENT 3:

Perryville Road to Citrus Road

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

SEGMENT 4:

Citrus Road to Cotton Lane

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

Segment 4: Citrus Road to Cotton Lane

Criteria		Advanced Candidate Alternative: Alternative 1 (on section line)	Alternative 2 (shift 5' south)	Advanced Candidate Alternative: Alternative 3 (shift 37' north)
Right-of-way Considerations	Area	◒ 716k SF	◒ 716k SF	◒ 718k SF
	Cost	◒	● Higher cost likely to south	○
Compatibility with Existing Developments		◒ Balances impacts	● Greatest impact to most properties	○ No known impacts
Compatibility with Planned Future Developments		◒ Balances impacts	○ No new planned development to south	● All planned development to the north
Compatibility with Existing and Planned Roadway Improvements		○ Half-street constructed at Citrus	◒	◒
Engineering Complexity & Constructability		◒ Access fronting Peoria Ave	◒ Access fronting Peoria Ave	○ Opportunity for frontage road
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		◒ No existing drainage infrastructure constructed; must continue channel from the west	◒ No existing drainage infrastructure constructed; must continue channel from the west	◒ No existing drainage infrastructure constructed; must continue channel from the west
Environmental Considerations	Socioeconomic	● Impacts to private property	● Impacts to private property	○ No known impacts
	Physical & Natural	◒ Balances impacts	◒ Balances impacts	● Impacts to farmland
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch
Utility Considerations		● 1 well site; 5200 ft lined irrigation ditch; 20 power poles	● 1 well site; 5200 ft lined irrigation ditch; 20 power poles	◒ 5200 ft lined irrigation ditch; 20 power poles

Segment 5: Cotton Lane to Sarival Road

Criteria		Advanced Candidate Alternative: Alternative 1 (on section line)	Alternative 2 (shift 55' south)	Alternative 3 (shift 55' north)
Right-of-way Considerations		● 543k SF	◒ 453k SF	◒ 457k SF
		◒	○ Lower cost to south	● Highest cost to north
Compatibility with Existing Developments		◒ Balances impacts	○ No known impacts	● Impacts property to the north
Compatibility with Planned Future Developments		○ Least impact to all properties	◒ Balances impacts	● Greatest impact to most properties
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible w/ ADOT's plans for SR303L interchange	◒	◒
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		○ Minimal impacts	○ Minimal impacts	○ Minimal impacts
Environmental Considerations	Socioeconomic	◒ Minor impacts to existing land uses	◒ Minor impacts to existing land uses	◒ Minor impacts to existing land uses
	Physical & Natural	◒ Minor impacts to farmlands	◒ Minor impacts to farmlands	◒ Minor impacts to farmlands
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	○ No known impacts
Utility Considerations		● 2 well sites; 4300 ft lined irrigation ditch; 14 power poles	● 2 well sites; 4300 ft lined irrigation ditch; 6 power poles	○ 8 power poles

○ Lowest impact/best performance

◒ Moderate impact/moderate performance

● Highest impact/worst performance

Maricopa County Department of Transportation

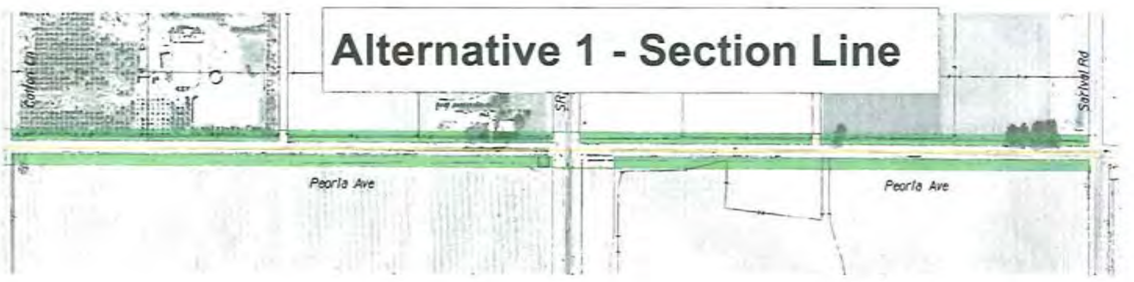
AECOM

PEORIA AVENUE

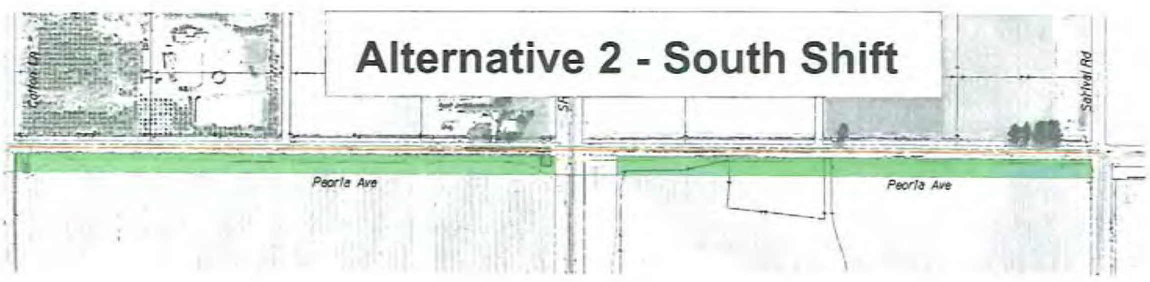
Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

MARICOPA COUNTY MCDOT TRANSPORTATION
Right Road Right Time Right Cost

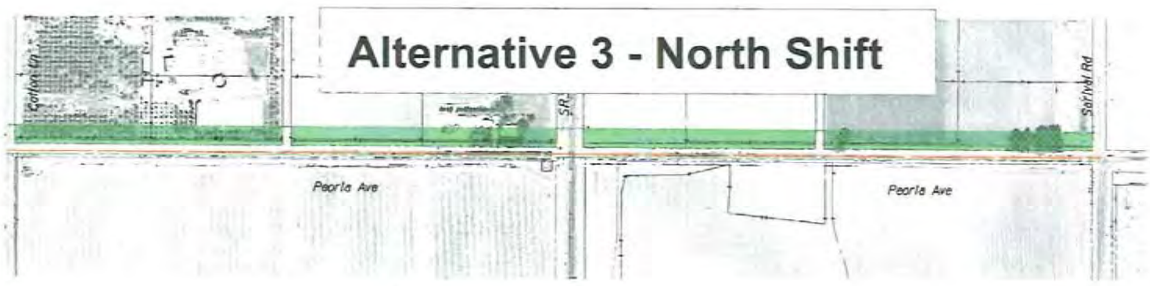
Alternative 1 - Section Line



Alternative 2 - South Shift



Alternative 3 - North Shift



SEGMENT 5:

Cotton Lane to Sarival Road

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header

Maricopa County Department of Transportation

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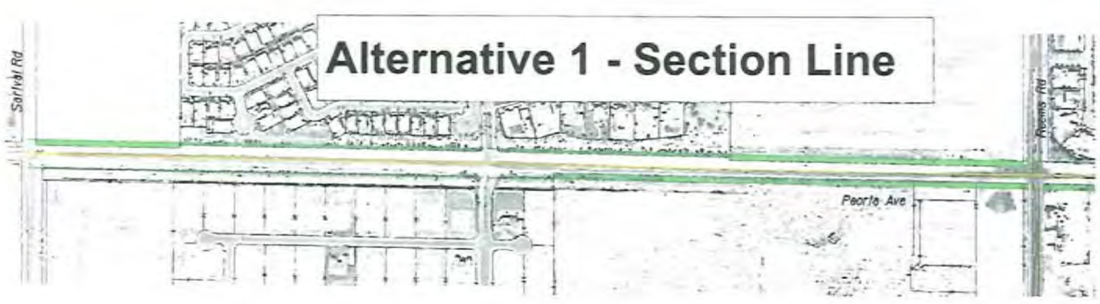
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

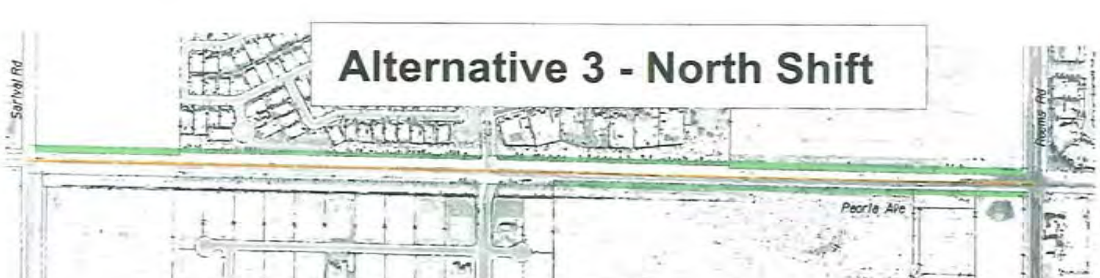
MARICOPA COUNTY MCDOT TRANSPORTATION
Right Road Right Time Right Cost

Alternative 1 - Section Line



Alternative 2 - South Shift

Alternative 3 - North Shift



SEGMENT 6:

Sarival Road to Reems Road

N

Legend

- Section Line
- Roadway ℄
- New R W
- Existing R/W
- R/W Aquisition
- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header

Maricopa County Department of Transportation

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MARICOPA COUNTY MCDOT TRANSPORTATION
Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

Segment 6: Sarival Road to Reems Road

Criteria		Advanced Candidate Alternative Alternative 1 (on section line)	Alternative 2 (shift 15' south)	Alternative 3 (shift 5' north)
Right-of-way Considerations		◒ 182k SF	◒ 182k SF	◒ 182k SF
		◒	○	● Greatest impact to existing and planned developments in right-of-way
Compatibility with Existing Developments		○ Balances impacts to both sides	◒ Minor impacts to south side	◒ Minor impacts to north side
Compatibility with Planned Future Developments		◒ Minor impact to future development to north	○ No known future development to south	● Impacts future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible with existing street and Reems Rd intersection	● Not compatible with existing street and Reems Rd intersection	◒ Not compatible with existing street but more compatible than #2 with Reems Rd intersection
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		○ Least impact to existing drainage facilities	◒ Minor impacts to existing drainage facilities	◒ Minor impacts to existing drainage facilities
Environmental Considerations	Socioeconomic	○ Minimal impact	○ Minimal impact	○ Minimal impact
	Physical & Natural	○ Minimal impact	○ Minimal impact	○ Minimal impact
	Cultural	○ No known impact	○ No known impact	○ No known impact
Utility Considerations		○ No known impacts to irrigation or power lines	◒ Potential relocation of underground irrigation facilities	○ No known impacts to irrigation or power lines

Segment 7: Reems Road to Bullard Ave

Criteria		Advanced Candidate Alternative Alternative 1 (on section line)	Alternative 2 (shift 5' south)	Advanced Candidate Alternative Alternative 3 (shift 30' north)
Right-of-way Considerations		◒ 227k SF	◒ 227k SF	◒ 224k SF
		◒	◒	● Higher cost likely to north; encroachment into residential lots
Compatibility with Existing Developments		◒ Balances impacts	◒ Balances impacts	● All existing development to the north
Compatibility with Planned Future Developments		◒ Balances impacts to both sides	○ No future development plans to the south	● All future development plans to the north
Compatibility with Existing and Planned Roadway Improvements		○ Reems Road improved to full street section; centered on section line	◒	◒
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		○ No known impacts	○ No known impacts	○ No known impacts
Environmental Considerations	Socioeconomic	◒ Impacts to agriculture	◒ Impacts to agriculture	● Impacts to private property
	Physical & Natural	● Potential impact to farms and habitat	● Potential impact to farms and habitat	◒ Potential impact to habitat
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	○ No known impacts
Utility Considerations		● 5 well sites; 4500 ft lined irrigation ditch; 16 power poles	◒ 5 well sites; 4500 ft lined irrigation ditch	○ 3 well sites; 16 power poles

○ Lowest impact/best performance
◒ Moderate impact/moderate performance
● Highest impact/worst performance

Maricopa County Department of Transportation

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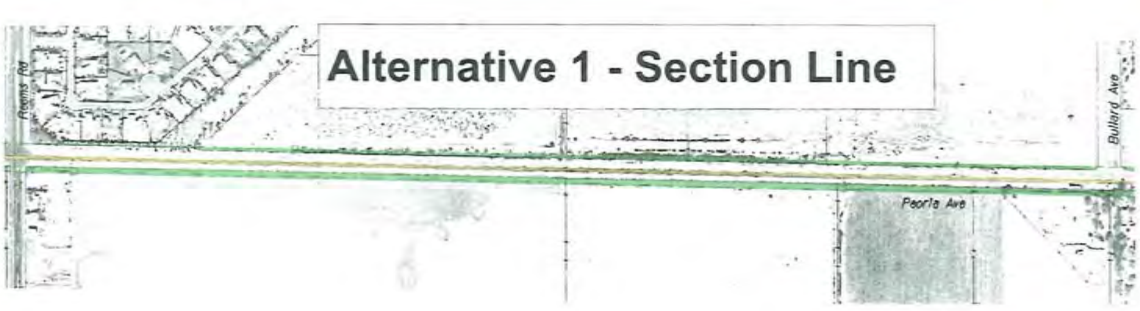
Right Road Right Time Right Cost

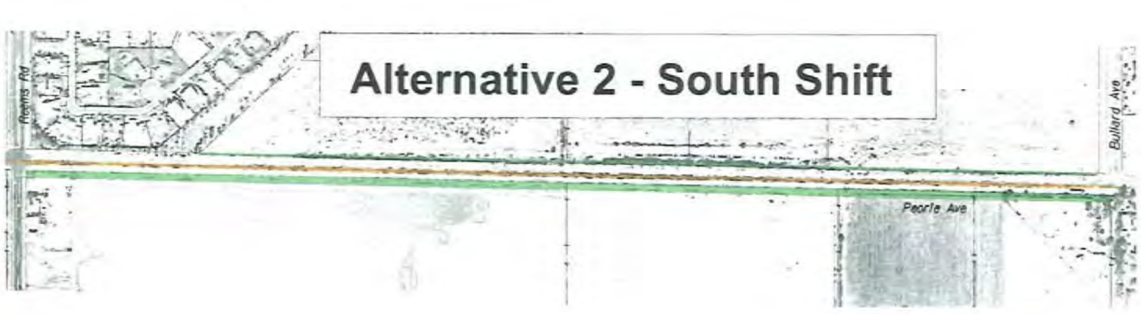
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

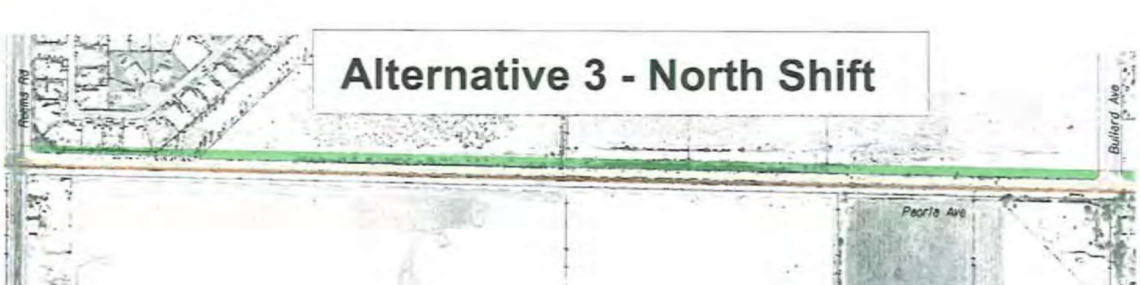
Alternative 1 - Section Line



Alternative 2 - South Shift



Alternative 3 - North Shift



SEGMENT 7:

Reems Road to Bullard Ave

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header

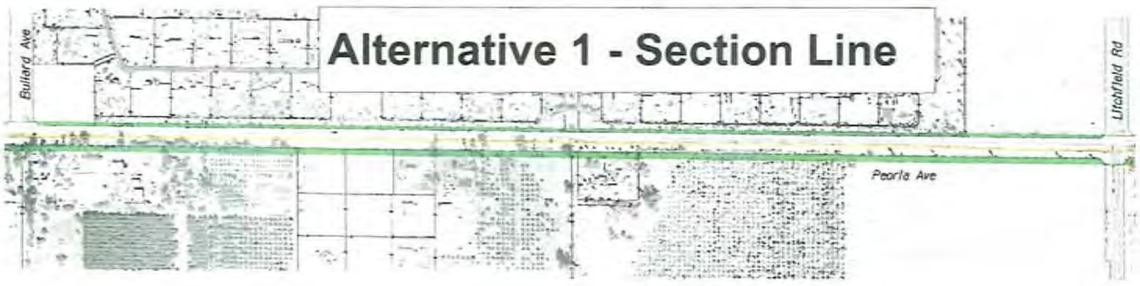
Maricopa County Department of Transportation

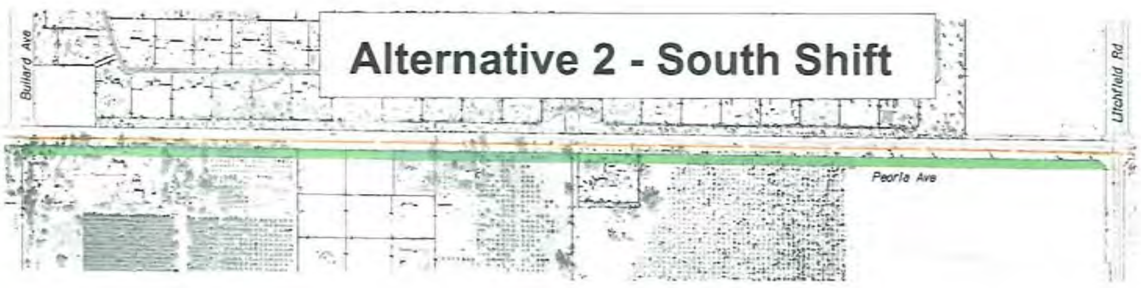
AECOM

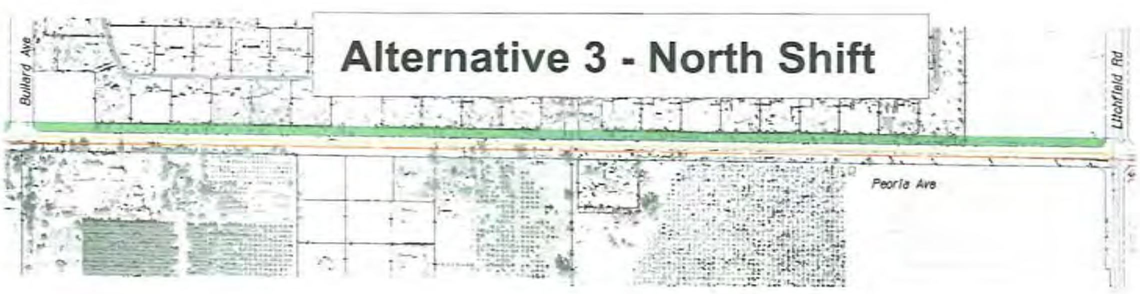
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

MARICOPA COUNTY MCDOT TRANSPORTATION
Right Road Right Time Right Cost







SEGMENT 8:

Bullard Ave to Litchfield Road

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

MARICOPA COUNTY MCDOT TRANSPORTATION
Right Road Right Time Right Cost

Segment 8: Bullard Ave to Litchfield Rd

Criteria		Advanced Candidate Alternative Alternative 1 (on section line)	Alternative 2 (shift 15' south)	Alternative 3 (shift 30' north)
Right-of-way Considerations		◒ 235k SF	◒ 235k SF	◒ 233k SF
		◒	● Highest cost likely to south	○
Compatibility with Existing Developments		◒ Balances impacts	● Impacts land uses to south	● Impacts land uses to north
Compatibility with Planned Future Developments		◒ Minor impacts to future development	○ No future development to south	● Impacts to future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Litchfield and Bullard intersections fully improved, centered on section line	◒	●
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		◒ Minor impacts to existing drainage facilities	○ Least impacts to existing drainage facilities	● Most impacts to existing drainage facilities (channel and box culverts)
Environmental Considerations	Socioeconomic	◒ Balanced impacts	● Impacts to private property lots	○ No known impacts
	Physical & Natural	◒ Balanced impacts	● Greatest impact to farmland and potential habitat areas	○ No known impacts
	Cultural	○ No known impacts	○ No known impacts	○ No known impacts
Utility Considerations		◒ 2 well sites	● 4 well sites	○ No well sites impacted

Segment 9: Litchfield Rd to Dysart Rd

Criteria		Alternative 1 (on section line)	Advanced Candidate Alternative Alternative 2 (shift south)	Alternative 3 (shift north)
Right-of-way Considerations		○ 257k SF	● 300k SF	○ 252k SF
		◒ Moderate costs	○ Lowest cost likely to south	● Highest cost likely to north, including potential building takes
Compatibility with Existing Developments		◒ Minor impacts to land uses to north	○ No known impacts	● Impacts to land uses to north
Compatibility with Planned Future Developments		○ No known impacts to future development	◒ Minor impacts to future development to south	● Impacts future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible with existing half-streets and Litchfield and Dysart intersections	◒ Balances impacts	● Least compatible with existing half-streets and Litchfield and Dysart intersections
Engineering Complexity & Constructability		○	○	○
Public Acceptability				
Local Agency Support				
Drainage/Flood Control Considerations		◒ Balances impacts	○ Least impact to existing drainage facilities	● Most impact to existing drainage facilities
Environmental Considerations	Socioeconomic	◒ Balances impacts	○ No known impacts	● Impacts to private property to north
	Physical & Natural	◒ Balances impacts	● Greatest impact to farmland	○ No known impacts
	Cultural	● Impacts to Ennis Spur	● Impacts to Ennis Spur	● Impacts to Ennis Spur
Utility Considerations		● 2 well sites; 2 reclaim taps; 7 power poles	● 2 well sites; 2 reclaim taps; 7 power poles	○ No well sites, reclaim taps or power poles

○ Lowest impact/best performance

◒ Moderate impact/moderate performance

● Highest impact/worst performance

Maricopa County Department of Transportation

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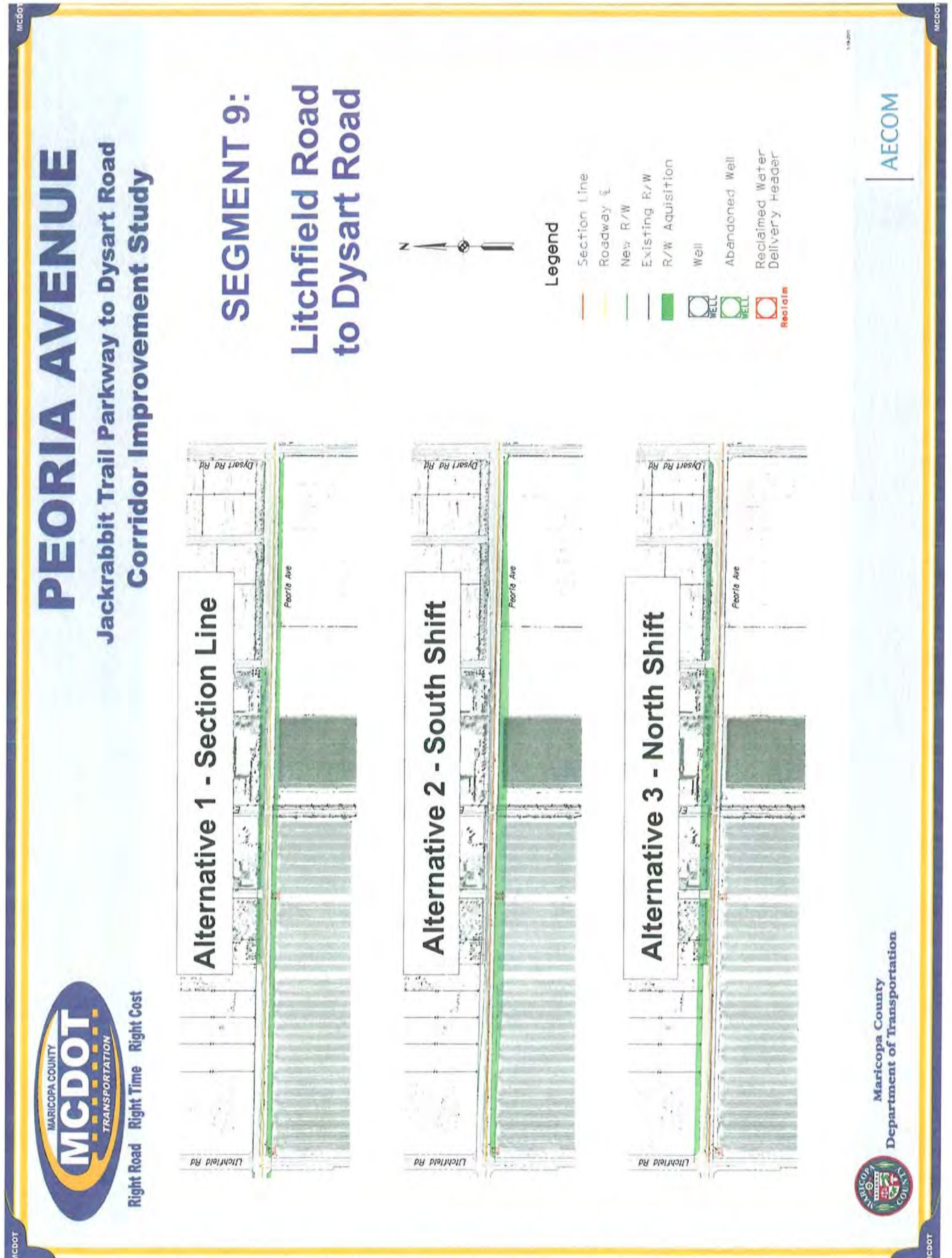


MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

We Need Your Input
Peoria Avenue
Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Findings & Recommendations Phase Public Input Meeting

The Maricopa County Department of Transportation's (MCDOT) ***RightRoads* Program**, is conducting the final in a series of three public open house meetings to gather community input about potential improvements along an eight-mile section of Peoria Avenue between Jackrabbit Trail Parkway and Dysart Road. The study goal is to identify and establish the future roadway type, alignment and right-of-way requirements along the Peoria Avenue corridor to safely address forecast travel demands and to accommodate the future six-lane major arterial roadway as identified in the Surprise, Glendale, MCDOT and MAG (Maricopa Association of Governments) long range transportation plans.

This final "Study Findings and Recommendations" public input meeting will provide area residents and other impacted study stakeholders with an opportunity to inform study team members about study area issues and local transportation needs. Evaluated alternatives along with the recommended "preferred" roadway cross section and future roadway alignment will be presented for public review and comment. Project information maps and exhibits will be available for viewing during the meeting. Stop by anytime between 5:00 p.m. and 7:00 p.m. to speak with MCDOT project team members.

For more information, contact Mitch Wagner at (602) 506-8054 write to Wagner at: MCDOT, 2901 W. Durango Street, Phoenix, AZ 85009, or e-mail at: mitchwagner@mail.maricopa.gov or contact Roberta Crowe, Public Information Officer at (602) 506-8003, robertacrowe@mail.maricopa.gov.

Public Open House

Tuesday, March 22, 2011
5:00 p.m. to 7:00 p.m.

Shadow Ridge High School

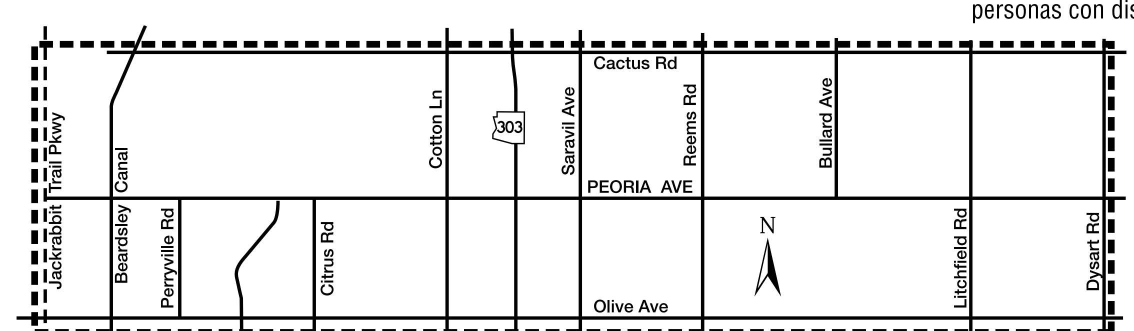
10909 N. Perryville Road
Surprise, AZ 85388
(On Perryville Road just north of Peoria Avenue)

The Peoria Avenue Corridor Improvement Study is one of several long range transportation planning studies currently being conducted by MCDOT on future West Valley roadways identified in the recently completed Maricopa Association of Governments (MAG) I-8/I-10 Hidden Valley Transportation Framework and Interstate 10/Hassayampa Roadway Framework Studies.

Reasonable accommodations may be made available for people with disabilities with a minimum 72-hour notice. For more information on such accommodations, contact Roberta Crowe at **(602) 506-8003**.

Si desea recibir esta información en Español, favor llame (480) 350-9288.

Con adviso de setenta y dos horas o más, es posible obtener plans reasonables para personas con discapacidades; lo mismo para representantes que hablan Español. Si quiere más información, llame (480) 350-9288.



District 4 Supervisor, Max Wilson
www.mcdot.maricopa.gov

MARICOPA COUNTY MCDOT TRANSPORTATION
Right Road Right Time Right Cost

Findings & Recommendations Phase Public Input Meeting Newspaper Advertisement

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

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Peoria Avenue
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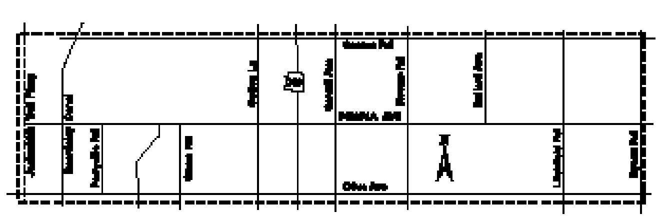


District 4 Supervisor, Max Wilson
www.mcdot.maricopa.gov

- Arizona Republic
- Buckeye Valley News
- Surprise Independent
- West Valley View

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

Safe Driving Tips:

Inoperative Traffic Light/Power Outage
- Treat the intersection just like a four-way STOP!

Flooded Roadway and Washes
- Don't Risk It!
- Never cross a rain-swollen wash
- Do not drive around roadway barriers
- Never underestimate the power and force of water
- A vehicle is NOT a flotation device!

Dust Storms
- Turn your headlights on and slow to a prudent speed
- If you pull off the road, get as far to the right as possible. Turn off the car and headlights, and set the parking brake
- Keep your foot off the brake pedal – other drivers may think you're a car in motion

Share the Ride!
Do your part to help improve air quality in Maricopa County. If you are planning on attending this public input meeting, why not car pool with a neighbor? Learn more ways to reduce ozone pollution by visiting **www.maricopa.gov/aq**.

Maricopa County Green Government Initiative

Study Schedule

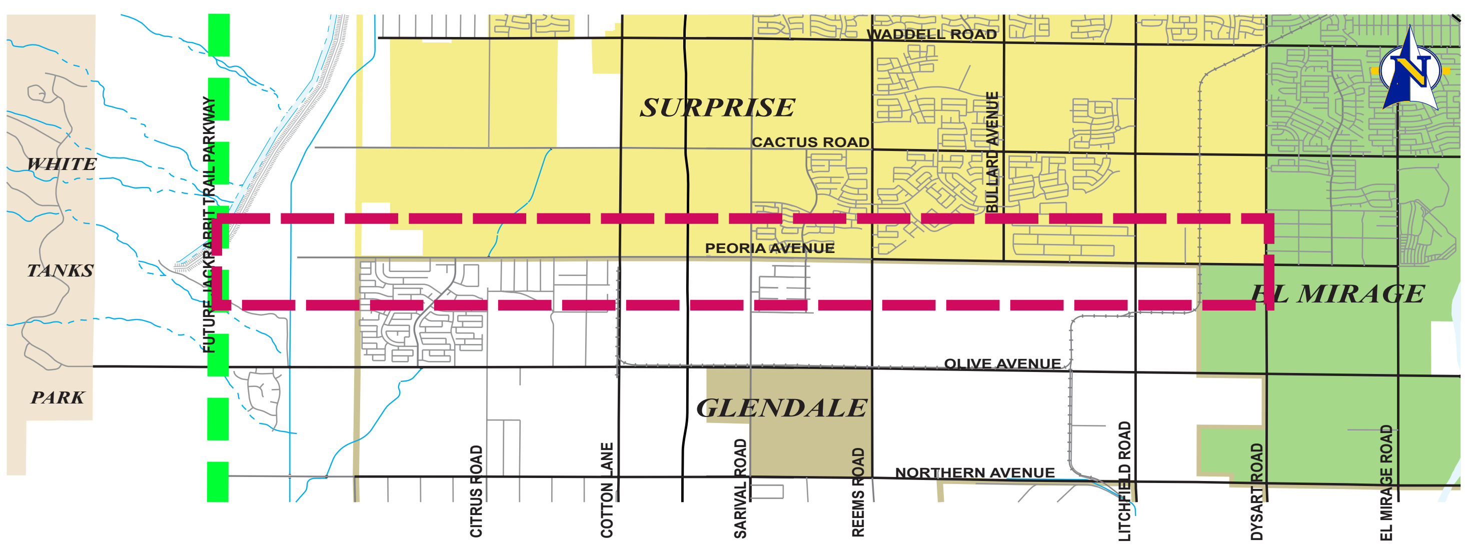
Project Kick-off & Study Initiation	July 2010
PHASE I: Data Collection/Issues Identification	July - September 2010
Public Input Meeting #1 (Scoping Phase)	**September 20, 2010**
PHASE II: Alternatives Development and Evaluation	October 2010 - January 2011
Public Input Meeting #2 (Alternatives Analysis Phase)	**January 2011**
Public Input Meeting #3 (Findings & Recommendations)	**March 22, 2011**
Study Completion/Final Report	June 2011

Public Involvement

Gaining consensus among the jurisdictional agencies and the public is critical to the success of the study and implementation of its recommendations to provide a safe and efficient roadway for the long term. A total of three public input meetings are planned during the course of the study process. The first public input meeting (September 20, 2010) was held during the data collection and Scoping Phase to inform the public of the objectives of the study and provide area residents and other stakeholders with an opportunity to inform project team members about study area issues and local transportation needs. This meeting also provided the public an opportunity to contribute feedback on the study purpose, goals, and objectives.

The second public input meeting (January 18, 2011) was conducted during the Alternatives Analysis Phase. This meeting served to provide the results of the issues and constraints identification process and reviewed the candidate alignment evaluation criteria. This meeting also presented the conceptual alternative alignments, and gathered more public feedback to assist further development and evaluation of the advanced Candidate Alternatives, leading to the study's primary objective, the selection of a Preferred Alignment.

The third and final public input meeting (March 22, 2011) is held during the Findings and Recommendations Phase of the study. This meeting reviews the results of the Candidate Alternative evaluation process, presents the Preferred Alternative (recommended alignment), and gathers additional public input and feedback for use in the development of the final report. Public participation and feedback during each phase of the study process is very important and a vital component of study development.



LEGEND

STUDY AREA

Maricopa County
Department of Transportation

www.mcdot.maricopa.gov

PEORIA AVENUE

Corridor Improvement Study

Jackrabbit Trail Parkway to Dysart Road

"Findings & Recommendations"

Right Road Right Time Right Cost

Maricopa County Department of Transportation **March 22, 2011**

Background

The Peoria Avenue Corridor Improvement Study (Jackrabbit Trail Parkway to Dysart Road) is one of a series of long-range transportation planning studies being conducted by the Maricopa County Department of Transportation (MCDOT). The City of Surprise, City of Glendale, City of El Mirage, and Maricopa County transportation plans all include Peoria Avenue as a future arterial roadway from Jackrabbit Trail Parkway to Dysart Road. The Maricopa Association of Governments (MAG) recently prepared the Interstate 10/Hassayampa Valley Transportation Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the build out of the area west of SR 303L. This long range regional transportation study identified the need for future roadway network consisting of freeways, parkways, and major arterial roads.

The MAG Hassayampa Framework Study recommended an extension of Peoria Avenue westward from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial roadway from the future Jackrabbit Trail Parkway to Sarival Avenue.

This study will identify the preferred alignment and "footprint" for the future Peoria Avenue between Jackrabbit Trail Parkway and Dysart Road and will facilitate future roadway implementation by developers and local jurisdictions, providing a cohesive transportation corridor, compatible with the City of Surprise, City of Glendale, City of El Mirage, Maricopa County, and MAG transportation plans.

Corridor Description

The Peoria Avenue Corridor study area includes the segment of Peoria Avenue between the future Jackrabbit Trail Parkway alignment and Dysart Road. The study area generally encompasses a two-mile wide corridor centered on the existing Peoria Avenue alignment.

Today's Peoria Avenue generally consists of a two-lane roadway (one travel lane in each direction). Half-street improvements have been constructed along the north side of Peoria Avenue adjacent to developments such as Shadow Ridge High School, Greer Ranch subdivision, Copper Canyon Ranch subdivision and Skyway Business Park. Improvements on the south side of Peoria Avenue have been constructed adjacent to the Cortessa subdivision. The only full-width roadway section of Peoria Avenue is located immediately east of Perryville Road between Cortessa and Shadow Ridge High School.

The BNSF Railway operates a north-south railroad spur (Ennis Spur) that crosses Peoria Avenue between Litchfield and Dysart Roads. SR 303L crosses the Peoria Avenue Corridor between Cotton Lane and Sarival Road.

The majority of the land in the study area is privately owned, with the exception of the westernmost limit (west of Beardsley Canal) which is owned by the Arizona State Land Department (ASLD). The majority of the existing land use is categorized as vacant (undeveloped) or agricultural. Several residential subdivisions are built or under development, which include three elementary schools, one middle school, and one high school. In several locations, existing homes not associated with large master-planned communities, are located adjacent to Peoria Avenue. Small clusters of industrial and commercial development are scattered throughout the eastern end of the study area.

Based on the City of Surprise, City of Glendale, and City of El Mirage future land use planning, a majority of the vacant and agricultural land within the study area is envisioned to be converted to single-family residential housing and mixed-use developments in the future. It is anticipated that commercial and industrial development will expand, but remain scattered throughout the study area.

Study Need

Today's land development and existing travel demands in the Peoria Avenue Corridor do not warrant a major east/west arterial roadway in the near-term; however, plans are underway to convert much of the rural and low density residential lands within the corridor to more intense land uses that will generate significantly more traffic. The "build-out" forecast for future land development and resulting travel demand warrant a major east/west arterial roadway in the long term.

To help make future roadway construction economically feasible, the planning process needs to begin now to

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MCDOT, 2901 W. Durango Street, Phoenix, AZ 85009, or e-mail at: MitchWagner@mail.maricopa.gov.

identify and protect long-term public right-of-way needs for the future roadway under ultimate "build-out" conditions.

Study Goals & Objectives

This corridor study is the first step in the planning process and its primary goal is to aid the affected agencies and jurisdictions in defining and protecting sufficient right-of-way for a continuous future Peoria Avenue Corridor that will safely accommodate projected travel demand and the future six-lane major arterial roadway as identified in the Surprise, Glendale, MCDOT and MAG long-range transportation plans. In general, the purpose of this Corridor Improvement Study is to provide MCDOT and partner jurisdictions with a future "footprint" of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

To accomplish this, the main focus of this study is to investigate, map, and analyze corridor constraints and opportunities to arrive at a recommended corridor alignment. This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also determine design standards based upon future roadway jurisdiction (anticipated roadway annexation) and an implementation or construction phasing plan.

The key objectives of this Corridor Improvement Study are to:

- Define and assess the strategic issues within the project study area
- Develop and evaluate conceptual alternative alignments within the corridor study area
- Recommend a preferred alignment
- Define the characteristics of the preferred alignment
- Develop consensus for the preferred alignment
- Develop an implementation (recommended construction phasing) plan

Preliminary Key Issues and Challenges

Early in the study process, a preliminary list of study issues and potential challenges is compiled. This list expands as the study progresses and input is obtained from public participation.

- Establish future connections of Peoria Avenue to planned roadways such as Jackrabbit Trail Parkway

- Account for future planned connection to SR 303L
- Evaluation of drainage structures across major washes, canals and channels.
- Evaluation of crossing of the BNSF Railway Ennis Spur
- Maintain functional integrity of roadway through constrained areas
- Maximize use of existing roadway improvements along corridor to reduce costs
- Identify ultimate alignment and access management strategies
- Consideration of environmental constraints

Study Approach

The Peoria Avenue Corridor Improvement Study is carried out in two phases, a planning phase and an engineering phase.

Planning Phase
During the Planning Phase, general background information regarding the corridor is gathered and documented in reports that will lead to well-founded recommendations for improvements and longer-term needs along Peoria Avenue. Meetings are conducted with affected jurisdictions, agencies, stakeholders, and the impacted public to form a broad consensus of the overall needs and vision of the corridor.

Based on identified needs, conceptual alternatives are developed and candidate alternatives are then evaluated for technical and environmental feasibility, public acceptability, and economic viability.

Engineering Phase
The Engineering Phase of the study begins following the selection of a preferred alternative. Preliminary engineering design plans, right-of-way requirements, and estimated construction costs will be prepared for long-term roadway design features. Priorities for roadway construction phasing along with policies and guidelines to preserve the intended regional function of the road are developed.

Alternatives Development & Evaluation

After completion of the inventory of existing and future conditions, the study team developed the following evaluation criteria to help determine the alignment for Peoria Avenue:

- Right-of-way impacts
- Compatibility with existing developments
- Compatibility with planned future developments
- Compatibility with existing and planned roadway improvements
- Engineering complexity and constructability
- Public acceptance
- Local agency support
- Drainage/flood control considerations
- Utility considerations
- Environmental considerations

Preferred Alternatives (Recommended Alignments)

The Peoria Avenue corridor was split into nine east/west geographic segments to conduct the evaluation. Up to three alternative alignments were considered for each segment: Alternative 1 included widening the corridor symmetric to the section line, attempting to balance impacts to both sides of the corridor; Alternative 2 included widening the corridor to the south, maintaining the northern right-of-way boundary; Alternative 3 included widening the corridor to the north, maintaining the southern right-of-way boundary.

Based on this evaluation and study findings, the following alternatives are being recommended along the corridor:

Segment 1 (future Jackrabbit Trail Parkway to Beardsley Canal):
- Alternative 1 - new corridor along section line

Segment 2 (Beardsley Canal to Perryville Road):
- Alternative 1 - new corridor along the section line

Segment 3 (Perryville Road to Citrus Road):
- Alternative 1 - widen symmetric along the section line

Segment 4 (Citrus Road to Cotton Lane):
- Alternative 3 - shift north

Segment 5 (Cotton Lane to Sarival Road):
- Alternative 1 - widen symmetric along the section line

Segment 6 (Sarival Road to Reems Road):
- Alternative 1 - widen symmetric along the section line

Segment 7 (Reems Road to Bullard Avenue):
- Alternative 3 - shift north

Segment 8 (Bullard Avenue to Litchfield Road):
- Alternative 1 - widen symmetric along the section line

Segment 9 (Litchfield Road to Dysart Road):
- Alternative 2 - shift south

After receiving input from the public and the local agencies, the recommended alignment and corridor plan will be finalized and used for future land development planning.

Recommended Implementation Plan

The recommendations of this study are intended to be used to preserve corridor right-of-way for the ultimate Peoria Avenue, as construction of improvements will not likely be completed in the near-term, but rather by developers as development occurs along the corridor.

Near-Term Improvements
In the near-term, projects that are already funded will be completed, such as improvements at the Loop 303/Peoria Avenue interchange (to be constructed by ADOT when Loop 303 is upgraded to a freeway) and City of Surprise planned completion of the north half-street section between Sarival and Reems Roads. Other near-term improvements recommended for consideration include acquiring right-of-way and constructing a two-lane roadway between Citrus Road and Cotton Lane, and constructing drainage improvements at Litchfield and Sarival roads.

