

# FINAL DESIGN CONCEPT REPORT

## SR 347 at Union Pacific Railroad

ADOT Project No. 347 PN 172 H7007 01L

Federal Aid No. 347-A(204)T

March 2015



Prepared for:  
**THE CITY OF MARICOPA**  
39700 West Civic Center Plaza and  
Maricopa, Arizona 85239



**ARIZONA DEPARTMENT OF TRANSPORTATION**  
Multimodal Planning Division  
205 South 17th Avenue  
Phoenix, Arizona 85007



PREPARED BY





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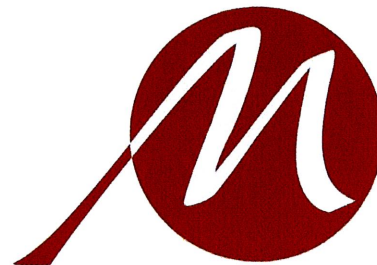
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**Federal Aid No. 347-A(204)T**

**ADOT Tucson District**

**Pinal County**

PREPARED FOR



**THE CITY OF MARICOPA**  
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Maricopa, Arizona 85239

AND



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## Executive Summary

### Background

The Arizona Department of Transportation (ADOT) and the City of Maricopa, in coordination with the Federal Highway Administration (FHWA) are conducting a study to identify and evaluate a potential State Route (SR) 347 grade-separated crossing of the Union Pacific Railroad (UPRR) (ADOT Project No. 347 PN 172 H7007 01L, Federal Aid No. 347-A(204)T). The study area is located within the City of Maricopa between Edison Road and Bowlin Road, mileposts 174.0 and 172.5, respectively. The purpose of the SR 347 at UPRR DCR is to evaluate potential grade separated crossings of the UPRR tracks and recommend specific solutions that will improve mobility and alleviate congestion on SR 347.

The City of Maricopa (City) is one of the fastest growing communities in the nation with a population that has increased from approximately 1,040 residents to 43,482 residents in the last decade (per US Census 2012). SR 347 is the main transportation corridor through the community, serving as the principal regional connector between Maricopa and the Phoenix metropolitan area. Daily traffic on SR 347 in downtown Maricopa averages approximately 34,000 vehicles per day. Future traffic projections on SR 347 show as many as 69,000 vehicles per day in the 2040 design year. SR 347 is currently a 4-lane, minor arterial roadway within the study area and has a posted speed limit of 35 mph.



SR 347 is bisected near milepost 173.4 by UPRR's Sunset Line, which currently consists of two tracks. This UPRR facility is a trans-continental route with 40 to 60 trains per day crossing SR 347. The UPRR has plans to add up to two additional tracks at this crossing in the future which may increase the rail traffic up to 130 trains per day.

Amtrak's Maricopa Station is located on the northeast corner of the SR 347/UPRR intersection. When stopped to load and unload passengers, these trains extend through the intersection and stop traffic. This results in substantial traffic queuing delays lasting 30 minutes or more.

The purpose of this design concept report is to identify and recommend specific solutions to provide a grade separated crossing of the UPRR tracks that will improve mobility and alleviate congestion on SR 347 while limiting and/or mitigating environmental and socioeconomic impacts.

Additional reports that have been prepared as part of this Design Concept Report include the following:

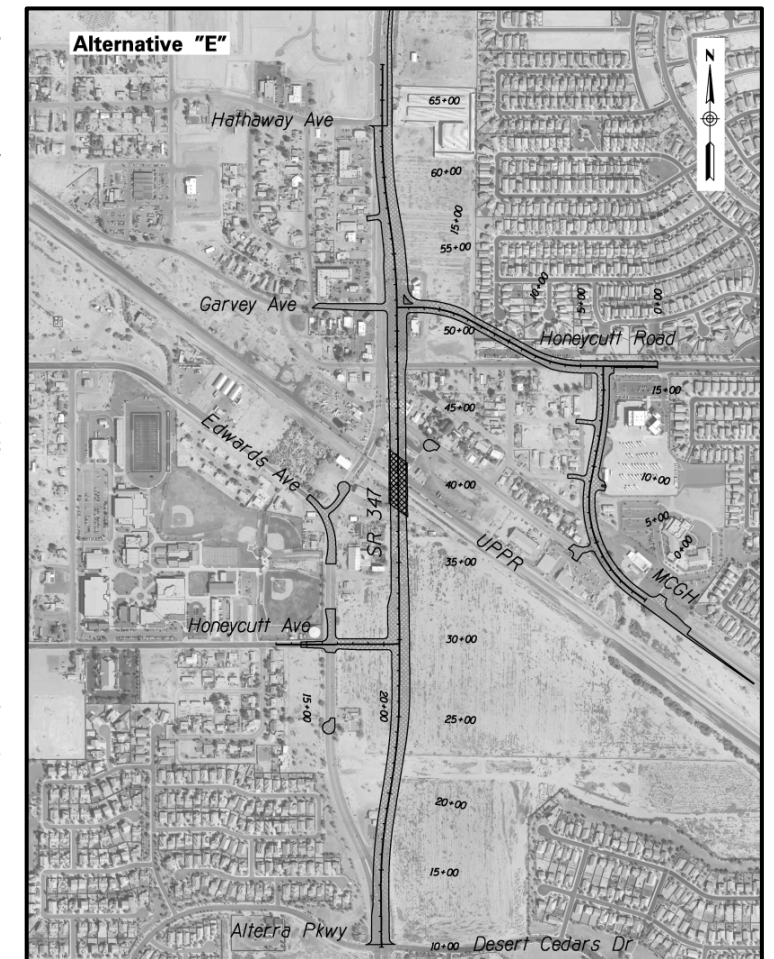
- Design Parameters Report (May 2012)
- Preliminary Initial Site Assessment (PISA) (pending)
- Class III Cultural Resource Survey (May 2013)
- Draft Agency and Public Information Meeting Summary (July 2013)
- Drainage Memo (January 2014)
- Bridge Memo (April 2014)
- Traffic Analysis Report (September 2013)