Mid-Term Improvements
Several additional improvement projects, most likely constructed by adjacent development, would be needed in the mid-term timeframe to provide a continuous four-lane facility by the year 2030:
- South half-street and frontage road construction between Citrus Road and Cotton Lane
- Cotton Lane intersection improvements
- Reems Road intersection improvements
- South half-street construction between Bullard Avenue and Litchfield Road

Long-Term Improvements
Long-term (likely beyond 2030) improvements will focus on bringing uniformity to the corridor and widening to the ultimate six-lane facility. Areas where these improvements would occur include:
- Perryville Road to Citrus Road
- Sarival Road to Reems Road
- Bullard Road to Litchfield Road
- Litchfield Road to Dysart Road

Study Stakeholders

- Arizona Department of Transportation (ADOT)
- Arizona Game and Fish Department
- Arizona State Land Department (ASLD)
- BNSF Railway
- Flood Control District of Maricopa County (FCDMC)
- Maricopa Association of Governments (MAG)
- Maricopa County Department of Transportation (MCDOT)
- Maricopa County Environmental Services
- Maricopa County Parks Department
- Maricopa County Planning and Development
- Maricopa Water District
- City of Surprise
- City of Glendale
- City of El Mirage
- Dysart Unified School District
- Major Utility Providers
- Land Developments
- Impacted residents, businesses and property owners

MCDOT

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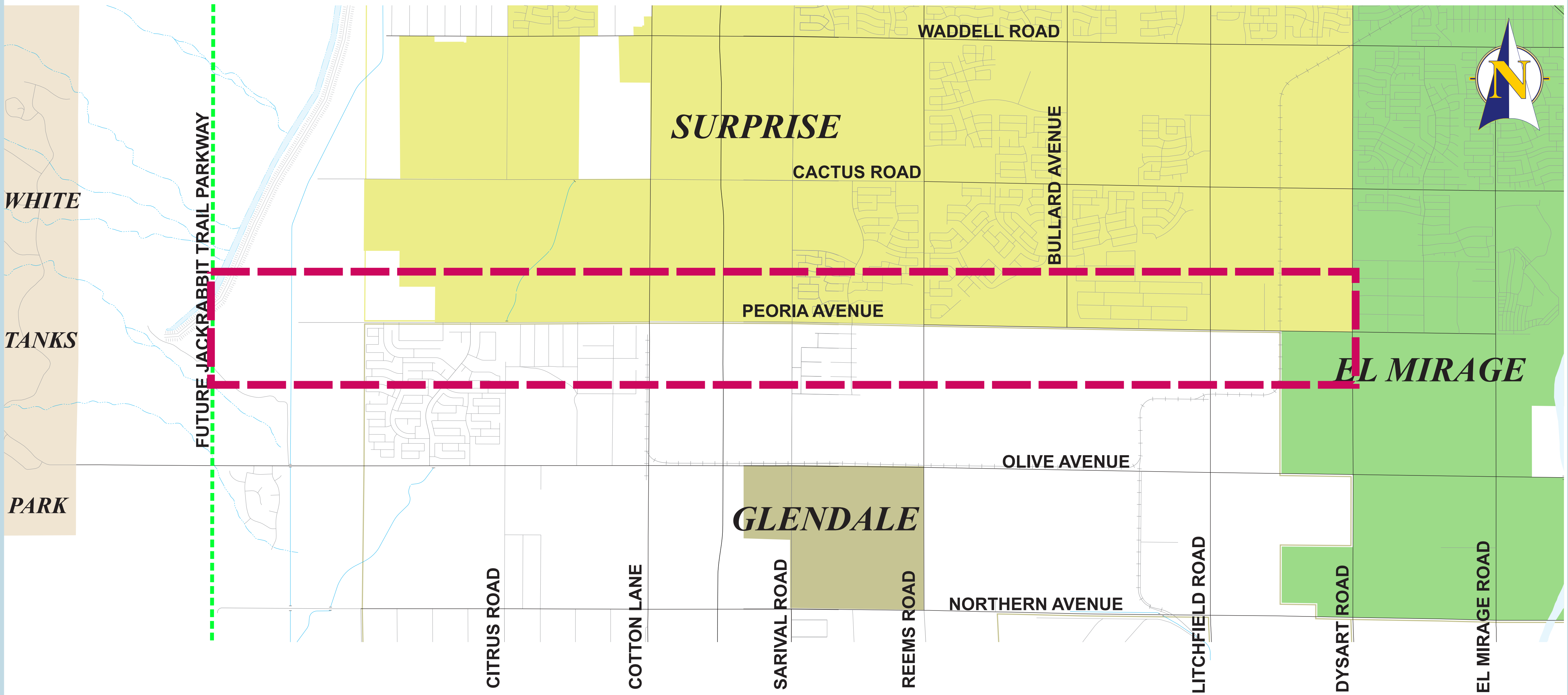
Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road

Corridor Improvement Study



LEGEND

STUDY AREA

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

KEY STUDY OBJECTIVES

- Define and assess the strategic issues within the project study area
- Develop and evaluate conceptual alternative alignments within the corridor study area
- Recommend a preferred alignment
- Define the characteristics of the preferred alignment
- Develop consensus for the preferred alignment
- Develop an implementation (recommended construction phasing) plan

STUDY NEED

- Address regional and local growth and development within study area (3.5 million population projected at build-out between Wickenburg and Gila Bend -- MAG I-8/I-10 Hidden Valley and I-10/Hassayampa Valley Transportation Framework studies)
- Preserve sufficient public right-of-way for an east/west transportation corridor
- Ensure future roadway compatibility with existing/future land uses and environmental conditions
- Identify potential connectivity issues with other future planned roadways and freeways

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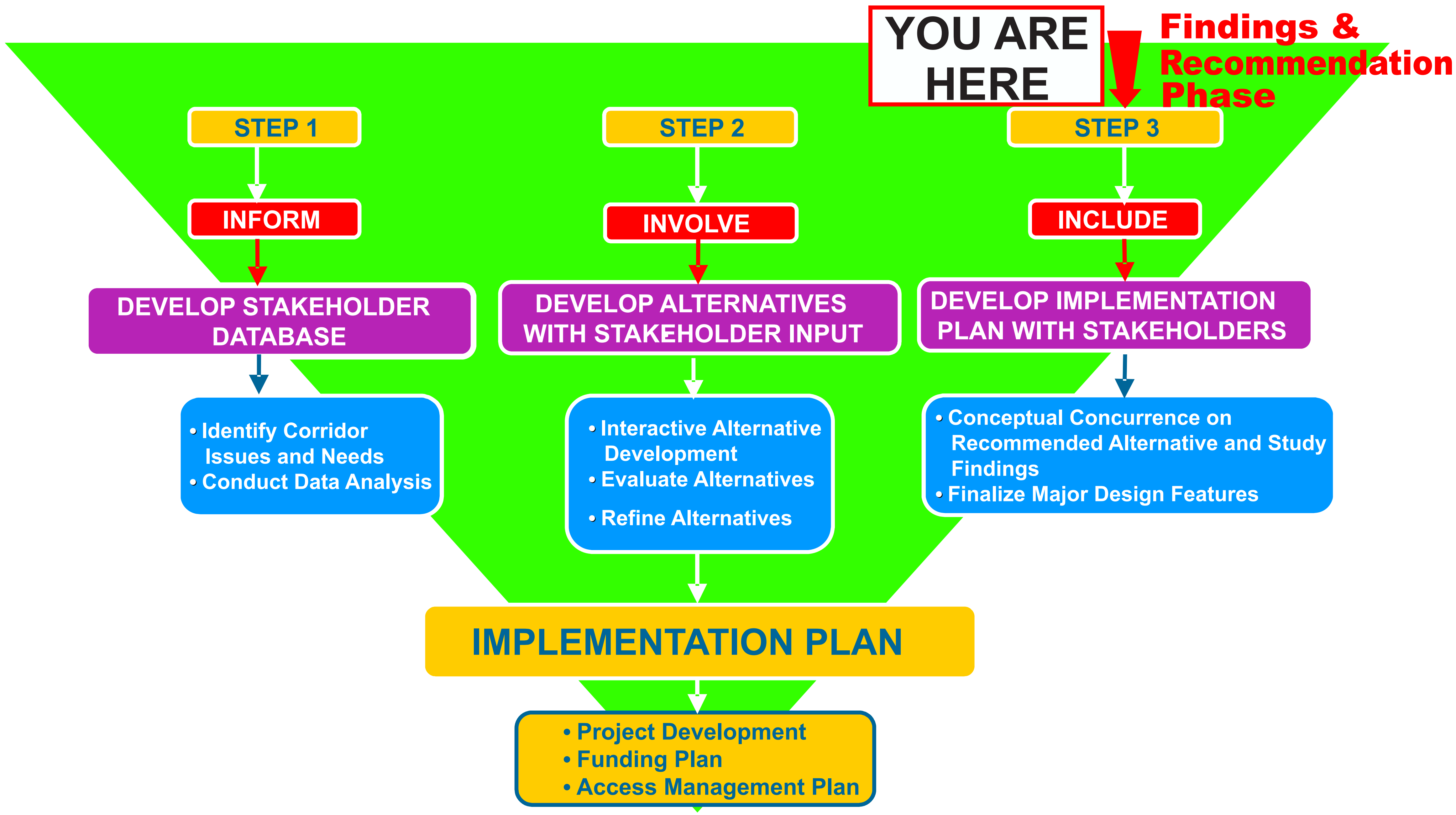
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road

Corridor Improvement Study

Interactive Study Process



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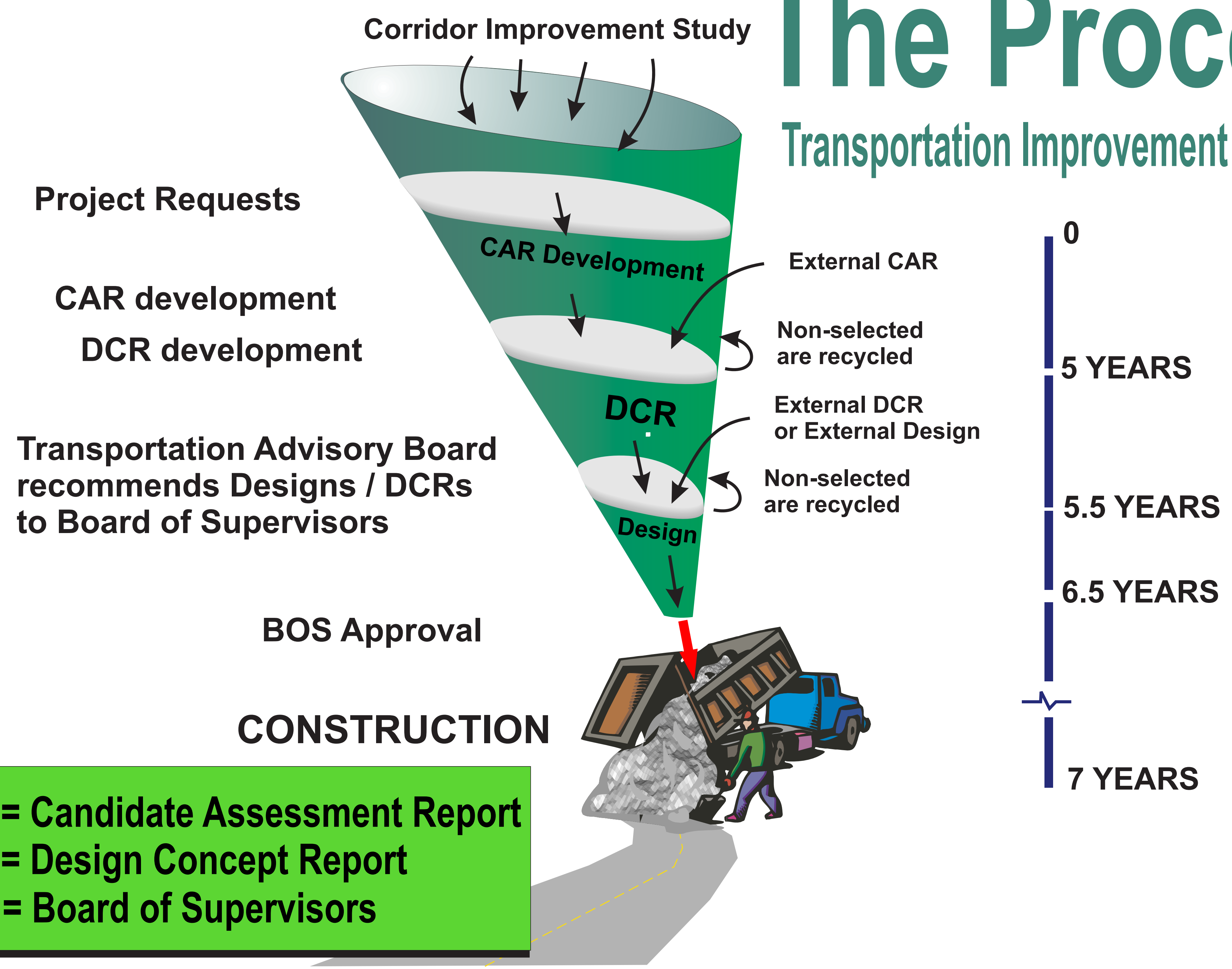
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road

Corridor Improvement Study

The Process

Transportation Improvement Program



CAR = Candidate Assessment Report
DCR = Design Concept Report
BOS = Board of Supervisors

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

Study Schedule

Project Kick-off & Study Initiation	July 2010
PHASE I:	
Data Collection/Issues Identification	July - September 2010
Public Input Meeting #1 (Scoping Phase)	September 20, 2010
PHASE II:	
Alternative Development and Evaluation	October 2010 - January 2011
Public Input Meeting #2 (Alternatives Analysis Phase)	**January 18, 2011**
Public Input Meeting #3 (Study Findings & Recommendations Phase)	**March 22, 2011**
Study Completion/Final Report Submitted	June 2011

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

STUDY STAKEHOLDERS

- Arizona Department of Transportation (ADOT)
- Arizona Game and Fish Department
- Arizona State Land Department
- Burlington Northern Santa Fe Railway (BNSF)
- Flood Control District of Maricopa County (FCDMC)
- Maricopa Association of Governments (MAG)
- Maricopa County Department of Transportation (MCDOT)
- Maricopa County Environmental Services
- Maricopa County Parks Department
- Maricopa County Planning and Development
- Maricopa Water District
- City of Surprise
- City of Glendale
- City of El Mirage
- Dysart School District
- Major Utility Providers
- Land Developments
- Affected Businesses, Property Owners and Residents

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

Issues and Challenges

- Right-of-way impacts
- Compatibility with existing developments
- Compatibility with planned future developments
- Compatibility with existing and planned roadway improvements
- Engineering complexity and constructability
- Public acceptance
- Local agency support
- Drainage/flood control considerations
- Utility considerations
- Environmental considerations

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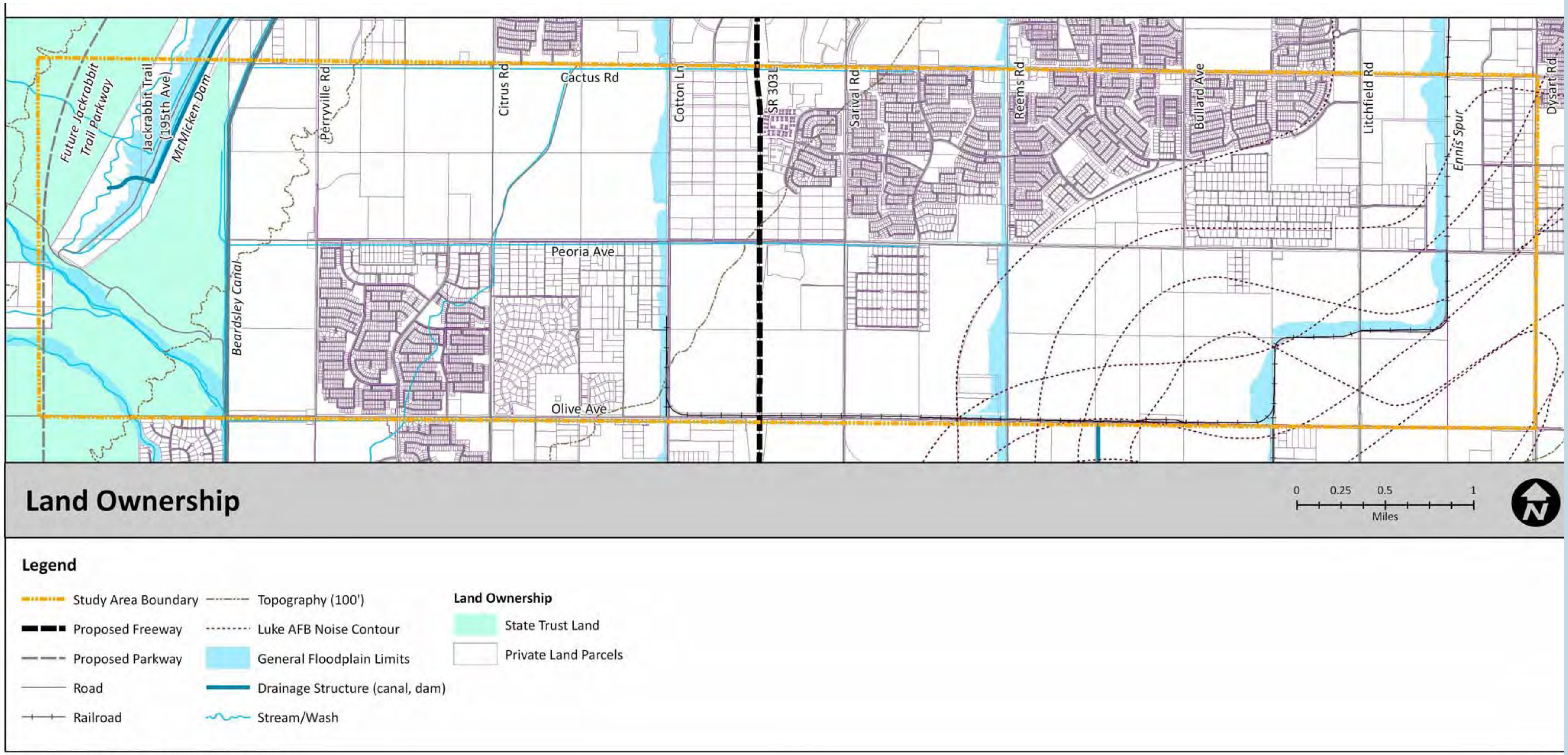
Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

LAND OWNERSHIP



Source: Flood Control District of Maricopa County, ALRIS

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

MUNICIPAL PLANNING AREAS AND INCORPORATED AREAS

Municipal Planning Areas and Incorporated Areas

0 0.25 0.5 1 Miles

N

Legend

- Study Area Boundary
- Peoria Avenue Section Line
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Muncipal Planning Area	Incorporated Areas
El Mirage	El Mirage
Glendale	Glendale
Surprise	Surprise

Source: Flood Control District of Maricopa County, ALRIS

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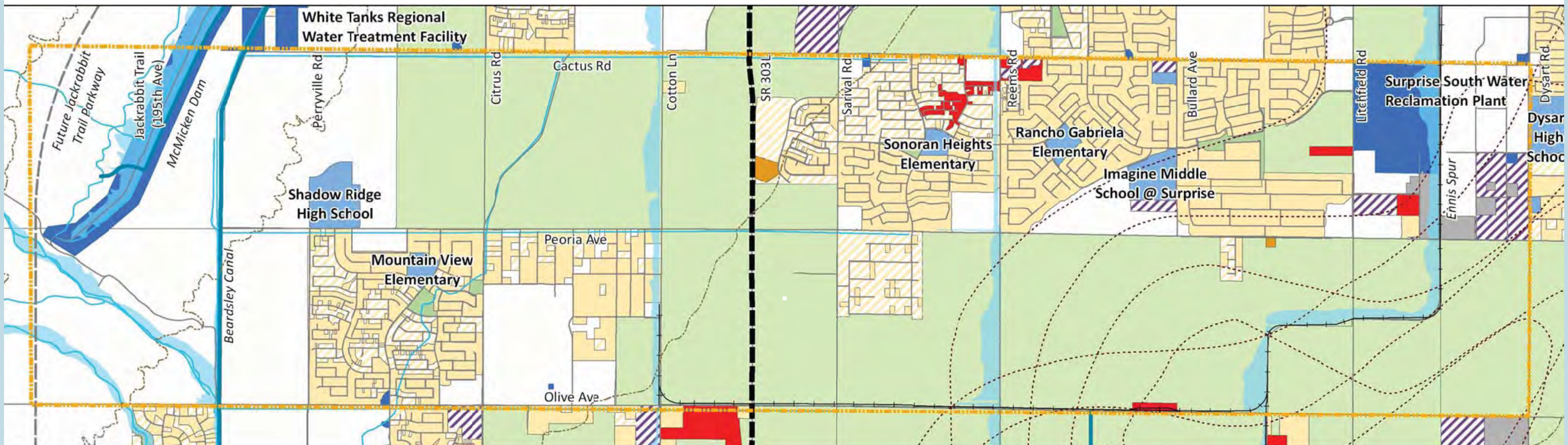
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

EXISTING LAND USE



Existing Land Use

0 0.25 0.5 1
Miles

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Existing Land Use

- Single-Family Residential
- Multi-Family Residential
- Developing Residential
- Commercial
- Employment
- Developing Employment
- Public Facility
- Institutional
- Industrial
- Open Space
- Agriculture
- Vacant

ource: Flood Control District of Maricopa County, ALRIS, MAG

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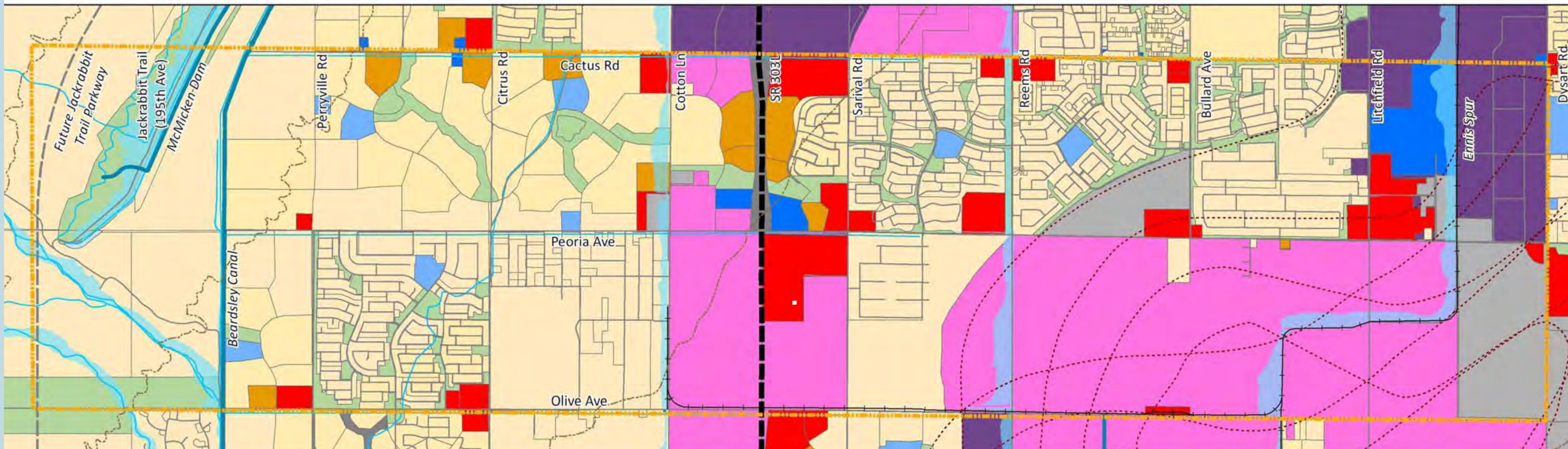
Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

FUTURE LAND USE



Future Land Use

0 0.25 0.5 1
Miles

N

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash

Future Land Use

- Single-Family Residential
- Multi-Family Residential
- Mixed Use
- Commercial
- Employment
- Institutional
- Public Facility
- Industrial
- Open Space

ource: Flood Control District of Maricopa County, ALRIS, MAG

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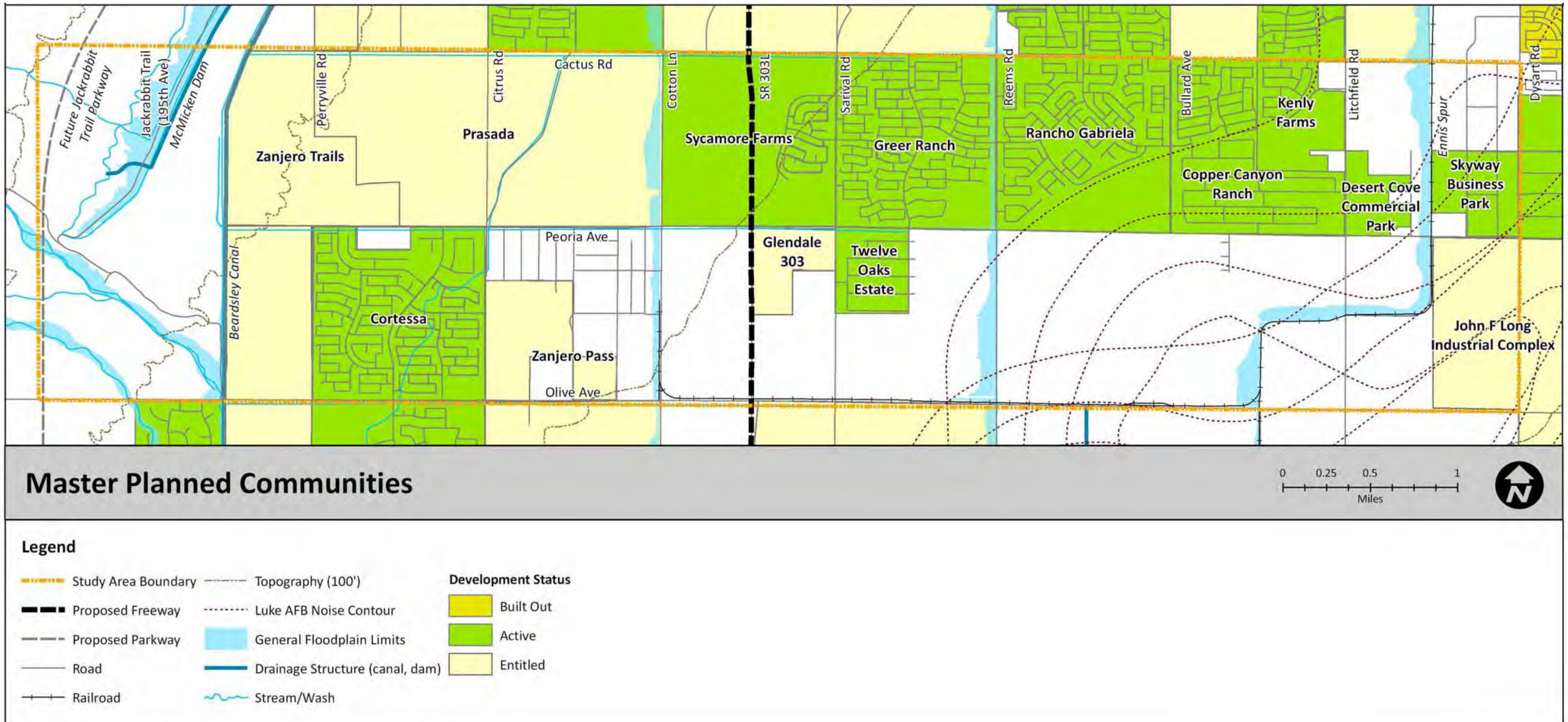
Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

MASTER PLANNED COMMUNITIES



Source: Flood Control District of Maricopa County, ALRIS, MAG 2007, City of Glendale, City of Surprise

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

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Right Road Right Time Right Cost

DRAINAGE

Major Drainage Features

0 0.25 0.5 1 Miles

N

Legend

- Study Area Boundary
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- Drainage Structure (canal, dam)
- Stream/Wash
- Well

Floodplain

- 100-year floodplain
- Floodway

Source: Flood Control District of Maricopa County, ALRIS

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road

Corridor Improvement Study

AVERAGE DAILY TRAFFIC VOLUMES

2031 Projected Average Daily Traffic Volumes

0 0.25 0.5 1
Miles

Legend

- Study Area Boundary
- Road
- Railroad
- Drainage Structure (canal, dam)
- Stream/Wash

Future Roadway Network

- Freeway
- Parkway
- Arterial

- Traffic Interchange

Daily Traffic Volumes

- XXX 2031 Projected Average Daily Traffic (from MAG model)
- XXX Existing Daily Traffic Volumes (City of Surpise and MCDOT 2008 & 2009; and 2010 field counts)

NOTE: Bullard Avenue from Peoria Avenue to Olive Avenue is not included in the Glendale General Plan, however is in the MAG model network.

Source: Flood Control District of Maricopa County, ALRIS, MAG Travel Demand Model

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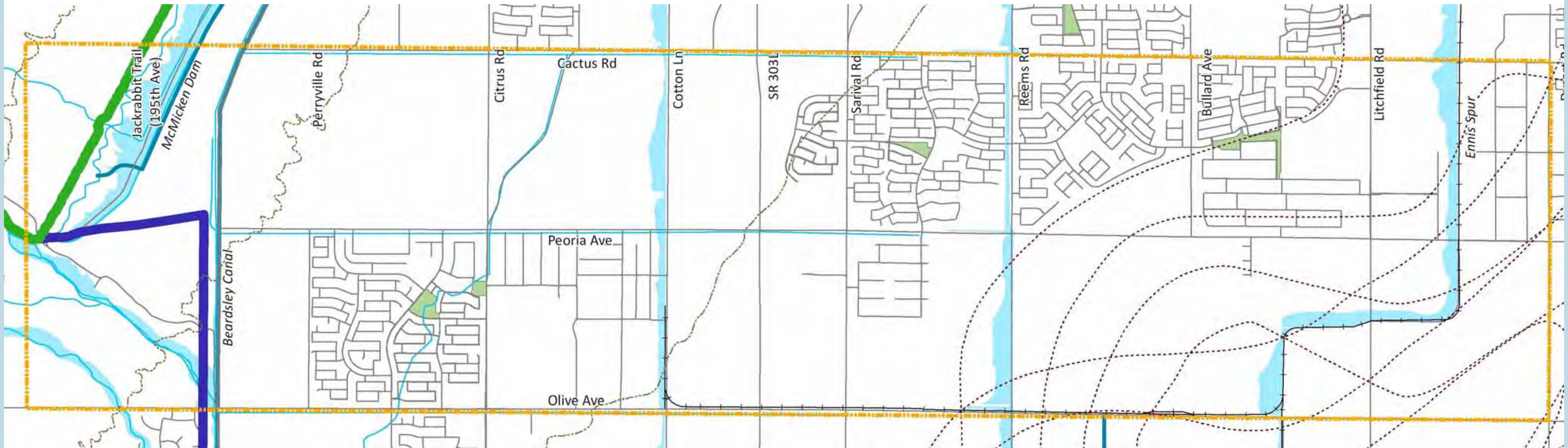
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

RECREATION AND TRAILS



Recreation and Trails

0 0.25 0.5 1
Miles

Legend

- Study Area Boundary
- Road
- Railroad
- Topography (100')
- Luke AFB Noise Contour
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash
- Community Parks

Maricopa County Trail System

- Existing Trail
- Future Trail

urce: Flood Control District of Maricopa County, ALRIS

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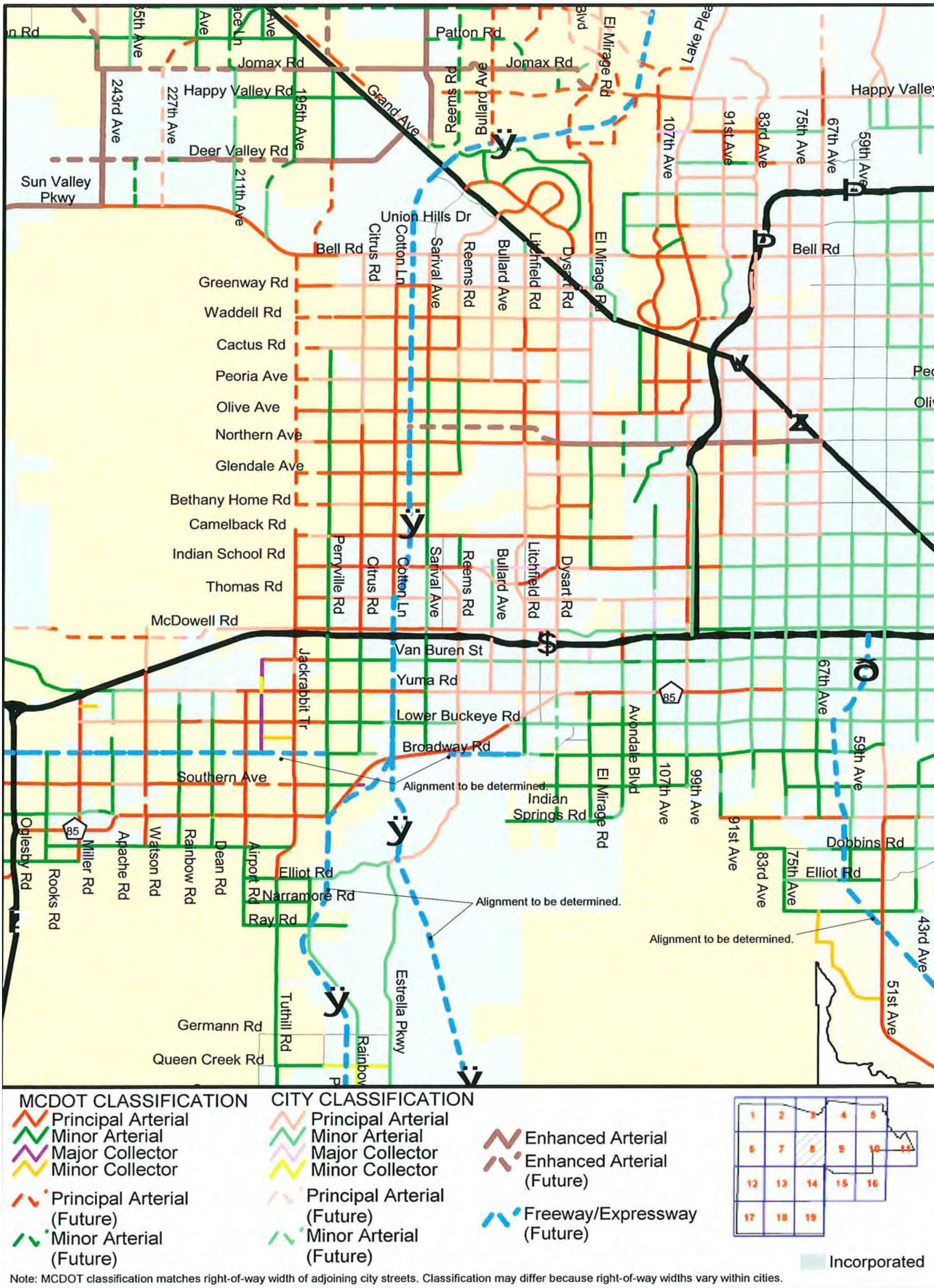
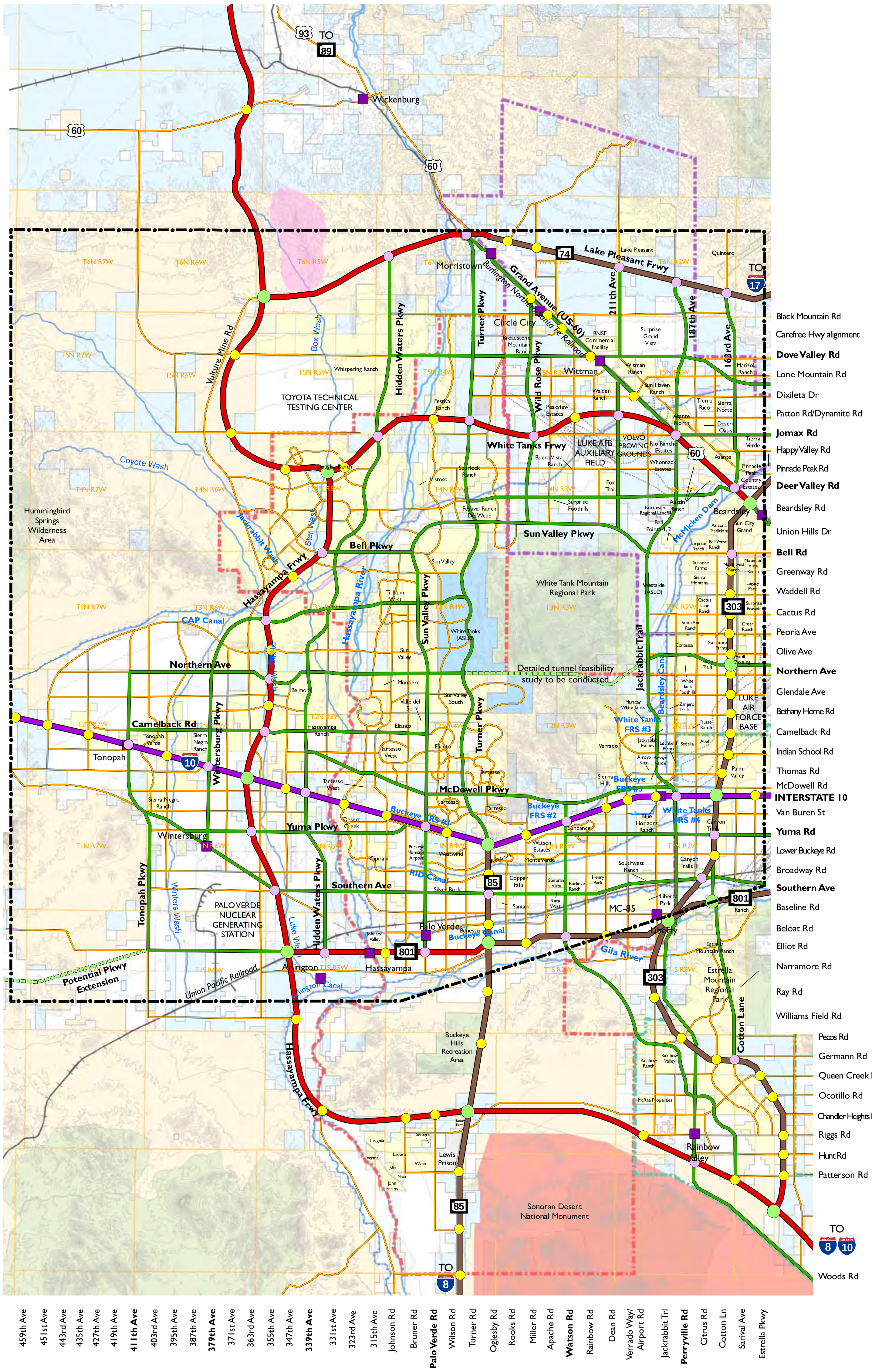
MCDOT Roadway Classification





TRANSPORTATION FRAMEWORK RECOMMENDATION

Legend

Study Area Boundary
Railroads
Roads
Rivers/Washes
Canals
Unincorporated Communities
Township/Range
Noise Contours

Topography (100' contours)
Proposed Service Traffic Interchanges
Proposed Parkway Traffic Interchanges
Proposed System Interchanges
Planned Developments
BLM Raptor Protection Zone

State Land Development Master Plan
National Monument
Wilderness Area

Land Ownership
BLM
State Land
Regional Parks
Military
Bureau of Reclamation

Planning Areas
Buckeye
Glendale
Goodyear
Surprise

Proposed Roadway Network
Improvements to Existing Freeways
Future Regional Transportation Plan (RTP) Freeways (Prop 400)
New Freeway Proposals
New Parkway Proposals
New Parkway Alternatives
Future Major Arterial Network

Notes

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

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

Locations of proposed freeway interchanges and the use of parallel roads connecting to freeways are preliminary and subject to review and approval of the FHWA and ADOT.

Arterial river crossings are conceptual to demonstrate the number of crossing needed to support development. Final locations and number will be determined in engineering and water resource studies.

Locations of proposed roadway facilities south of the study area are subject to refinement in the I-8 and I-10/Hidden Valley Roadway Framework Study to be completed in 2008, and roadways north to be planned in the New River Roadway Framework Study, schedule to be determined.

Olive Avenue traffic interchange on SR-303L to be a half-diamond.

0 5
Miles

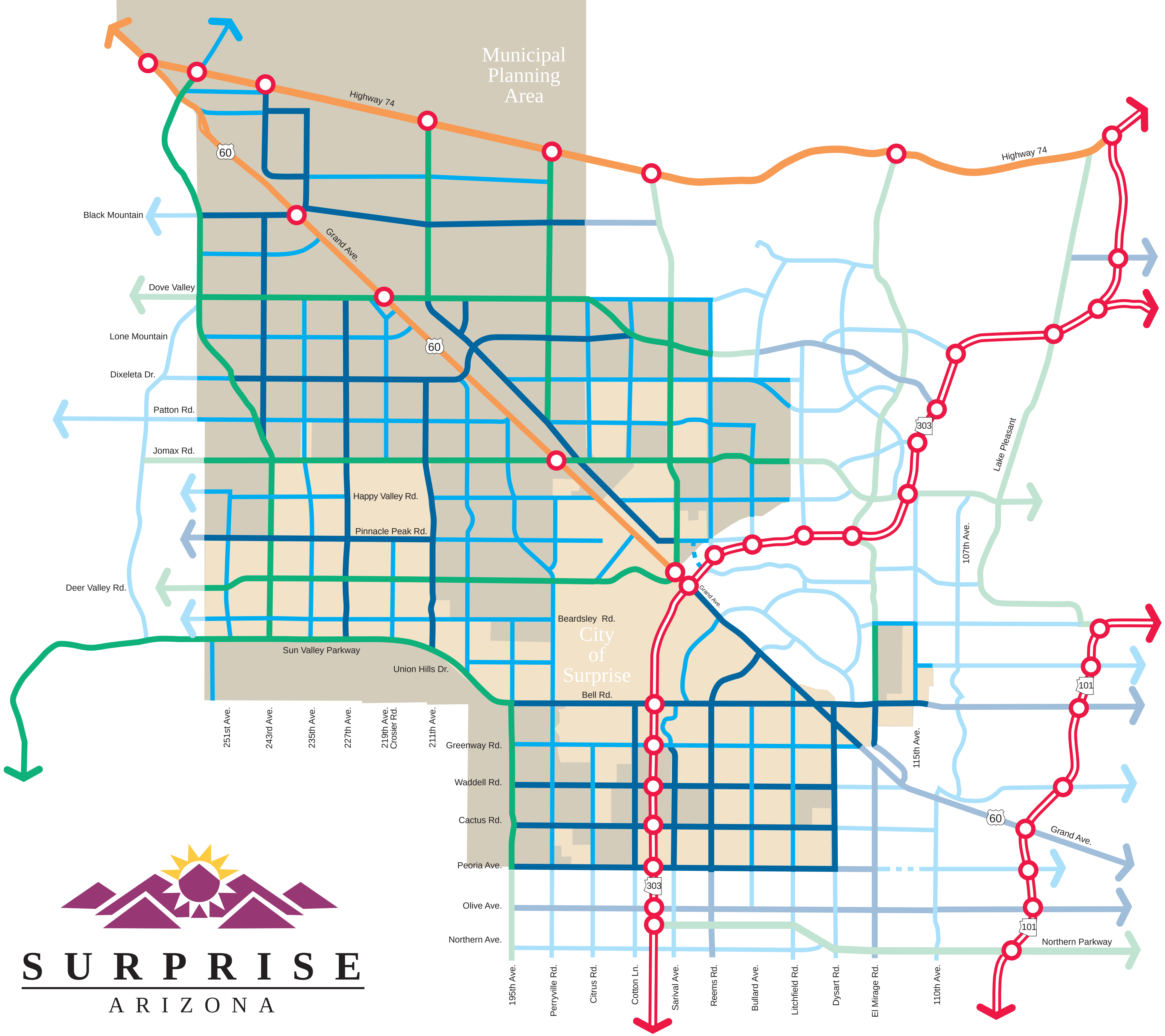
7-1

Interstate 10/Hassayampa Valley Transportation Framework Study

MARICOPA ASSOCIATION of GOVERNMENTS

February 22, 2008

Roadway Plan



Roadway Classification

- Freeway
- Expressway
- Parkway
- Major Arterial
- Minor Arterial
- Interchange

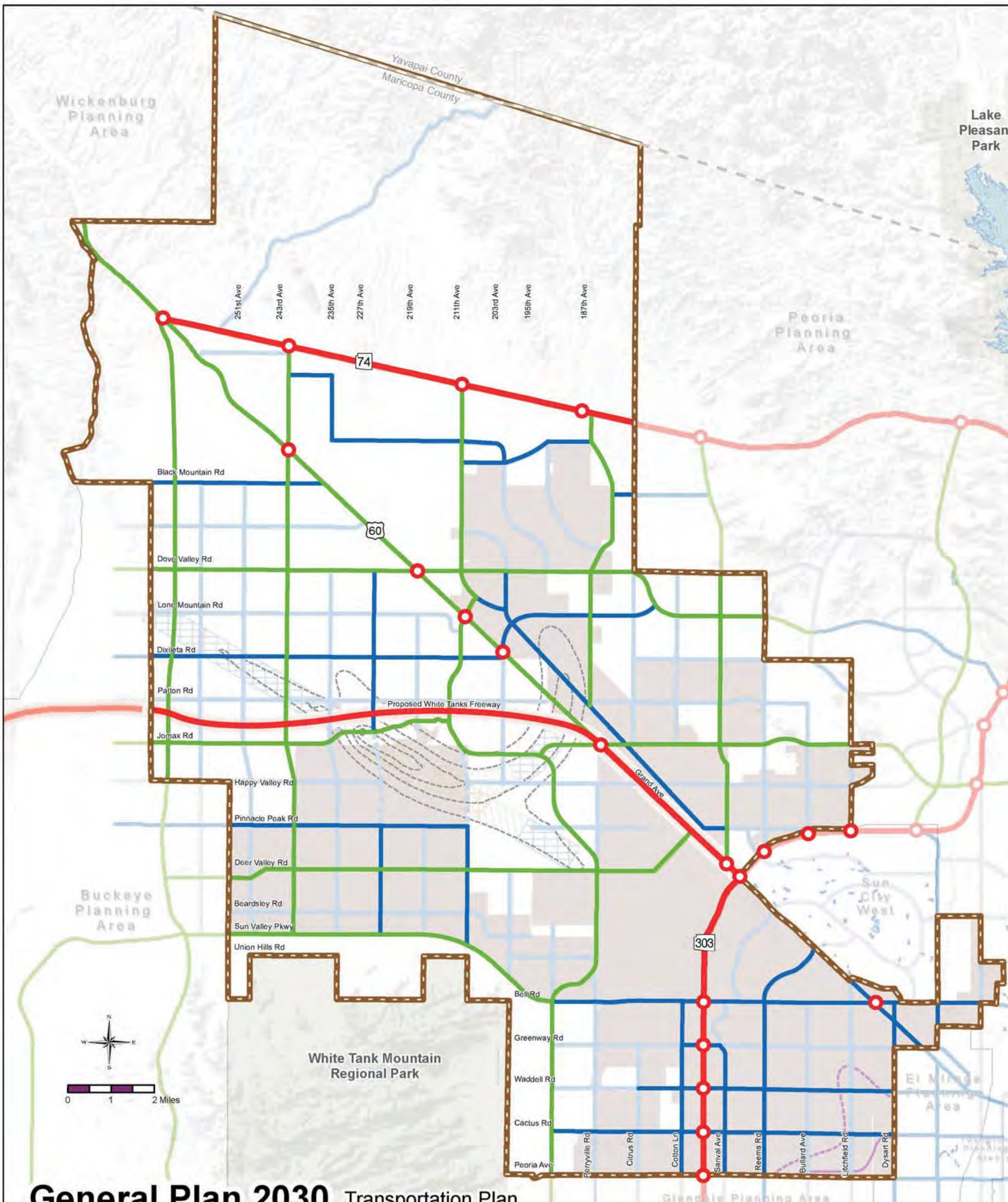
City Boundary
Municipal Planning Area

NORTH

0 Mile 1 Mile 2 Mile 3 Mile 4 Mile 5 Mile 6 Mile
Scale in Miles

SURPRISE
ARIZONA

4-1
FIGURE



General Plan 2030 Transportation Plan

Roadway Functional Classification

- Freeway
- Parkway
- Major Arterial
- Minor Arterial
- Interchanges

Transportation Corridor Preservation

These road segments are shown for Transportation Corridor Preservation only. Luke AFB will review and must concur with any improvements made. Transportation Corridors through Ford Motor Company's Proving Grounds shall remain conceptual until such time that the use ceases to exist

Map Features

60 US Highway
303 State Freeway
74 State Highway

Boundaries
- City Limits
- Planning Area
- County

Noise Contours
- Aux 1 F-16
- Luke AFB 1992

APZ's
- APZ I
- APZ II
- CLEAR ZONE

Map 3.1A - Transportation

Map prepared by the City of Surprise: January, 2010
Adopted by City Council: July 24, 2008
Amended by City Council: July 22, 2010

SURPRISE
ARIZONA

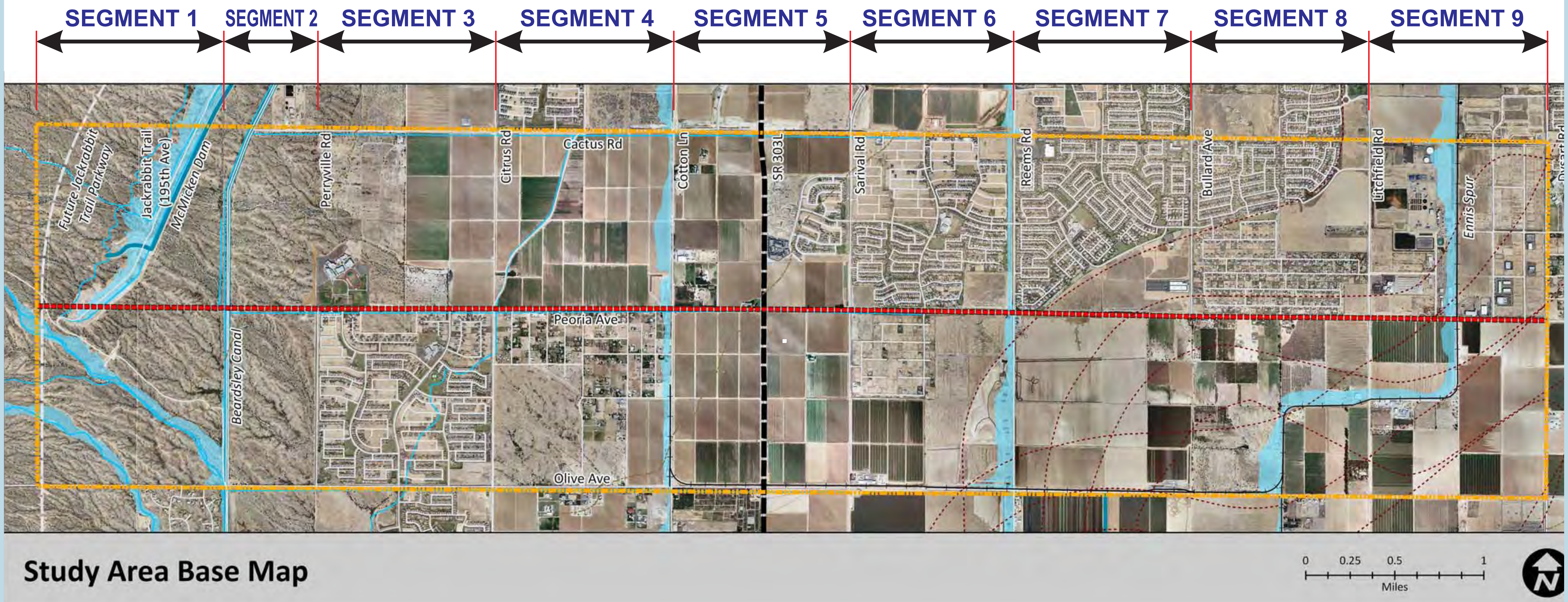
MARICOPA COUNTY MCDOT TRANSPORTATION

Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

BASE MAP



Legend

Study Area Boundary	Railroad
Peoria Avenue Section Line	Topography (100')
Proposed Freeway	Luke AFB Noise Contour
Proposed Parkway	General Floodplain Limits
Road	Drainage Structure (canal, dam)
Stream/Wash	

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

EVALUATION CRITERIA

- Right-of-way impacts
- Compatibility with existing developments
- Compatibility with planned future developments
- Compatibility with existing and planned roadway improvements
- Engineering complexity and constructability
- Public acceptance
- Local agency support
- Drainage/flood control considerations
- Utility considerations
- Environmental considerations

PRELIMINARY KEY ISSUES AND CHALLENGES

Early in the study process, a preliminary list of study issues and potential challenges is compiled. This list expands as the study progresses and input is obtained from public participation.

- Establish future connections of Peoria Avenue to planned roadways such as Jackrabbit Trail Parkway
- Account for future planned connection to SR Loop 303
- Evaluation of drainage structures across major washes, canals and channels
- Evaluation of crossing of the BNSF Railroad
- Maintain functional integrity of roadway through constrained areas
- Maximize use of existing roadway improvements along corridor to reduce costs
- Identify ultimate alignment and access management strategies
- Consideration of environmental constraints

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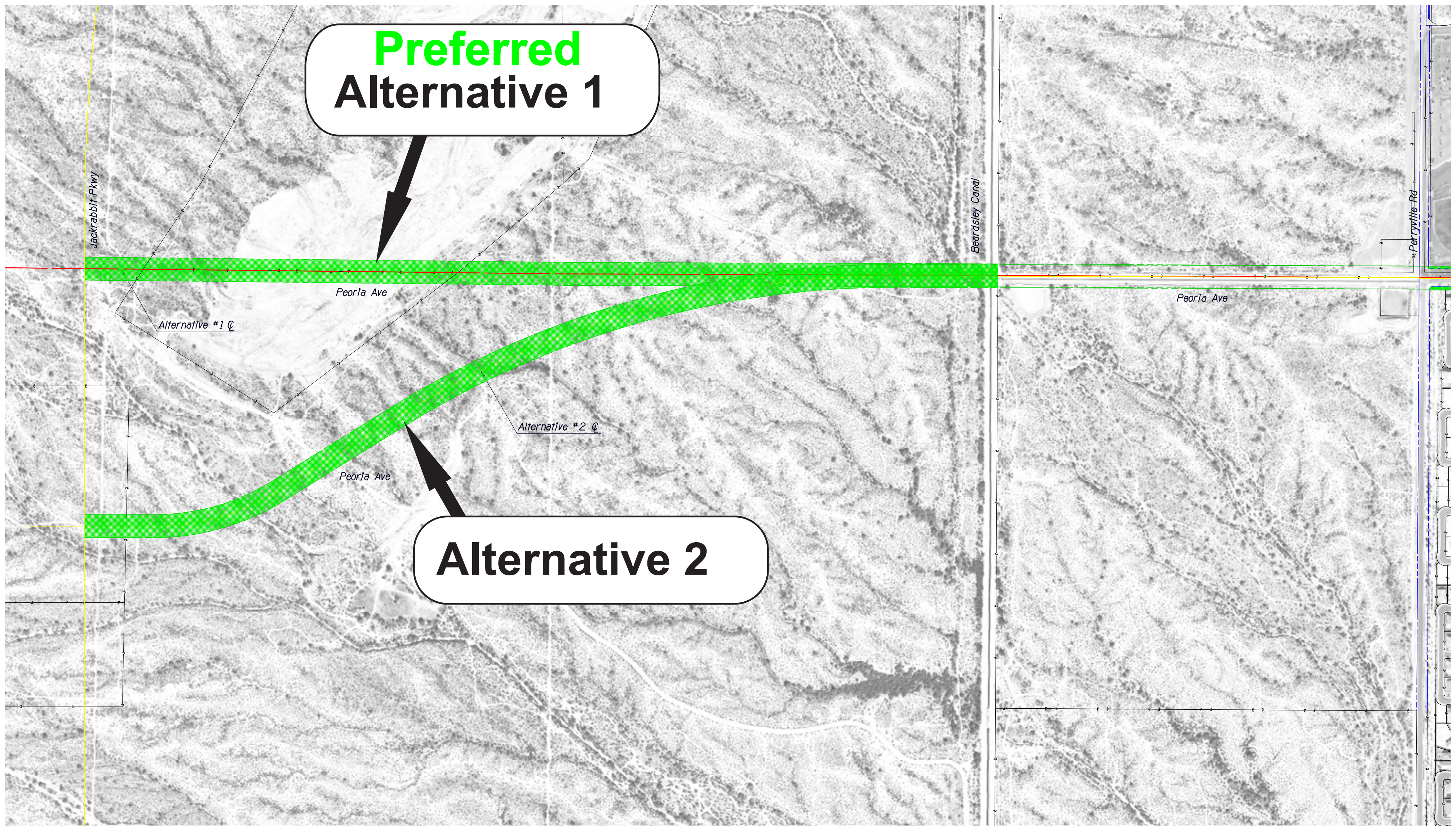
Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

SEGMENT 1:
Jackrabbit Pkwy to Perryville Road



N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

Segment 1: Jackrabbit Trail to Beardsley Canal

Criteria		Preferred Alternative Alternative 1 (on section line)	Alternative 2 (shift to south)
Right-of-way Considerations		◒ 779k SF	● 825k SF
		◒	● Higher cost due to additional length
Compatibility with Existing Developments		○ No existing development	○ No existing development
Compatibility with Planned Future Developments		○ Likely to provide more developable land near intersection	◒
Compatibility with Existing and Planned Roadway Improvements		○ Facilitates 1-mile intersection spacing along Jackrabbit Parkway	◒
Engineering Complexity & Constructability		◒	● Numerous wash and floodplain crossing
Public Acceptability		◒	◒
Local Agency Support		◒	◒
Drainage/Flood Control Considerations		◒	● Numerous wash and floodplain crossing
Environmental Considerations	Socioeconomic	○ No known impacts	○ No known impacts
	Physical & Natural	◒	● Greatest impact to wash corridors and floodplains
	Cultural	● Impacts to Beardsley Canal	● Impacts to Beardsley Canal
Utility Considerations		○ No known impacts	○ No known impacts

Segment 3: Perryville Road to Citrus Road

Criteria		Preferred Alternative Alternative 1 (on section line)	Alternative 2 (shift 5' south)	Alternative 3 (shift 15' north)
Right-of-way Considerations		◒ 295k SF	◒ 293k SF	● 309k SF
		◒	◒	◒
Compatibility with Existing Developments		◒ Moderate impact to existing land uses	◒ Moderate impact to existing land uses	○ Least impact to existing land uses
Compatibility with Planned Future Developments		◒ Moderate impact to planned land uses	◒ Moderate impact to planned land uses	● Least compatible with future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible with existing street improvements	◒	●
Engineering Complexity & Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		○ Minimal impact	○ Minimal impact	◒ Slight impact to existing drainage channel to the north
Environmental Considerations	Socioeconomic	◒ Slight impact to land; no impact to public access or structures	◒ Slight impact to land; no impact to public access or structures	◒ Slight impact to land; no impact to public access or structures
	Physical & Natural	◒ Some impact to farmland	◒ Some impact to farmland	◒ Some impact to farmland
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch
Utility Considerations		◒ 1600 ft lined irrigation ditch, 7 power poles, 2 well sites	◒ 1600 ft lined irrigation ditch, 7 power poles, 2 well sites	◒ 1600 ft lined irrigation ditch, 7 power poles, 2 well sites

○ **Lowest impact/best performance**

◒ **Moderate impact/moderate performance**

● **Highest impact/worst performance**

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Right Road Right Time Right Cost

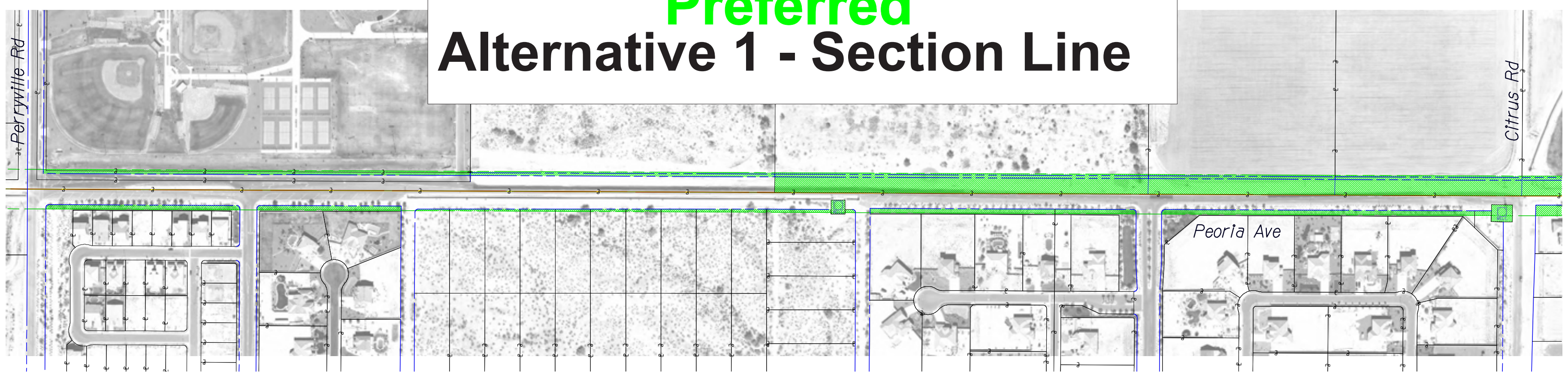
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road

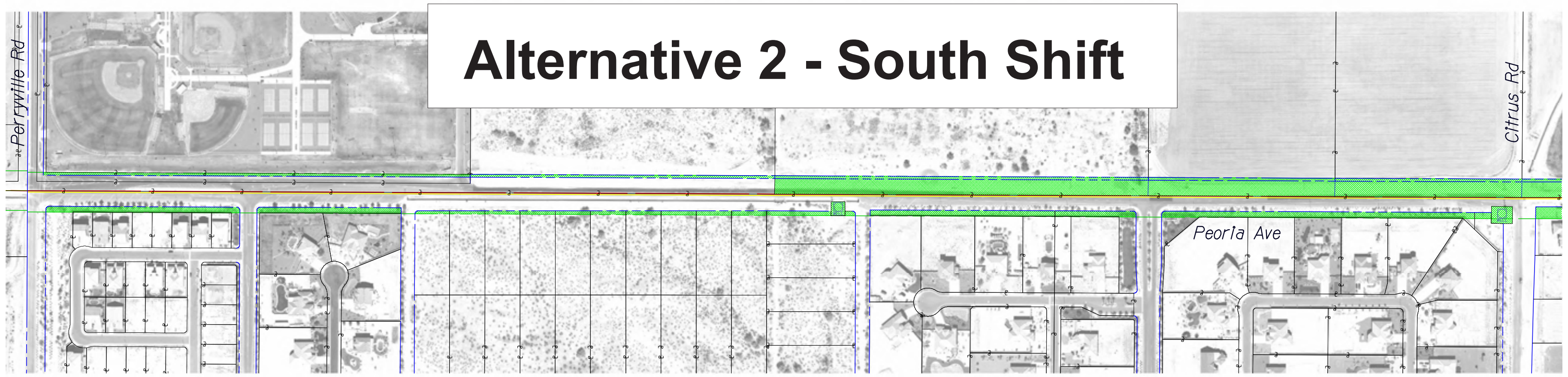
Corridor Improvement Study

Preferred

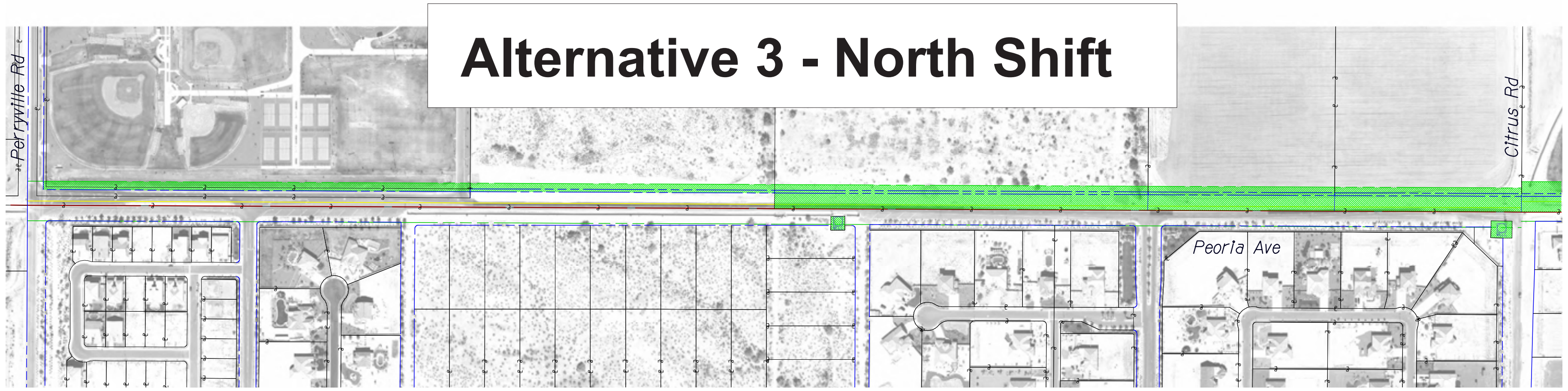
Alternative 1 - Section Line



Alternative 2 - South Shift



Alternative 3 - North Shift



SEGMENT 3:

Perryville Road to Citrus Road

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header

3-22-2011

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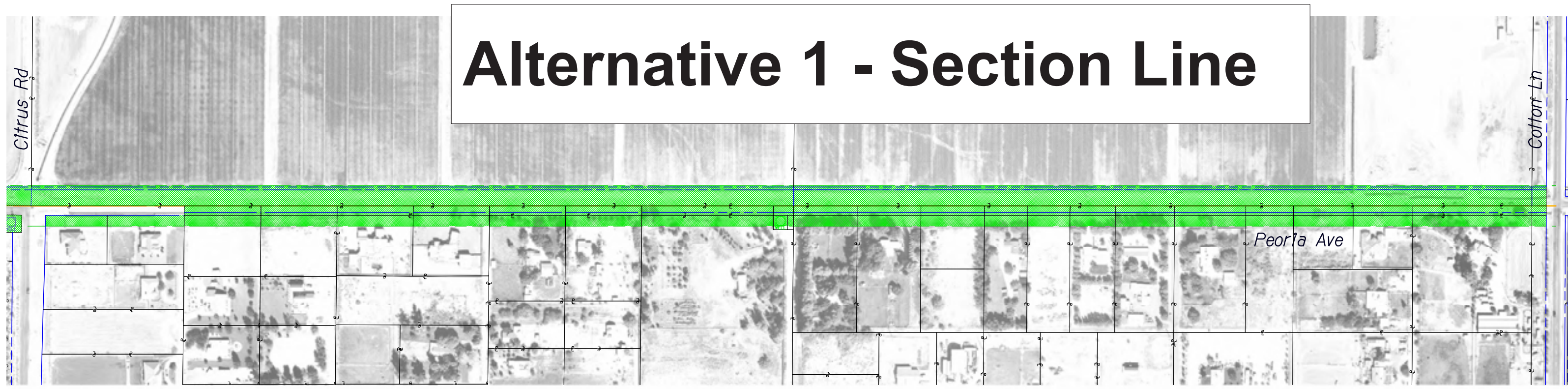
Right Road Right Time Right Cost

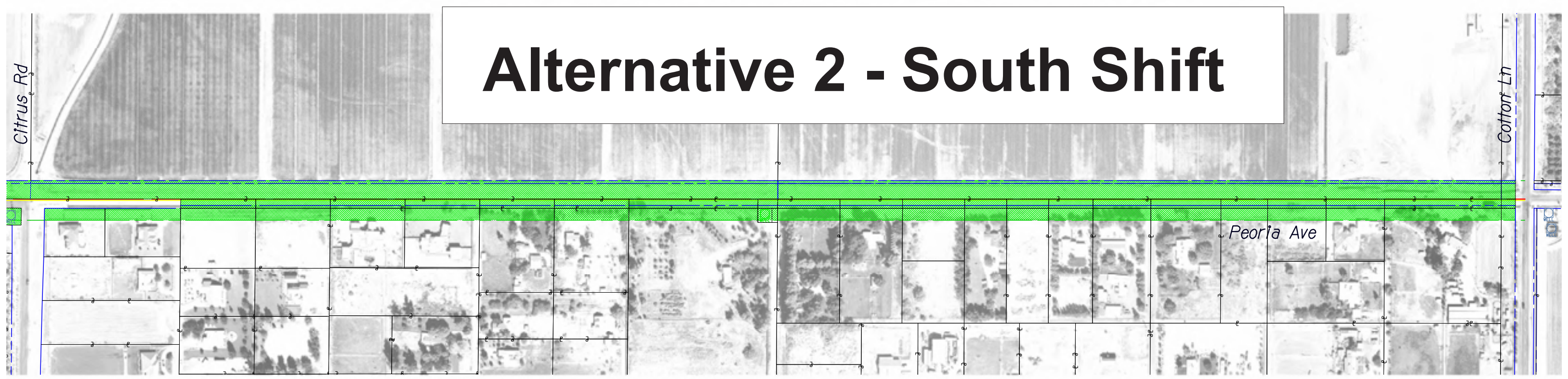
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

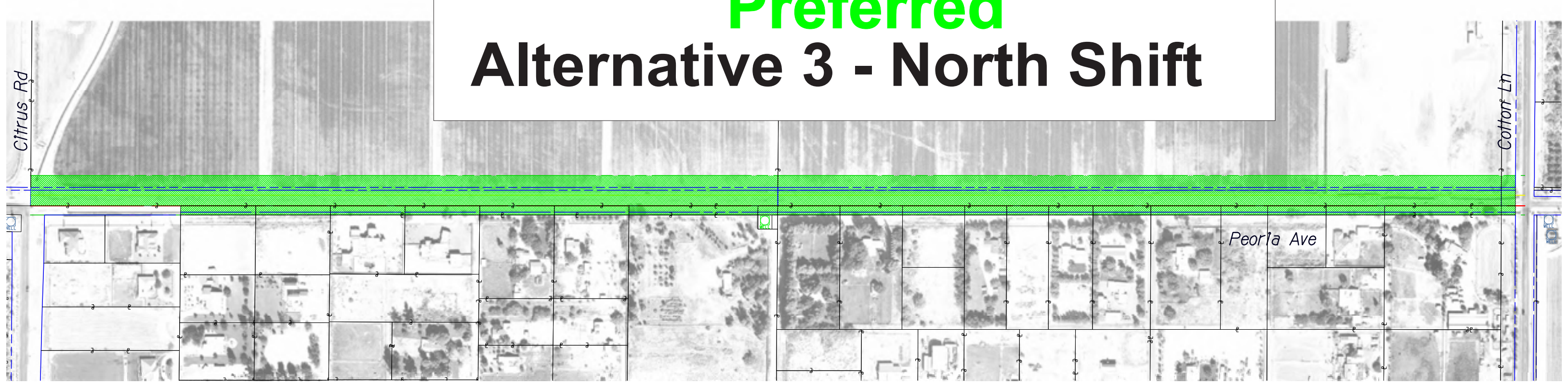
Alternative 1 - Section Line



Alternative 2 - South Shift



Preferred
Alternative 3 - North Shift



SEGMENT 4:

Citrus Road to Cotton Lane

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL — Well
- WELL — Abandoned Well
- Reclaim — Reclaimed Water Delivery Header

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

Segment 4: Citrus Road to Cotton Lane

Criteria		Alternative 1 (on section line)	Alternative 2 (shift 5' south)	Preferred Alternative: Alternative 3 (shift 37' north)
Right-of-way Considerations	Area	◒ 716k SF	◒ 716k SF	◒ 718k SF
	Cost	◒	● Higher cost likely to south	○
Compatibility with Existing Developments		◒ Balances impacts	● Greatest impact to most properties	○ No known impacts
Compatibility with Planned Future Developments		◒ Balances impacts	○ No new planned development to south	● All planned development to the north
Compatibility with Existing and Planned Roadway Improvements		○ Half-street constructed at Citrus	◒	◒
Engineering Complexity & Constructability		◒ Access fronting Peoria Ave	◒ Access fronting Peoria Ave	○ Opportunity for frontage road
Public Acceptability		●	●	○
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		◒ No existing drainage infrastructure constructed; must continue channel from the west	◒ No existing drainage infrastructure constructed; must continue channel from the west	◒ No existing drainage infrastructure constructed; must continue channel from the west
Environmental Considerations	Socioeconomic	● Impacts to private property	● Impacts to private property	○ No known impacts
	Physical & Natural	◒ Balances impacts	◒ Balances impacts	● Impacts to farmland
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch
Utility Considerations		● 1 well site; 5200 ft lined irrigation ditch; 20 power poles	● 1 well site; 5200 ft lined irrigation ditch; 20 power poles	◒ 5200 ft lined irrigation ditch; 20 power poles

Segment 5: Cotton Lane to Sarival Road

Criteria		Preferred Alternative: Alternative 1 (on section line)	Alternative 2 (shift 55' south)	Alternative 3 (shift 55' north)
Right-of-way Considerations		● 543k SF	◒ 453k SF	◒ 457k SF
		◒	○ Lower cost to south	● Highest cost to north
Compatibility with Existing Developments		◒ Balances impacts	○ No known impacts	● Impacts property to the north
Compatibility with Planned Future Developments		○ Least impact to all properties	◒ Balances impacts	● Greatest impact to most properties
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible w/ ADOT's plans for SR303L interchange	◒	◒
Engineering Complexity & Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		○ Minimal impacts	○ Minimal impacts	○ Minimal impacts
Environmental Considerations	Socioeconomic	◒ Minor impacts to existing land uses	◒ Minor impacts to existing land uses	◒ Minor impacts to existing land uses
	Physical & Natural	◒ Minor impacts to farmlands	◒ Minor impacts to farmlands	◒ Minor impacts to farmlands
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	○ No known impacts
Utility Considerations		● 2 well sites; 4300 ft lined irrigation ditch; 14 power poles	● 2 well sites; 4300 ft lined irrigation ditch; 6 power poles	○ 8 power poles

○ Lowest impact/best performance

◒ Moderate impact/moderate performance

● Highest impact/worst performance

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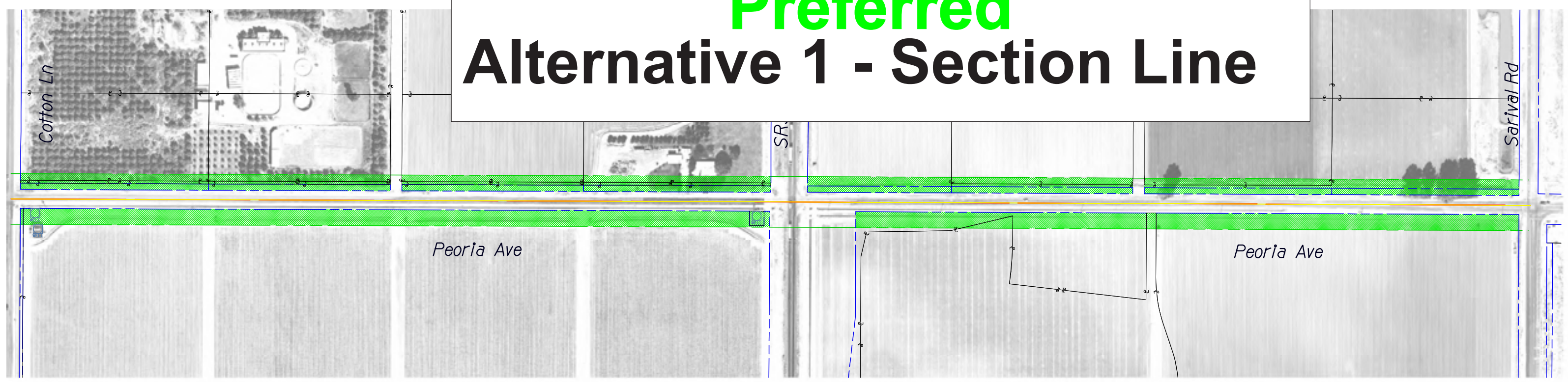
Right Road Right Time Right Cost

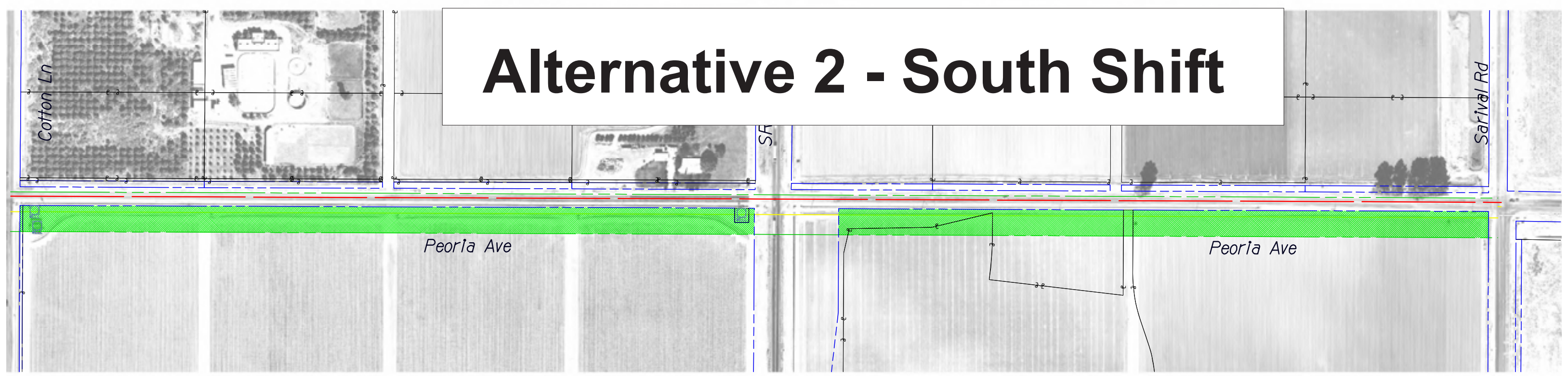
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

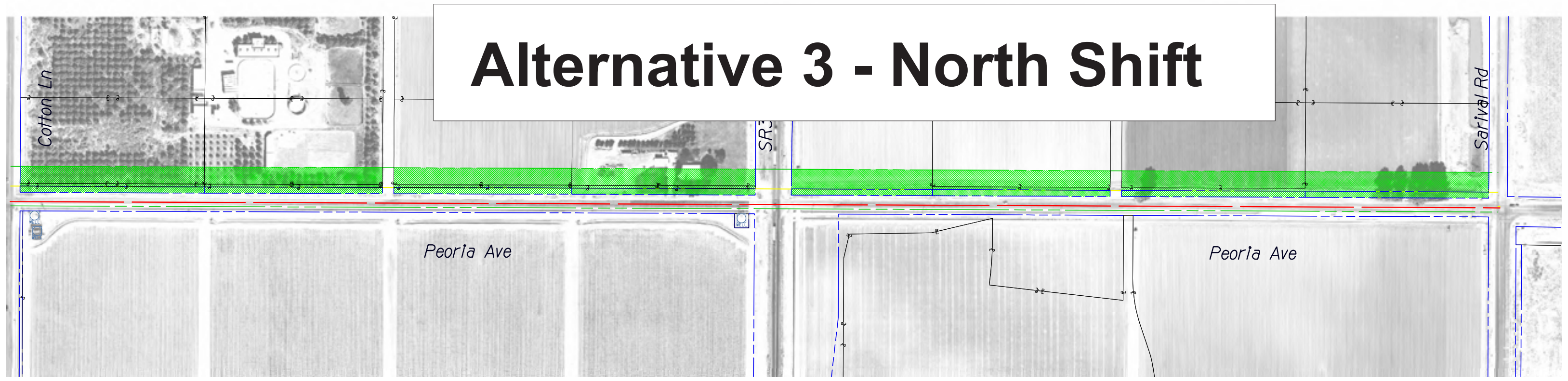
Preferred
Alternative 1 - Section Line



Alternative 2 - South Shift



Alternative 3 - North Shift



SEGMENT 5:

Cotton Lane to Sarival Road

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL — Well
- WELL — Abandoned Well
- Reclaim — Reclaimed Water Delivery Header

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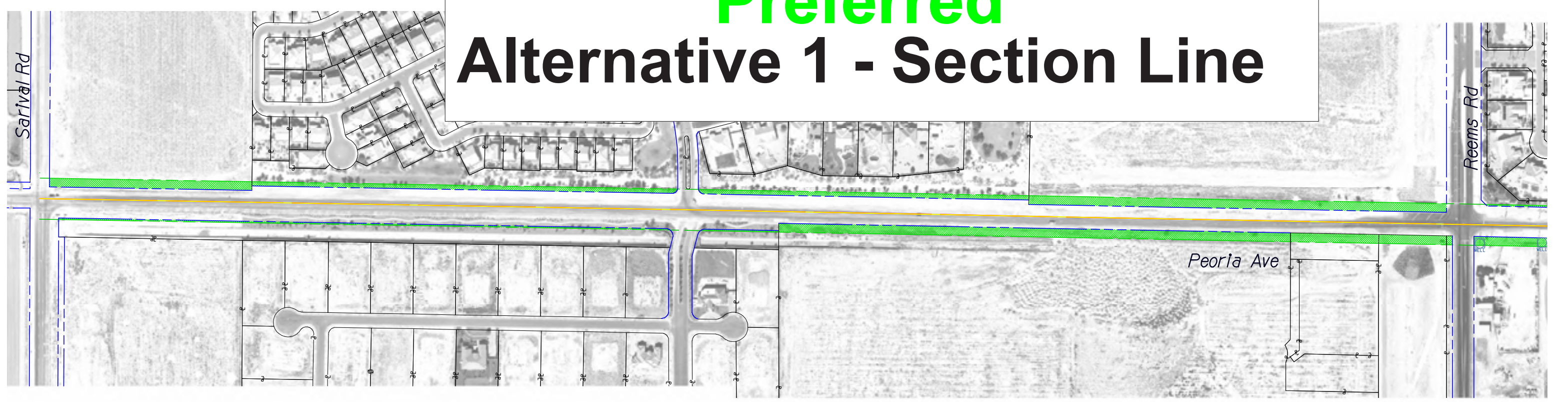
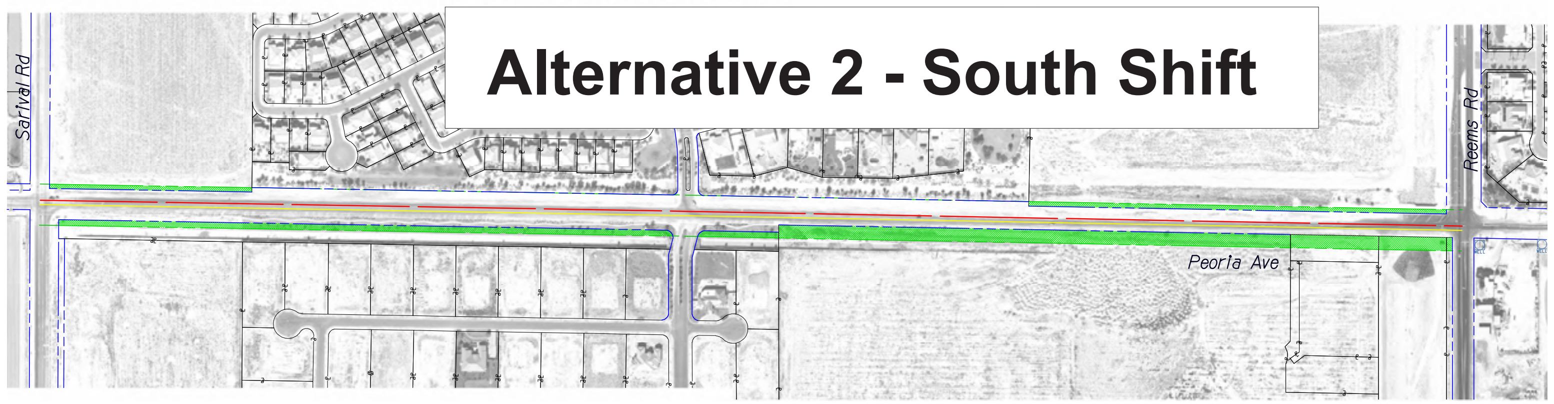
Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

Preferred

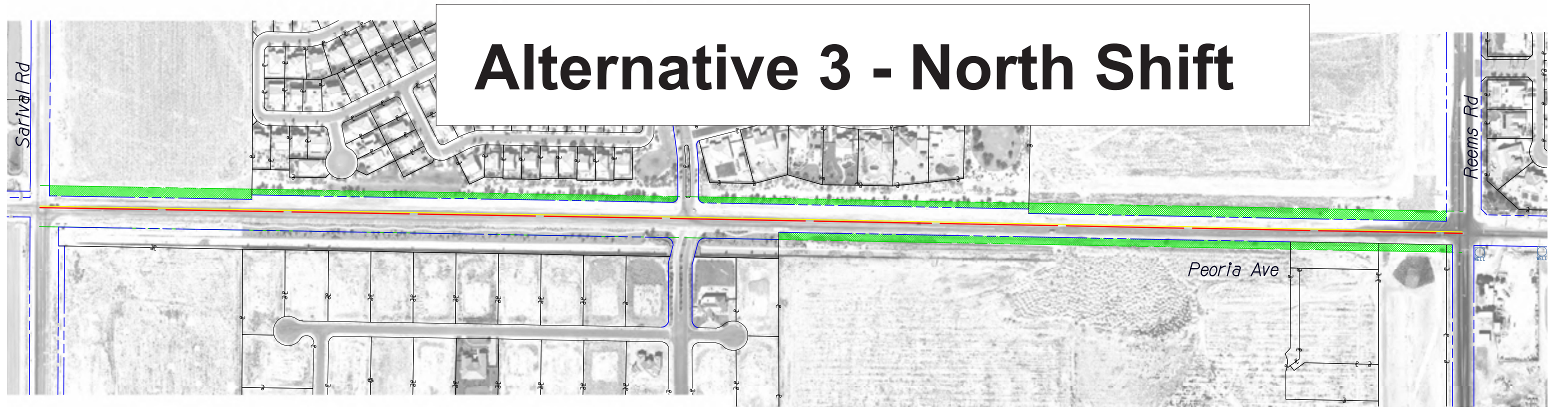
Alternative 1 - Section Line



Alternative 2 - South Shift



Alternative 3 - North Shift



SEGMENT 6:

Sarival Road to Reems Road

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL Well
- WELL Abandoned Well
- Reclaim Reclaimed Water Delivery Header

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

Segment 6: Sarival Road to Reems Road

Criteria		Preferred Alternative Alternative 1 (on section line)	Alternative 2 (shift 15' south)	Alternative 3 (shift 5' north)
Right-of-way Considerations		◒ 182k SF	◒ 182k SF	◒ 182k SF
		◒	○	● Greatest impact to existing and planned developments in right-of-way
Compatibility with Existing Developments		○ Balances impacts to both sides	◒ Minor impacts to south side	◒ Minor impacts to north side
Compatibility with Planned Future Developments		◒ Minor impact to future development to north	○ No known future development to south	● Impacts future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible with existing street and Reems Rd intersection	● Not compatible with existing street and Reems Rd intersection	◒ Not compatible with existing street but more compatible than #2 with Reems Rd intersection
Engineering Complexity & Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		○ Least impact to existing drainage facilities	◒ Minor impacts to existing drainage facilities	◒ Minor impacts to existing drainage facilities
Environmental Considerations	Socioeconomic	○ Minimal impact	○ Minimal impact	○ Minimal impact
	Physical & Natural	○ Minimal impact	○ Minimal impact	○ Minimal impact
	Cultural	○ No known impact	○ No known impact	○ No known impact
Utility Considerations		○ No known impacts to irrigation or power lines	◒ Potential relocation of underground irrigation facilities	○ No known impacts to irrigation or power lines

Segment 7: Reems Road to Bullard Ave

Criteria		Alternative 1 (on section line)	Alternative 2 (shift 5' south)	Preferred Alternative Alternative 3 (shift 30' north)
Right-of-way Considerations		◒ 227k SF	◒ 227k SF	◒ 224k SF
		◒	◒	● Higher cost likely to north; encroachment into residential lots
Compatibility with Existing Developments		◒ Balances impacts	◒ Balances impacts	● All existing development to the north
Compatibility with Planned Future Developments		◒ Balances impacts to both sides	○ No future development plans to the south	● All future development plans to the north
Compatibility with Existing and Planned Roadway Improvements		○ Reems Road improved to full street section; centered on section line	◒	◒
Engineering Complexity & Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		○ No known impacts	○ No known impacts	○ No known impacts
Environmental Considerations	Socioeconomic	◒ Impacts to agriculture	◒ Impacts to agriculture	● Impacts to private property
	Physical & Natural	● Potential impact to farms and habitat	● Potential impact to farms and habitat	◒ Potential impact to habitat
	Cultural	◒ Impacts to irrigation ditch	◒ Impacts to irrigation ditch	○ No known impacts
Utility Considerations		● 5 well sites; 4500 ft lined irrigation ditch; 16 power poles	◒ 5 well sites; 4500 ft lined irrigation ditch	○ 3 well sites; 16 power poles

○ **Lowest impact/best performance**

◒ **Moderate impact/moderate performance**

● **Highest impact/worst performance**

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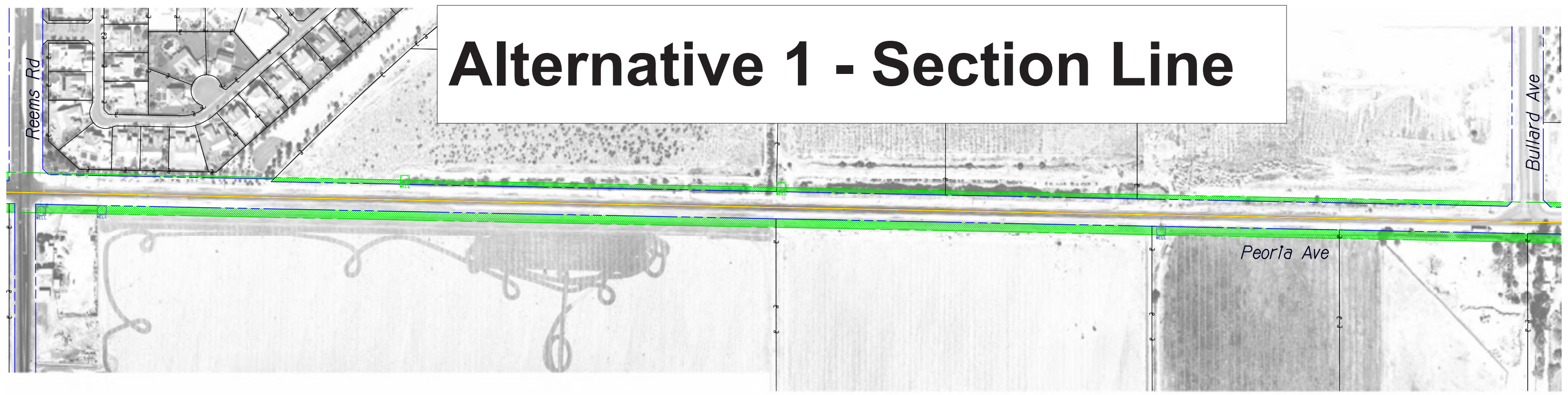
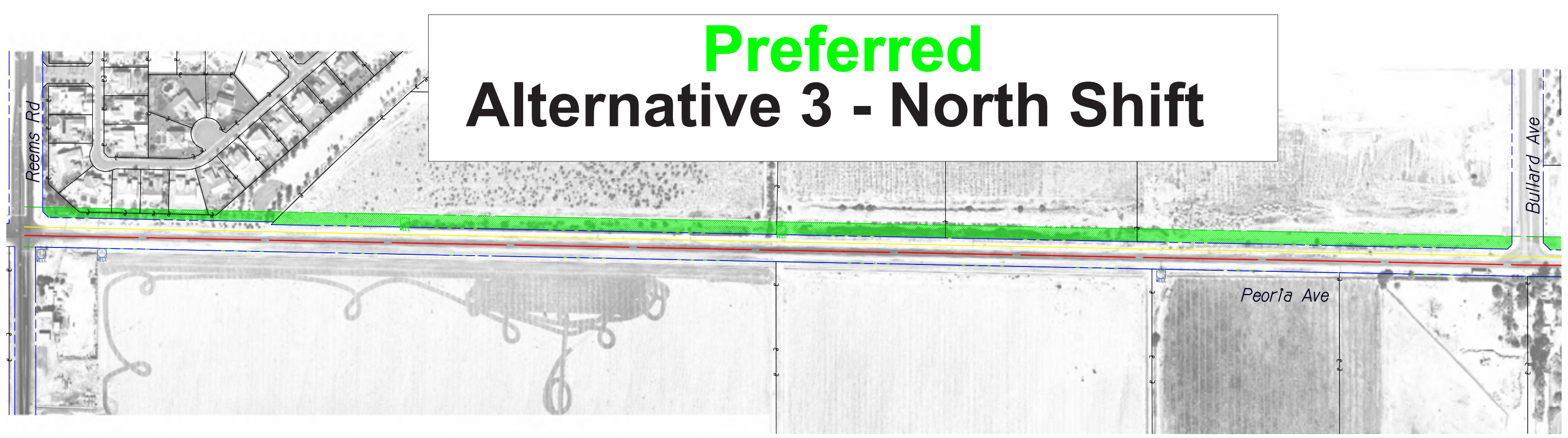
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study





SEGMENT 7:

Reems Road to Bullard Ave

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL — Well
- WELL — Abandoned Well
- Reclaim — Reclaimed Water Delivery Header

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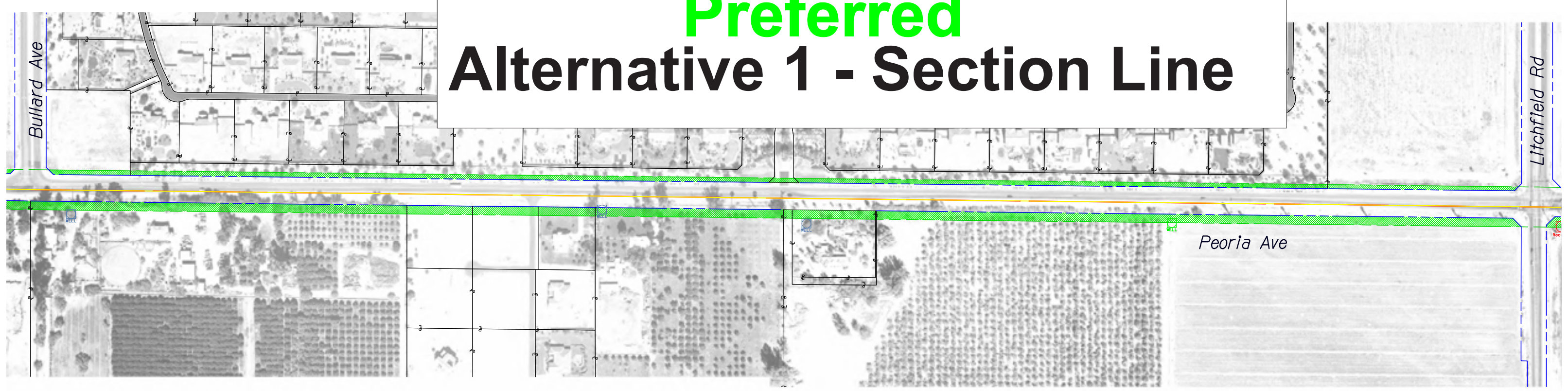
PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road