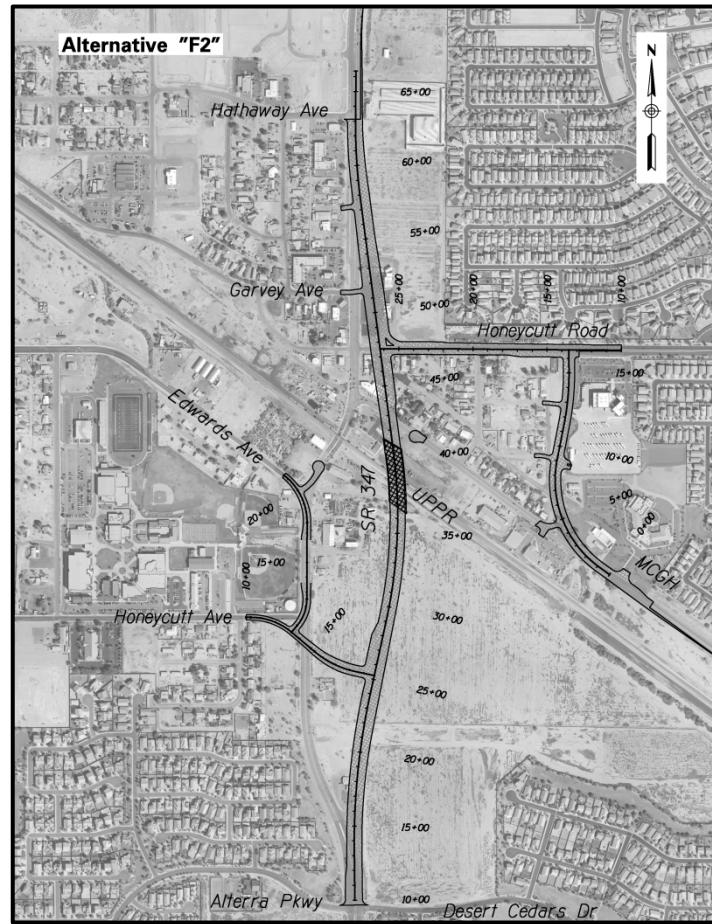
### Alternative Development

Agency coordination and public involvement were part of the scoping process. Initial agency and public scoping meetings were held in July 2012. Additional information meetings were conducted in June 2013. All agency and public meetings were held in the City of Maricopa. These meetings offered the public and attending organizations the opportunity to speak one-on-one with ADOT officials, project planners, and engineers. In addition, the meetings allowed ADOT officials, project engineers, and planners the opportunity to hear the ideas and concerns of those who might be affected by the project.

Ten alternatives, in addition to the 'no-build' alternative, were developed to address the project needs. After a qualitative evaluation process, which considered numerous engineering and environmental criteria, three of these (Alternatives E, F2, and H) were carried forward for detailed analysis in this DCR.

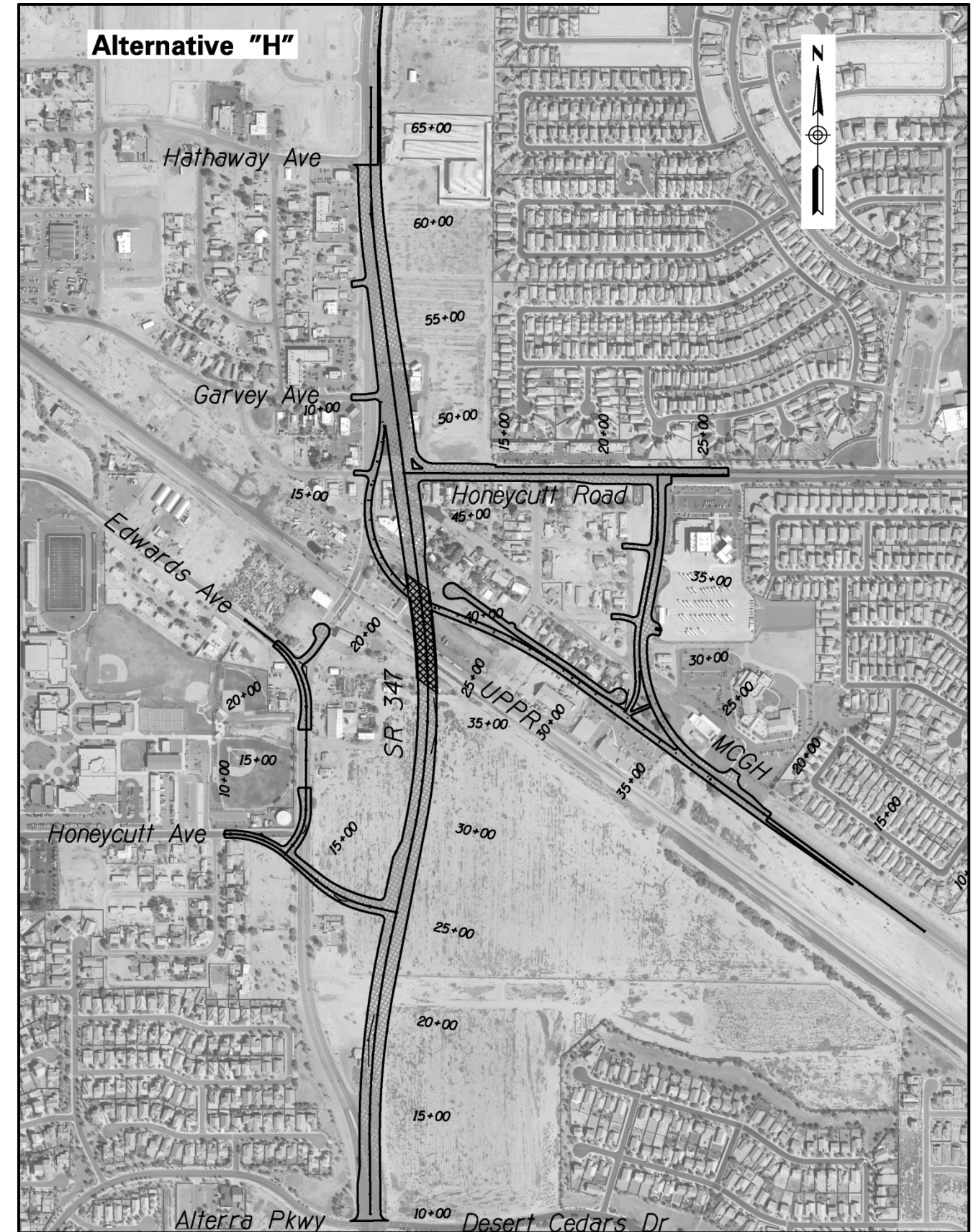
Alternative E was developed with the intent to create a new Honeycutt Road/Maricopa-Casa Grande Highway (MCGH) intersection aligned with Garvey Avenue at an elevation relatively close to existing ground. Alternative E meets minimum design speeds for SR 347, MCGH, and Honeycutt Road.