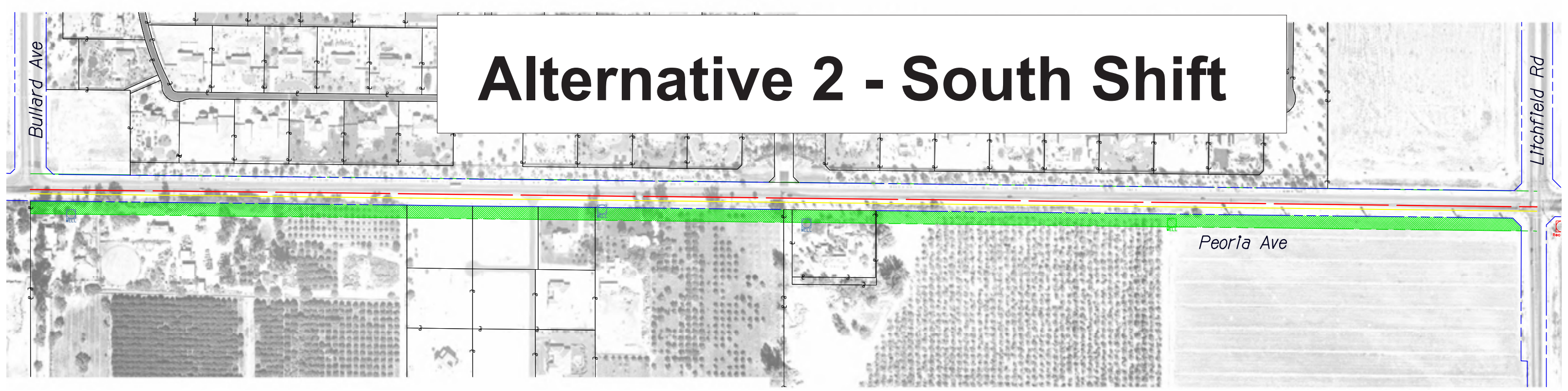
Corridor Improvement Study

Preferred

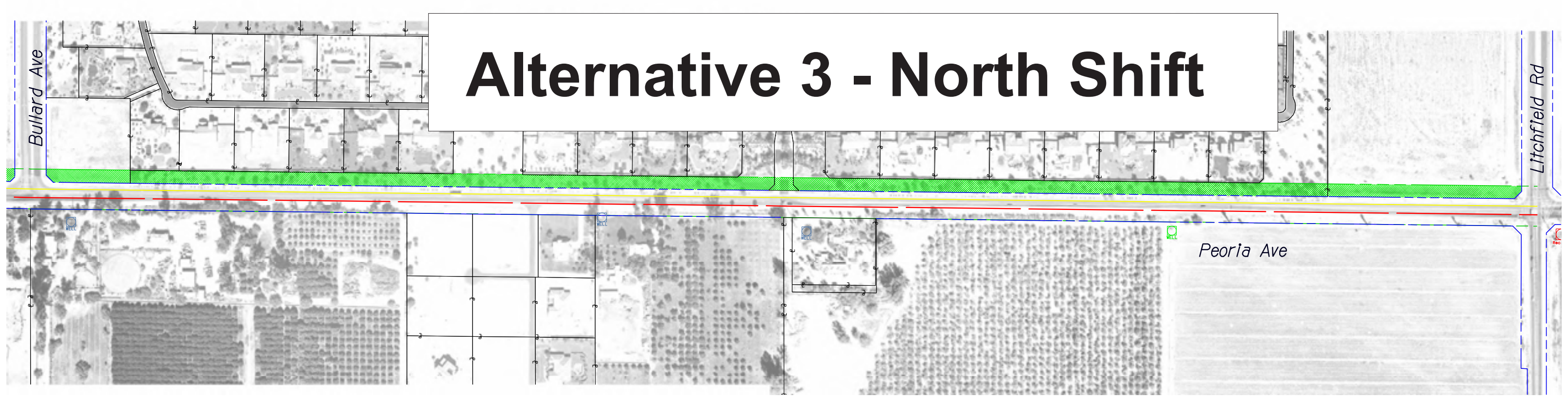
Alternative 1 - Section Line



Alternative 2 - South Shift



Alternative 3 - North Shift



SEGMENT 8:

Bullard Ave to Litchfield Road

N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL — Well
- WELL — Abandoned Well
- Reclaim — Reclaimed Water Delivery Header

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

Segment 8: Bullard Ave to Litchfield Rd

Criteria		Preferred Alternative Alternative 1 (on section line)	Alternative 2 (shift 15' south)	Alternative 3 (shift 30' north)
Right-of-way Considerations		◒ 235k SF	◒ 235k SF	◒ 233k SF
		◒	● Highest cost likely to south	○
Compatibility with Existing Developments		◒ Balances impacts	● Impacts land uses to south	● Impacts land uses to north
Compatibility with Planned Future Developments		◒ Minor impacts to future development	○ No future development to south	● Impacts to future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Litchfield and Bullard intersections fully improved; centered on section line	◒	●
Engineering Complexity & Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		◒ Minor impacts to existing drainage facilities	○ Least impacts to existing drainage facilities	● Most impacts to existing drainage facilities (channel and box culverts)
Environmental Considerations	Socioeconomic	◒ Balanced impacts	● Impacts to private property lots	○ No known impacts
	Physical & Natural	◒ Balanced impacts	● Greatest impact to farmland and potential habitat areas	○ No known impacts
	Cultural	○ No known impacts	○ No known impacts	○ No known impacts
Utility Considerations		◒ 2 well sites	● 4 well sites	○ No well sites impacted

Segment 9: Litchfield Rd to Dysart Rd

Criteria		Alternative 1 (on section line)	Preferred Alternative Alternative 2 (shift south)	Alternative 3 (shift north)
Right-of-way Considerations		○ 257k SF	● 300k SF	○ 252k SF
		◒ Moderate costs	○ Lowest cost likely to south	● Highest cost likely to north, including potential building takes
Compatibility with Existing Developments		◒ Minor impacts to land uses to north	○ No known impacts	● Impacts to land uses to north
Compatibility with Planned Future Developments		○ No known impacts to future development	◒ Minor impacts to future development to south	● Impacts future development to north
Compatibility with Existing and Planned Roadway Improvements		○ Most compatible with existing half-streets and Litchfield and Dysart intersections	◒ Balances impacts	● Least compatible with existing half-streets and Litchfield and Dysart intersections
Engineering Complexity & Constructability		○	○	○
Public Acceptability		◒	◒	◒
Local Agency Support		◒	◒	◒
Drainage/Flood Control Considerations		◒ Balances impacts	○ Least impact to existing drainage facilities	● Most impact to existing drainage facilities
Environmental Considerations	Socioeconomic	◒ Balances impacts	○ No known impacts	● Impacts to private property to north
	Physical & Natural	◒ Balances impacts	● Greatest impact to farmland	○ No known impacts
	Cultural	● Impacts to Ennis Spur	● Impacts to Ennis Spur	● Impacts to Ennis Spur
Utility Considerations		● 2 well sites; 2 reclaim taps; 7 power poles	● 2 well sites; 2 reclaim taps; 7 power poles	○ No well sites, reclaim taps or power poles

○ **Lowest impact/best performance**

◒ **Moderate impact/moderate performance**

● **Highest impact/worst performance**

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PEORIA AVENUE

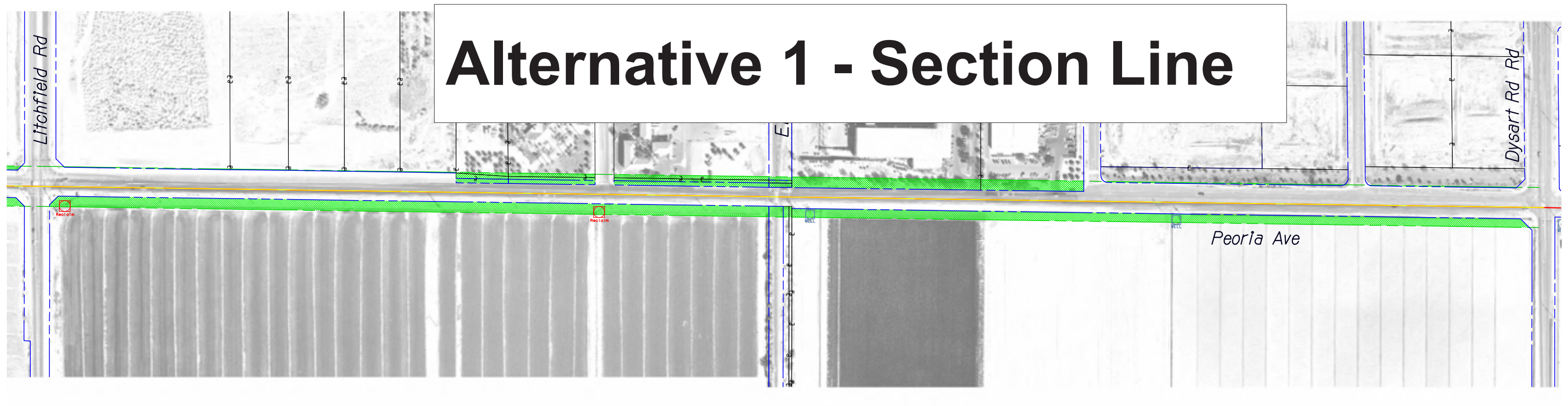
Jackrabbit Trail Parkway to Dysart Road

Corridor Improvement Study

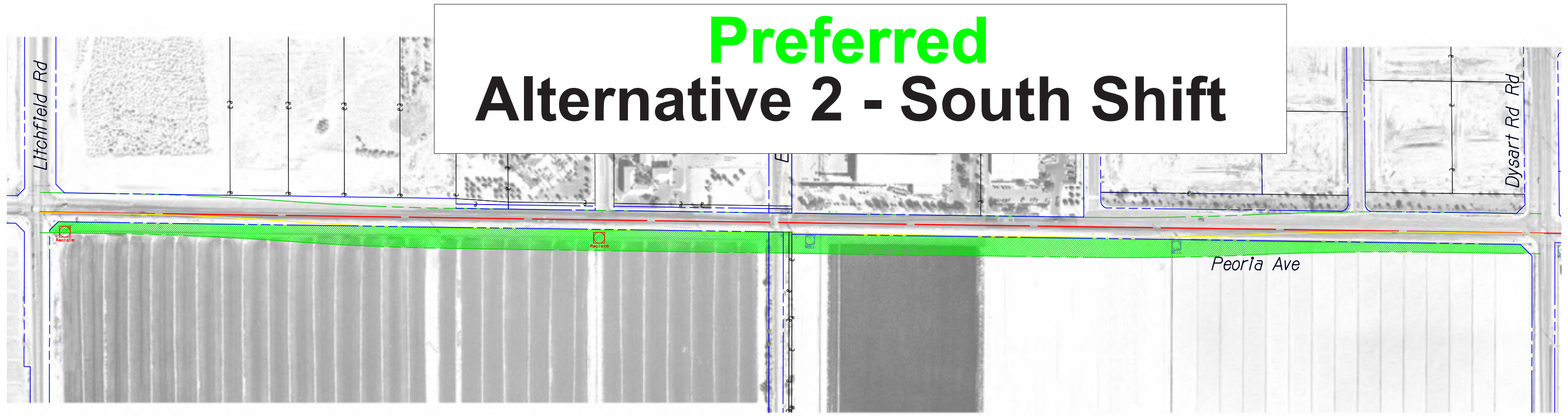
SEGMENT 9:

Litchfield Road to Dysart Road

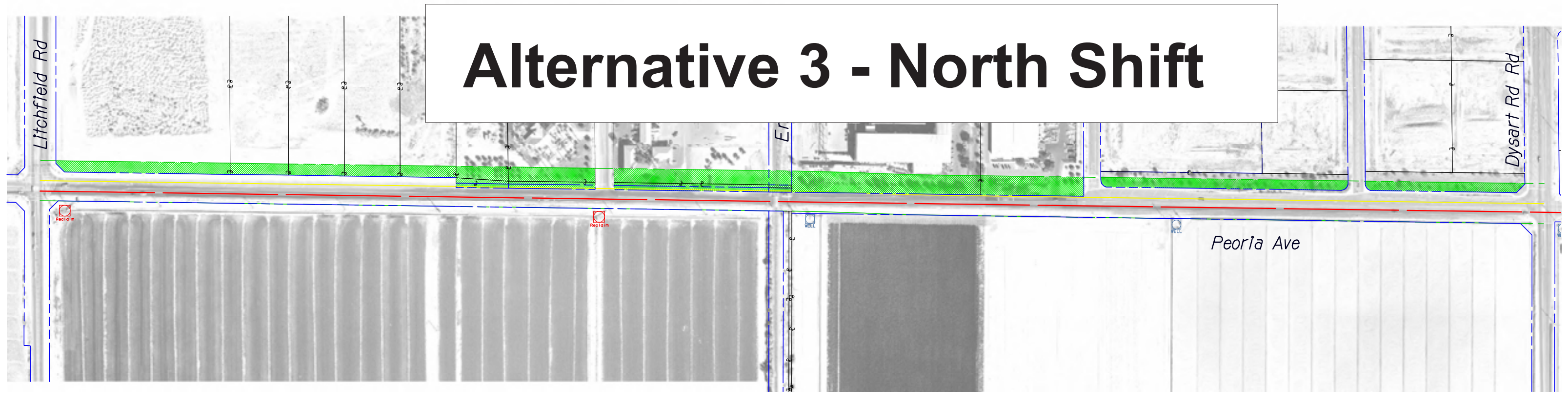
Alternative 1 - Section Line



Preferred
Alternative 2 - South Shift



Alternative 3 - North Shift



N

Legend

- Section Line
- Roadway ℄
- New R/W
- Existing R/W
- R/W Aquisition
- WELL — Well
- WELL — Abandoned Well
- Reclaim — Reclaimed Water Delivery Header

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Right Road Right Time Right Cost

PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road Corridor Improvement Study

Summary of Recommended Alignment

Segment	Location	Recommended Alignment	Comments
1	Future Jackrabbit Trail Parkway to Beardsley Canal	**Alternative 1** Centered on section line	Scored higher due to shorter corridor length and less disturbance to drainage corridors.
2	Beardsley Canal to Perryville Road	**Alternative 1** Centered on section line	Independent evaluation not carried out; alignment is already set in the Zanjero Trails Preliminary Plat.
3	Perryville Road to Citrus Road	**Alternative 1** Centered on section line	Scored highest of the three alternatives; most compatible with existing street improvement on Peoria Avenue. Corridor will transition at east end to meet segment 4, shifted north of the section line.
4	Citrus Road to Cotton Lane	**Alternative 3** Centerline shifted 37 feet north of section line	Scored highest of the three alternatives; most compatible with existing development; likely to have least Right-of-way cost.
5	Cotton Lane to Sarival Road	**Alternative 1** Centered on section line	All three alternatives scored similarly. Alternative 1 chosen due to compatibility with existing development and planned roadway improvements, specifically placement of Loop 303 and the Peoria Avenue traffic interchange. Corridor will transition from Segment 4 north shift to centerline symmetry at the west end of this segment.
6	Sarival Road to Reems Road	**Alternative 1** Centered on section line	Scored highest of the three alternatives; balances impacts throughout segment and performs best in key factors, including compatibility with existing development and drainage/flood control considerations.
7	Segment 7: Reems Road to Bullard Avenue	**Alternative 3** Centerline shifted 30-feet north of section line for short distance in middle portion of segment	Although scoring the lowest due to impacts to existing development, maintaining section line alignment at west end and transitioning to the north, east of existing development allows alignment to miss well site and balance impacts throughout remainder of segment. Corridor will transition at east end to meet segment 8, centered on the section line.
8	Bullard Avenue to Litchfield Road	**Alternative 1** Centered on section line	Scored highest of the three alternatives; balances impacts throughout segment and performs better than Alternative 3 in key factors,
9	Litchfield Road to Dysart Road	**Alternative 2** Centerline shifted south of section line	Because of the varying shifts associated with Alternative 2, it best minimizes impacts to existing land uses throughout the segment.

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PEORIA AVENUE

Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

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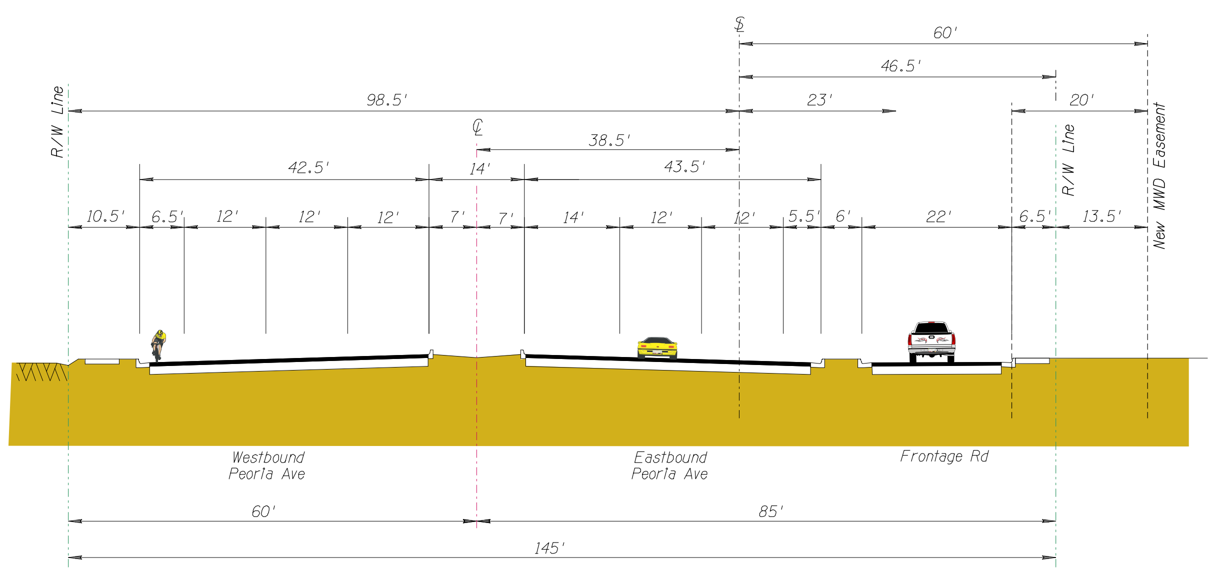
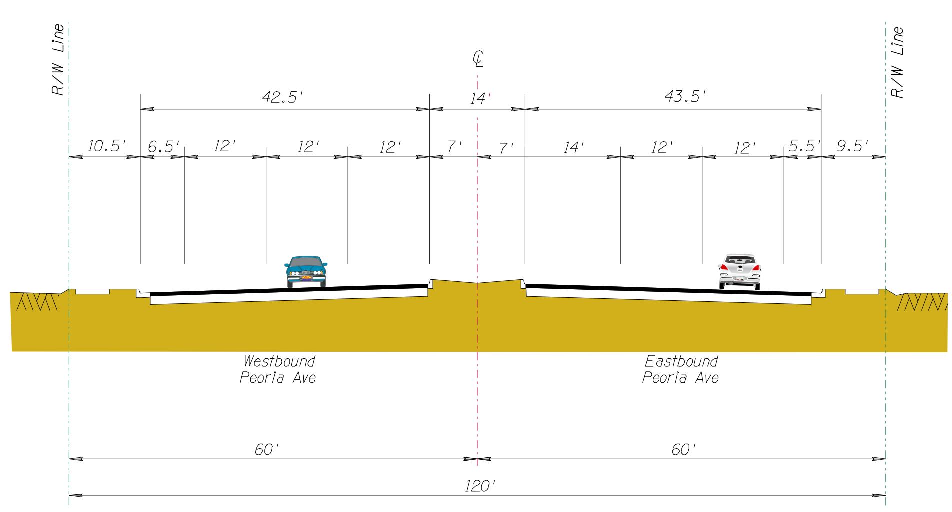


Typical Section with Frontage Road

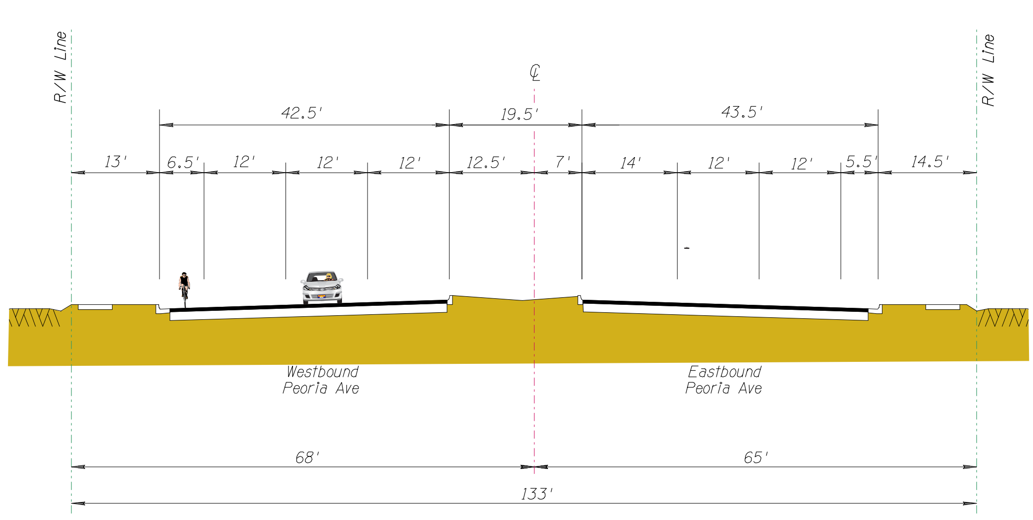
- Citrus Rd to Cotton Ln

frontage road concept



Typical Section 120' Right-of-Way

- Perryville Rd to Citrus Rd
- Sarival Rd to Reems Rd
- Bullard Ave to Litchfield Rd



Typical Section 133' Right-of-Way

- Jackrabbit Parkway to Perryville Rd
- Reems Rd to Bullard Ave
- Litchfield Rd to Dysart Rd

Typical Section 169' Right-of-Way

- Cotton Ln to Sarival Rd

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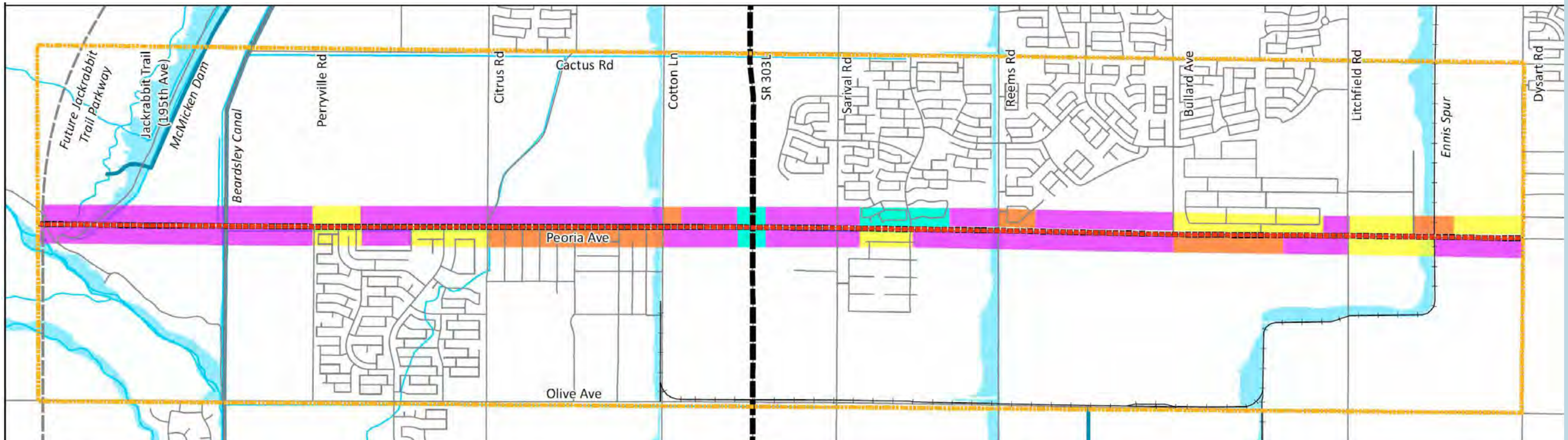
PEORIA AVENUE
Jackrabbit Trail Parkway to Dysart Road
Corridor Improvement Study

Implementation Plan



Implementation Plan

0 0.25 0.5 1
Miles

N

Legend

- Study Area Boundary
- Peoria Avenue Section Line
- Proposed Freeway
- Proposed Parkway
- Road
- Railroad
- General Floodplain Limits
- Drainage Structure (canal, dam)
- Stream/Wash
- Future Improvements by Developer
- Future Mid-Term Improvements by City/County
- Future Long-Term Improvements by City/County
- Improvements Currently Programmed/Planned

NOTES:
1. Implementation of corridor improvements will be primarily driven by development as it occurs adjacent to Peoria Avenue.
2. Segments shown as "by developer" are assumed to occur prior to 2030.
3. Segments identified as "mid-term" are those needed prior to 2030, based on traffic projections, to provide a continuous 4-lane facility.
4. Segments identified as "long-term" are those needed after 2030 to provide a 6-lane facility and provide corridor continuity.
5. This implementation plan is conceptual and does not guarantee actual construction by any specific time. Actual programming of future planning, design, and construction to be determined as part of normal budgeting process of city and/or county.

3-22-2011

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Department of Transportation

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Surprise City Council OKs Peoria Avenue agreement

The Arizona Republic
4-29-11

The Surprise City Council on Tuesday discussed the following items.

ISSUE

Vote to allow city staff to enter into an intergovernmental agreement that would make Surprise responsible for operating and maintaining the road. Maricopa County has conducted a transportation study that suggests Peoria Avenue between Dysart Road and Jackrabbit Trail Parkway be converted into a six-lane, major arterial street.

The road is currently two lanes across most of the 7.5-mile span and is bordered by Surprise to the north and Glendale and the county to the south.

Construction and design will not begin for years, but city staff hopes that taking ownership over the road will give Surprise a say in its design and provide another east-west crossing of the Agua Fria River. Maintaining the new road is estimated to cost the city an additional $137,000 per year and would begin once it is complete.

VOTE

Approved 7-0.

Appendix C:
MCDOT RightRoads Program Summary of Public Involvement

MCDOT *RightRoads* Program

Summary of Public Involvement

Peoria Avenue
Corridor Improvement Study
Jackrabbit Trail to Dysart Road

May 10, 2011

Maricopa County Department of Transportation

Maricopa County
Department of Transportation

2901 W. Durango St.
Phoenix, AZ 85009
Phone: 602-506-4608
Fax: 602-506-4882
www.maricopa.gov

MCDOT *RightRoads* Program
Summary of Public Involvement

Peoria Avenue Corridor Improvement Study
Jackrabbit Trail to Dysart Road
TT005

FINAL REPORT

PURPOSE OF PUBLIC INVOLVEMENT

This study evaluated planned corridor development and the resulting projected 2030 traffic volumes along the future Peoria Avenue corridor between Jackrabbit Trail and Dysart Road to develop the most cost-effective improvement plans that include a recommendation for establishing the future roadway type, alignment, access management strategies, future drainage structures and network connectivity.

Gaining consensus among the agencies and the public is critical to the success of this long range transportation study as well as the future implementation of its recommendations to provide an efficient roadway for the long term.

Maricopa County Department of Transportation (MCDOT), Flood Control District of Maricopa County (FCDMC), Arizona Department of Transportation (ADOT), Arizona State Land Department (ASLD), Maricopa Association of Governments (MAG), the Burlington-Santa Fe Railway (BNSF), Maricopa County Environmental Services, Maricopa County Parks Department, Maricopa County Planning and Development, Maricopa Water District, the City of Surprise, the City of Glendale, the City of El Mirage, Dysart Unified School District, major utility providers, impacted land developments, affected businesses, property owners and residents are all major stakeholders in this study.

The participation of stakeholder public and multi-agency involvement aids in the development of a consistent roadway and the resolution of conflicting agency requirements; facilitates ultimate regional traffic flow; and preserves the interests and rights of area residents and adjacent development.

STUDY BACKGROUND & PURPOSE

The Peoria Avenue Corridor Improvement Study (Jackrabbit Trail Parkway to Dysart Road) is one of a series of long-range transportation planning studies being conducted by the Maricopa County Department of Transportation (MCDOT). The City of Surprise, City of Glendale, City of El Mirage, and Maricopa County transportation plans all include Peoria Avenue as a future arterial roadway from Jackrabbit Trail Parkway to Dysart Road. The Maricopa Association of Governments (MAG) recently prepared the Interstate 10/Hassayampa Valley Transportation Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the build out of the area west of SR 303L. This long range regional transportation study identified the need for future roadway network consisting of freeways, parkways, and major arterial roads.

The MAG Hassayampa Framework Study recommended an extension of Peoria Avenue westward from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial roadway from the future Jackrabbit Trail Parkway to Sarival Avenue.

This study will identify the preferred alignment and “footprint” for the future Peoria Avenue between Jackrabbit Trail Parkway and Dysart Road and will facilitate future roadway implementation by developers and local jurisdictions, providing a cohesive transportation corridor, compatible with the City of Surprise, City of Glendale, City of El Mirage, Maricopa County, and MAG transportation plans.

Corridor Description

The Peoria Avenue Corridor study area includes the segment of Peoria Avenue between the future Jackrabbit Trail Parkway alignment and Dysart Road. The study area generally encompasses a two-mile wide corridor centered on the existing Peoria Avenue alignment.

Today’s Peoria Avenue generally consists of a two-lane roadway (one travel lane in each direction). Half-street improvements have been constructed along the north side of Peoria Avenue adjacent to developments such as Shadow Ridge High School, Greer Ranch subdivision, Copper Canyon Ranch subdivision and Skyway Business Park. Improvements on the south side of Peoria Avenue have been constructed adjacent to the Cortessa subdivision. The only full-width roadway section of Peoria Avenue is located immediately east of Perryville Road between Cortessa and Shadow Ridge High School.

The BNSF Railway operates a north-south railroad spur (Ennis Spur) that crosses Peoria Avenue between Litchfield and Dysart Roads. SR 303L crosses the Peoria Avenue Corridor between Cotton Lane and Sarival Road.

The majority of the land in the study area is privately owned, with the exception of the westernmost limit (west of Beardsley Canal) which is owned by the Arizona State Land Department (ASLD). The majority of the existing land use is categorized as vacant (undeveloped) or agricultural. Several residential subdivisions are built or under development, which include three elementary schools, one middle school, and one high school. In several locations, existing homes not associated with large master-planned communities, are located adjacent to Peoria Avenue. Small clusters of industrial and commercial development are scattered throughout the eastern end of the study area.

Based on the City of Surprise, City of Glendale, and City of El Mirage future land use planning, a majority of the vacant and agricultural land within the study area is envisioned to be converted to single-family residential housing and mixed-use developments in the future. It is anticipated that commercial and industrial development will expand, but remain scattered throughout the study area.

Study Need
Today's land development and existing travel demands in the Peoria Avenue Corridor do not warrant a major east/west arterial roadway in the near-term; however, plans are underway to convert much of the rural and low density residential lands within the corridor to more intense land uses that will generate significantly more traffic. The "build-out" forecast for future land development and resulting travel demand warrant a major east/west arterial roadway in the long term.

To help make future roadway construction economically feasible, the planning process needs to begin now to identify and protect long-term public right-of-way needs for the future roadway under ultimate "build-out" conditions.

Study Goals & Objectives
This corridor study is the first step in the planning process and its primary goal is to aid the affected agencies and jurisdictions in defining and protecting sufficient right-of-way for a continuous future Peoria Avenue Corridor that will safely accommodate projected travel demand and the future six-lane major arterial roadway as identified in the Surprise, Glendale, MCDOT and MAG long-range transportation plans. In general, the purpose of this Corridor Improvement Study is to provide MCDOT and partner jurisdictions with a future "footprint" of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

To accomplish this, the main focus of this study is to investigate, map, and analyze corridor constraints and opportunities to arrive at a recommended corridor alignment. This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also determine design standards based upon future roadway jurisdiction (anticipated roadway annexation) and an implementation or construction phasing plan.

The key objectives of this Corridor Improvement Study are to:

- Define and assess the strategic issues within the project study area

- Develop and evaluate conceptual alternative alignments within the corridor study area
- Recommend a preferred alignment
- Define the characteristics of the preferred alignment
- Develop consensus for the preferred alignment
- Develop an implementation (recommended construction phasing) plan

Preliminary Key Issues and Challenges
Early in the study process, a preliminary list of study issues and potential challenges is compiled. This list expands as the study progresses and input is obtained from public participation.

- Establish future connections of Peoria Avenue to planned roadways such as Jackrabbit Trail Parkway
- Account for future planned connection to SR 303L
- Evaluation of drainage structures across major washes, canals and channels.
- Evaluation of crossing of the BNSF Railway Ennis Spur
- Maintain functional integrity of roadway through constrained areas
- Maximize use of existing roadway improvements along corridor to reduce costs
- Identify ultimate alignment and access management strategies
- Consideration of environmental constraints

Study Approach
The Peoria Avenue Corridor Improvement Study is carried out in two phases, a planning phase and an engineering phase.

Planning Phase
During the Planning Phase, general background information regarding the corridor is gathered and documented in reports that will lead to well-founded recommendations for improvements and longer-term needs along Peoria Avenue. Meetings are conducted with affected jurisdictions, agencies, stakeholders, and the impacted public to form a broad consensus of the overall needs and vision of the corridor.

Based on identified needs, conceptual alternatives are developed and candidate alternatives are then evaluated for technical and environmental feasibility, public acceptability, and economic viability.

Engineering Phase
The Engineering Phase of the study begins following the selection of a preferred alternative. Preliminary engineering design plans, right-of-way requirements, and estimated construction costs will be prepared for long-term roadway design features.

Priorities for roadway construction phasing along with policies and guidelines to preserve the intended regional function of the road are developed.

STUDY MILESTONES

Project Kick-off & Study Initiation	July 2010
PHASE I: Data Collection/Issues Identification	July - September 2010
Public Input Meeting #1 (Scoping Phase)	September 20, 2010
PHASE II: Alternatives Development and Evaluation	October 2010 – January 2011
Public Input Meeting #2 (Alternatives Analysis Phase)	January 18, 2011
Public Input Meeting #3 (Findings & Recommendations)	March 22, 2011
Study Completion/Final Report	June 2011

ALTERNATIVES DEVELOPMENT & EVALUATION

After completion of the inventory of existing and future conditions, the study team developed the following evaluation criteria to help determine the alignment for Peoria Avenue:

- Right-of-way impacts
- Compatibility with existing developments
- Compatibility with planned future developments
- Compatibility with existing and planned roadway improvements
- Engineering complexity and constructability
- Public acceptance
- Local agency support
- Drainage/flood control considerations
- Utility considerations
- Environmental considerations

Preferred Alternatives (Recommended Alignments)
The Peoria Avenue corridor was split into nine east/west geographic segments to conduct the evaluation. Up to three alternative alignments were considered for each segment: Alternative 1 included widening the corridor symmetric to the section line,

attempting to balance impacts to both sides of the corridor; Alternative 2 included widening the corridor to the south, maintaining the northern right-of-way boundary; Alternative 3 included widening the corridor to the north, maintaining the southern right-of-way boundary.

Based on this evaluation and study findings, the following alternatives are recommended along the corridor:

Segment 1 (future Jackrabbit Trail Parkway to Beardsley Canal):
- Alternative 1 – new corridor along section line

Segment 2 (Beardsley Canal to Perryville Road):
- Alternative 1 – new corridor along the section line

Segment 3 (Perryville Road to Citrus Road):
- Alternative 1 - widen symmetric along the section line

Segment 4 (Citrus Road to Cotton Lane):
- Alternative 3 – shift north

Segment 5 (Cotton Lane to Sarival Road):
- Alternative 1 - widen symmetric along the section line

Segment 6 (Sarival Road to Reems Road):
- Alternative 1 - widen symmetric along the section line

Segment 7 (Reems Road to Bullard Avenue):
- Alternative 3 - shift north

Segment 8 (Bullard Avenue to Litchfield Road):
- Alternative 1 - widen symmetric along the section line

Segment 9 (Litchfield Road to Dysart Road):
- Alternative 2 - shift south

SUMMARY OF RECOMMENDED ALIGNMENT

Segment	Location	Recommended Alignment	Comments
1	Future Jackrabbit Trail Parkway to Beardsley Canal	**Alternative 1** Centered on section line	Scored higher due to shorter corridor length and less disturbance to drainage corridors.
2	Beardsley Canal to Perryville Road	**Alternative 1** Centered on section line	Independent evaluation not carried out; alignment is already set in the Zanjero Trails Preliminary Plat.
3	Perryville Road to Citrus Road	**Alternative 1** Centered on section line	Scored highest of the three alternatives; most compatible with existing street improvement on Peoria Avenue. Corridor will transition at east end to meet Segment 4, shifted north of the section line.

Segment	Location	Recommended Alignment	Comments
4	Citrus Road to Cotton Lane	**Alternative 3** Centerline shifted 37 feet north of section line	Scored highest of the three alternatives; most compatible with existing development; likely to have least right-of-way cost.
5	Cotton Lane to Sarival Road	**Alternative 1** Centered on section line	All three alternatives scored similarly. Alternative 1 chosen due to compatibility with existing development and planned roadway improvements, specifically placement of Loop 303 and the Peoria Avenue traffic interchange. Corridor will transition from Segment 4 north shift to centerline symmetry at the west end of this segment.
6	Sarival Road to Reems Road	**Alternative 1** Centered on section line	Scored highest of the three alternatives; balances impacts throughout segment and performs best in key factors, including compatibility with existing development and drainage/flood control considerations.
7	Segment 7: Reems Road to Bullard Avenue	**Alternative 3** Centerline shifted 30- feet north of section line for short distance in middle portion of segment	Although scoring the lowest due to impacts to existing development, maintaining section line alignment at west end and transitioning to the north, east of existing development allows alignment to miss well site and balance impacts throughout remainder of segment. Corridor will transition at east end to meet segment 8, centered on the section line.
8	Bullard Avenue to Litchfield Road	**Alternative 1** Centered on section line	Scored highest of the three alternatives; balances impacts throughout segment and performs better than Alternative 3 in key factors, including compatibility with existing development and drainage/flood control considerations.
9	Litchfield Road to Dysart Road	**Alternative 2** Centerline shifted south of section line	Because of the varying shifts associated with Alternative 2, it best minimizes impacts to existing land uses throughout the segment.

Recommended Implementation Plan
The recommendations of this study are intended to be used to preserve corridor right-of-way for the ultimate Peoria Avenue. It is anticipated that construction of

improvements will not likely be completed in the near-term, but rather by private developers as development along the corridor occurs.

Near-Term Improvements
In the near-term, projects that are already funded will be completed, such as improvements at the SR Loop 303/Peoria Avenue interchange (to be constructed by ADOT when SR Loop 303 is upgraded to a freeway) and City of Surprise planned completion of the north half-street section between Sarival and Reems Roads. Other near-term improvements recommended for consideration include acquiring public right-of-way and constructing a two-lane roadway between Citrus Road and Cotton Lane, and constructing drainage improvements at Litchfield and Sarival roads.

Mid-Term Improvements
Several additional improvement projects, most likely constructed by adjacent development, would be needed in the mid-term timeframe to provide a continuous four-lane facility by the year 2030:

- South half-street and frontage road construction between Citrus Road and Cotton Lane
- Cotton Lane intersection improvements
- Reems Road intersection improvements
- South half-street construction between Bullard Avenue and Litchfield Road

Long-Term Improvements
Long-term (likely beyond 2030) improvements will focus on bringing uniformity to the corridor and widening to the ultimate six-lane facility. Areas where these improvements would occur include:

- Perryville Road to Citrus Road
- Sarival Road to Reems Road
- Bullard Road to Litchfield Road
- Litchfield Road to Dysart Road

PUBLIC INVOLVEMENT

Public participation and feedback during each phase of the study process is very important and a vital component of study development. Gaining consensus among the jurisdictional agencies and the public is critical to the success of the study and implementation of its recommendations to provide a safe and efficient roadway for the long term.

In addition to multiple Stakeholder Advisory Committee meetings, a total of three public input meetings are conducted during the course of the study process. The first public input meeting (September 20, 2010) was held during the data collection and Scoping Phase to inform the public of the objectives of the study and provide area residents and other stakeholders with an opportunity to inform project team members about study area issues and local transportation needs. This meeting also provided the public an opportunity to contribute feedback on the study purpose, goals, and objectives.

The second public input meeting (January 18, 2011) was conducted during the Alternatives Analysis Phase. This meeting served to provide the results of the issues and constraints identification process and reviewed the candidate alignment evaluation criteria. This meeting also presented the conceptual alternative alignments, and gathered more public feedback to assist further development and evaluation of the advanced Candidate Alternatives, leading to the study's primary objective, the selection of a Preferred Alignment.

The third and final public input meeting (March 22, 2011) was held during the Findings and Recommendations Phase of the study. This meeting reviewed the results of the Candidate Alternative evaluation process, presented the Preferred Alternative (recommended alignment), and gathered additional public input and feedback for use in the development of the final report.

Participants

MCDOT Planning & Engineering:	Consultant Team:
Mitch Wagner	Rodney Bragg (AECOM)
Roberta Crowe	Jackie Pfeiffer (AECOM)
Mike Pavlina	Javier Guana (Andes)

Public Works Lands/Real Estate:
Robert Sachs

Outreach Methods
The following outreach methods were used to inform and notify the general public and impacted residents about the study, public input meeting dates and locations and additional opportunities or means for input:

- Media releases
- Newspaper articles
- Display advertisements in local and regional publications
  - Arizona Republic
  - Surprise Independent
  - West Valley View
  - Buckeye Valley News
- MCDOT website
- Partner agency mediums
- Direct mail flyers to adjacent property owners and previous meeting attendees

PUBLIC COMMENT

Over 150 people attended three public input meetings conducted through the course of this study. Graphics, aerials and display exhibits presented corridor alternatives and study information. Study Fact Sheets and Comment Sheets were distributed to those in attendance. All public meetings were conducted in an "open house" format providing a free, open and accurate exchange of information between area residents with specific issues or questions and the project team. The following information is representative of discussions that the project team had with meeting attendees and written comments received by MCDOT:

Scoping Phase Public Meeting
Meeting Purpose: Gather public comment regarding the study area, existing conditions, current corridor deficiencies, future transportation needs and public review of overall Study Goals and Objectives.

5:00 – 7:00 p.m., September 20, 2011
Shadow Ridge High School Media Center
Surprise, AZ 85388

Attendance: 66

- There are lot of people using this road especially in the peak hours. I would suggest there should be a minimum of 2 lanes on each side with lighting on both sides of the road. West of Bullard avenue there is no lighting on the road .There is lot of vacant land surrounding the Peoria Ave and I am assuming there will be lot of future residential/commercial development will be happening adjacent to Peoria Avenue.
- Intersection of 303 & Peoria Avenue needs to be signalized.
- I support the completion/improvement of Peoria Avenue from Jackrabbit Trail to Dysart Road. It is imperative that alternate ingress and egress roadways are established for the residents in this area.
- Peoria between Cotton Lane and Citrus needs to be addressed sooner than later. For emergency services to meet somewhat decent response times this road should be paved or monthly maintained for proper and secure road travel. Owner made speed bumps and or ditches should be addressed.
- If a road improvement is needed then Olive should be the road. It has much less housing affected and it goes all the way through to the 101. Peoria after Dysart turns into 25 mph. Peoria does not make sense.
- MCDOT not very knowledgeable about Peoria Avenue & Citrus as to how it is going to be improved (# of lanes, speed, traffic control devices) right of way purchasing and speed enforcement/traffic control devices, i.e. residential neighborhood 25mph or less. What time frame for project improvements. This section of roadway provides a very big environmental issue caused by the dust. Very big impact from developments to the west of this location to the high school.

- Please pave Peoria between Cotton Lane and Citrus ASAP. Thank you.
- The community on 178th Avenue does not want the street (178th Ave.) to exit onto Peoria Ave. What noise barriers are going to be installed to cut down on noise pollution? The dust pollution on Peoria is terrible. What is the County and City of Surprise going to do about the pollution from traffic between now and the time pavement is installed.
- My concern is the area from Cotton Lane to Citrus on Peoria. Before the school was built, someone should have thought about the people who already live in the neighborhood. What is the speed limit; will there be stoplights or stop signs? Where will the intersections be? What can you do in the meantime to control the dust? What about the speeders? How many lanes will there be? We need to have more answers if you wanted out opinions!
- Provide more info at next meeting. Do something about the dirt road between Cotton lane and Citrus. The dust is killing us. Keep the speed limit at 25mph on dirt road and enforce it. Need to know number of lanes and traffic control devices. Dust control and environmental issues at the present time and future.
- Hopeful that Peoria will become paved from Cotton Lane to Perryville. We have kids at the elementary school and traffic would be significantly decreased if this were to happen.
- Interested in the sequence/timeline of improvements and proposed changes to Peoria Ave Also – type of interchanges at 303 and arterials.
- Nobody working this meeting really had any information as to what was going to happen if anything. Nick Mascia (City of Surprise) was very helpful and knowledgeable however there are no plans for anything to happen. This meeting led me to believe there was something in the "works". What a disappointment to find out it is a dead-end. The high school will have Seniors and Juniors driving – the dust level for Peoria and Cotton area will be much worse. The 4-way stop at Cotton and Olive is very busy and in the mornings it is impossible to get through.
- I know money is dear, but can't we pave some of the dirt roads before tearing up existing roads constantly?
- Project needs to be "fast tracked" thru local City/State/County DOT officials. I was disheartened to find out this "project" is still in the study phase. My main concern is Peoria fronting the community of Greer Ranch. The HOA is concerned regarding road signs, sidewalks and necessary landscaping that need to be to actually finish off the development. I would be more than happy to discuss this further. Appreciate the "Open House".
- This is a very needed project improvement for the area. The challenge will be on getting the owners (all of them) to agree on the best alternatives. The District has tried that before when we built the school and met resistance.
- We live in Cortessa and Olive Avenue right now is the only in and out of this area. Should Peoria Avenue get improved, it would help the traffic flow tremendously. Also, with the High School now being open, it would assist with traffic as well. I don't believe that there is any reason not to

- Improve Peoria Avenue with the exception of the home owners that happen to live there and don't want the additional traffic - then they should move.
- Recently a large school was put in at the end of Peoria and Citrus. Since this school was put in, we have had nothing but traffic speeding down Peoria (dirt road) each morning and also in the afternoon. I assume these are people taking and picking up their children from school. This causes a tremendous amount of dust for the people who live in my neighborhood, especially the people whose houses face Peoria Road. Don't get me wrong, I would love to see the road paved to cut down on the dust in our neighborhood, however I have some concerns.
- We do not want 178th Avenue to connect to Peoria Avenue. In addition, we would like to have a sound wall as well.
- My questions to you are if this road is paved, who will incur the cost? Will our taxes be raised so people who do not live in our neighborhood can take their kids to the new school? Is there some sort of stimulus that will take care of the cost? Will the people whose houses face Peoria loose part of their frontage property, and what about the irrigation canals that run along Peoria? The stretch of road on Peoria from Cotton Lane to Citrus will there be speed bumps or stop signs?
- We would like for the road to be paved. Since Shadow Ridge High School has opened we have experienced a lot of traffic thru our community (Cortessa) and have even experienced a number of accidents down Olive ave towards Cotton Lane. Perryville Rd going towards Olive has become a race way for the High School kids as well resulting in the kids driving extremely fast down that road. We feel if Peoria Ave was paved it would eliminate the high school kids driving thru the community, allowing more routes to exit the High School eliminating accidents, kids getting hit (which this has happened) and reducing traffic flow/speed down Olive ave towards Cotton and Perryville Rd towards Olive.
- I would love to see road improvements to Peoria Ave! Not only for quicker, safer access to the High School but congestion and traffic would be reduced at all entrances/exits on Olive Ave west of Cotton Lane as well. Though the housing boom has ceased, there are many who live in the Cortessa development that would greatly benefit from the improvements. Work and shopping expeditions would have less drive, which saves on gas in these tough economic times. It is a great time to update Peoria Ave and also provide work for many. My vote is a YES!

The following are key issues captured by the study team during conversations with meeting attendees:

- Support (from a number of people who live in Cortessa) to pave the one-mile of Peoria Avenue between Citrus Road and Cotton Lane.
- Want improvements made to Peoria Avenue sooner rather than later.
- Concern about emergency access if emergency vehicles "detour" around unpaved segment.
- Desire for the use of asphalt rubber to reduce noise levels.
- Don't want 178th Ave connected to Peoria Avenue when Peoria Ave is improved.
- Questions about the study schedule and future input opportunities.
- Questions about alternatives under consideration.
- Questions about the timing of new development/master planned communities.
- Clarification of study purpose.
- Concern about other unpaved roads (not in the study area) and when the county will pave them.
- Questions about specific development entitlements relative to future land use (e.g., when/where will a gas station be placed in the neighborhood; when will the new Safeway begin construction, etc.).

Alternatives Analysis Phase Public Meeting
Meeting Purpose: Gather public comment regarding preliminary study findings, traffic analysis, corridor alignment alternatives and future roadway options.

5:00 – 7:00 p.m., September 20, 2011
Shadow Ridge High School Media Center
Surprise, AZ 85388

Attendance: 35

- We live at 15751 W. Becker Lane and Peoria Ave. is just beyond our back wall. Traffic noise is already high. Peoria Ave. doesn't go through to the 101 so it makes no sense to widen it. A better idea would be to widen Olive Ave. instead. There are very few homes along the corridor planned and there are stop lights already installed at the major intersections including the 303 and the 101. It is more of a major road than Peoria Ave. We are against your plans at this time.
- I attended the open house last night at the High School. Thank you for taking the time to speak with all of us and listen to the concerns of the homeowners in the neighborhood. My first concerns at this meeting was to be sure that there were no plans to open up our dead end street to Peoria Ave. (178th, 177th, 176, all dead end at the irrigation ditches).
  You nodded your head and said that that was not included in this study or the plans. I was good with that. My second concern was a noise barrier along Peoria. This was not addressed at the meeting... so I am not sure what the plans are for that.
- After reviewing the 3 alternatives that were posted. I have to say that Alternative 3

(road to the north) is really the only option. I am the billing coordinator for Co-op 100, the co-op that owns the small irrigation ditches that provides irrigation to the homes from 175th - Citrus, south of Peoria Ave. If you went with Alt. 1 or 2, this will affect the irrigation ditches and the wells. I am not sure how that would affect the irrigating of our property.
- Some of the homeowners have been there for over 40 years, and some are fairly new; but nevertheless, we all moved out there for the irrigated acre's and raise our children in a rural environment. I completely understand that "progress" and "change" is coming. We dealt with that with Cortessa. If there is an option (Alt. 3) that can improve the road without disturbing the homes in our neighborhood, I feel that that should be your only option. The only thing on the North side of Peoria is farmland. No homes, no families, nothing personal will be disturbed by using the farmland for your Peoria Corridor.
- PS: If the county would like to pave the existing 2 lane road from Cotton Lane to Citrus, I don't think anyone would have heartache over that.

- Peoria's unpaved section East of Citrus needs 2 lanes paved "yesterday", if not dust to control the dust, to eliminate the extra 2 miles of travel getting around it in lieu destroying your vehicle. It does not appear to be any reasonable alternative route other than Peoria, at least nothing as straight forward and nothing that wouldn't cost a lot more money.

Findings and Recommendations Phase Public Meeting
Meeting Purpose: Gather public comment regarding study findings and "Preferred Alternative", recommended access management strategies and guidelines, and an improvement phasing timeline.

5:00 – 7:00 p.m., September 20, 2011
Shadow Ridge High School Media Center
Surprise, AZ 85388

Attendance: 50

- I live at 18537 W. Onyx Ave near Shadow Ridge School. I would like to see Peoria improved from Cactus Lane to 303. This would cut 2 miles off every time I drive to Surprise. Also the intersection of Olive and 303 is in deplorable condition. A little patch work could smoothen it up. The bumps could cause accidents. Thank You
- It is simply my feeling that the County should proceed with the plan for Peoria Ave. that make sense. There are a few vocal individuals (as usual) that will cause delay and therefore added expense to this project
- If the County doesn't proceed. The Peoria "cow trail" east of Citrus is a prime example of a few, delaying what should have been done ages ago ,but would a single lane in each direction west of the 303 be any sort of an option, at least for that section, until the entire project can move forward ?

Comments/questions received by Project Team during discussions with meeting attendees:

- Most attendees want improvements built now to mitigate dust issues along Peoria from Citrus Road to Cotton Lane.
- General support for frontage road concept in segment between Citrus Road and Cotton Lane.
- Some concerns/questions regarding frequency of median breaks/access to Peoria Avenue and intersecting side streets.
- Want noise mitigation to be considered between Citrus Road and Cotton Lane as homes will be close to roadway.
- Request to reduce speed limit along Peoria Avenue between Citrus Rood and Cotton Lane as homes will be close to roadway.
- Several questions on timeframe of implementation of Peoria Avenue improvements; preference for improvements sooner rather than later.

FUTURE PROJECT DEVELOPMENT CONSIDERATIONS

It is important to recognize that the Peoria Avenue Corridor Improvement Study is a long range transportation planning study and the earliest phase of potential project development. It is intended to identify the facility type and roadway alignment at some future date along the Peoria Avenue corridor to address forecasted travel demand associated with future area land development. No public funding is currently allocated for design, right-of-way acquisition, or construction of any elements of this segment of the Peoria Avenue corridor.

The Preferred Alignments as recommended in this study will be used to guide future planning efforts and ensure that subsequent land development proposals and transportation system plans are compatible with future construction of Peoria Avenue. Further refinement and negotiation of the roadway centerline right-of-way limits and consideration of environmental impacts will take place in later phases of project development as properties develop and as transportation system improvements are implemented.

The following are key issues captured during this study's stakeholder and public involvement process that should be taken into consideration by individual jurisdictions as the recommendations of this study are carried forward into design and construction:

- **Project Funding:** It can be anticipated that area developers will participate as part of project requirements.
- **Access Management Strategies:** Specific strategies should be implemented to ensure a seamless roadway with efficient traffic flow, safety and good access to local land uses.

- **Environmental Impacts:** (Natural, Cultural and Archeological Resources) and Noise Mitigation. Specific impacts on the local environment will require further evaluation during future project development.
- **New Right-of-Way Requirements:** Final roadway configuration (during preparation of Final Design Plans) will determine exactly how much land will need to be acquired to accommodate the future roadway.
- **Landscaping Plans:** Final project design will specify the type of landscaping to be used.
- **Drainage Structures:** Bridges along the new roadway will be designed during final roadway design efforts. It will be critical to ensure the roadway is designed to provide "all weather" crossings during major storm flows.
- **Bicycle, Pedestrian and Transit Access:** Future projects will be designed to accommodate alternative modes of travel and provide access to trails and neighborhoods in the area.
- **Corridor Traffic Management:** ITS (Intelligent Transportation System) will control operation of traffic between jurisdictions and differing intersection configurations.
- **Jurisdictional Coordination:** As with the overall traffic control, implementation of different corridor improvements and access management concepts will be coordinated to ensure a safe, seamless and efficient transportation facility.

Next Steps: Implementation of Recommended Improvements

- Adoption of Recommendations by Individual Jurisdictions
  - Functional Roadway Classification (Urban Arterial)
  - Corridor Alignment
  - Access Management Plan
- Right-of-way Preservation in Developing Areas
- Design Concept Report (DCR) or Scoping Report for Consideration in project programming
- Appropriation of Funds for Design, Right-of-Way Acquisition and Construction of Recommended Corridor Improvements

- Consistent Coordination between various Jurisdictions on Transportation Improvements and Traffic Issues

This report contains capsulated key issues identified during this study's public involvement process that should be taken into consideration by individual jurisdictions as the recommendations of this study are carried forward through design and construction.

It is recommended that future project development build upon the public involvement program established during this study and continue as a comprehensive program progression.

For more information about the study, contact Mitch Wagner, MCDOT Planning, at 602/506-8054 or Roberta Crowe, MCDOT Public Information Officer at 602/506-8003.

Appendix G
Technical Memorandum No. 7: Traffic Analysis

Peoria Avenue Corridor Improvement Study: Jackrabbit Trail Parkway to Dysart Road

Technical Memorandum #7: Traffic Analysis

February 2011

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Appendices

1.0 INTRODUCTION

The Maricopa Association of Governments (MAG) prepared the Interstate 10/Hassayampa Valley Transportation Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the build out of the area west of State Route 303 (SR 303L). This long range regional transportation study identified the need for a roadway network consisting of freeways, parkways, and major arterial roads.

The Hassayampa Framework Study recommended an extension of Peoria Avenue west from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial from the future Jackrabbit Trail Parkway to Sarival Avenue. The study area for this project includes Peoria Avenue from the future Jackrabbit Trail Parkway alignment to Dysart Road (Peoria Avenue Corridor). The study area generally encompasses a two-mile wide corridor centered on the existing Peoria Avenue. The study area is shown in Figure 1.

This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also develop access management guidelines, determine design standards based upon which jurisdiction anticipates annexing the roadway, and develop an implementation plan. In general, the purpose of this Corridor Improvement Study is to provide the Maricopa County Department of Transportation (MCDOT) and other jurisdictions with a future “footprint” of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

The key objectives of this Corridor Improvement Study are to:

- Define and assess strategic issues within the project study area;
- Develop and evaluate conceptual alternative alignments within the corridor study area;
- Recommend a preferred alignment;
- Develop consensus for the preferred alignment;
- Define the characteristics of the preferred alignment; and
- Develop an implementation plan.

This technical memorandum identifies the existing and future travel demand, roadway network, and traffic conditions for the Peoria Avenue Corridor.

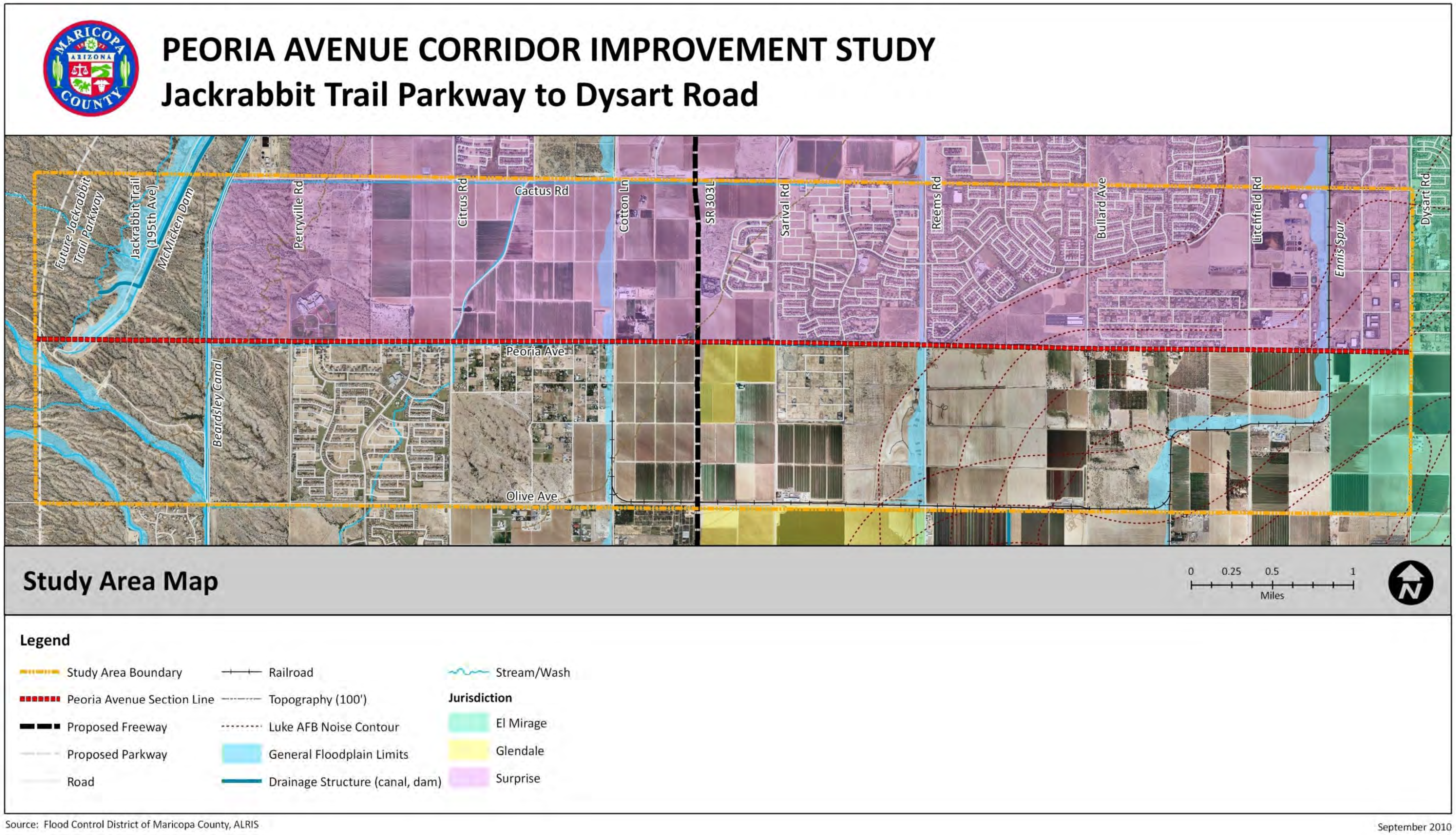


Figure 1 – Vicinity Map

2.0 EXISTING TRAFFIC CONDITIONS

Existing Transportation Network

Figure 2 illustrates the existing transportation network in the study area. Currently, Peoria Avenue is a two-lane roadway, with varying degrees of improvements. Presently, Peoria Avenue extends west as far as Perryville Road as a paved road, with the exception of one mile between Citrus Road and Cotton Lane that is unpaved. Between Perryville Road and the Beardsley Canal, an unpaved and narrow maintenance/access road exists. In the wider context of the study area, Jackrabbit Trail Parkway does not yet exist; Olive Avenue is the only crossing of the Beardsley Canal, granting access to the west; and SR 303L remains a major arterial road with no freeway improvements completed. Local roadways are intermittently developed, depending on the degree of built residential and industrial land uses. The BNSF Ennis Spur crosses Peoria Avenue at an at-grade railroad crossing, protected by lights and gates.

Based on its current function in the existing network, MCDOT functionally classifies the existing Peoria Avenue roadway as a major collector in the Maricopa County Transportation System Plan, February 2007. A major collector provides short-distance (less than three miles) traffic movement, collects and distributes traffic between local and arterial streets, and provides direct access to abutting land.

The existing portion of Peoria Avenue within the study area has eight major cross-street intersections from Perryville Road to Dysart Road, not including the intersection with SR 303L. The intersection with Litchfield Road is a four-legged signal controlled intersection. The other seven intersections are either two-way stop controlled or all-way stop controlled. The Perryville Road intersection is a “T” intersection, with the existing Peoria Avenue terminating here. The roadway lane geometry and intersection traffic control was taken from aerial mapping provided by Maricopa County and field-verified in August 2010. Table 1 summarizes the configuration of these eight intersections, including the type of intersection, current traffic control, and number of lanes at each approach. Figure 3 shows the lane geometry of each intersection along with an aerial plan view of the intersection.

Table 1 – Existing Intersection Characteristics

Intersection	Type	Traffic Control	Approach Lanes			
			NB	SB	EB	WB
Perryville Road	“T”-intersection	Three-Way STOP	1	1	n/a*	2
Citrus Road	Four-legged	NB/SB STOP	1	1	2	1
Cotton Lane	Four-legged	EB/WB STOP	1	1	1	1
Sarival Road	Four-legged	Four-Way STOP	3	2	2	2
Reems Road	Four-legged	Four-Way STOP	2	3	1	1
Bullard Avenue	“T”-intersection	Three-Way STOP	n/a	2	1	2
Litchfield Road	Four-legged	SIGNAL	2	3	2	3
Dysart Road	Four-legged	Four-Way STOP	3	3	2	3

*n/a applies to approach lanes that do not exist (e.g., three-legged intersection).
Source: Maricopa County 2010; Field verification 2010.

Technical Memorandum #7
Traffic Analysis
Peoria Avenue Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Existing Traffic Volumes

Historical traffic volumes were obtained from the City of Surprise and MCDOT for years 2008–2009 where available. In addition, Traffic Research & Analysis, Inc. (TRA) conducted traffic counts in August 2010, at several locations in the study area. The existing average daily traffic (ADT) volumes within the study area are shown in Figure 4. TRA also conducted turning movement counts at eight major intersections in the same month. These intersection volumes represent existing peak hour traffic between the hours of 7:00-9:00 a.m. and 4:00-6:00 p.m. Figure 5 displays the 2010 peak hour turning movements at each of the major intersections along the Peoria Avenue study corridor.

Existing daily traffic on Peoria Avenue varies in the study area from approximately 900 vehicles per day (vpd) at the west end to 9,000 vpd between Bullard Avenue and Litchfield Road. A majority of the north/south arterial cross streets along the corridor currently carry more traffic than Peoria Avenue. With the exception of SR 303, Litchfield Road has the highest existing cross street daily traffic volume (16,500 to 14,600 vpd) in the study area.

Classification counts were also conducted at three locations within the Peoria Avenue study area: (1) Peoria Avenue east of Cotton Lane; (2) Cotton Lane north of Peoria Avenue; and (3) Litchfield Road north of Peoria Avenue. All three locations show that passenger cars comprise a vast majority of the existing daily traffic volumes (approximately 98%) while large trucks comprise less than 1% of the daily traffic volumes. The remaining 1% to 2% is medium-sized vehicles (buses, RVs, small trucks).

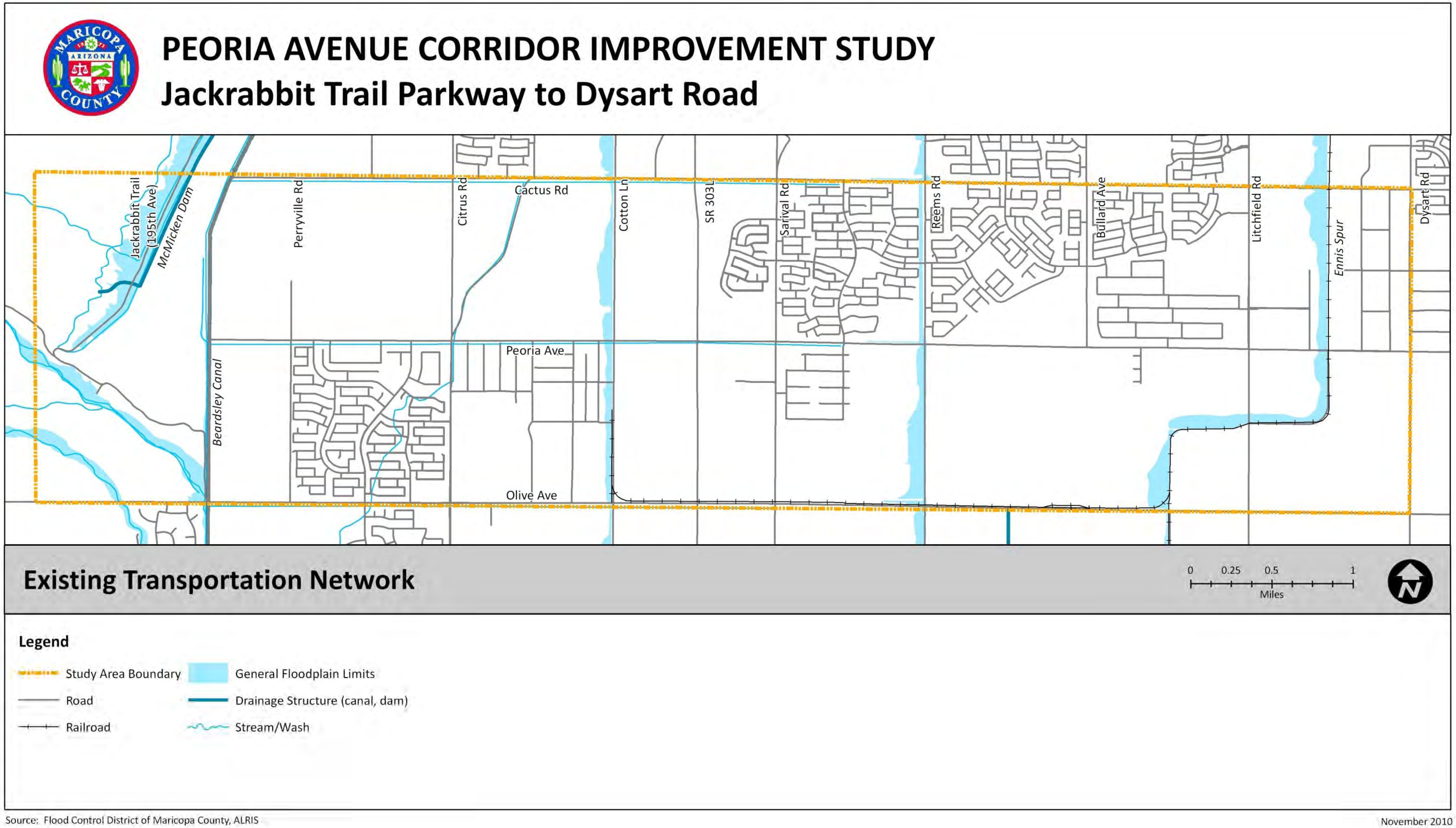


Figure 2 – Existing Transportation Network

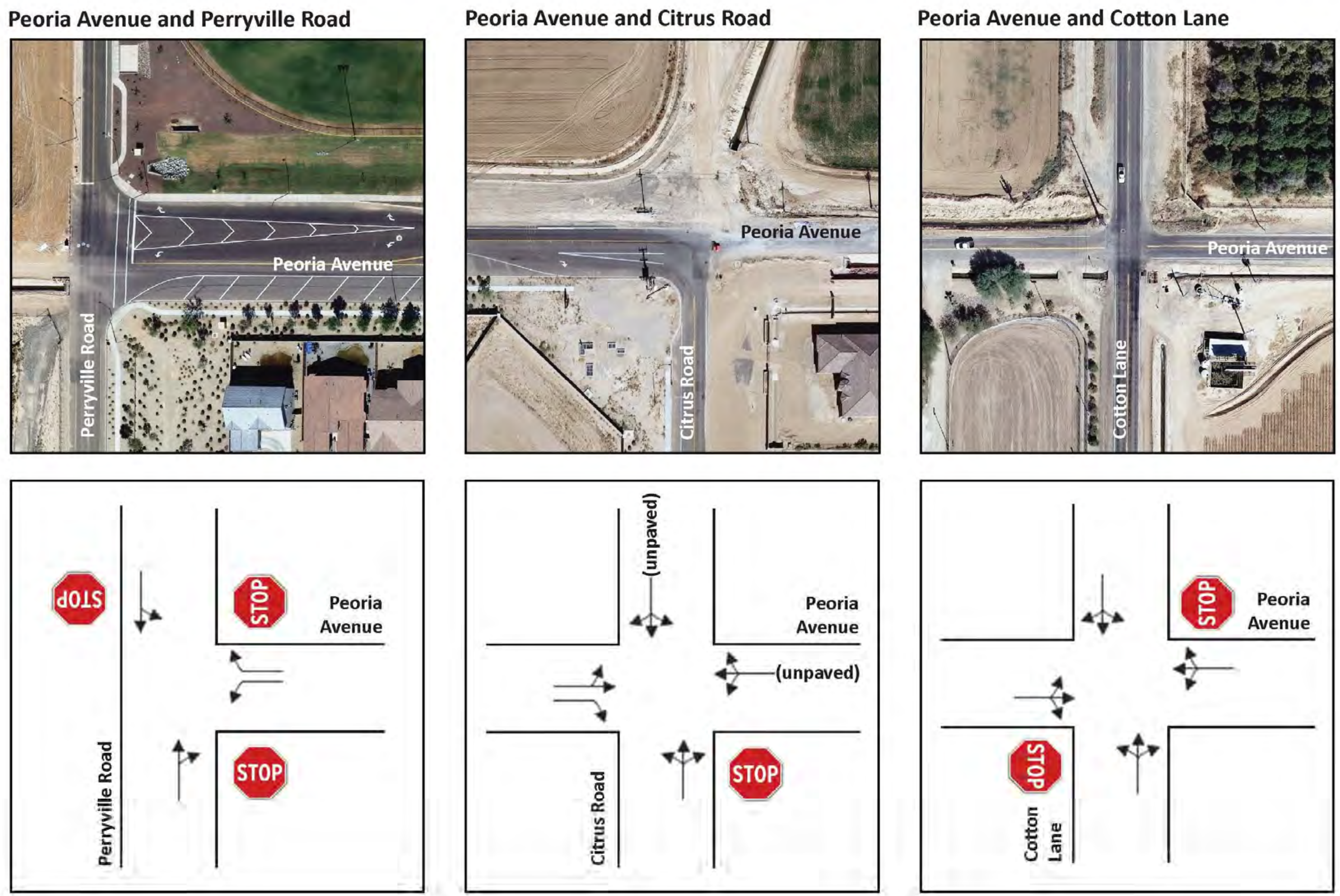


Figure 3 – Existing Intersection Configurations

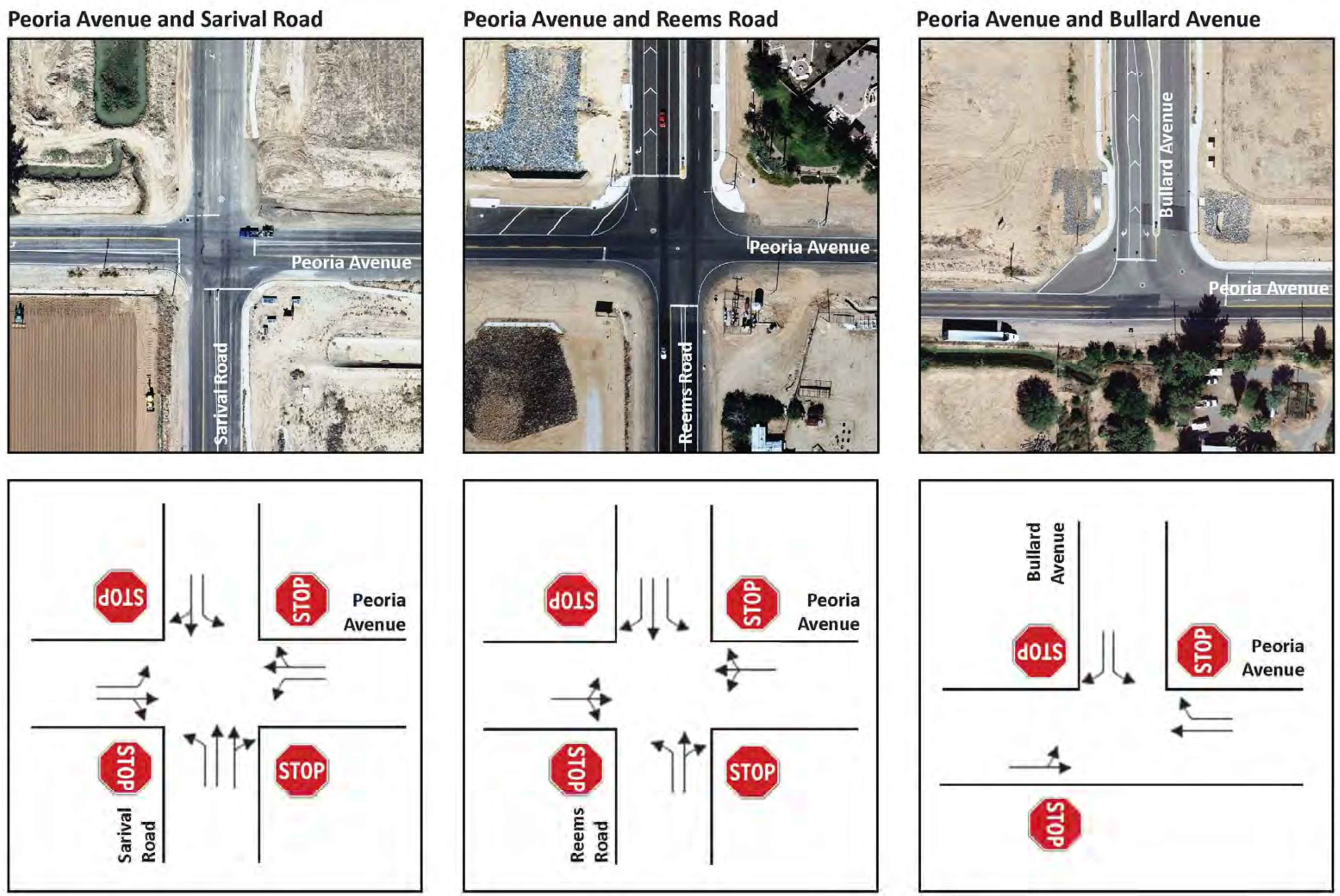


Figure 3 – Continued

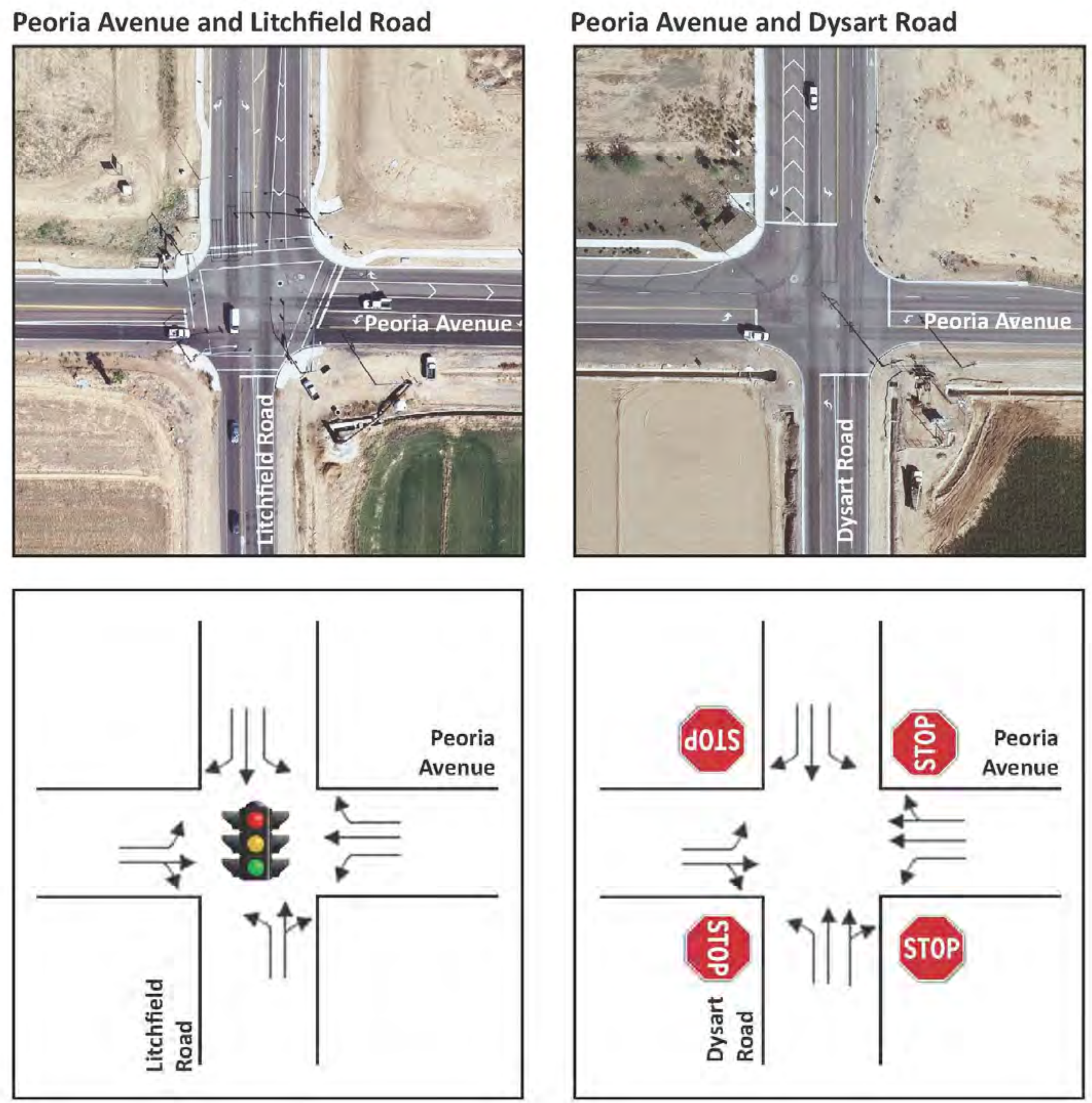
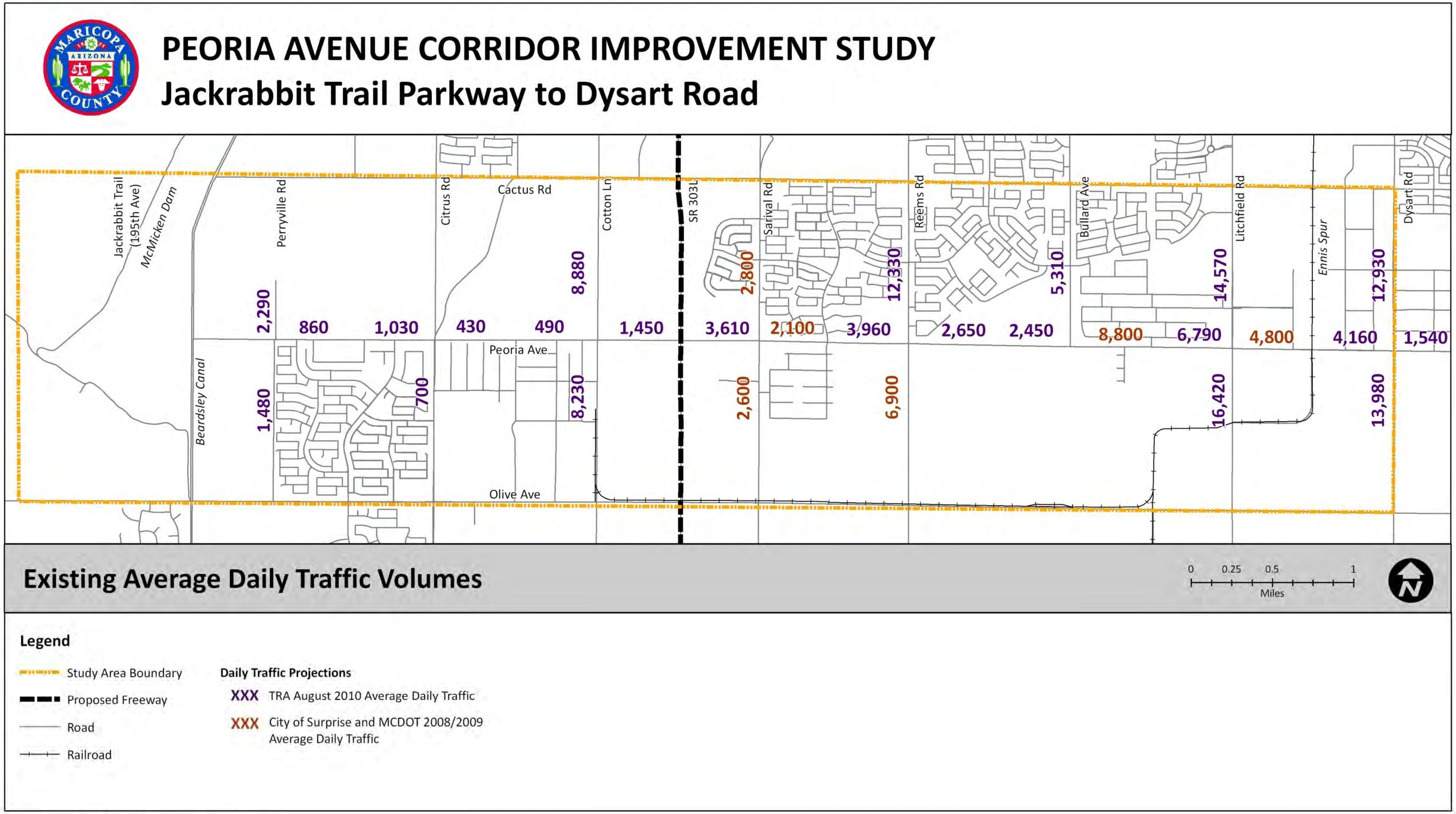


Figure 3 – Continued



Source: Flood Control District of Maricopa County, ALRIS

October 2010

Figure 4 – Existing ADT Volumes

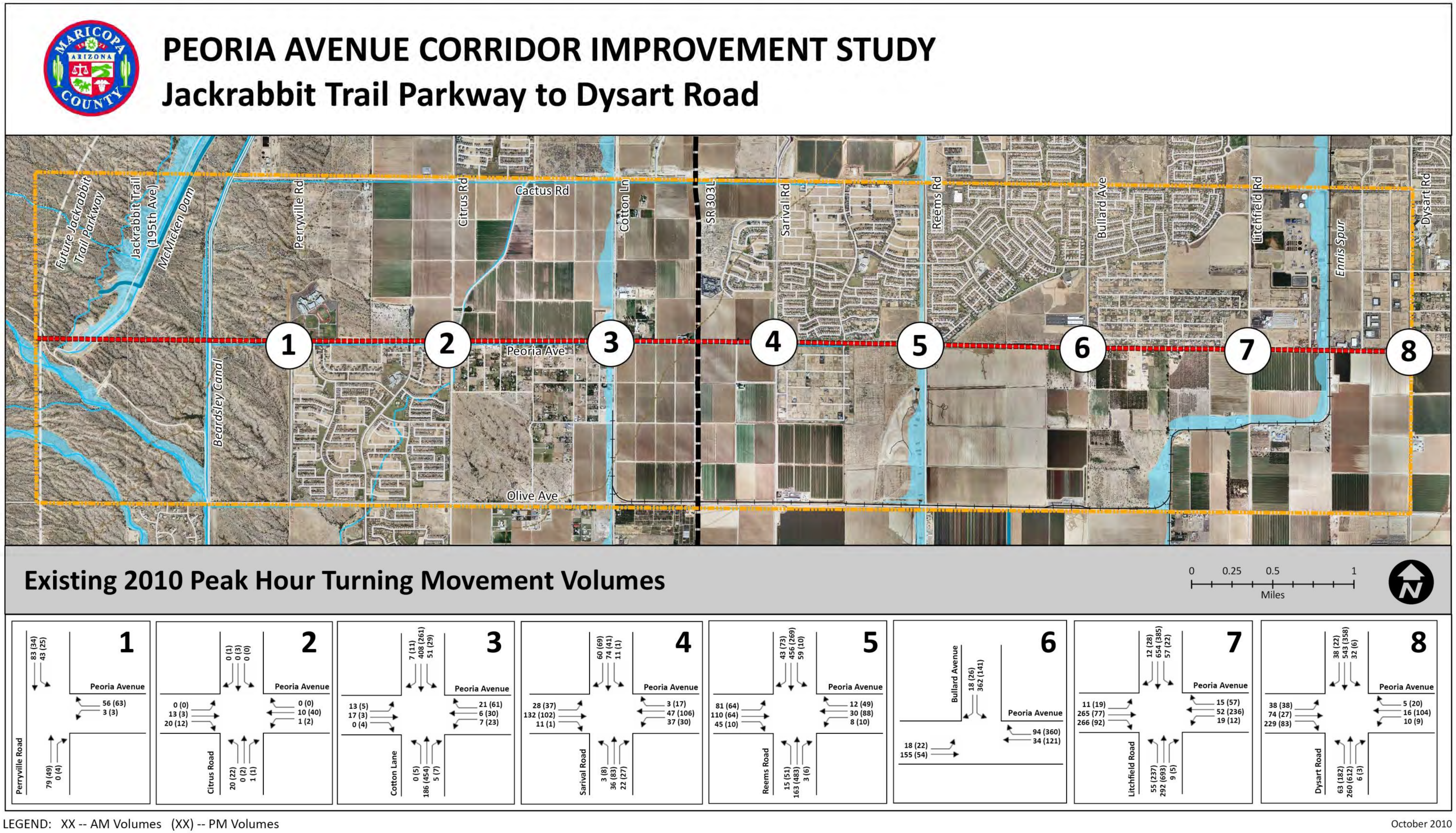


Figure 5 – Existing 2010 Peak Hour Turning Movement Volumes

3.0 FUTURE TRAFFIC CONDITIONS

Future Transportation Network

For the planned future network, functional classification is the process by which roads are grouped into classes or systems according to the kind of service they will provide in the future. Roadways functionally classified as high-speed, high-capacity facilities tend to maximize mobility and minimize direct land access. The hierarchy of functional classification typically includes freeways, expressways, parkways, major and minor arterials, collectors, and local streets.

Maricopa County and MAG similarly classify Peoria Avenue as an (urban) principal arterial in the future network. However, Peoria Avenue actually falls within multiple jurisdictions in the study area. Each jurisdiction has assigned its own future functional classification to the portion of Peoria Avenue within its boundaries. The overlapping classifications are even more complex where Peoria Avenue forms the boundary between jurisdictions.

For the planned future network, Peoria Avenue has been classified by the local jurisdictions as listed below:

- MCDOT – Urban Principal Arterial
- MAG – Major Arterial
- City of El Mirage – Minor Arterial
- City of Glendale – Major Arterial
- City of Surprise – Major Arterial

The future MCDOT functional classification of Peoria Avenue in the study area is an urban principal arterial, as stated in the Maricopa County Major Streets and Routes Plan, adopted in 2001 and revised in 2004 (Figure 6). The corridor currently exists from Dysart to Perryville Roads, and is classified as "future" from Perryville Road to Jackrabbit Trail. A principal arterial is defined as a street that provides for long-distance traffic movement within Maricopa County or between Maricopa County and urban areas. Access to abutting land is restricted and controlled through frontage roads and raised medians, as well as by the spacing and location of driveways and intersections. Opposing traffic flows may be separated by a raised median.

MCDOT also classifies all other one-mile grid roadways in the study area as principal arterials, except Perryville Road south of Cactus Road, which is defined as a minor arterial and SR 303L, defined as a future freeway.

The MAG I-10/Hassayampa Valley Transportation Framework Study identifies Peoria Avenue as a major arterial, as illustrated in the functional classification network map in Figure 7. This is supported in the 2010 MAG Regional Transportation Plan (RTP), which defines Peoria Avenue as a four-lane arterial from Dysart to Reems Road, and as a six-lane arterial from Reems Road to Jackrabbit Trail in 2030 (Figure 8).

The City of Surprise incorporated area within the study area extends north from Peoria Avenue, between the Beardsley Canal and Dysart Road. Surprise classifies Peoria Avenue as a major arterial in the current General Plan, illustrated in Figure 9.

Incorporated El Mirage includes the areas both north and south of Peoria Avenue east of Dysart Road (and therefore out of the study area), but also the area south of Peoria Avenue between the Ennis Spur and Dysart Road. El Mirage classifies Peoria Avenue as a minor arterial (based upon City of Peoria standard details). El Mirage does not have a functional classification map at the current time.

The City of Glendale maintains planning jurisdiction over the south side of Peoria Avenue from the Ennis Spur to Perryville Road as part of its Municipal Planning Area (MPA). One-half mile between SR 303L and Sarival Road is incorporated, fronting Peoria Avenue to the south. Recent General Plan amendments have upgraded Peoria Avenue to a major arterial roadway (Figure 10).

Planned Network Improvements

Much of the surrounding roadway system to the project area does not exist or is planned to be expanded or adjusted from its current configuration. SR 303L, Jackrabbit Trail Parkway, and Northern Avenue Parkway are planned roadway facilities in the surrounding network that are considered regional routes.

SR 303L Corridor

SR 303L is located roughly in the center of the study area. It intersects Peoria Avenue between Cotton Lane and Sarival Road. It has been studied, classified, reclassified, restudied, and ultimately confirmed as a major link in the regional and state highway system. SR 303L is currently being improved from an interim two-lane roadway into a "Rural Major Freeway," as classified by MAG. SR 303L is an important link in the regional freeway system because it will alleviate the bottlenecks on the Grand Avenue arterial (US 60/US 93) and provide a new transportation corridor for the West Valley.

The ultimate improved SR 303L will be a fully access-controlled, grade-separated urban freeway with a rolling profile that will be elevated or depressed at the arterial crossroads and near ground level at all other locations. The ultimate freeway will include four general purpose lanes with high-occupancy vehicle (HOV) lanes and auxiliary lanes between service interchanges. Thirteen service interchanges for arterial crossroads and two system interchanges at Northern Parkway and US 60 are also planned for this freeway.

Peoria Avenue is one of the thirteen service interchanges planned for the ultimate corridor. This interchange is currently under design as a full diamond interchange. The Stage III ADOT design plans have been obtained for this interchange and will be considered throughout the study.

Jackrabbit Trail Parkway

Jackrabbit Trail Parkway has undergone several planning and corridor-level studies in the last few years. In the 2007 MAG I-10/Hassayampa Valley Transportation Framework Study, Jackrabbit Trail was established as an Arizona Parkway, a new category of roadway classification in Arizona. The framework study also changed the alignment of the corridor – specifically within the Peoria Avenue study area, offsetting it a half mile west of the section line – to miss major topographical and drainage features.

Jackrabbit Trail Parkway will follow the new *Design Guideline Recommendations for the Arizona Parkway* (MCDOT, August 2008), which includes an intermediate-capacity, six- to eight-lane divided highway with partial access control and no direct left turns permitted at major intersections. Compared with a conventional arterial, an Arizona Parkway can provide additional travel capacity without full grade separations at major intersections. It can provide the benefit of increasing intersection capacity while maintaining direct driveway access to each quadrant of the intersection. The junction of Peoria Avenue with Jackrabbit Trail Parkway will need to consider the design standards in the *Arizona Parkway Intersection/Interchange Operational Analysis and Design Concepts Study* (MCDOT, August 2009).

In 2008, MCDOT completed the Jackrabbit Trail Access Control and Corridor Improvement Study, which further refined the corridor and established a preferred alignment, supported by preliminary engineering considerations that provide operational and design details regarding its classification as an Arizona Parkway. Because Peoria Avenue will intersect Jackrabbit Trail Parkway, this study can provide guidance for future roadway improvements in the study corridor.

Northern Avenue Parkway

While located outside the study area, Northern Avenue through the Phoenix metropolitan area has been under study for several years, with a view to upgrading it to a "super street." With a fourteen–mile gap in the freeway system between I-10 and SR 101L, Northern Avenue has been envisioned as another east-west connection across the metropolitan area, offering more access control and capacity than a major arterial, but less speed than a freeway.

In the MAG I-10/Hassayampa Valley Transportation Framework Study, this facility is defined as an Arizona Parkway, positioned approximately one-half mile between the Northern and Olive Avenue section lines throughout the study corridor.

Future Typical Sections

As mentioned previously, Peoria Avenue has been classified by the local jurisdictions as follows:

- MCDOT – Urban Principal Arterial
- MAG – Major Arterial
- City of El Mirage – Minor Arterial
- City of Glendale – Major Arterial
- City of Surprise – Major Arterial

A MCDOT principal arterial is six lanes wide, constructed on a minimum right-of-way of 130 feet, including a bicycle lane. Right-of-way for future bus pullouts should be provided on the far side of each intersection of a principal arterial with another principal or minor arterial – which, in the study area, includes every one-mile cross street. Figure 11 illustrates this MCDOT typical cross-section for Peoria Avenue.

A MAG principal arterial is also six lanes wide, constructed on a minimum right-of-way of 140 feet, including a bicycle lane. Figure 12 depicts the MAG typical cross-section for Peoria Avenue.

Surprise classifies Peoria Avenue as a major arterial in the current General Plan, whereas El Mirage classifies Peoria Avenue as a minor arterial (based on City of Peoria standard details). Typical cross-sections for both cities are illustrated in Figures 13 and 14.

The City of Glendale has indicated that amendments to the General Plan have upgraded Peoria Avenue to a major arterial. A typical cross-section for the City of Glendale is shown in Figure 15.