Like all three of the alignments considered, Alternative E shifts SR 347 to the east of its current location through much of the study area to maintain traffic on SR 347 during bridge construction. MCGH is also redirected into a new intersection with Honeycutt Road located approximately 1500 feet east of SR 347. West of this intersection, Honeycutt Road is shifted northward and intersects SR 347 at Garvey Avenue. This shift to the north further separates the intersection from the UPRR overpass bridge resulting in an intersection that is close to existing ground.

Alternative F2 was developed with the intent to create an intersection of Honeycutt Rd and SR 347 with minimal impacts to existing residential properties/subdivisions. Alternative F2 also meets minimum design speeds for SR 347, MCGH, and Honeycutt Road. Like Alternative E, SR 347 is also shifted to the east and a new intersection between MCGH and Honeycutt Road is created approximately 1500 feet east of SR 347. Unlike Alternative E, Honeycutt Road essentially remains on its current alignment.



Alternative H was developed to create an intersection of Honeycutt Road and SR 347 with minimal impacts to existing residential properties/subdivisions, and to create a separate southbound SR 347 to eastbound MCGH connection to better accommodate future traffic demands and local business access. The geometrics for this alternative are virtually identical to those of Alternative F2 with the exception of a two lane, one-way connector roadway that allows southbound SR 347 traffic to exit, pass beneath the new UPRR grade separation bridge, and merge directly onto eastbound MCGH. Alternative H also meets minimum design speeds for SR 347, MCGH, and Honeycutt Road.

Alternatives Analysis

Analyses of each of the three alternatives were completed to determine their relative feasibility and ability to meet the stated study purpose and need. The 'no-build' alternative does not meet the study purpose and need creating a grade separation of the UPRR tracks and of increasing capacity. The No-Build Alternative results in a Level of Service (LOS) F at the following SR 347 intersections in the 2040 design year: Honeycutt Avenue, Edwards Avenue, MCGH, Honeycutt Road, Garvey Avenue, and Hathaway Avenue.

Alternatives E, F2 and H each meet the study purpose and need. After analyzing each alternative against various environmental impact criteria, community impact criteria, and engineering criteria, Alternative H is the recommended alternative because it minimized community impacts and was the only candidate alternative with acceptable levels of service for all intersections within the study area.

The estimated cost of the recommended alternative is \$54,962,599 (See Table 5-1).