Future Traffic Volumes

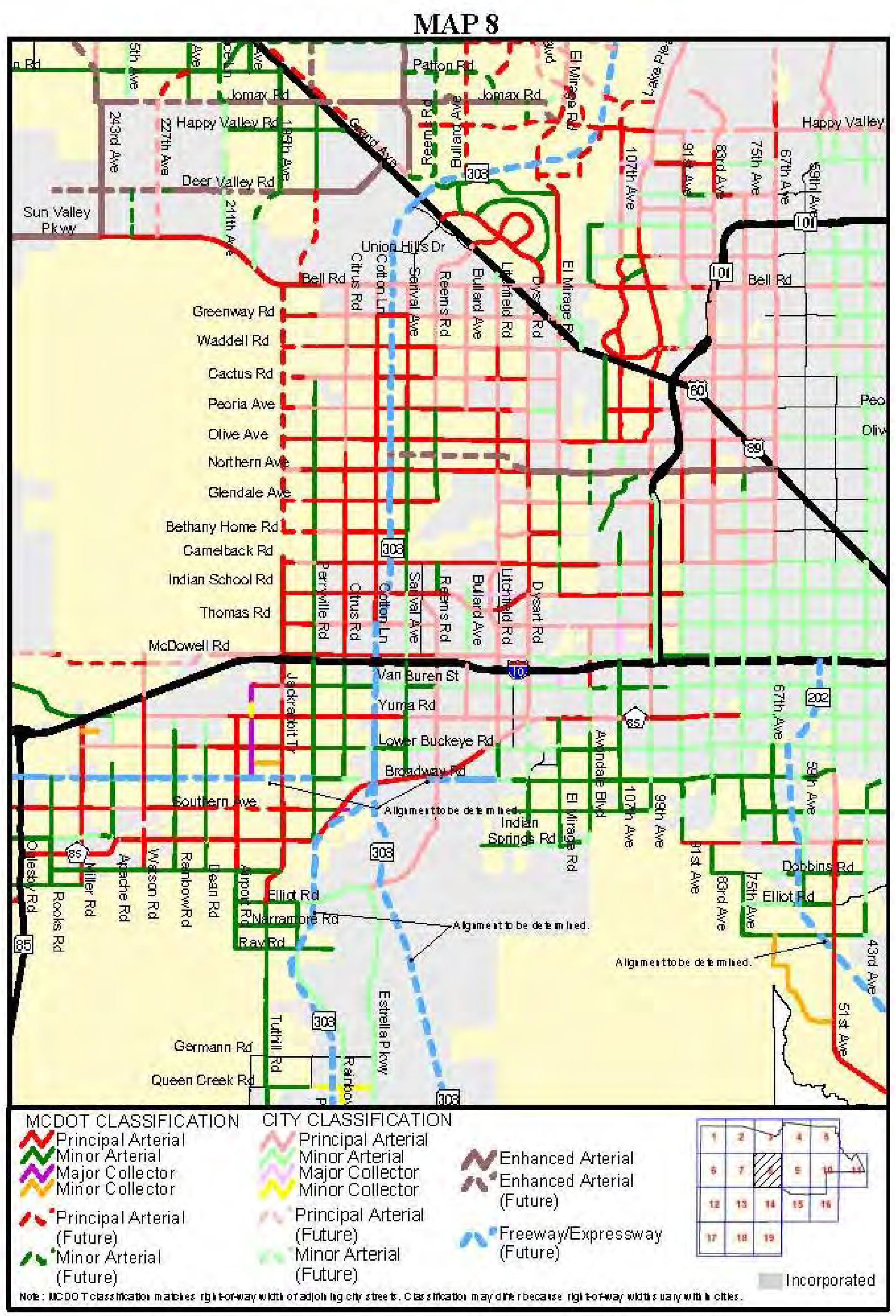
MAG provided design year 2031 traffic volume projections for use in this study. MAG maintains a regional traffic forecasting model based on projected socioeconomic data, which provides numerous outputs including daily traffic and peak hour traffic. MAG network simulations were provided for the 2031 design year under the build scenario. For the purposes of the MAG model, the "build scenario" network corresponds to three traffic lanes in each direction of travel. The 2031 Build traffic volume projections are shown in Figure 16.

MCDOT does not include a Peoria Avenue crossing of the Agua Fria River in its current or future roadway network. Other regional planning studies have suggested a need for a river crossing and the City of El Mirage has included a crossing in its roadway network. While this river crossing may not be implemented in the near future, a conservative approach (by including the river crossing) was used to project the 2031 Peoria Avenue travel demand. While the transportation plans described above were used to establish the ultimate Peoria Avenue classification, the 2031 travel demand will be used to help determine an implementation strategy for the corridor.

The 2031 MAG daily traffic projections were also used to develop projected peak hour turning movements at the major intersections. The following assumptions were applied to the daily traffic projections to estimate approach and departure peak hour volumes at each major intersection:

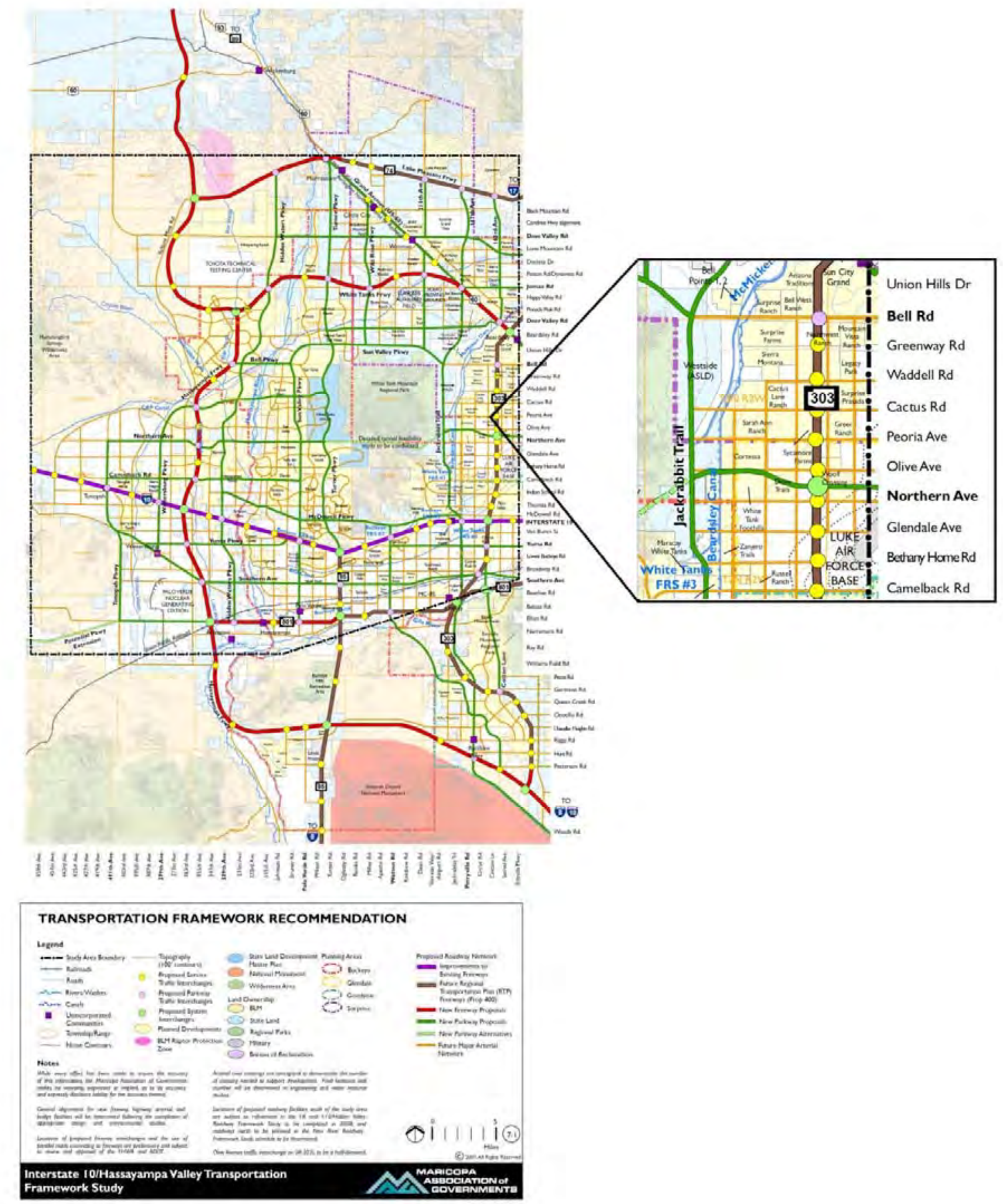
- Approximately 8% of the daily traffic would occur during the peak hours (K factor)
- A 60/40 directional split (D factor) would occur during the peak hours with the dominant movement in the A.M. peak hour being toward SR 303L and to the south with the reverse movement in the P.M. peak hour

The estimated approach and departure volumes were then converted to peak hour turning volumes utilizing procedures outlined in NCHRP 255. In order to balance the turning movements, slight adjustments were made to the K factor at isolated locations with the resulting K factors varying between 7% and 9%. The projected 2031 peak hour turning movements are shown in Figure 17.



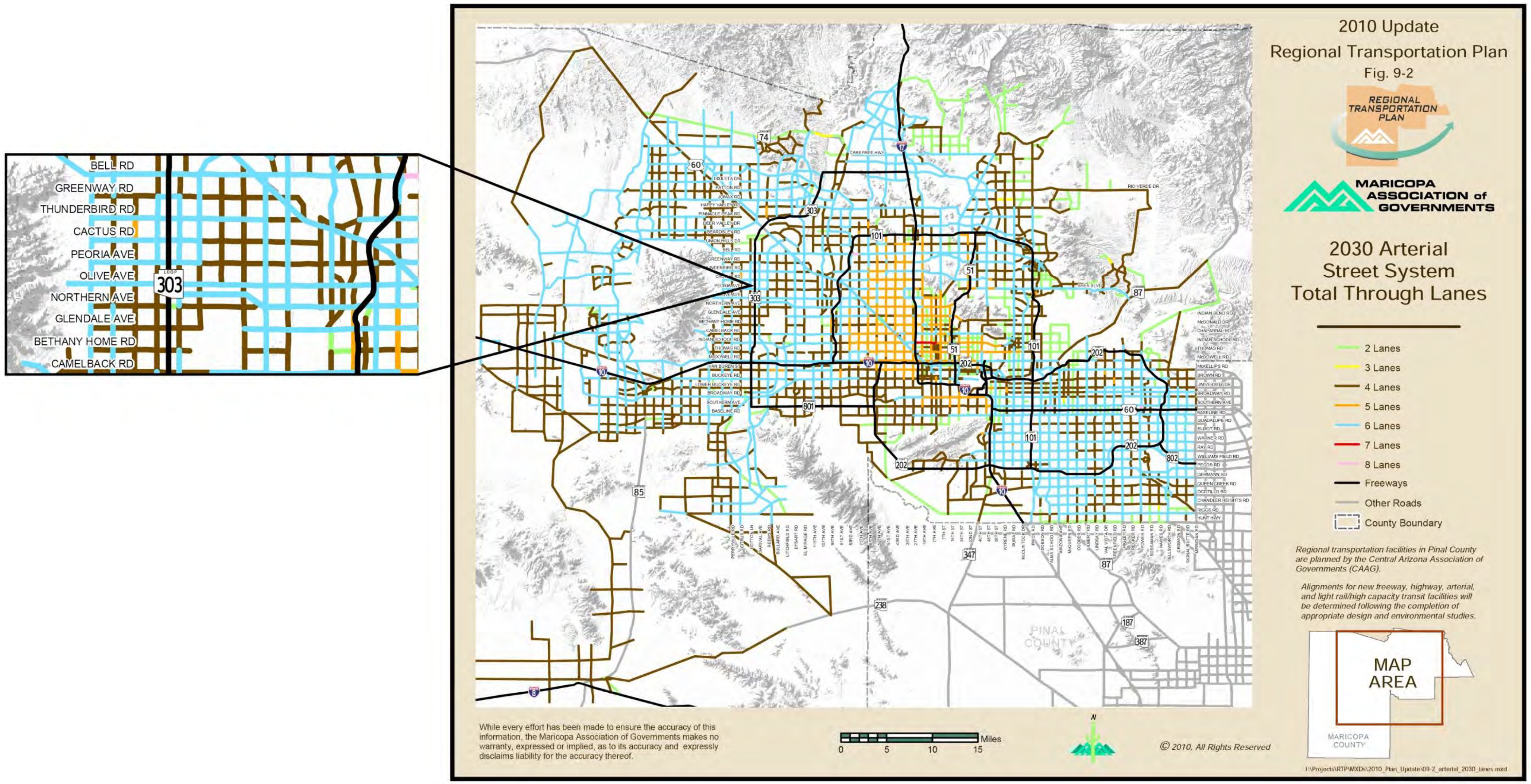
Source: Maricopa County Major Streets and Routes Plan, Street Atlas, revised 2004.

Figure 6 – Maricopa County Major Streets and Routes Plan Functional Classification



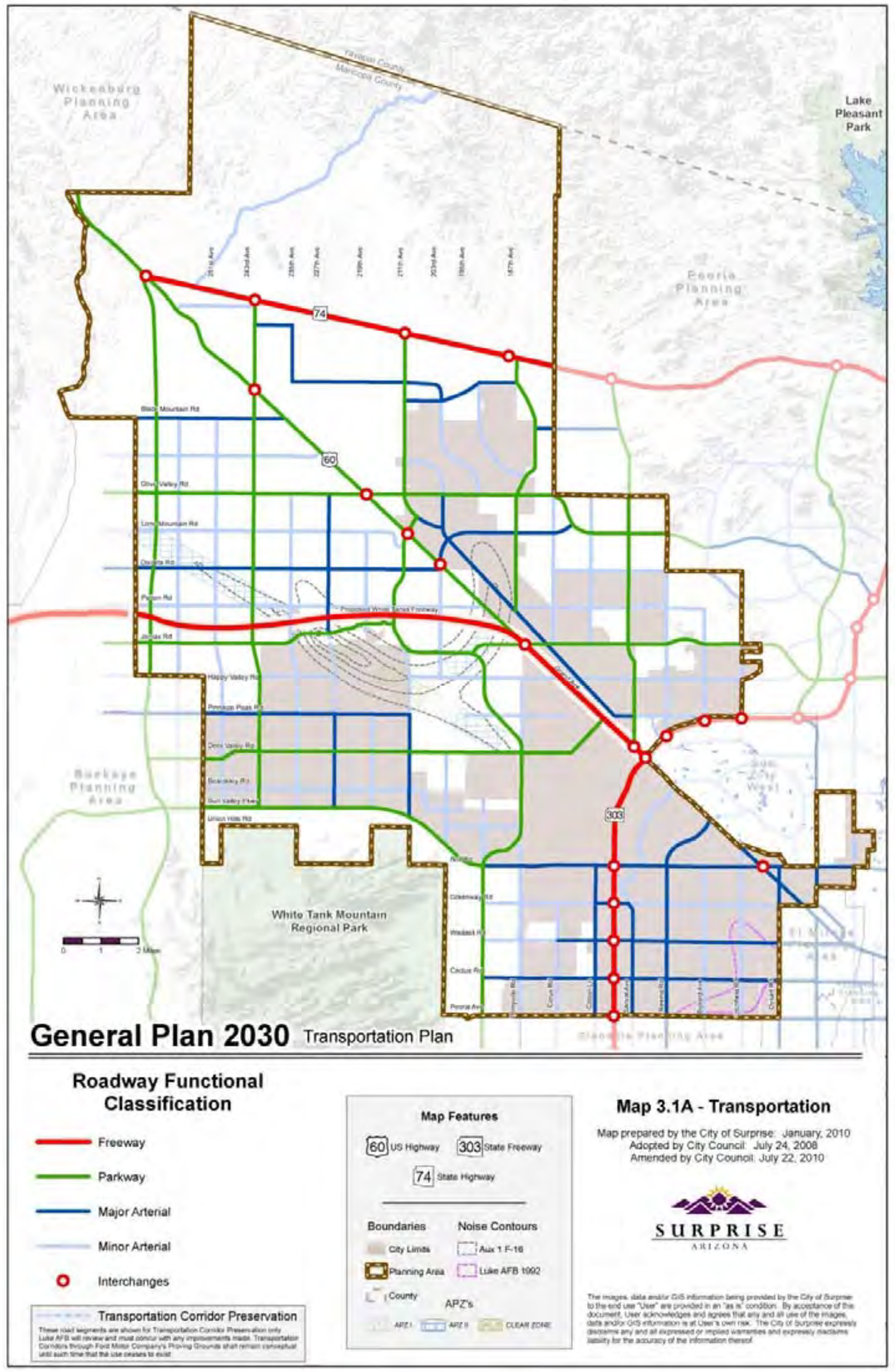
Source: MAG I-10 Hassayampa Valley Transportation Framework Study, 2007.

Figure 7 – MAG I-10/Hassayampa Valley Transportation Framework Study Functional Classification



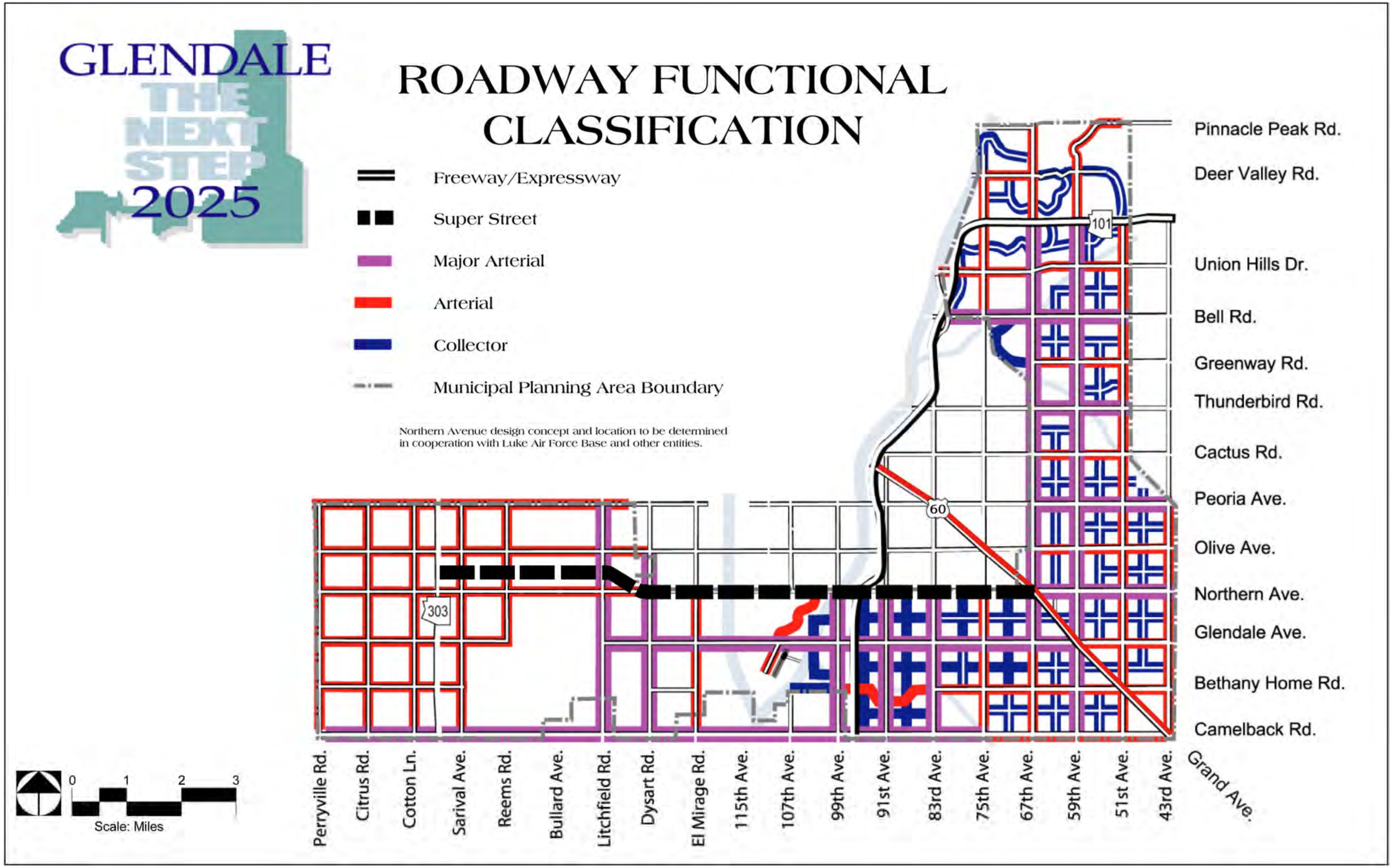
Source: MAG RTP 2010 Update, 2010.

Figure 8 – MAG 2030 Arterial Street System



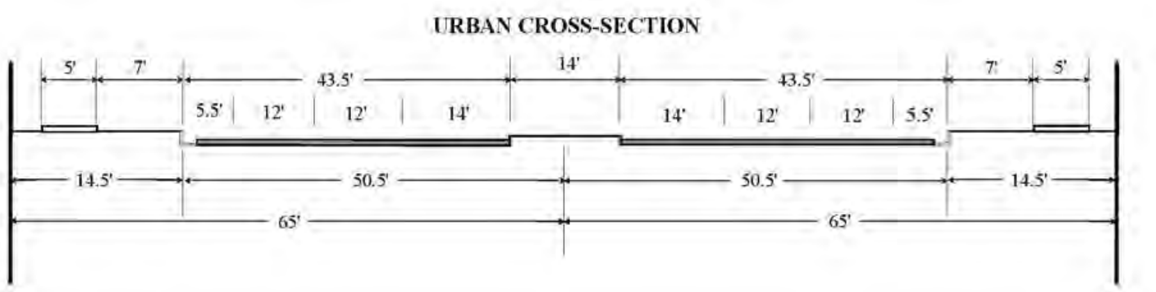
Source: City of Surprise General Plan 2030, Transportation Plan, 2010.

Figure 9 – City of Surprise Functional Classification Map



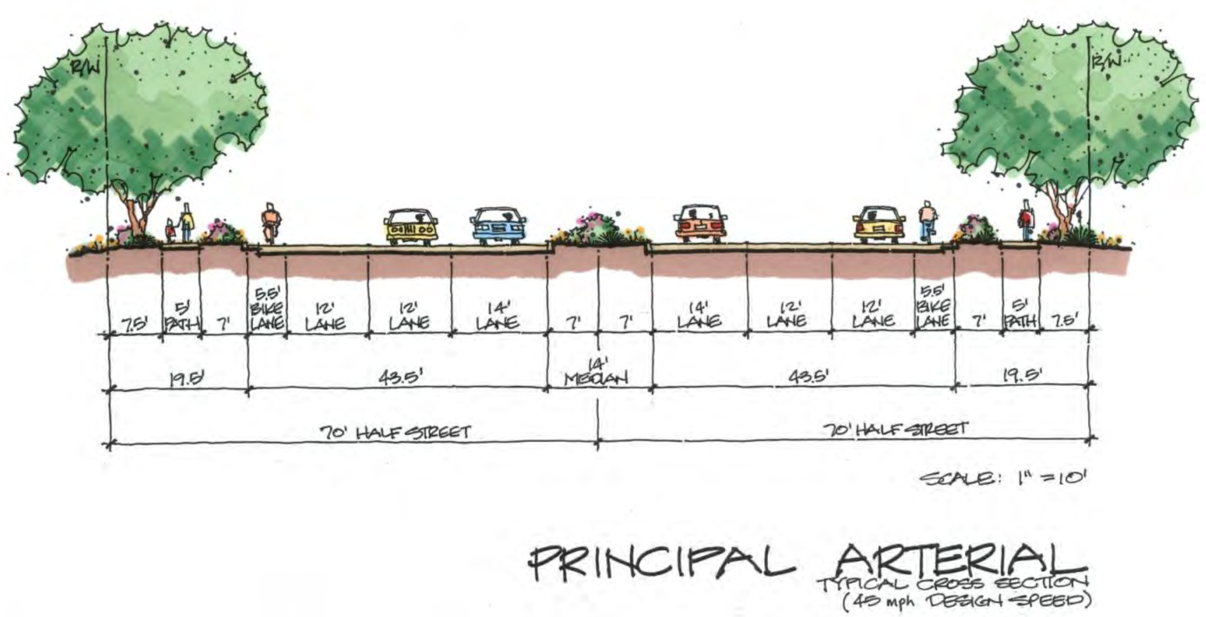
Source: City of Glendale General Plan 2025.

Figure 10 – City of Glendale Functional Classification Map



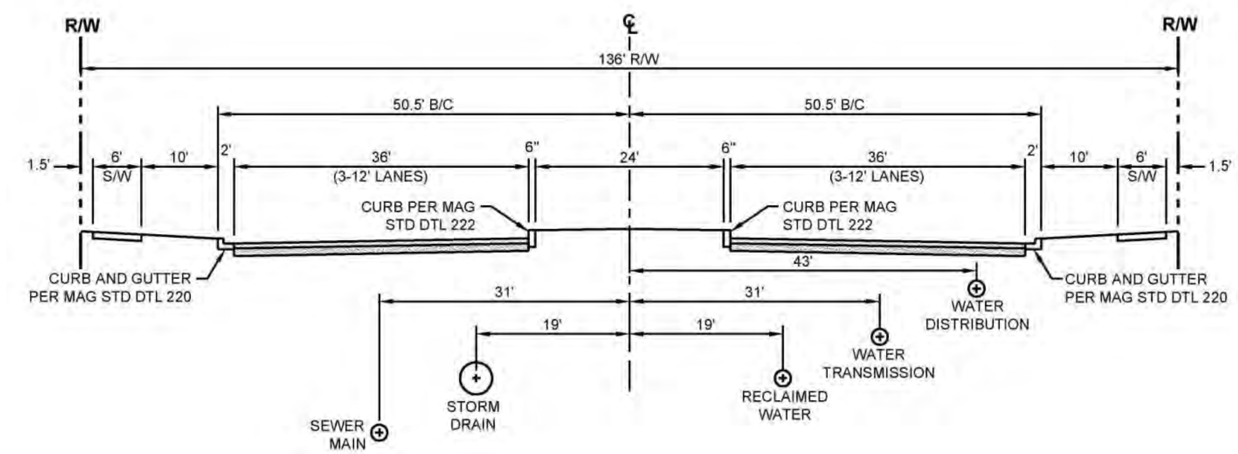
Source: Maricopa County Major Streets and Routes Plan, Policy Document, revised 2004.

Figure 11 – MCDOT Urban Principal Arterial Cross-Section



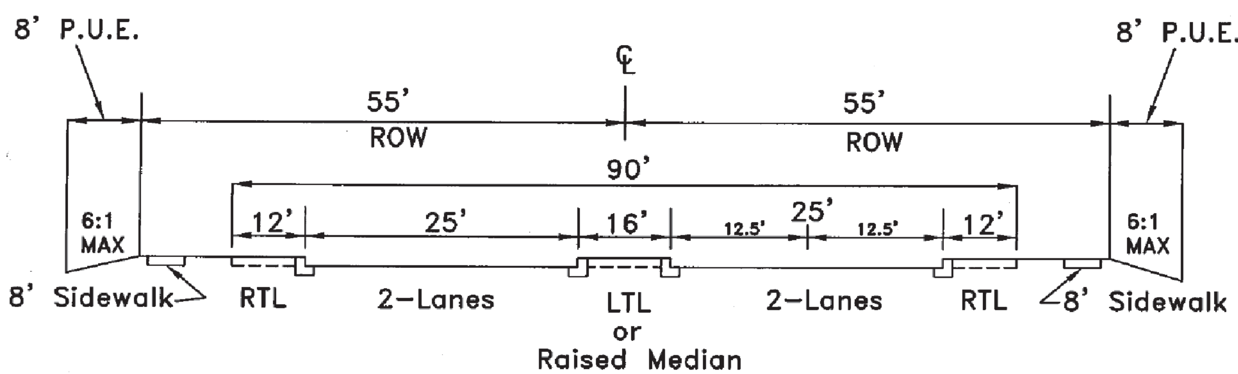
Source: MAG I-10 Hassayampa Valley Transportation Framework Study, 2007.

Figure 12 – MAG Principal Arterial Cross-Section



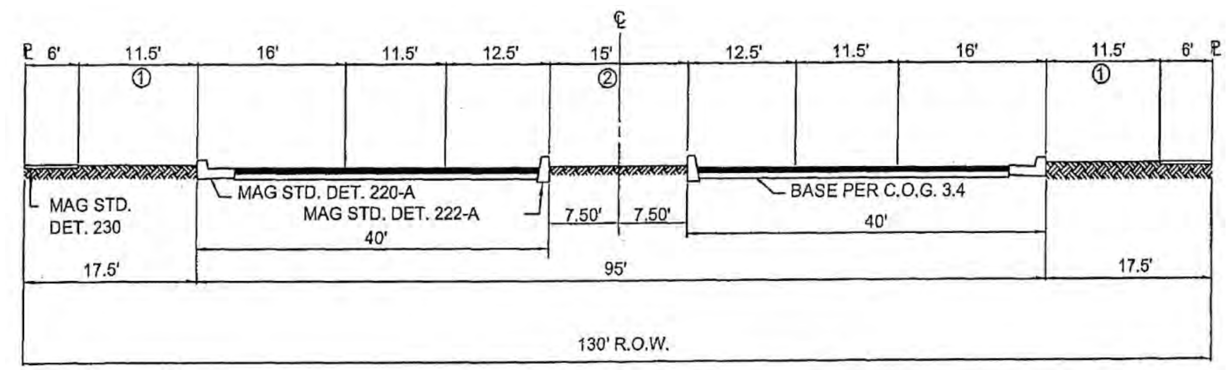
Source: City of Surprise Street Design Guidelines, 2009.

Figure 13 – City of Surprise Major Arterial Cross-Section



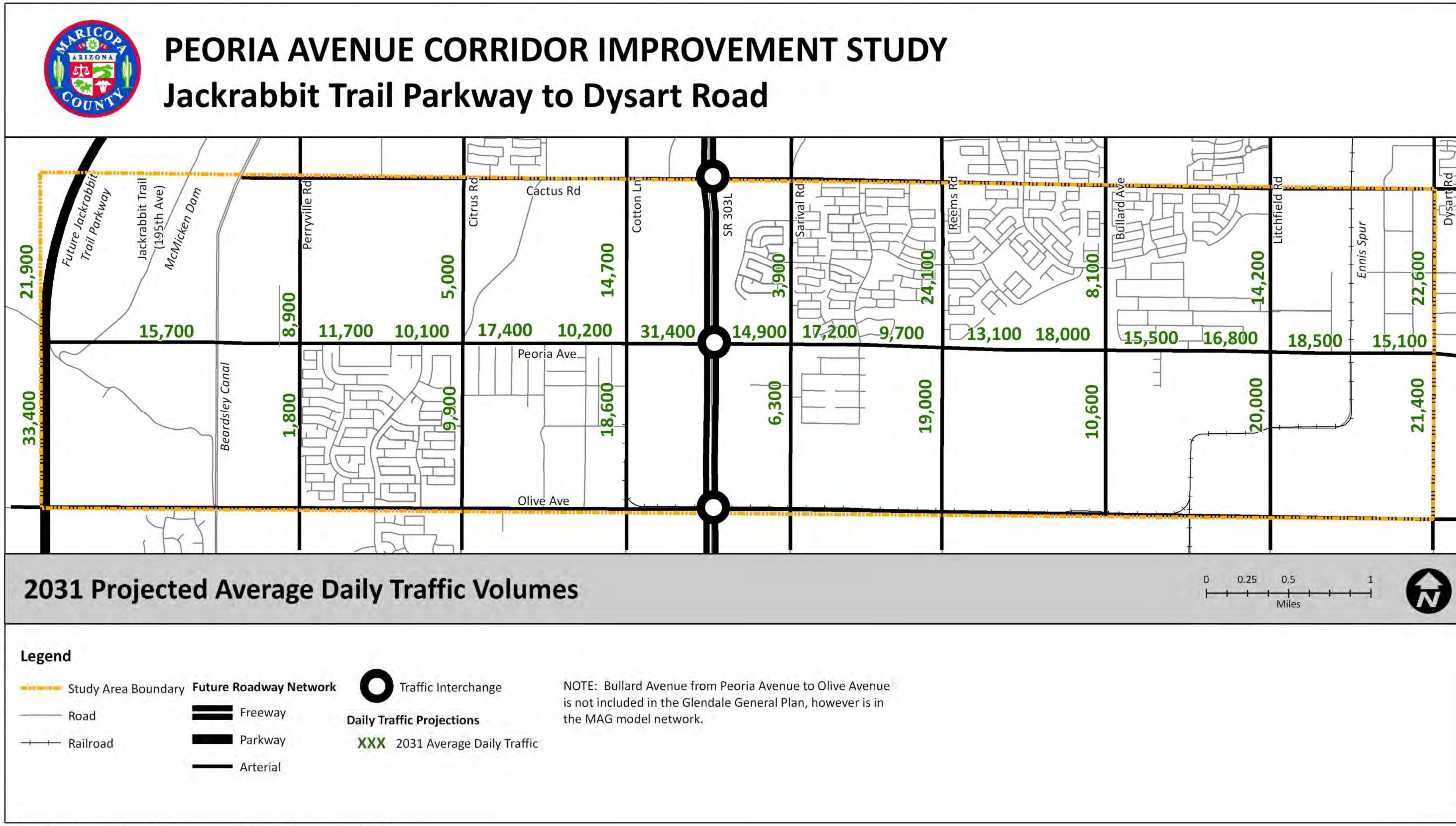
Source: City of Peoria Standard Detail, 2007.

Figure 14 – City of El Mirage Minor Arterial Cross-Section



Source: City of Glendale Standard Detail Index, 2002.

Figure 15 – City of Glendale Major Arterial Cross-Section



Source: Flood Control District of Maricopa County, ALRIS, MAG Travel Demand Model

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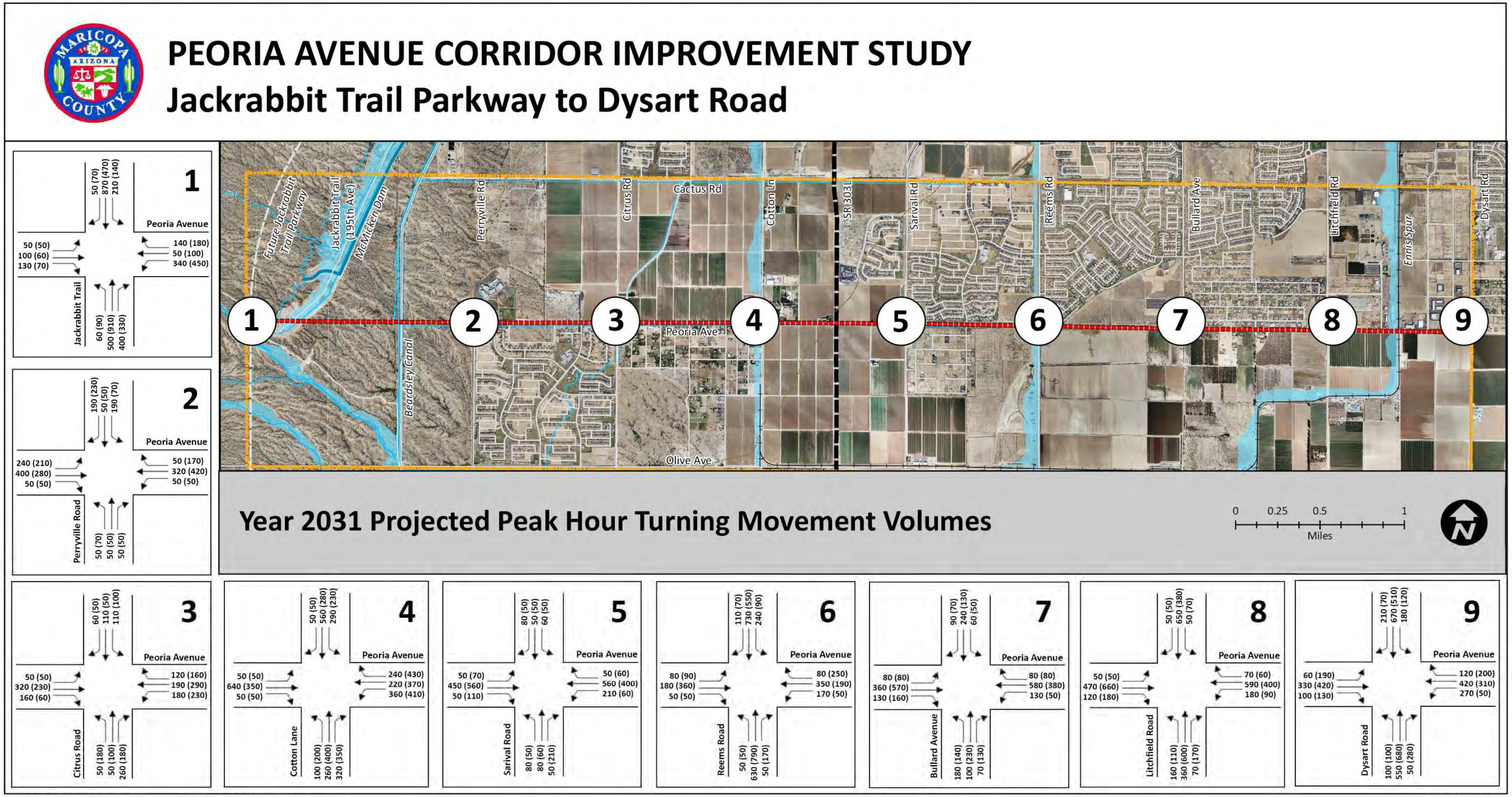
Figure 16 – 2031 Projected Daily Traffic Volumes



LEGEND: XX -- AM Volumes (XX) -- PM Volumes

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Figure 17 – 2031 Projected Peak Hour Turing Volumes

4.0 TRAFFIC ANALYSIS

Methodology

Arterial Street Analysis

Table 2.1 of the MCDOT *Roadway Design Manual* includes information regarding planning level traffic volume thresholds for different facility types. According to this table, a 4-lane urban arterial can accommodate approximately 35,000 vpd.

In addition, planning level analyses were conducted using Highway Capacity Software to estimate volume thresholds for a 4-lane urban arterial roadway. The following assumptions were utilized in this analysis:

- 45 mph free-flow speed
- 60/40 directional split in peak hour
- 0.95 peak hour factor (PHF)
- 9% of daily traffic occurs during peak hour
- Class II street with medians and turn bays
- 15% turns from exclusive lanes
- 1 mile segment
- 3 signals (actuated)
- Random arrivals (type 3)
- 90 sec cycle length
- 0.42 g/c ratio

Table 2 shows the resulting daily traffic ranges and corresponding level-of-service thresholds.

Table 2 – 4-Lane Arterial LOS Thresholds

Level-of-Service	ADT Range - Arterial (veh/day)
C	< 19,000
D	19,000 – 31,000
E	31,000 – 33,000
F	> 33,000

This analysis, along with the MCDOT Roadway Design Manual, generally shows that a 4-lane arterial can accommodate approximately 30,000 vpd. Daily traffic volumes greater than approximately 30,000 vpd would warrant a 6-lane arterial.

Signal Warrant Analysis

Signal warrant analyses were conducted in accordance with MCDOT Traffic Engineering Policy/Procedure Guideline (PPG), Section 4, Subject 4.6. This guideline sets forth the ADT volume warrant to be evaluated for future traffic needs on a new intersection, an intersection revised by a proposed roadway construction project, or at the driveway of a new commercial or

residential development. The warrant is met when the estimated ADT on the major street and on the higher volume minor street or driveway approach to the intersection equals or exceeds the values in Table 3.

Table 3 – ADT Volume Warrant

Lanes for Moving Traffic on Each Approach		Estimated ADT	
Major Street	Minor Street	Major Street	Minor Street
1	1	10,000	3,000
2 or more	1	12,000	3,000
2 or more	2 or more	12,000	4,000
1	2 or more	10,000	4,000
1	1	15,000	1,500
2 or more	1	18,000	1,500
2 or more	2 or more	18,000	2,000
1	2 or more	15,000	2,000

Source: MCDOT Traffic Engineering Policy/Procedure Guideline (PPG), Section 4, Subject 4.6

Intersection Analysis

Intersection Level-of-Service (LOS) analyses were conducted using Synchro 6.0 in accordance with procedures outlined in the Highway Capacity Manual (HCM). The concept of level-of-service uses qualitative measures that characterize operational conditions within a stream of traffic. The descriptions of individual levels-of-service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience. Six levels of service are defined for each type of facility for which the analytical procedures are available. They are given letter designations from ‘A’ to ‘F’, with LOS ‘A’ representing the best operational conditions and LOS ‘F’ representing an over-capacity condition (congestion). Each level-of-service represents a range of operating conditions.

Table 4 below shows the control delays and corresponding levels-of-service established in the HCM for signalized intersections.

Table 4 – Control Delays and Corresponding Levels-of-Service

Level-of-Service	Control Delay (sec/veh)
A	< 10
B	10 – 20
C	20 – 35
D	35 – 55
E	55 – 80
F	> 80

The following assumptions/input parameters were used in the intersection analysis:

- Peak hour factor: 0.92
- Vehicle travel speed: 45 mph
- Percentage of heavy vehicles: 4%
- Lane widths: 12 feet
- Base saturation flow rate: 1,900 pcphpl for all movements
- Right-turn on red movement was allowed and modeled in the software
- Cycle length: 60 seconds

Analysis Results

Arterial Street Analysis Results

As shown in Figure 16, the 2031 traffic volumes along Peoria Avenue range from approximately 10,000 vpd to 31,000 vpd. According to the criteria established above, in 2031 a 4-lane facility would be warranted from Jackrabbit Trail Parkway to Dysart Road however, the ultimate classification is for 6 lanes.

Signal Warrant Analysis Results

According to the criteria shown in Table 3 and the 2031 traffic volume shown in Figure 16, all major intersections along Peoria Avenue would warrant signalization by 2031.

Intersection Analysis Results

The intersection analysis results and recommended 2031 lane configurations are shown in Figure 18. For the 2031 design year, single left-turn lanes are recommended at a majority of the intersections with dual left-turn lanes being recommended at Jackrabbit Trail Parkway and at Cotton Lane. As signalized intersections, under the conditions shown in Figures 17 and 18, all of the intersections are expected to operate at level-of-service 'C' or better during the peak hours. These lane configurations show what is warranted in 2031 based on the conditions analyzed, the ultimate classification is for 6 lanes.

Sensitivity Analysis

Since the 2031 traffic volumes warrant a 4-lane facility, a sensitivity analysis was conducted to help determine if and when a 6-lane facility might be needed. This analysis included a review of 2031 socioeconomic data in the MAG model to determine the land use densities assumed in 2031; a review of the growth trends in the travel demand from 2010 to 2031; and a review of the Hassayampa Framework Study travel demand model which is generally representative of a potential "build-out" scenario in the far west valley.

Socioeconomic Data

The thirteen socioeconomic analysis zones (SAZ) within the study area constitute approximately 17.5 square miles (less than one-half percent) of the 9,223-square-mile MAG planning area and modeling region. In 2005, the study area had a population of approximately 4,550 persons and an employment base of approximately 1,500 employees. By 2030, these numbers are expected to dramatically increase.

Table 5 presents the socioeconomic data for the existing 2005 and adopted 2030 forecast scenarios, as well as the percent change between the two forecast years.

Table 5 – Socioeconomic Data

Scenario	Population (persons)	Employment (employees)
2005	4,550	1,500
2030	36,330	21,010
Percent Change	698%	1,300%

Source: MAG, 2010.

Population density maps (Figures 19 and 20) show the highest existing density located in the built out/under construction master planned communities located north of Peoria Avenue between Reems and Litchfield Roads. While that will remain an area of higher density, the greatest densities in the future will be located in the Prasada community, north of Peoria Avenue between Citrus Road and SR 303L. The areas of lowest population density include much of the area affected by the BNSF Ennis Spur and Luke Air Force Base noise contours, and the area surrounding the McMicken Dam. This will remain the same in the future, as these features are generally incompatible with adjacent residential development.

Employment density maps (Figures 21 and 22) illustrate that the largest number of existing jobs are located north of Peoria Avenue between Reems and Dysart Roads, although the employment density is still quite low, reflecting an average of 1.1 to 4 jobs per acre. Employment growth to 2030 is scattered, with the highest densities of jobs located adjacent to SR 303L and Dysart Road. The areas with the lowest employment densities are the McMicken Dam and the area south of Peoria Avenue between Sarival Road and the Ennis Spur – generally affected by the Luke Air Force Base noise contours.

A majority of the area adjacent to Peoria Avenue has a 2030 population density (less than 4 persons per acre) which is lower than the current population density in the more urban areas of the valley (6 to 9 persons per acre). Therefore, it is likely that the 2030 socioeconomic data used in the MAG model is well below the future potential “build-out” of the study area. Additional development could occur beyond that reflected in the MAG 2030 socioeconomic data that would result in increased travel demand along the Peoria Avenue corridor.

Travel Demand Growth Trends

Based on the existing traffic volumes and the 2031 traffic projections, the travel demand along Peoria Avenue is expected to experience substantial growth over the next 20 years. The annual growth rates vary from approximately 5 percent to 100 percent per year. While this type of growth in travel demand can occur as development occurs in undeveloped areas, these growth rates cannot be sustained over a long period. Assuming that the annual growth rate beyond 2031 will be approximately 15 percent per year, the daily traffic volumes along a majority of Peoria Avenue will exceed 35,000 vpd by the year 2040.

I-10/Hassayampa Valley Transportation Framework Study

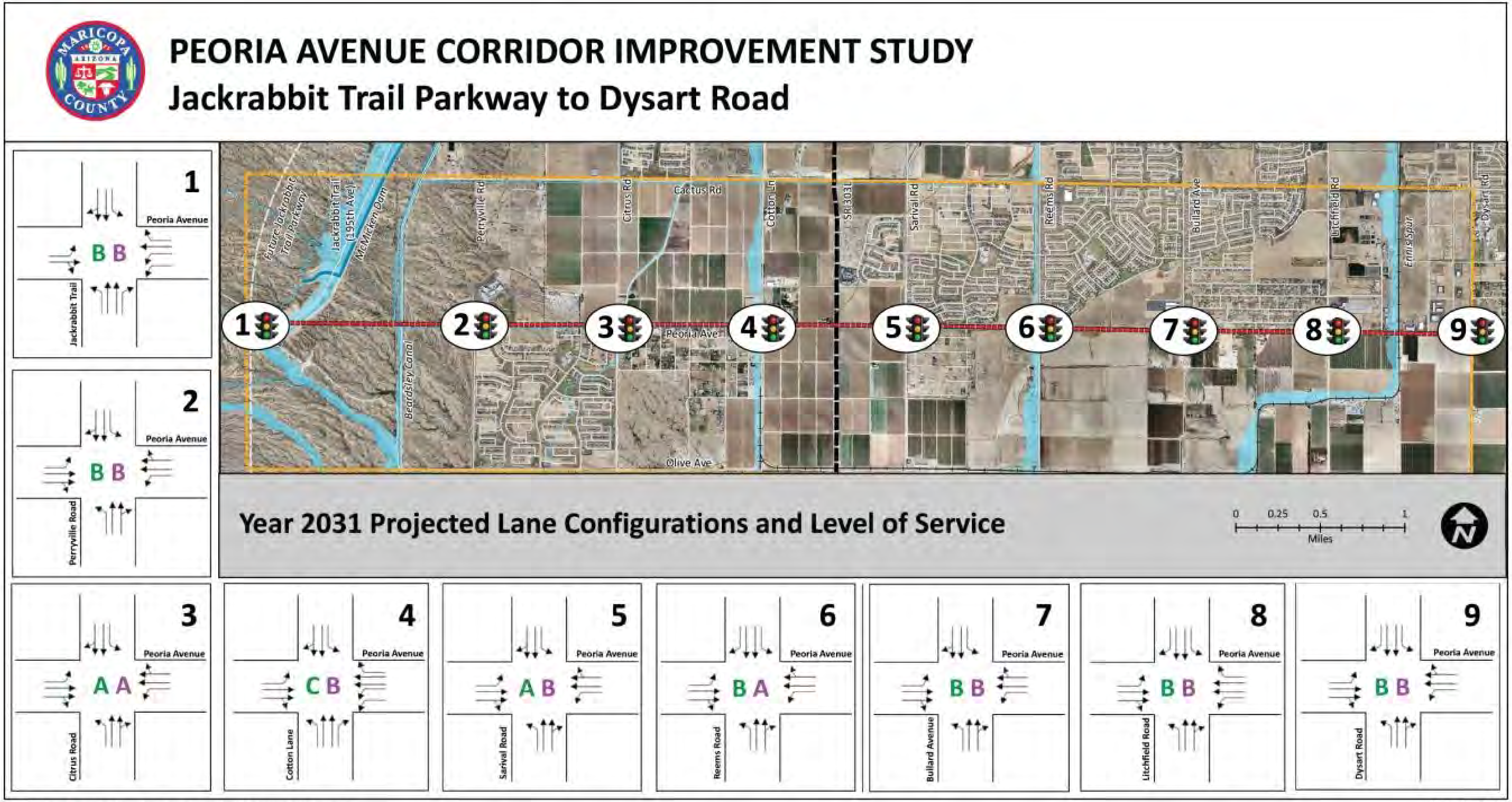
An expanded and updated version of the MAG regional transportation model was used to forecast the growth in total travel demand and future changes in travel patterns in the Hassayampa Study Area.

As the first step in the update of the model, MAG developed new build-out population and employment estimates. “Build-out” refers not to a specific future year, but rather to an unspecified date when urban development will have reached its highest level or maximum extent. These assumptions were based on an amalgamation of (1) expected land development patterns and densities in general plans and comprehensive plans, (2) approved private development plans, and (3) planned or proposed development plans. Each of these sources provided a glimpse of the level of future development in the MAG planning area and, specifically, the density of development for all major land uses. Build-out represents the best current understanding of how the region will develop in the long term. Build-out of the Hassayampa Valley is expected to occur at least 40 to 60 years in the future.

Daily traffic projections were obtained from MAG for the Hassayampa Framework Study model. The daily traffic projections for Peoria Avenue from this model ranged from approximately 30,000 to 60,000 vpd which would warrant a 6-lane arterial roadway.

Conclusions

Maricopa County, City of Surprise, and City of Glendale all classify Peoria Avenue as a 6-lane arterial facility. It is likely that the 2030 socioeconomic data used in the MAG model is well below the future potential build-out of the study area. Additional development could occur beyond that reflected in the MAG 2030 socioeconomic data that would result in increased travel demand along Peoria Avenue. The MAG Hassayampa Framework Study travel demand model was based on a build-out scenario of western Maricopa County and produced daily traffic projections that would warrant a 6-lane arterial facility. Based on the growth trends between 2010 and 2031, a 6-lane facility may be warranted by approximately 2040.



LEGEND: X -- AM Level of Service X -- PM Level of Service

October 2010

Note: This lane configuration is the minimum warranted by projected 2031 conditions. The ultimate configuration includes 3 lanes in each direction of travel.

Figure 18 – 2031 Lane Configurations and Level of Service

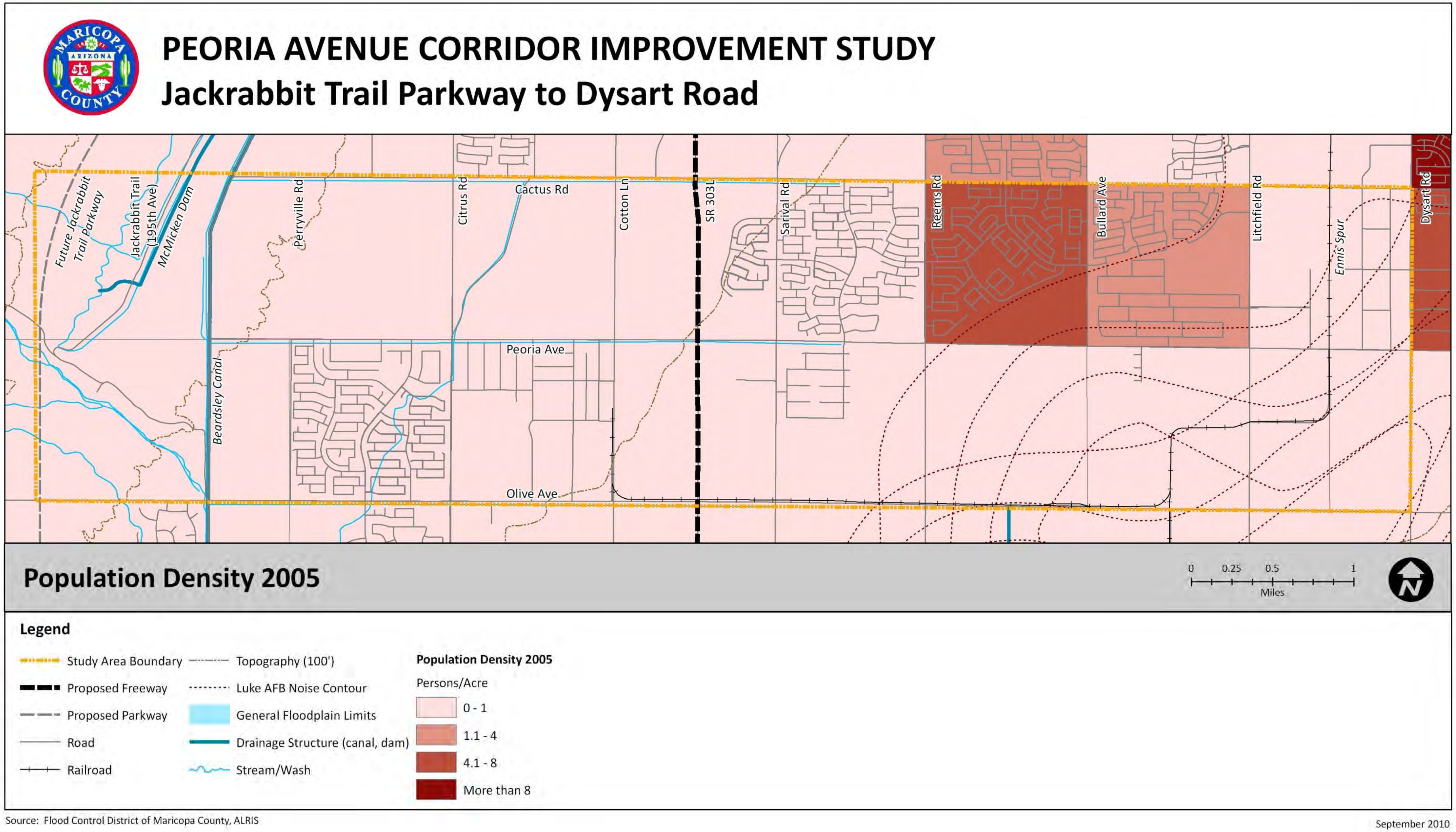
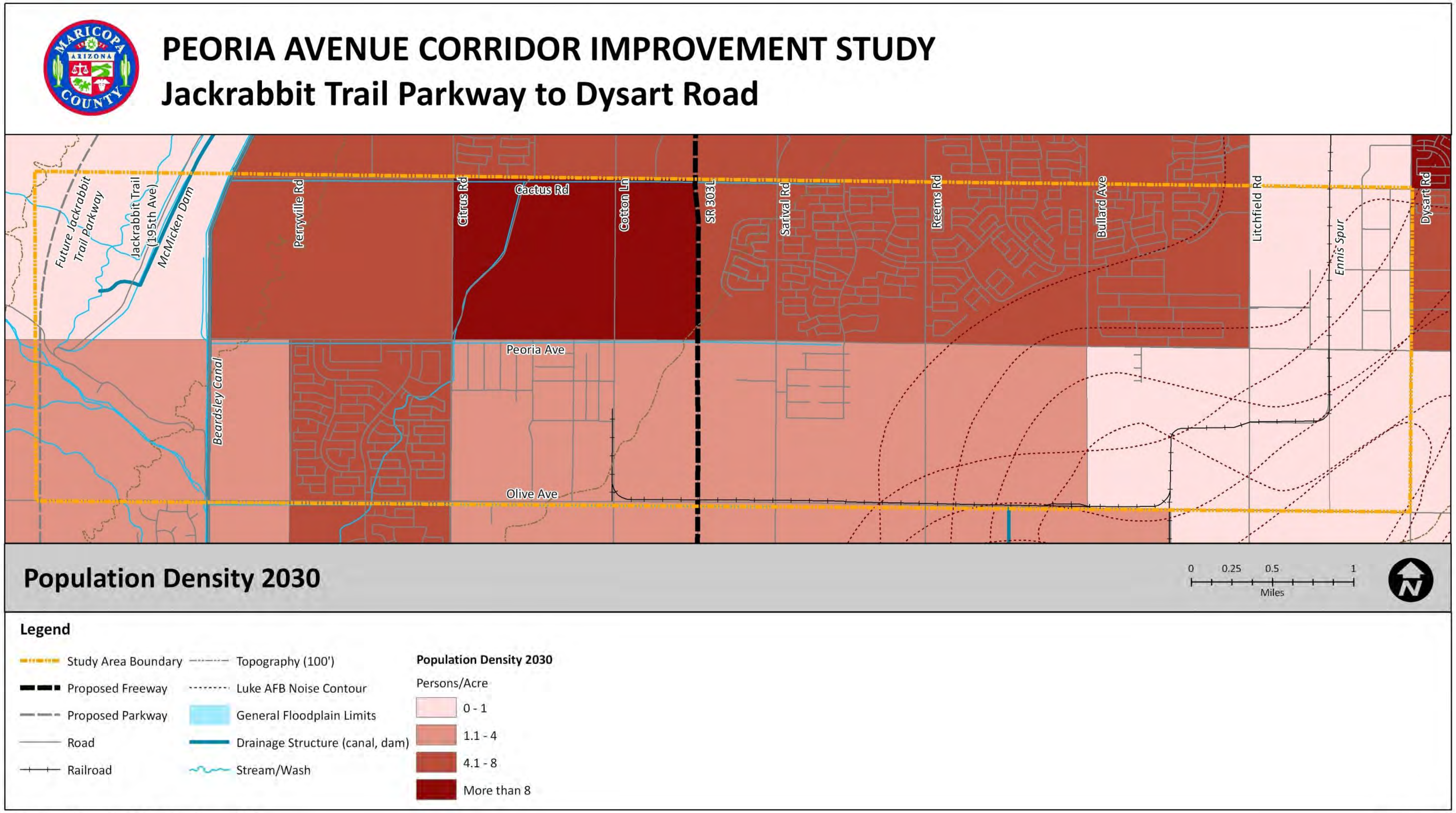


Figure 19 – Population Density 2005



Source: Flood Control District of Maricopa County, ALRIS

September 2010

Figure 20 – Population Density 2030

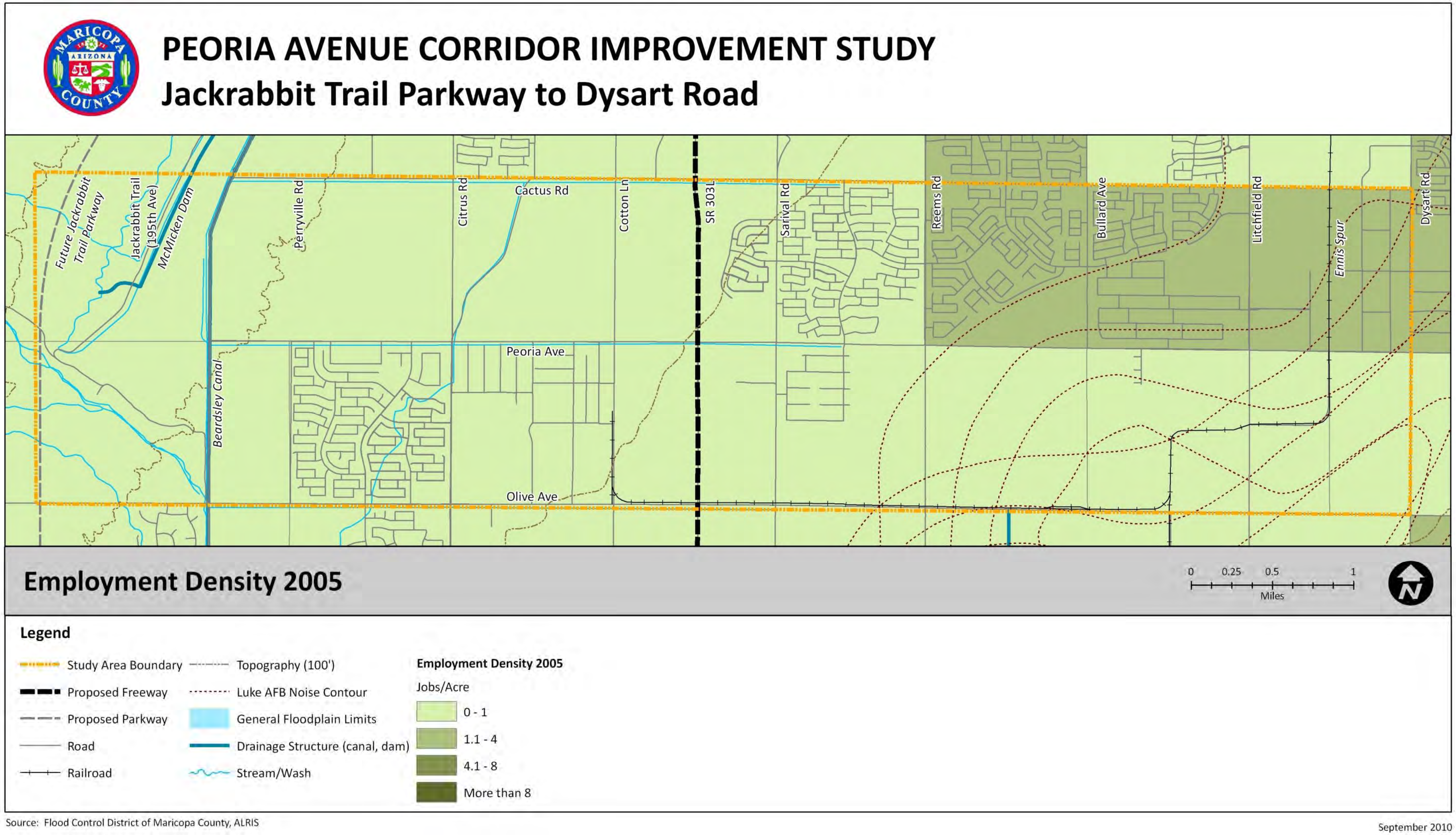


Figure 21 – Employment Density 2005

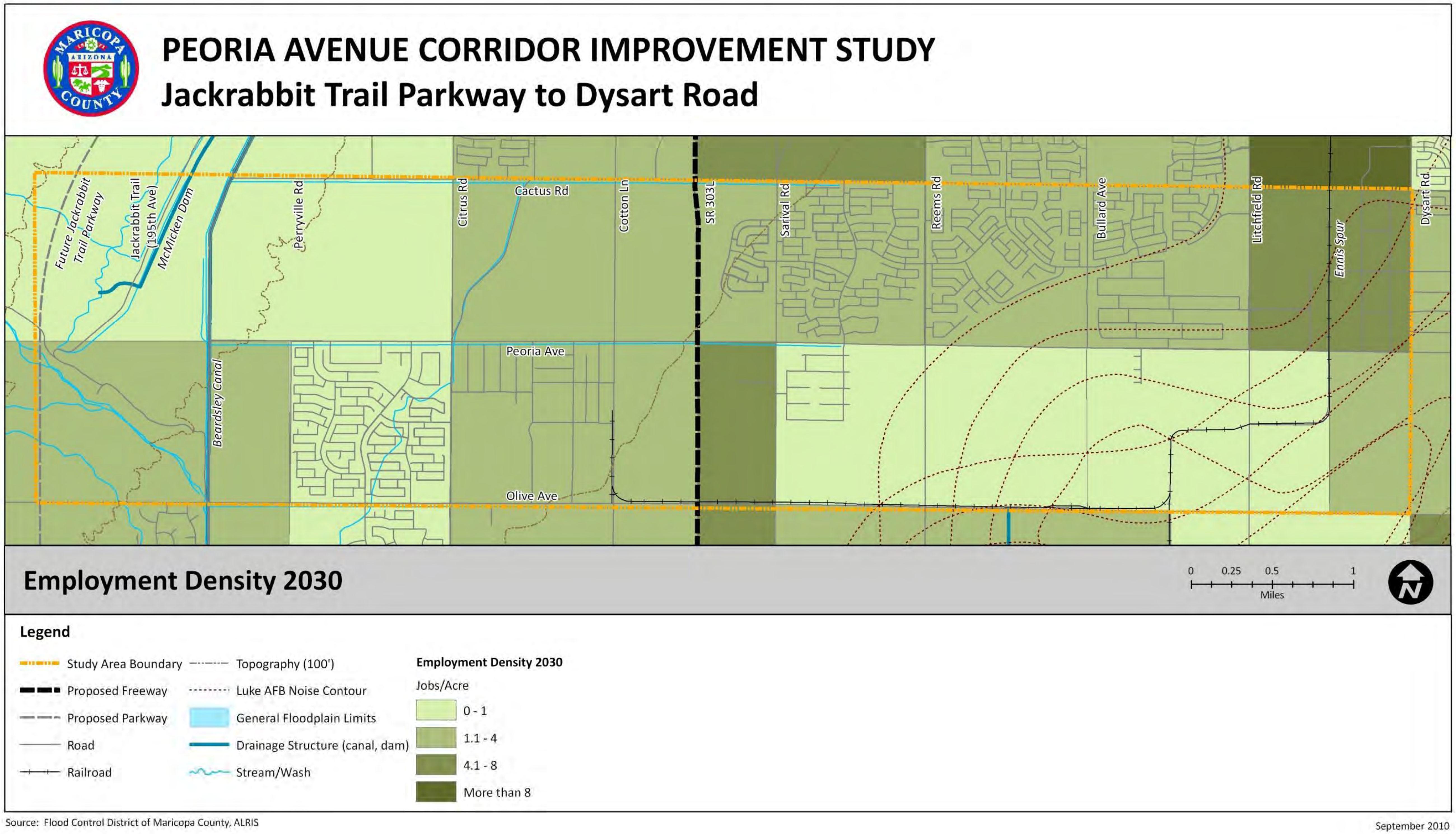


Figure 22 – Employment Density 2030

5.0 CRASH ANALYSIS

MCDOT provided detailed information on 79 crashes reported along Peoria Avenue between Perryville Road and Dysart Road, during the three-year period beginning January 1, 2004 and ending December 31, 2006. A review of the crash data showed the following information:

- Approximately 90% (71 of 79) of the reported crashes were classified as multi-vehicle crashes.
- Of these 71 multi-vehicle crashes, approximately 87% were reported as angle (60%) or rear-end crashes (27%).
- Of the 79 crashes, approximately 68% were reported as non-injury.
- One crash involved a fatality.
- Approximately 82% (65) of the 79 crashes were recorded as occurring at an intersection.
- A review of the remaining 14 crashes showed that 1 occurred at a driveway, and 12 crashes occurred near an intersection (within 200') even though they were recorded as not related to an intersection or no data was provided as to their relationship to an intersection.

Appendix A

HCM Signalized Intersection Capacity Analysis
1: Peoria Ave & Jackrabbit Pkwy

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰↰	↑	↱	↰	↑↑	↱	↰	↑↱	
Volume (vph)	50	100	130	340	50	140	60	500	400	210	870	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1736	1672		3367	1827	1553	1736	3471	1553	1736	3443	
Flt Permitted	0.72	1.00		0.52	1.00	1.00	0.24	1.00	1.00	0.32	1.00	
Satd. Flow (perm)	1319	1672		1825	1827	1553	436	3471	1553	582	3443	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	109	141	370	54	152	65	543	435	228	946	54
RTOR Reduction (vph)	0	80	0	0	0	105	0	0	281	0	6	0
Lane Group Flow (vph)	54	170	0	370	54	47	65	543	154	228	994	0
Turn Type	Perm			Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)	18.4	18.4		18.4	18.4	18.4	23.6	21.2	21.2	33.6	27.2	
Effective Green, g (s)	18.4	18.4		18.4	18.4	18.4	23.6	21.2	21.2	33.6	27.2	
Actuated g/C Ratio	0.31	0.31		0.31	0.31	0.31	0.39	0.35	0.35	0.56	0.45	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	404	513		560	560	476	223	1226	549	487	1561	
v/s Ratio Prot		0.10			0.03		0.01	0.16		c0.07	c0.29	
v/s Ratio Perm	0.04			c0.20		0.03	0.10		0.10	0.20		
v/c Ratio	0.13	0.33		0.66	0.10	0.10	0.29	0.44	0.28	0.47	0.64	
Uniform Delay, d1	15.0	16.0		18.1	14.9	14.9	11.6	14.9	13.9	7.3	12.6	
Progression Factor	1.00	1.00		0.75	0.75	0.45	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	1.7		5.9	0.3	0.4	0.7	1.2	1.3	0.7	2.0	
Delay (s)	15.7	17.8		19.5	11.4	7.1	12.3	16.0	15.2	8.0	14.6	
Level of Service	B	B		B	B	A	B	B	B	A	B	
Approach Delay (s)		17.4			15.5			15.5			13.4	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Peoria Ave & Perryville Rd

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	240	400	50	50	320	50	50	50	50	190	50	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.98		1.00	0.93		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3414		1736	3401		1736	3211		1736	3058	
Flt Permitted	0.52	1.00		0.47	1.00		0.59	1.00		0.68	1.00	
Satd. Flow (perm)	942	3414		852	3401		1079	3211		1249	3058	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	435	54	54	348	54	54	54	54	207	54	207
RTOR Reduction (vph)	0	16	0	0	21	0	0	37	0	0	141	0
Lane Group Flow (vph)	261	473	0	54	381	0	54	71	0	207	120	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	33.0	33.0		33.0	33.0		19.0	19.0		19.0	19.0	
Effective Green, g (s)	33.0	33.0		33.0	33.0		19.0	19.0		19.0	19.0	
Actuated g/C Ratio	0.55	0.55		0.55	0.55		0.32	0.32		0.32	0.32	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	518	1878		469	1871		342	1017		396	968	
v/s Ratio Prot		0.14			0.11			0.02			0.04	
v/s Ratio Perm	c0.28			0.06			0.05			c0.17		
v/c Ratio	0.50	0.25		0.12	0.20		0.16	0.07		0.52	0.12	
Uniform Delay, d1	8.4	7.1		6.5	6.8		14.7	14.3		16.8	14.6	
Progression Factor	0.76	0.82		0.79	0.85		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.1	0.3		0.5	0.2		1.0	0.1		4.9	0.3	
Delay (s)	9.4	6.1		5.6	6.1		15.7	14.5		21.7	14.8	
Level of Service	A	A		A	A		B	B		C	B	
Approach Delay (s)		7.3			6.0			14.9			17.9	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

10: Peoria Ave & Citrus Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	50	320	160	180	190	120	50	50	260	110	110	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.94		1.00	0.87		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3298		1736	3270		1736	3034		1736	3288	
Flt Permitted	0.55	1.00		0.45	1.00		0.64	1.00		0.53	1.00	
Satd. Flow (perm)	1003	3298		821	3270		1161	3034		970	3288	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	348	174	196	207	130	54	54	283	120	120	65
RTOR Reduction (vph)	0	75	0	0	56	0	0	198	0	0	46	0
Lane Group Flow (vph)	54	447	0	196	281	0	54	139	0	120	140	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	34.0	34.0		34.0	34.0		18.0	18.0		18.0	18.0	
Effective Green, g (s)	34.0	34.0		34.0	34.0		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.57	0.57		0.57	0.57		0.30	0.30		0.30	0.30	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	568	1869		465	1853		348	910		291	986	
v/s Ratio Prot		0.14			0.09			0.05			0.04	
v/s Ratio Perm	0.05			c0.24			0.05			c0.12		
v/c Ratio	0.10	0.24		0.42	0.15		0.16	0.15		0.41	0.14	
Uniform Delay, d1	6.0	6.5		7.4	6.2		15.4	15.4		16.8	15.4	
Progression Factor	0.75	0.64		1.10	0.49		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.3		2.8	0.2		0.9	0.4		4.3	0.3	
Delay (s)	4.8	4.4		10.9	3.2		16.4	15.8		21.0	15.7	
Level of Service	A	A		B	A		B	B		C	B	
Approach Delay (s)		4.5			6.0			15.8			17.8	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

13: Peoria Ave & Cotton Ln

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰↰	↑↑	↱	↰	↑↑	↱	↰	↑↱	
Volume (vph)	50	640	50	360	220	240	100	260	320	290	560	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1736	3434		3367	3471	1553	1736	3471	1553	1736	3429	
Flt Permitted	0.60	1.00		0.22	1.00	1.00	0.31	1.00	1.00	0.51	1.00	
Satd. Flow (perm)	1102	3434		796	3471	1553	571	3471	1553	934	3429	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	696	54	391	239	261	109	283	348	315	609	54
RTOR Reduction (vph)	0	9	0	0	0	184	0	0	172	0	10	0
Lane Group Flow (vph)	54	741	0	391	239	77	109	283	176	315	653	0
Turn Type	pm+pt			pm+pt		Perm	pm+pt		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)	18.6	16.2		21.8	17.8	17.8	21.6	16.8	16.8	26.0	19.0	
Effective Green, g (s)	18.6	16.2		21.8	17.8	17.8	21.6	16.8	16.8	26.0	19.0	
Actuated g/C Ratio	0.31	0.27		0.36	0.30	0.30	0.36	0.28	0.28	0.43	0.32	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	367	927		461	1030	461	299	972	435	498	1086	
v/s Ratio Prot	0.01	0.22		c0.06	0.07		0.03	0.08		c0.07	0.19	
v/s Ratio Perm	0.04			c0.25		0.05	0.10		0.11	c0.20		
v/c Ratio	0.15	0.80		0.85	0.23	0.17	0.36	0.29	0.40	0.63	0.60	
Uniform Delay, d1	14.7	20.4		16.5	15.9	15.6	13.2	16.9	17.5	12.0	17.3	
Progression Factor	0.76	0.84		0.80	0.82	1.24	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	7.0		13.3	0.5	0.8	0.8	0.8	2.8	2.6	2.5	
Delay (s)	11.4	24.2		26.5	13.5	20.1	14.0	17.7	20.3	14.6	19.8	
Level of Service	B	C		C	B	C	B	B	C	B	B	
Approach Delay (s)		23.3			21.2			18.4			18.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	50	450	50	210	560	50	80	80	50	60	50	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	0.99		1.00	0.94		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3419		1736	3429		1736	3272		1736	3150	
Flt Permitted	0.38	1.00		0.44	1.00		0.66	1.00		0.66	1.00	
Satd. Flow (perm)	694	3419		809	3429		1210	3272		1210	3150	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	489	54	228	609	54	87	87	54	65	54	87
RTOR Reduction (vph)	0	14	0	0	11	0	0	40	0	0	64	0
Lane Group Flow (vph)	54	529	0	228	652	0	87	101	0	65	77	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	36.0	36.0		36.0	36.0		16.0	16.0		16.0	16.0	
Effective Green, g (s)	36.0	36.0		36.0	36.0		16.0	16.0		16.0	16.0	
Actuated g/C Ratio	0.60	0.60		0.60	0.60		0.27	0.27		0.27	0.27	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	416	2051		485	2057		323	873		323	840	
v/s Ratio Prot		0.15			0.19			0.03			0.02	
v/s Ratio Perm	0.08			c0.28			c0.07			0.05		
v/c Ratio	0.13	0.26		0.47	0.32		0.27	0.12		0.20	0.09	
Uniform Delay, d1	5.2	5.7		6.7	5.9		17.4	16.6		17.0	16.5	
Progression Factor	0.58	0.63		1.08	0.97		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.2		3.2	0.4		2.0	0.3		1.4	0.2	
Delay (s)	3.5	3.8		10.4	6.1		19.4	16.9		18.4	16.8	
Level of Service	A	A		B	A		B	B		B	B	
Approach Delay (s)		3.8			7.2			17.9			17.3	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	8.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↑	↱
Volume (vph)	80	180	50	170	350	80	50	630	50	240	730	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.97		1.00	0.97		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3359		1736	3374		1736	3433		1736	3471	1553
Flt Permitted	0.40	1.00		0.60	1.00		0.32	1.00		0.34	1.00	1.00
Satd. Flow (perm)	738	3359		1090	3374		578	3433		622	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	196	54	185	380	87	54	685	54	261	793	120
RTOR Reduction (vph)	0	39	0	0	33	0	0	10	0	0	0	50
Lane Group Flow (vph)	87	211	0	185	434	0	54	729	0	261	793	70
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	17.0	17.0		17.0	17.0		35.0	35.0		35.0	35.0	35.0
Effective Green, g (s)	17.0	17.0		17.0	17.0		35.0	35.0		35.0	35.0	35.0
Actuated g/C Ratio	0.28	0.28		0.28	0.28		0.58	0.58		0.58	0.58	0.58
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	209	952		309	956		337	2003		363	2025	906
v/s Ratio Prot		0.06			0.13			0.21			0.23	
v/s Ratio Perm	0.12			c0.17			0.09			c0.42		0.05
v/c Ratio	0.42	0.22		0.60	0.45		0.16	0.36		0.72	0.39	0.08
Uniform Delay, d1	17.5	16.4		18.6	17.7		5.7	6.6		9.0	6.8	5.5
Progression Factor	0.91	0.85		0.57	0.51		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.9	0.5		7.6	1.4		1.0	0.5		11.6	0.6	0.2
Delay (s)	21.8	14.6		18.1	10.4		6.8	7.1		20.6	7.3	5.6
Level of Service	C	B		B	B		A	A		C	A	A
Approach Delay (s)		16.4			12.6			7.1			10.1	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Peoria Ave & Bullard Ave

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	80	360	130	130	580	80	180	100	70	60	240	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	0.98		1.00	0.94		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3333		1736	3408		1736	3257		1736	3329	
Flt Permitted	0.31	1.00		0.41	1.00		0.54	1.00		0.64	1.00	
Satd. Flow (perm)	559	3333		758	3408		982	3257		1161	3329	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	391	141	141	630	87	196	109	76	65	261	98
RTOR Reduction (vph)	0	61	0	0	18	0	0	43	0	0	56	0
Lane Group Flow (vph)	87	471	0	141	699	0	196	142	0	65	303	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.0	26.0		26.0	26.0		26.0	26.0		26.0	26.0	
Effective Green, g (s)	26.0	26.0		26.0	26.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.43	0.43		0.43	0.43	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	242	1444		328	1477		426	1411		503	1443	
v/s Ratio Prot		0.14			c0.21			0.04			0.09	
v/s Ratio Perm	0.16			0.19			c0.20			0.06		
v/c Ratio	0.36	0.33		0.43	0.47		0.46	0.10		0.13	0.21	
Uniform Delay, d1	11.4	11.2		11.8	12.1		12.0	10.1		10.2	10.6	
Progression Factor	0.97	0.96		0.80	0.77		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.8	0.6		3.7	1.0		3.5	0.1		0.5	0.3	
Delay (s)	14.9	11.3		13.2	10.3		15.6	10.2		10.7	10.9	
Level of Service	B	B		B	B		B	B		B	B	
Approach Delay (s)		11.8			10.8			13.0			10.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
25: Peoria Ave & Litchfield Rd

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↑↱		↰	↑↑	↱
Volume (vph)	50	470	120	180	590	70	160	360	70	50	650	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3366		1736	3471	1553	1736	3386		1736	3471	1553
Flt Permitted	0.35	1.00		0.35	1.00	1.00	0.31	1.00		0.46	1.00	1.00
Satd. Flow (perm)	636	3366		636	3471	1553	569	3386		837	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	511	130	196	641	76	174	391	76	54	707	54
RTOR Reduction (vph)	0	37	0	0	0	43	0	27	0	0	0	31
Lane Group Flow (vph)	54	604	0	196	641	33	174	440	0	54	707	23
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	26.0	26.0		26.0	26.0	26.0	26.0	26.0		26.0	26.0	26.0
Effective Green, g (s)	26.0	26.0		26.0	26.0	26.0	26.0	26.0		26.0	26.0	26.0
Actuated g/C Ratio	0.43	0.43		0.43	0.43	0.43	0.43	0.43		0.43	0.43	0.43
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	276	1459		276	1504	673	247	1467		363	1504	673
v/s Ratio Prot		0.18			0.18			0.13			0.20	
v/s Ratio Perm	0.08			c0.31		0.02	c0.31			0.06		0.02
v/c Ratio	0.20	0.41		0.71	0.43	0.05	0.70	0.30		0.15	0.47	0.03
Uniform Delay, d1	10.5	11.7		13.9	11.8	9.8	13.9	11.1		10.3	12.1	9.8
Progression Factor	0.89	0.93		0.96	0.93	0.98	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.6	0.9		13.9	0.9	0.1	15.6	0.5		0.9	1.1	0.1
Delay (s)	11.0	11.7		27.3	11.9	9.7	29.4	11.6		11.2	13.2	9.9
Level of Service	B	B		C	B	A	C	B		B	B	A
Approach Delay (s)		11.7			15.0			16.4			12.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↑	↱
Volume (vph)	60	330	100	270	420	120	100	550	50	180	670	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.97		1.00	0.97		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3350		1736	3356		1736	3428		1736	3471	1553
Flt Permitted	0.39	1.00		0.46	1.00		0.29	1.00		0.34	1.00	1.00
Satd. Flow (perm)	704	3350		843	3356		535	3428		613	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	359	109	293	457	130	109	598	54	196	728	228
RTOR Reduction (vph)	0	48	0	0	43	0	0	11	0	0	0	133
Lane Group Flow (vph)	65	420	0	293	544	0	109	641	0	196	728	95
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	27.0	27.0		27.0	27.0		25.0	25.0		25.0	25.0	25.0
Effective Green, g (s)	27.0	27.0		27.0	27.0		25.0	25.0		25.0	25.0	25.0
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.42	0.42		0.42	0.42	0.42
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	317	1508		379	1510		223	1428		255	1446	647
v/s Ratio Prot		0.13			0.16			0.19			0.21	
v/s Ratio Perm	0.09			c0.35			0.20			c0.32		0.06
v/c Ratio	0.21	0.28		0.77	0.36		0.49	0.45		0.77	0.50	0.15
Uniform Delay, d1	10.0	10.4		13.9	10.8		12.8	12.6		15.0	12.9	10.9
Progression Factor	0.63	0.56		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.4	0.4		14.2	0.7		7.5	1.0		19.7	1.3	0.5
Delay (s)	7.7	6.2		28.1	11.5		20.3	13.6		34.7	14.2	11.4
Level of Service	A	A		C	B		C	B		C	B	B
Approach Delay (s)		6.4			17.0			14.5			17.1	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰↰	↑	↱	↰	↑↑	↱	↰	↑↱	
Volume (vph)	50	60	70	450	100	180	90	910	330	140	470	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1736	1679		3367	1827	1553	1736	3471	1553	1736	3404	
Flt Permitted	0.69	1.00		0.67	1.00	1.00	0.39	1.00	1.00	0.20	1.00	
Satd. Flow (perm)	1255	1679		2364	1827	1553	712	3471	1553	357	3404	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	65	76	489	109	196	98	989	359	152	511	76
RTOR Reduction (vph)	0	56	0	0	0	144	0	0	192	0	19	0
Lane Group Flow (vph)	54	85	0	489	109	52	98	989	167	152	568	0
Turn Type	Perm			Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)	15.9	15.9		15.9	15.9	15.9	32.1	27.9	27.9	32.1	27.9	
Effective Green, g (s)	15.9	15.9		15.9	15.9	15.9	32.1	27.9	27.9	32.1	27.9	
Actuated g/C Ratio	0.27	0.27		0.27	0.27	0.27	0.54	0.46	0.46	0.54	0.46	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	333	445		626	484	412	453	1614	722	288	1583	
v/s Ratio Prot		0.05			0.06		0.02	c0.28		c0.04	0.17	
v/s Ratio Perm	0.04			c0.21		0.03	0.10		0.11	0.25		
v/c Ratio	0.16	0.19		0.78	0.23	0.13	0.22	0.61	0.23	0.53	0.36	
Uniform Delay, d1	16.9	17.1		20.4	17.2	16.8	6.9	12.0	9.6	8.1	10.3	
Progression Factor	1.00	1.00		0.80	0.82	0.63	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.2		6.2	0.2	0.1	0.2	1.7	0.7	1.7	0.6	
Delay (s)	17.2	17.3		22.5	14.3	10.8	7.2	13.8	10.4	9.8	10.9	
Level of Service	B	B		C	B	B	A	B	B	A	B	
Approach Delay (s)		17.3			18.5			12.5			10.7	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Peoria Ave & Perryville Rd

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	210	280	50	50	420	170	70	50	50	70	50	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.96		1.00	0.93		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3393		1736	3321		1736	3211		1736	3043	
Flt Permitted	0.34	1.00		0.54	1.00		0.57	1.00		0.68	1.00	
Satd. Flow (perm)	627	3393		980	3321		1035	3211		1249	3043	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	228	304	54	54	457	185	76	54	54	76	54	250
RTOR Reduction (vph)	0	31	0	0	101	0	0	30	0	0	139	0
Lane Group Flow (vph)	228	327	0	54	541	0	76	78	0	76	165	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	25.3	25.3		25.3	25.3		26.7	26.7		26.7	26.7	
Effective Green, g (s)	25.3	25.3		25.3	25.3		26.7	26.7		26.7	26.7	
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.44	0.44		0.44	0.44	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	264	1431		413	1400		461	1429		556	1354	
v/s Ratio Prot		0.10			0.16			0.02			0.05	
v/s Ratio Perm	c0.36			0.06			c0.07			0.06		
v/c Ratio	0.86	0.23		0.13	0.39		0.16	0.05		0.14	0.12	
Uniform Delay, d1	15.8	11.1		10.6	12.0		10.0	9.5		9.8	9.8	
Progression Factor	0.86	0.92		0.83	0.73		1.00	1.00		1.00	1.00	
Incremental Delay, d2	22.9	0.1		0.1	0.2		0.8	0.1		0.5	0.2	
Delay (s)	36.4	10.3		9.0	8.9		10.7	9.5		10.4	10.0	
Level of Service	D	B		A	A		B	A		B	A	
Approach Delay (s)		20.5			8.9			10.0			10.0	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Peoria Ave & Citrus Rd

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	50	230	60	230	290	160	180	100	180	100	50	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.95		1.00	0.90		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3364		1736	3286		1736	3137		1736	3211	
Flt Permitted	0.42	1.00		0.56	1.00		0.68	1.00		0.57	1.00	
Satd. Flow (perm)	761	3364		1024	3286		1249	3137		1034	3211	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	250	65	250	315	174	196	109	196	109	54	54
RTOR Reduction (vph)	0	42	0	0	113	0	0	94	0	0	26	0
Lane Group Flow (vph)	54	273	0	250	376	0	196	211	0	109	82	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	20.9	20.9		20.9	20.9		31.1	31.1		31.1	31.1	
Effective Green, g (s)	20.9	20.9		20.9	20.9		31.1	31.1		31.1	31.1	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.52	0.52		0.52	0.52	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	265	1172		357	1145		647	1626		536	1664	
v/s Ratio Prot		0.08			0.11			0.07			0.03	
v/s Ratio Perm	0.07			c0.24			c0.16			0.11		
v/c Ratio	0.20	0.23		0.70	0.33		0.30	0.13		0.20	0.05	
Uniform Delay, d1	13.7	13.9		16.9	14.4		8.3	7.5		7.8	7.1	
Progression Factor	0.79	0.71		0.48	0.32		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.1		5.7	0.2		1.2	0.2		0.9	0.1	
Delay (s)	11.2	10.0		13.8	4.7		9.5	7.6		8.6	7.2	
Level of Service	B	A		B	A		A	A		A	A	
Approach Delay (s)		10.1			7.8			8.3			7.9	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	8.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
13: Peoria Ave & Cotton Ln

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰↰	↑↑	↱	↰	↑↑	↱	↰	↑↱	
Volume (vph)	50	350	50	410	370	430	200	400	350	230	280	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1736	3406		3367	3471	1553	1736	3471	1553	1736	3393	
Flt Permitted	0.52	1.00		0.33	1.00	1.00	0.54	1.00	1.00	0.39	1.00	
Satd. Flow (perm)	942	3406		1181	3471	1553	983	3471	1553	716	3393	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	380	54	446	402	467	217	435	380	250	304	54
RTOR Reduction (vph)	0	19	0	0	0	335	0	0	269	0	24	0
Lane Group Flow (vph)	54	415	0	446	402	132	217	435	111	250	334	0
Turn Type	pm+pt			pm+pt		Perm	pm+pt		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)	14.9	14.9		17.0	17.0	17.0	16.2	16.2	16.2	18.1	18.1	
Effective Green, g (s)	14.9	14.9		17.0	17.0	17.0	16.2	16.2	16.2	18.1	18.1	
Actuated g/C Ratio	0.25	0.25		0.28	0.28	0.28	0.27	0.27	0.27	0.30	0.30	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	272	846		517	983	440	341	937	419	350	1024	
v/s Ratio Prot	0.01	c0.12		c0.07	0.12		c0.06	0.13		c0.09	0.10	
v/s Ratio Perm	0.04			c0.17		0.09	0.11		0.07	c0.12		
v/c Ratio	0.20	0.49		0.86	0.41	0.30	0.64	0.46	0.26	0.71	0.33	
Uniform Delay, d1	18.0	19.3		19.6	17.4	16.8	19.9	18.3	17.2	17.5	16.2	
Progression Factor	1.06	1.10		0.76	0.76	0.27	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	0.4		13.8	0.3	0.4	3.9	1.7	1.5	6.8	0.8	
Delay (s)	19.4	21.7		28.7	13.5	4.9	23.7	19.9	18.7	24.2	17.1	
Level of Service	B	C		C	B	A	C	B	B	C	B	
Approach Delay (s)		21.4			15.6			20.3			20.0	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Peoria Ave & Sarival Rd

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	70	560	110	60	400	60	50	60	210	50	50	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.98		1.00	0.88		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3385		1736	3403		1736	3066		1736	3211	
Flt Permitted	0.40	1.00		0.24	1.00		0.68	1.00		0.57	1.00	
Satd. Flow (perm)	723	3385		433	3403		1249	3066		1046	3211	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	609	120	65	435	65	54	65	228	54	54	54
RTOR Reduction (vph)	0	37	0	0	27	0	0	101	0	0	24	0
Lane Group Flow (vph)	76	692	0	65	473	0	54	192	0	54	84	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.2	19.2		19.2	19.2		32.8	32.8		32.8	32.8	
Effective Green, g (s)	19.2	19.2		19.2	19.2		32.8	32.8		32.8	32.8	
Actuated g/C Ratio	0.32	0.32		0.32	0.32		0.55	0.55		0.55	0.55	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	231	1083		139	1089		683	1676		572	1755	
v/s Ratio Prot		c0.20			0.14			c0.06			0.03	
v/s Ratio Perm	0.11			0.15			0.04			0.05		
v/c Ratio	0.33	0.64		0.47	0.43		0.08	0.11		0.09	0.05	
Uniform Delay, d1	15.5	17.4		16.3	16.1		6.4	6.6		6.5	6.3	
Progression Factor	0.67	0.69		0.98	0.95		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	1.1		2.5	0.3		0.2	0.1		0.3	0.1	
Delay (s)	11.2	13.1		18.5	15.7		6.7	6.7		6.8	6.4	
Level of Service	B	B		B	B		A	A		A	A	
Approach Delay (s)		12.9			16.0			6.7			6.5	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↑	↱
Volume (vph)	90	360	50	50	190	250	50	790	170	90	550	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.98		1.00	0.91		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3408		1736	3175		1736	3379		1736	3471	1553
Flt Permitted	0.35	1.00		0.39	1.00		0.42	1.00		0.24	1.00	1.00
Satd. Flow (perm)	643	3408		705	3175		767	3379		430	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	391	54	54	207	272	54	859	185	98	598	76
RTOR Reduction (vph)	0	19	0	0	122	0	0	26	0	0	0	27
Lane Group Flow (vph)	98	426	0	54	357	0	54	1018	0	98	598	49
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	13.5	13.5		13.5	13.5		38.5	38.5		38.5	38.5	38.5
Effective Green, g (s)	13.5	13.5		13.5	13.5		38.5	38.5		38.5	38.5	38.5
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.64	0.64		0.64	0.64	0.64
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	145	767		159	714		492	2168		276	2227	997
v/s Ratio Prot		0.12			0.11			c0.30			0.17	
v/s Ratio Perm	c0.15			0.08			0.07			0.23		0.03
v/c Ratio	0.68	0.55		0.34	0.50		0.11	0.47		0.36	0.27	0.05
Uniform Delay, d1	21.3	20.6		19.5	20.3		4.1	5.5		5.0	4.7	4.0
Progression Factor	0.64	0.56		0.88	0.77		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	11.3	0.8		1.2	0.5		0.5	0.7		3.5	0.3	0.1
Delay (s)	24.8	12.3		18.3	16.2		4.6	6.2		8.5	5.0	4.1
Level of Service	C	B		B	B		A	A		A	A	A
Approach Delay (s)		14.5			16.4			6.2			5.3	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	80	570	160	50	380	80	140	230	130	50	130	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.97		1.00	0.95		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3357		1736	3381		1736	3283		1736	3289	
Flt Permitted	0.40	1.00		0.21	1.00		0.62	1.00		0.52	1.00	
Satd. Flow (perm)	733	3357		380	3381		1125	3283		952	3289	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	620	174	54	413	87	152	250	141	54	141	76
RTOR Reduction (vph)	0	52	0	0	36	0	0	66	0	0	35	0
Lane Group Flow (vph)	87	742	0	54	464	0	152	325	0	54	182	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.9	19.9		19.9	19.9		32.1	32.1		32.1	32.1	
Effective Green, g (s)	19.9	19.9		19.9	19.9		32.1	32.1		32.1	32.1	
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.54	0.54		0.54	0.54	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	243	1113		126	1121		602	1756		509	1760	
v/s Ratio Prot		c0.22			0.14			0.10			0.06	
v/s Ratio Perm	0.12			0.14			c0.14			0.06		
v/c Ratio	0.36	0.67		0.43	0.41		0.25	0.19		0.11	0.10	
Uniform Delay, d1	15.2	17.2		15.6	15.5		7.5	7.2		6.9	6.9	
Progression Factor	0.80	0.76		0.96	0.86		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	1.5		2.3	0.2		1.0	0.2		0.4	0.1	
Delay (s)	13.0	14.6		17.3	13.5		8.5	7.4		7.3	7.0	
Level of Service	B	B		B	B		A	A		A	A	
Approach Delay (s)		14.4			13.9			7.7			7.0	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
25: Peoria Ave & Litchfield Rd

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↑↱		↰	↑↑	↱
Volume (vph)	50	660	180	90	400	60	110	600	170	70	380	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3359		1736	3471	1553	1736	3356		1736	3471	1553
Flt Permitted	0.47	1.00		0.18	1.00	1.00	0.51	1.00		0.27	1.00	1.00
Satd. Flow (perm)	856	3359		334	3471	1553	924	3356		488	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	717	196	98	435	65	120	652	185	76	413	54
RTOR Reduction (vph)	0	49	0	0	0	40	0	36	0	0	0	28
Lane Group Flow (vph)	54	864	0	98	435	25	120	801	0	76	413	26
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	22.9	22.9		22.9	22.9	22.9	29.1	29.1		29.1	29.1	29.1
Effective Green, g (s)	22.9	22.9		22.9	22.9	22.9	29.1	29.1		29.1	29.1	29.1
Actuated g/C Ratio	0.38	0.38		0.38	0.38	0.38	0.49	0.49		0.49	0.49	0.49
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	327	1282		127	1325	593	448	1628		237	1683	753
v/s Ratio Prot		0.26			0.13			c0.24			0.12	
v/s Ratio Perm	0.06			c0.29		0.02	0.13			0.16		0.02
v/c Ratio	0.17	0.67		0.77	0.33	0.04	0.27	0.49		0.32	0.25	0.03
Uniform Delay, d1	12.2	15.4		16.3	13.1	11.7	9.1	10.5		9.4	9.0	8.1
Progression Factor	0.52	0.60		1.14	1.08	1.65	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	1.3		24.0	0.1	0.0	1.5	1.1		3.5	0.3	0.1
Delay (s)	6.6	10.6		42.5	14.2	19.2	10.6	11.5		13.0	9.4	8.2
Level of Service	A	B		D	B	B	B	B		B	A	A
Approach Delay (s)		10.4			19.4			11.4			9.8	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
28: Peoria Ave & Dysart Rd

10/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↑	↱
Volume (vph)	190	420	130	50	310	200	100	680	280	120	510	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.96		1.00	0.94		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3348		1736	3267		1736	3319		1736	3471	1553
Flt Permitted	0.36	1.00		0.33	1.00		0.43	1.00		0.20	1.00	1.00
Satd. Flow (perm)	661	3348		604	3267		776	3319		372	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	457	141	54	337	217	109	739	304	130	554	76
RTOR Reduction (vph)	0	50	0	0	111	0	0	72	0	0	0	35
Lane Group Flow (vph)	207	548	0	54	443	0	109	971	0	130	554	41
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	20.0	20.0		20.0	20.0		32.0	32.0		32.0	32.0	32.0
Effective Green, g (s)	20.0	20.0		20.0	20.0		32.0	32.0		32.0	32.0	32.0
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.53	0.53		0.53	0.53	0.53
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	220	1116		201	1089		414	1770		198	1851	828
v/s Ratio Prot		0.16			0.14			0.29			0.16	
v/s Ratio Perm	c0.31			0.09			0.14			c0.35		0.03
v/c Ratio	0.94	0.49		0.27	0.41		0.26	0.55		0.66	0.30	0.05
Uniform Delay, d1	19.4	15.9		14.6	15.4		7.6	9.2		10.1	7.8	6.7
Progression Factor	0.65	0.53		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	40.4	0.3		0.7	0.2		1.5	1.2		15.8	0.4	0.1
Delay (s)	53.0	8.7		15.4	15.7		9.1	10.5		25.8	8.2	6.8
Level of Service	D	A		B	B		A	B		C	A	A
Approach Delay (s)		20.1			15.6			10.3			11.1	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Appendix H

MCDOT *RightRoads* Summary of Public and Stakeholder Involvement

MCDOT *RightRoads* Program

Right Road Right Time Right Cost

Summary of Public Involvement

Peoria Avenue
Corridor Improvement Study
Jackrabbit Trail to Dysart Road

May 10, 2011

Maricopa County Department of Transportation

Maricopa County
Department of Transportation

2901 W. Durango St.
Phoenix, AZ 85009
Phone: 602-506-4608
Fax: 602-506-4882
www.maricopa.gov

MCDOT *RightRoads* Program
Summary of Public Involvement

Peoria Avenue Corridor Improvement Study
Jackrabbit Trail to Dysart Road
TT005

FINAL REPORT

PURPOSE OF PUBLIC INVOLVEMENT

This study evaluated planned corridor development and the resulting projected 2030 traffic volumes along the future Peoria Avenue corridor between Jackrabbit Trail and Dysart Road to develop the most cost-effective improvement plans that include a recommendation for establishing the future roadway type, alignment, access management strategies, future drainage structures and network connectivity.

Gaining consensus among the agencies and the public is critical to the success of this long range transportation study as well as the future implementation of its recommendations to provide an efficient roadway for the long term.

Maricopa County Department of Transportation (MCDOT), Flood Control District of Maricopa County (FCDMC), Arizona Department of Transportation (ADOT), Arizona State Land Department (ASLD), Maricopa Association of Governments (MAG), the Burlington-Santa Fe Railway (BNSF), Maricopa County Environmental Services, Maricopa County Parks Department, Maricopa County Planning and Development, Maricopa Water District, the City of Surprise, the City of Glendale, the City of El Mirage, Dysart Unified School District, major utility providers, impacted land developments, affected businesses, property owners and residents are all major stakeholders in this study.

The participation of stakeholder public and multi-agency involvement aids in the development of a consistent roadway and the resolution of conflicting agency requirements; facilitates ultimate regional traffic flow; and preserves the interests and rights of area residents and adjacent development.

STUDY BACKGROUND & PURPOSE

The Peoria Avenue Corridor Improvement Study (Jackrabbit Trail Parkway to Dysart Road) is one of a series of long-range transportation planning studies being conducted by the Maricopa County Department of Transportation (MCDOT). The City of Surprise, City of Glendale, City of El Mirage, and Maricopa County transportation plans all include Peoria Avenue as a future arterial roadway from Jackrabbit Trail Parkway to Dysart Road. The Maricopa Association of Governments (MAG) recently prepared the Interstate 10/Hassayampa Valley Transportation Framework Study (Hassayampa Framework Study) that identified a comprehensive roadway network to meet traffic demands for the build out of the area west of SR 303L. This long range regional transportation study identified the need for future roadway network consisting of freeways, parkways, and major arterial roads.

The MAG Hassayampa Framework Study recommended an extension of Peoria Avenue westward from Perryville Road to the future Jackrabbit Trail Parkway, and identified Peoria Avenue as a major arterial roadway from the future Jackrabbit Trail Parkway to Sarival Avenue.

This study will identify the preferred alignment and “footprint” for the future Peoria Avenue between Jackrabbit Trail Parkway and Dysart Road and will facilitate future roadway implementation by developers and local jurisdictions, providing a cohesive transportation corridor, compatible with the City of Surprise, City of Glendale, City of El Mirage, Maricopa County, and MAG transportation plans.

Corridor Description

The Peoria Avenue Corridor study area includes the segment of Peoria Avenue between the future Jackrabbit Trail Parkway alignment and Dysart Road. The study area generally encompasses a two-mile wide corridor centered on the existing Peoria Avenue alignment.

Today’s Peoria Avenue generally consists of a two-lane roadway (one travel lane in each direction). Half-street improvements have been constructed along the north side of Peoria Avenue adjacent to developments such as Shadow Ridge High School, Greer Ranch subdivision, Copper Canyon Ranch subdivision and Skyway Business Park. Improvements on the south side of Peoria Avenue have been constructed adjacent to the Cortessa subdivision. The only full-width roadway section of Peoria Avenue is located immediately east of Perryville Road between Cortessa and Shadow Ridge High School.

The BNSF Railway operates a north-south railroad spur (Ennis Spur) that crosses Peoria Avenue between Litchfield and Dysart Roads. SR 303L crosses the Peoria Avenue Corridor between Cotton Lane and Sarival Road.

The majority of the land in the study area is privately owned, with the exception of the westernmost limit (west of Beardsley Canal) which is owned by the Arizona State Land Department (ASLD). The majority of the existing land use is categorized as vacant (undeveloped) or agricultural. Several residential subdivisions are built or under development, which include three elementary schools, one middle school, and one high school. In several locations, existing homes not associated with large master-planned communities, are located adjacent to Peoria Avenue. Small clusters of industrial and commercial development are scattered throughout the eastern end of the study area.

Based on the City of Surprise, City of Glendale, and City of El Mirage future land use planning, a majority of the vacant and agricultural land within the study area is envisioned to be converted to single-family residential housing and mixed-use developments in the future. It is anticipated that commercial and industrial development will expand, but remain scattered throughout the study area.

Study Need
Today's land development and existing travel demands in the Peoria Avenue Corridor do not warrant a major east/west arterial roadway in the near-term; however, plans are underway to convert much of the rural and low density residential lands within the corridor to more intense land uses that will generate significantly more traffic. The "build-out" forecast for future land development and resulting travel demand warrant a major east/west arterial roadway in the long term.

To help make future roadway construction economically feasible, the planning process needs to begin now to identify and protect long-term public right-of-way needs for the future roadway under ultimate "build-out" conditions.

Study Goals & Objectives
This corridor study is the first step in the planning process and its primary goal is to aid the affected agencies and jurisdictions in defining and protecting sufficient right-of-way for a continuous future Peoria Avenue Corridor that will safely accommodate projected travel demand and the future six-lane major arterial roadway as identified in the Surprise, Glendale, MCDOT and MAG long-range transportation plans. In general, the purpose of this Corridor Improvement Study is to provide MCDOT and partner jurisdictions with a future "footprint" of the Peoria Avenue Corridor and a timeframe for the implementation of the recommended future roadway improvements.

To accomplish this, the main focus of this study is to investigate, map, and analyze corridor constraints and opportunities to arrive at a recommended corridor alignment. This study will establish the facility type, number of lanes, right-of-way needs, and general alignment for the Peoria Avenue Corridor that will be required to accommodate projected traffic growth and enhance safety. In cooperation with the City of Surprise, the City of Glendale, and the City of El Mirage, the study will also determine design standards based upon future roadway jurisdiction (anticipated roadway annexation) and an implementation or construction phasing plan.

The key objectives of this Corridor Improvement Study are to:

- Define and assess the strategic issues within the project study area

- Develop and evaluate conceptual alternative alignments within the corridor study area
- Recommend a preferred alignment
- Define the characteristics of the preferred alignment
- Develop consensus for the preferred alignment
- Develop an implementation (recommended construction phasing) plan

Preliminary Key Issues and Challenges
Early in the study process, a preliminary list of study issues and potential challenges is compiled. This list expands as the study progresses and input is obtained from public participation.

- Establish future connections of Peoria Avenue to planned roadways such as Jackrabbit Trail Parkway
- Account for future planned connection to SR 303L
- Evaluation of drainage structures across major washes, canals and channels.
- Evaluation of crossing of the BNSF Railway Ennis Spur
- Maintain functional integrity of roadway through constrained areas
- Maximize use of existing roadway improvements along corridor to reduce costs
- Identify ultimate alignment and access management strategies
- Consideration of environmental constraints

Study Approach
The Peoria Avenue Corridor Improvement Study is carried out in two phases, a planning phase and an engineering phase.

Planning Phase
During the Planning Phase, general background information regarding the corridor is gathered and documented in reports that will lead to well-founded recommendations for improvements and longer-term needs along Peoria Avenue. Meetings are conducted with affected jurisdictions, agencies, stakeholders, and the impacted public to form a broad consensus of the overall needs and vision of the corridor.

Based on identified needs, conceptual alternatives are developed and candidate alternatives are then evaluated for technical and environmental feasibility, public acceptability, and economic viability.

Engineering Phase
The Engineering Phase of the study begins following the selection of a preferred alternative. Preliminary engineering design plans, right-of-way requirements, and estimated construction costs will be prepared for long-term roadway design features.

Priorities for roadway construction phasing along with policies and guidelines to preserve the intended regional function of the road are developed.

STUDY MILESTONES

Project Kick-off & Study Initiation	July 2010
PHASE I: Data Collection/Issues Identification	July - September 2010
Public Input Meeting #1 (Scoping Phase)	September 20, 2010
PHASE II: Alternatives Development and Evaluation	October 2010 – January 2011
Public Input Meeting #2 (Alternatives Analysis Phase)	January 18, 2011
Public Input Meeting #3 (Findings & Recommendations)	March 22, 2011
Study Completion/Final Report	June 2011

ALTERNATIVES DEVELOPMENT & EVALUATION

After completion of the inventory of existing and future conditions, the study team developed the following evaluation criteria to help determine the alignment for Peoria Avenue:

- Right-of-way impacts
- Compatibility with existing developments
- Compatibility with planned future developments
- Compatibility with existing and planned roadway improvements
- Engineering complexity and constructability
- Public acceptance
- Local agency support
- Drainage/flood control considerations
- Utility considerations
- Environmental considerations

Preferred Alternatives (Recommended Alignments)
The Peoria Avenue corridor was split into nine east/west geographic segments to conduct the evaluation. Up to three alternative alignments were considered for each segment: Alternative 1 included widening the corridor symmetric to the section line,

attempting to balance impacts to both sides of the corridor; Alternative 2 included widening the corridor to the south, maintaining the northern right-of-way boundary; Alternative 3 included widening the corridor to the north, maintaining the southern right-of-way boundary.

Based on this evaluation and study findings, the following alternatives are recommended along the corridor:

Segment 1 (future Jackrabbit Trail Parkway to Beardsley Canal):
- Alternative 1 – new corridor along section line

Segment 2 (Beardsley Canal to Perryville Road):
- Alternative 1 – new corridor along the section line

Segment 3 (Perryville Road to Citrus Road):
- Alternative 1 - widen symmetric along the section line

Segment 4 (Citrus Road to Cotton Lane):
- Alternative 3 – shift north

Segment 5 (Cotton Lane to Sarival Road):
- Alternative 1 - widen symmetric along the section line

Segment 6 (Sarival Road to Reems Road):
- Alternative 1 - widen symmetric along the section line

Segment 7 (Reems Road to Bullard Avenue):
- Alternative 3 - shift north

Segment 8 (Bullard Avenue to Litchfield Road):
- Alternative 1 - widen symmetric along the section line

Segment 9 (Litchfield Road to Dysart Road):
- Alternative 2 - shift south

SUMMARY OF RECOMMENDED ALIGNMENT

Segment	Location	Recommended Alignment	Comments
1	Future Jackrabbit Trail Parkway to Beardsley Canal	**Alternative 1** Centered on section line	Scored higher due to shorter corridor length and less disturbance to drainage corridors.
2	Beardsley Canal to Perryville Road	**Alternative 1** Centered on section line	Independent evaluation not carried out; alignment is already set in the Zanjero Trails Preliminary Plat.
3	Perryville Road to Citrus Road	**Alternative 1** Centered on section line	Scored highest of the three alternatives; most compatible with existing street improvement on Peoria Avenue. Corridor will transition at east end to meet Segment 4, shifted north of the section line.

Segment	Location	Recommended Alignment	Comments
4	Citrus Road to Cotton Lane	**Alternative 3** Centerline shifted 37 feet north of section line	Scored highest of the three alternatives; most compatible with existing development; likely to have least right-of-way cost.
5	Cotton Lane to Sarival Road	**Alternative 1** Centered on section line	All three alternatives scored similarly. Alternative 1 chosen due to compatibility with existing development and planned roadway improvements, specifically placement of Loop 303 and the Peoria Avenue traffic interchange. Corridor will transition from Segment 4 north shift to centerline symmetry at the west end of this segment.
6	Sarival Road to Reems Road	**Alternative 1** Centered on section line	Scored highest of the three alternatives; balances impacts throughout segment and performs best in key factors, including compatibility with existing development and drainage/flood control considerations.
7	Segment 7: Reems Road to Bullard Avenue	**Alternative 3** Centerline shifted 30- feet north of section line for short distance in middle portion of segment	Although scoring the lowest due to impacts to existing development, maintaining section line alignment at west end and transitioning to the north, east of existing development allows alignment to miss well site and balance impacts throughout remainder of segment. Corridor will transition at east end to meet segment 8, centered on the section line.
8	Bullard Avenue to Litchfield Road	**Alternative 1** Centered on section line	Scored highest of the three alternatives; balances impacts throughout segment and performs better than Alternative 3 in key factors, including compatibility with existing development and drainage/flood control considerations.
9	Litchfield Road to Dysart Road	**Alternative 2** Centerline shifted south of section line	Because of the varying shifts associated with Alternative 2, it best minimizes impacts to existing land uses throughout the segment.

Recommended Implementation Plan
The recommendations of this study are intended to be used to preserve corridor right-of-way for the ultimate Peoria Avenue. It is anticipated that construction of

improvements will not likely be completed in the near-term, but rather by private developers as development along the corridor occurs.

Near-Term Improvements
In the near-term, projects that are already funded will be completed, such as improvements at the SR Loop 303/Peoria Avenue interchange (to be constructed by ADOT when SR Loop 303 is upgraded to a freeway) and City of Surprise planned completion of the north half-street section between Sarival and Reems Roads. Other near-term improvements recommended for consideration include acquiring public right-of-way and constructing a two-lane roadway between Citrus Road and Cotton Lane, and constructing drainage improvements at Litchfield and Sarival roads.

Mid-Term Improvements
Several additional improvement projects, most likely constructed by adjacent development, would be needed in the mid-term timeframe to provide a continuous four-lane facility by the year 2030:

- South half-street and frontage road construction between Citrus Road and Cotton Lane
- Cotton Lane intersection improvements
- Reems Road intersection improvements
- South half-street construction between Bullard Avenue and Litchfield Road

Long-Term Improvements
Long-term (likely beyond 2030) improvements will focus on bringing uniformity to the corridor and widening to the ultimate six-lane facility. Areas where these improvements would occur include:

- Perryville Road to Citrus Road
- Sarival Road to Reems Road
- Bullard Road to Litchfield Road
- Litchfield Road to Dysart Road

PUBLIC INVOLVEMENT

Public participation and feedback during each phase of the study process is very important and a vital component of study development. Gaining consensus among the jurisdictional agencies and the public is critical to the success of the study and implementation of its recommendations to provide a safe and efficient roadway for the long term.

In addition to multiple Stakeholder Advisory Committee meetings, a total of three public input meetings are conducted during the course of the study process. The first public input meeting (September 20, 2010) was held during the data collection and Scoping Phase to inform the public of the objectives of the study and provide area residents and other stakeholders with an opportunity to inform project team members about study area issues and local transportation needs. This meeting also provided the public an opportunity to contribute feedback on the study purpose, goals, and objectives.

The second public input meeting (January 18, 2011) was conducted during the Alternatives Analysis Phase. This meeting served to provide the results of the issues and constraints identification process and reviewed the candidate alignment evaluation criteria. This meeting also presented the conceptual alternative alignments, and gathered more public feedback to assist further development and evaluation of the advanced Candidate Alternatives, leading to the study's primary objective, the selection of a Preferred Alignment.

The third and final public input meeting (March 22, 2011) was held during the Findings and Recommendations Phase of the study. This meeting reviewed the results of the Candidate Alternative evaluation process, presented the Preferred Alternative (recommended alignment), and gathered additional public input and feedback for use in the development of the final report.

Participants

MCDOT Planning & Engineering:	Consultant Team:
Mitch Wagner	Rodney Bragg (AECOM)
Roberta Crowe	Jackie Pfeiffer (AECOM)
Mike Pavlina	Javier Guana (Andes)

Public Works Lands/Real Estate:
Robert Sachs

Outreach Methods
The following outreach methods were used to inform and notify the general public and impacted residents about the study, public input meeting dates and locations and additional opportunities or means for input:

- Media releases
- Newspaper articles
- Display advertisements in local and regional publications
  - Arizona Republic
  - Surprise Independent
  - West Valley View
  - Buckeye Valley News
- MCDOT website
- Partner agency mediums
- Direct mail flyers to adjacent property owners and previous meeting attendees

PUBLIC COMMENT

Over 150 people attended three public input meetings conducted through the course of this study. Graphics, aerials and display exhibits presented corridor alternatives and study information. Study Fact Sheets and Comment Sheets were distributed to those in attendance. All public meetings were conducted in an "open house" format providing a free, open and accurate exchange of information between area residents with specific issues or questions and the project team. The following information is representative of discussions that the project team had with meeting attendees and written comments received by MCDOT:

Scoping Phase Public Meeting
Meeting Purpose: Gather public comment regarding the study area, existing conditions, current corridor deficiencies, future transportation needs and public review of overall Study Goals and Objectives.

5:00 – 7:00 p.m., September 20, 2011
Shadow Ridge High School Media Center
Surprise, AZ 85388

Attendance: 66

- There are lot of people using this road especially in the peak hours. I would suggest there should be a minimum of 2 lanes on each side with lighting on both sides of the road. West of Bullard avenue there is no lighting on the road .There is lot of vacant land surrounding the Peoria Ave and I am assuming there will be lot of future residential/commercial development will be happening adjacent to Peoria Avenue.
- Intersection of 303 & Peoria Avenue needs to be signalized.
- I support the completion/improvement of Peoria Avenue from Jackrabbit Trail to Dysart Road. It is imperative that alternate ingress and egress roadways are established for the residents in this area.
- Peoria between Cotton Lane and Citrus needs to be addressed sooner than later. For emergency services to meet somewhat decent response times this road should be paved or monthly maintained for proper and secure road travel. Owner made speed bumps and or ditches should be addressed.
- If a road improvement is needed then Olive should be the road. It has much less housing affected and it goes all the way through to the 101. Peoria after Dysart turns into 25 mph. Peoria does not make sense.
- MCDOT not very knowledgeable about Peoria Avenue & Citrus as to how it is going to be improved (# of lanes, speed, traffic control devices) right of way purchasing and speed enforcement/traffic control devices, i.e. residential neighborhood 25mph or less. What time frame for project improvements. This section of roadway provides a very big environmental issue caused by the dust. Very big impact from developments to the west of this location to the high school.

- Please pave Peoria between Cotton Lane and Citrus ASAP. Thank you.
- The community on 178th Avenue does not want the street (178th Ave.) to exit onto Peoria Ave. What noise barriers are going to be installed to cut down on noise pollution? The dust pollution on Peoria is terrible. What is the County and City of Surprise going to do about the pollution from traffic between now and the time pavement is installed.
- My concern is the area from Cotton Lane to Citrus on Peoria. Before the school was built, someone should have thought about the people who already live in the neighborhood. What is the speed limit; will there be stoplights or stop signs? Where will the intersections be? What can you do in the meantime to control the dust? What about the speeders? How many lanes will there be? We need to have more answers if you wanted out opinions!
- Provide more info at next meeting. Do something about the dirt road between Cotton lane and Citrus. The dust is killing us. Keep the speed limit at 25mph on dirt road and enforce it. Need to know number of lanes and traffic control devices. Dust control and environmental issues at the present time and future.
- Hopeful that Peoria will become paved from Cotton Lane to Perryville. We have kids at the elementary school and traffic would be significantly decreased if this were to happen.
- Interested in the sequence/timeline of improvements and proposed changes to Peoria Ave Also – type of interchanges at 303 and arterials.
- Nobody working this meeting really had any information as to what was going to happen if anything. Nick Mascia (City of Surprise) was very helpful and knowledgeable however there are no plans for anything to happen. This meeting led me to believe there was something in the "works". What a disappointment to find out it is a dead-end. The high school will have Seniors and Juniors driving – the dust level for Peoria and Cotton area will be much worse. The 4-way stop at Cotton and Olive is very busy and in the mornings it is impossible to get through.
- I know money is dear, but can't we pave some of the dirt roads before tearing up existing roads constantly?
- Project needs to be "fast tracked" thru local City/State/County DOT officials. I was disheartened to find out this "project" is still in the study phase. My main concern is Peoria fronting the community of Greer Ranch. The HOA is concerned regarding road signs, sidewalks and necessary landscaping that need to be to actually finish off the development. I would be more than happy to discuss this further. Appreciate the "Open House".
- This is a very needed project improvement for the area. The challenge will be on getting the owners (all of them) to agree on the best alternatives. The District has tried that before when we built the school and met resistance.
- We live in Cortessa and Olive Avenue right now is the only in and out of this area. Should Peoria Avenue get improved, it would help the traffic flow tremendously. Also, with the High School now being open, it would assist with traffic as well. I don't believe that there is any reason not to

- Improve Peoria Avenue with the exception of the home owners that happen to live there and don't want the additional traffic - then they should move.
- Recently a large school was put in at the end of Peoria and Citrus. Since this school was put in, we have had nothing but traffic speeding down Peoria (dirt road) each morning and also in the afternoon. I assume these are people taking and picking up their children from school. This causes a tremendous amount of dust for the people who live in my neighborhood, especially the people whose houses face Peoria Road. Don't get me wrong, I would love to see the road paved to cut down on the dust in our neighborhood, however I have some concerns.
- We do not want 178th Avenue to connect to Peoria Avenue. In addition, we would like to have a sound wall as well.
- My questions to you are if this road is paved, who will incur the cost? Will our taxes be raised so people who do not live in our neighborhood can take their kids to the new school? Is there some sort of stimulus that will take care of the cost? Will the people whose houses face Peoria loose part of their frontage property, and what about the irrigation canals that run along Peoria? The stretch of road on Peoria from Cotton Lane to Citrus will there be speed bumps or stop signs?
- We would like for the road to be paved. Since Shadow Ridge High School has opened we have experienced a lot of traffic thru our community (Cortessa) and have even experienced a number of accidents down Olive ave towards Cotton Lane. Perryville Rd going towards Olive has become a race way for the High School kids as well resulting in the kids driving extremely fast down that road. We feel if Peoria Ave was paved it would eliminate the high school kids driving thru the community, allowing more routes to exit the High School eliminating accidents, kids getting hit (which this has happened) and reducing traffic flow/speed down Olive ave towards Cotton and Perryville Rd towards Olive.
- I would love to see road improvements to Peoria Ave! Not only for quicker, safer access to the High School but congestion and traffic would be reduced at all entrances/exits on Olive Ave west of Cotton Lane as well. Though the housing boom has ceased, there are many who live in the Cortessa development that would greatly benefit from the improvements. Work and shopping expeditions would have less drive, which saves on gas in these tough economic times. It is a great time to update Peoria Ave and also provide work for many. My vote is a YES!

The following are key issues captured by the study team during conversations with meeting attendees:

- Support (from a number of people who live in Cortessa) to pave the one-mile of Peoria Avenue between Citrus Road and Cotton Lane.
- Want improvements made to Peoria Avenue sooner rather than later.
- Concern about emergency access if emergency vehicles “detour” around unpaved segment.
- Desire for the use of asphalt rubber to reduce noise levels.
- Don’t want 178th Ave connected to Peoria Avenue when Peoria Ave is improved.
- Questions about the study schedule and future input opportunities.
- Questions about alternatives under consideration.
- Questions about the timing of new development/master planned communities.
- Clarification of study purpose.
- Concern about other unpaved roads (not in the study area) and when the county will pave them.
- Questions about specific development entitlements relative to future land use (e.g., when/where will a gas station be placed in the neighborhood; when will the new Safeway begin construction, etc.).

Alternatives Analysis Phase Public Meeting
Meeting Purpose: Gather public comment regarding preliminary study findings, traffic analysis, corridor alignment alternatives and future roadway options.

5:00 – 7:00 p.m., September 20, 2011
Shadow Ridge High School Media Center
Surprise, AZ 85388

Attendance: 35

- We live at 15751 W. Becker Lane and Peoria Ave. is just beyond our back wall. Traffic noise is already high. Peoria Ave. doesn't go through to the 101 so it makes no sense to widen it. A better idea would be to widen Olive Ave. instead. There are very few homes along the corridor planned and there are stop lights already installed at the major intersections including the 303 and the 101. It is more of a major road than Peoria Ave. We are against your plans at this time.
- I attended the open house last night at the High School. Thank you for taking the time to speak with all of us and listen to the concerns of the homeowners in the neighborhood. My first concerns at this meeting was to be sure that there were no plans to open up our dead end street to Peoria Ave. (178th, 177th, 176, all dead end at the irrigation ditches).
  You nodded your head and said that that was not included in this study or the plans. I was good with that. My second concern was a noise barrier along Peoria. This was not addressed at the meeting... so I am not sure what the plans are for that.
- After reviewing the 3 alternatives that were posted. I have to say that Alternative 3

(road to the north) is really the only option. I am the billing coordinator for Co-op 100, the co-op that owns the small irrigation ditches that provides irrigation to the homes from 175th - Citrus, south of Peoria Ave. If you went with Alt. 1 or 2, this will affect the irrigation ditches and the wells. I am not sure how that would affect the irrigating of our property.
- Some of the homeowners have been there for over 40 years, and some are fairly new; but nevertheless, we all moved out there for the irrigated acre's and raise our children in a rural environment. I completely understand that "progress" and "change" is coming. We dealt with that with Cortessa. If there is an option (Alt. 3) that can improve the road without disturbing the homes in our neighborhood, I feel that that should be your only option. The only thing on the North side of Peoria is farmland. No homes, no families, nothing personal will be disturbed by using the farmland for your Peoria Corridor.
- PS: If the county would like to pave the existing 2 lane road from Cotton Lane to Citrus, I don't think anyone would have heartache over that.

- Peoria’s unpaved section East of Citrus needs 2 lanes paved “yesterday”, if not dust to control the dust, to eliminate the extra 2 miles of travel getting around it in lieu destroying your vehicle. It does not appear to be any reasonable alternative route other than Peoria, at least nothing as straight forward and nothing that wouldn’t cost a lot more money.

Findings and Recommendations Phase Public Meeting
Meeting Purpose: Gather public comment regarding study findings and “Preferred Alternative”, recommended access management strategies and guidelines, and an improvement phasing timeline.

5:00 – 7:00 p.m., September 20, 2011
Shadow Ridge High School Media Center
Surprise, AZ 85388

Attendance: 50

- I live at 18537 W. Onyx Ave near Shadow Ridge School. I would like to see Peoria improved from Cactus Lane to 303. This would cut 2 miles off every time I drive to Surprise. Also the intersection of Olive and 303 is in deplorable condition. A little patch work could smoothen it up. The bumps could cause accidents. Thank You
- It is simply my feeling that the County should proceed with the plan for Peoria Ave. that make sense. There are a few vocal individuals (as usual) that will cause delay and therefore added expense to this project
- If the County doesn't proceed. The Peoria "cow trail" east of Citrus is a prime example of a few, delaying what should have been done ages ago ,but would a single lane in each direction west of the 303 be any sort of an option, at least for that section, until the entire project can move forward ?

Comments/questions received by Project Team during discussions with meeting attendees:

- Most attendees want improvements built now to mitigate dust issues along Peoria from Citrus Road to Cotton Lane.
- General support for frontage road concept in segment between Citrus Road and Cotton Lane.
- Some concerns/questions regarding frequency of median breaks/access to Peoria Avenue and intersecting side streets.
- Want noise mitigation to be considered between Citrus Road and Cotton Lane as homes will be close to roadway.
- Request to reduce speed limit along Peoria Avenue between Citrus Rood and Cotton Lane as homes will be close to roadway.
- Several questions on timeframe of implementation of Peoria Avenue improvements; preference for improvements sooner rather than later.

FUTURE PROJECT DEVELOPMENT CONSIDERATIONS

It is important to recognize that the Peoria Avenue Corridor Improvement Study is a long range transportation planning study and the earliest phase of potential project development. It is intended to identify the facility type and roadway alignment at some future date along the Peoria Avenue corridor to address forecasted travel demand associated with future area land development. No public funding is currently allocated for design, right-of-way acquisition, or construction of any elements of this segment of the Peoria Avenue corridor.

The Preferred Alignments as recommended in this study will be used to guide future planning efforts and ensure that subsequent land development proposals and transportation system plans are compatible with future construction of Peoria Avenue. Further refinement and negotiation of the roadway centerline right-of-way limits and consideration of environmental impacts will take place in later phases of project development as properties develop and as transportation system improvements are implemented.

The following are key issues captured during this study's stakeholder and public involvement process that should be taken into consideration by individual jurisdictions as the recommendations of this study are carried forward into design and construction:

- **Project Funding:** It can be anticipated that area developers will participate as part of project requirements.
- **Access Management Strategies:** Specific strategies should be implemented to ensure a seamless roadway with efficient traffic flow, safety and good access to local land uses.

- **Environmental Impacts:** (Natural, Cultural and Archeological Resources) and Noise Mitigation. Specific impacts on the local environment will require further evaluation during future project development.
- **New Right-of-Way Requirements:** Final roadway configuration (during preparation of Final Design Plans) will determine exactly how much land will need to be acquired to accommodate the future roadway.
- **Landscaping Plans:** Final project design will specify the type of landscaping to be used.
- **Drainage Structures:** Bridges along the new roadway will be designed during final roadway design efforts. It will be critical to ensure the roadway is designed to provide "all weather" crossings during major storm flows.
- **Bicycle, Pedestrian and Transit Access:** Future projects will be designed to accommodate alternative modes of travel and provide access to trails and neighborhoods in the area.
- **Corridor Traffic Management:** ITS (Intelligent Transportation System) will control operation of traffic between jurisdictions and differing intersection configurations.
- **Jurisdictional Coordination:** As with the overall traffic control, implementation of different corridor improvements and access management concepts will be coordinated to ensure a safe, seamless and efficient transportation facility.

Next Steps: Implementation of Recommended Improvements

- Adoption of Recommendations by Individual Jurisdictions
    - Functional Roadway Classification (Urban Arterial)
    - Corridor Alignment
    - Access Management Plan
- Right-of-way Preservation in Developing Areas
- Design Concept Report (DCR) or Scoping Report for Consideration in project programming
- Appropriation of Funds for Design, Right-of-Way Acquisition and Construction of Recommended Corridor Improvements

- Consistent Coordination between various Jurisdictions on Transportation Improvements and Traffic Issues

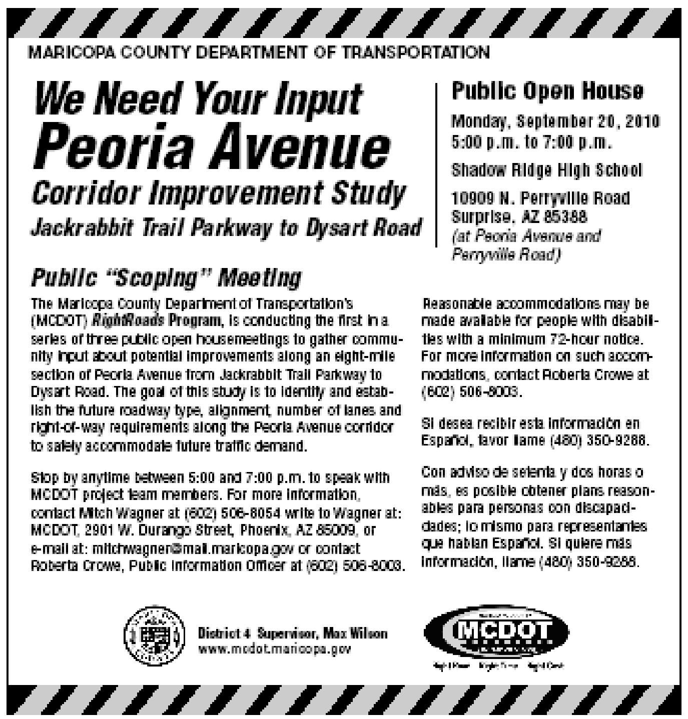
This report contains capsulated key issues identified during this study's public involvement process that should be taken into consideration by individual jurisdictions as the recommendations of this study are carried forward through design and construction.

It is recommended that future project development build upon the public involvement program established during this study and continue as a comprehensive program progression.

For more information about the study, contact Mitch Wagner, MCDOT Planning, at 602/506-8054 or Roberta Crowe, MCDOT Public Information Officer at 602/506-8003.

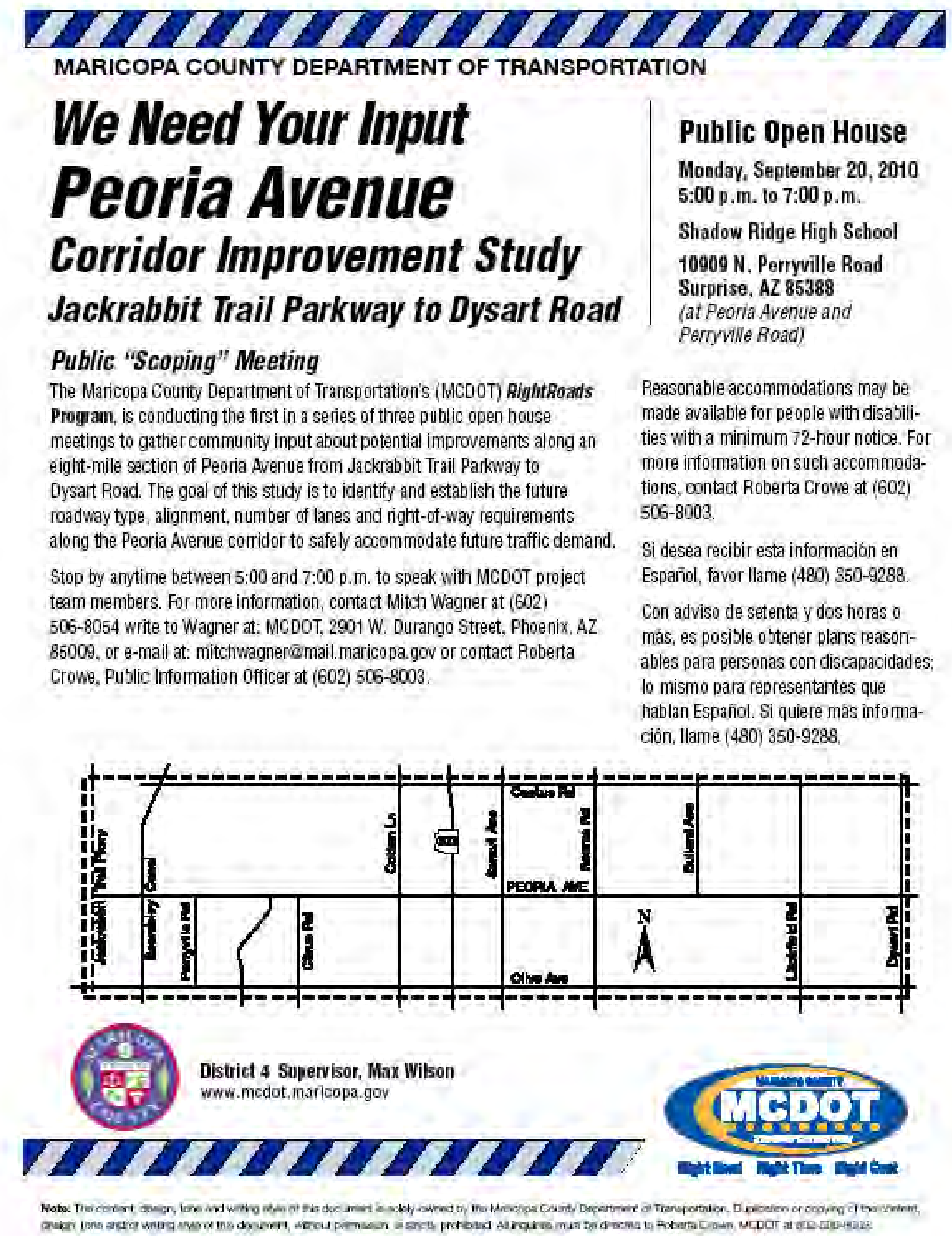
Exhibit A:
Public Meeting Notification & Newspaper Display Advertisement

Scoping Phase Public Input Meeting
Newspaper Advertisement



- Arizona Republic
- Buckeye Valley News
- Surprise Independent
- West Valley View

Scoping Phase Public Input Meeting
Mail Notification



Alternatives Analysis Phase Public Input Meeting
Newspaper Advertisement

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

We Need Your Input
Peoria Avenue
Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Public Open House
Tuesday, January 18, 2011
5:00 p.m. to 7:00 p.m.

Shadow Ridge High School

10909 N. Perryville Road
Surprise, AZ 85388
(On Perryville Road just north of Peoria Avenue)

"Alternative Analysis" Phase Public Input Meeting

The Maricopa County Department of Transportation's (MCDOT) ***RightRoads* Program**, is conducting the second in a series of three public open house meetings to gather community input about potential improvements along an eight-mile section of Peoria Avenue between Jackrabbit Trail Parkway and Dysart Road. The study goal is to identify and establish the future roadway type, alignment and right-of-way requirements along the Peoria Avenue corridor to safely address forecast travel demands and to accommodate the future six-lane major arterial roadway as identified in the Surprise, Glendale, MCDOT and MAG (Maricopa Association of Governments) long range transportation plans.

This second (Alternatives Analysis Phase) public input meeting will provide area residents and other impacted study stakeholders with an opportunity to inform study team members about study area issues and local transportation needs. This meeting will also serve to elicit feedback regarding the study's purpose, goals and objectives. Alternatives for proposed roadway cross sections, alternative alignments, and an evaluation of each conceptual alternative will be presented for public review and comment. Study information, maps and exhibits will be available for viewing during the meeting.

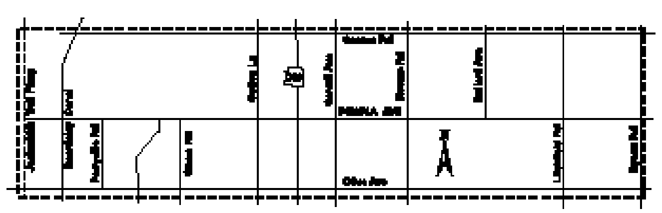
Stop by anytime between 5:00 and 7:00 p.m. to speak with MCDOT project team members. For more information, contact Mitch Wagner at (602) 506-8054 write to Wagner at: MCDOT, 2901 W. Durango Street, Phoenix, AZ 85009, or e-mail at: mitchwagner@mail.maricopa.gov or contact Roberta Crowe, Public Information Officer at **(602) 506-8003**, robertacrowe@mail.maricopa.gov.

The Peoria Avenue Corridor Improvement Study is one of several long range transportation planning studies currently being conducted by MCDOT on future West Valley roadways identified in the recently completed Maricopa Association of Governments (MAG) I-8/I-10 Hidden Valley Transportation Framework and Interstate 10/Hassayampa Roadway Framework Studies.

Reasonable accommodations may be made available for people with disabilities with a minimum 72-hour notice. For more information on such accommodations, contact Roberta Crowe at (602) 506-8003.

Si desea recibir esta información en Español, favor llame (480) 350-9288.

Con adviso de setenta y dos horas o más, es posible obtener plans reasonables para personas con discapacidades; lo mismo para representantes que hablan Español. Si quiere más información, llame (480) 350-9288.



District 4 Supervisor, Max Wilson
www.mcdot.maricopa.gov

- Arizona Republic
- Buckeye Valley News
- Surprise Independent
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Alternatives Analysis Phase Public Input Meeting
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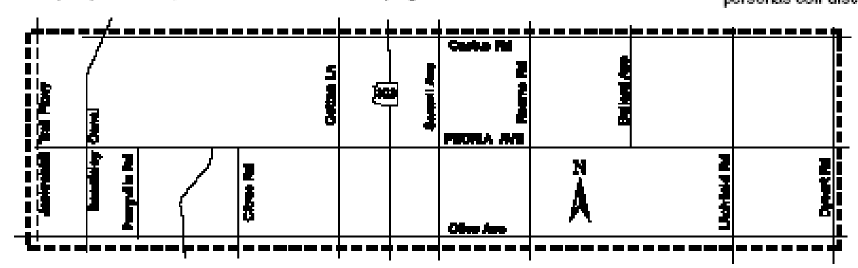

District 4 Supervisor, Max Wilson
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Right Road Right Time Right Cost

Findings & Recommendations Phase Public Input Meeting
Newspaper Advertisement

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

We Need Your Input
Peoria Avenue
Corridor Improvement Study
Jackrabbit Trail Parkway to Dysart Road

Public Open House
Tuesday, March 22, 2011
5:00 p.m. to 7:00 p.m.

Shadow Ridge High School

10909 N. Perryville Road
Surprise, AZ 85388
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Findings & Recommendations Phase Public Input Meeting

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This final "Study Findings and Recommendations" public input meeting will provide area residents and other impacted study stakeholders with an opportunity to inform study team members about study area issues and local transportation needs. Evaluated alternatives along with the recommended "preferred" roadway cross section and future roadway alignment will be presented for public review and comment. Project information maps and exhibits will be available for viewing during the meeting. Stop by anytime between 5:00 p.m. and 7:00 p.m. to speak with MCDOT project team members.

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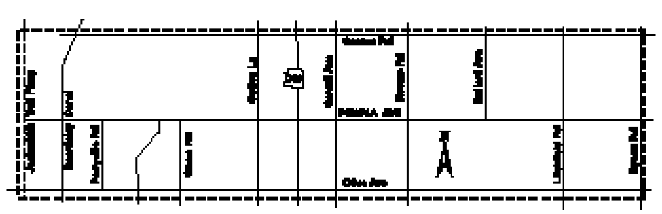

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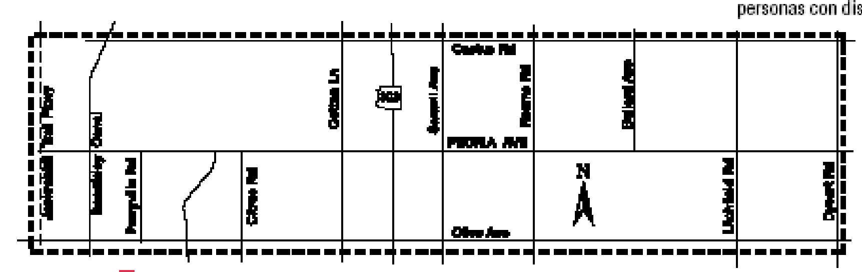

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Exhibit B:

1. **Public Meeting 1 "Scoping Phase"**
   Handouts, Exhibits/Graphics

2. **Public Meeting 2 "Alternatives Analysis" Phase"**
   Handouts, Exhibits/Graphics

3. **Public Meeting 3 "Findings and Recommendations Phase"**
   Handouts, Exhibits/Graphics

Exhibit C:

1. **Media Coverage**

Surprise City Council OKs Peoria Avenue agreement

The Arizona Republic
4-29-11

The Surprise City Council on Tuesday discussed the following items.

ISSUE

Vote to allow city staff to enter into an intergovernmental agreement that would make Surprise responsible for operating and maintaining the road. Maricopa County has conducted a transportation study that suggests Peoria Avenue between Dysart Road and Jackrabbit Trail Parkway be converted into a six-lane, major arterial street.

The road is currently two lanes across most of the 7.5-mile span and is bordered by Surprise to the north and Glendale and the county to the south.

Construction and design will not begin for years, but city staff hopes that taking ownership over the road will give Surprise a say in its design and provide another east-west crossing of the Agua Fria River. Maintaining the new road is estimated to cost the city an additional $137,000 per year and would begin once it is complete.

VOTE

Approved 7-0.