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## List of Acronyms and Abbreviations

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AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
APS	Arizona Public Service
AR-ACFC	Asphalt Rubber Asphalt Concrete Finish Course
ASLD	Arizona State Land Department
CAG	Central Arizona Governments
CIP	Capital Improvement Plan
COMRTP	City of Maricopa Regional Transportation Plan
DCR	Design Concept Report
DTM	Digital Terrain Model
EB	Eastbound
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
LOMR	Letter of Map Revision
LOS	Level of Service
MAG	Maricopa Association of Governments
MCGH	Maricopa-Casa Grande Highway
MIS	Major Investment Study
MP	Milepost
MPD	Multimodal Planning Division
MUSD	Maricopa Unified School District
MWID	Maricopa Water Improvement District
NB	Northbound
NRHP	National Register of Historic Places
RDG	Roadway Design Guidelines
RTP	Regional Transportation Plan
R/W	Right-of-Way
SB	Southbound
SDM	Safety Data Mart
SPUI	Single Point Urban Interchange
SR	State Route
TSS	Traffic Safety Section
UPRR	Union Pacific Railroad
USFWS	United States Fish and Wildlife Service
WB	Westbound

## 1.0 Introduction

### 1.1 Foreword

State Route 347 (SR 347) serves as the primary transportation corridor between the City of Maricopa and the Phoenix metropolitan area. In addition, it also provides the principal access to the Ak-Chin Indian Community and is a favored route for traffic between Phoenix, San Diego and other recreational areas. Located at the heart of rapidly growing Maricopa, SR 347 (also known as John Wayne Parkway) is a five-lane urban roadway that crosses two sets of heavily utilized Union Pacific Railroad (UPRR) tracks and is adjacent to an Amtrak passenger rail station. SR 347 has a posted speed limit of 35 miles per hour (mph) near its UPRR crossing.

Like many state highways in newly urbanized areas, SR 347 is encumbered by numerous arterial and local street intersections and has limited to no access control. Immediately north of the UPRR tracks, Maricopa-Casa Grande Highway (MCGH) and Honeycutt Road intersect SR 347. These two roadways carry substantial traffic volumes and provide access to large residential areas. MCGH intersects SR 347 at a severe skew and runs southeasterly (parallel to the UPRR tracks). This roadway provides a direct route between the City of Maricopa and the City of Casa Grande.

A variety of businesses, residential areas, and educational facilities surround and characterize the SR 347/ UPRR intersection area. Although historically a farming region, few agricultural properties remain near the railroad intersection and each of these has been planned for some type of future development.

This study will provide a recommended design concept which will provide for a grade separation of the UPRR tracks, improved access control, and will address issues/concerns associated with the current roadway configuration. An Environmental Assessment (EA) has been developed as part of this study and examines potential environmental and socioeconomic impacts which may result from the proposed improvements. Implementation of the recommended design concept will be dependent upon available funds and project programming.

Several agencies have been involved in the development of this Design Concept Report (DCR). These agencies include the City of Maricopa, Pinal County, Ak-Chin Indian Community, Gila River Indian Community, the Federal Highway Administration (FHWA), Maricopa Association of Governments (MAG), UPRR, Amtrak, ADOT Communication and Community Partnerships (CCP), ADOT Tucson District, ADOT Environmental Planning Group (EPG), ADOT Intermodal Transportation Division (ITD), and the ADOT Multimodal Planning Division (MPD).

### 1.2 Need for the Project

The City of Maricopa is one of the fastest growing communities in the nation with a population that has grown from approximately 1,040 residents in 2000 to 43,482 residents in 2010, for an overall increase of more than 42,000 people or 4,000 percent (US Census 2012). SR 347 is the primary north-south roadway within the City that crosses the UPRR tracks near MP 173.4. There are currently two active UPRR tracks that cross SR 347, with plans for two additional tracks in the future. When trains pass through the City, traffic on SR 347 is brought to a halt. The nearest alternative

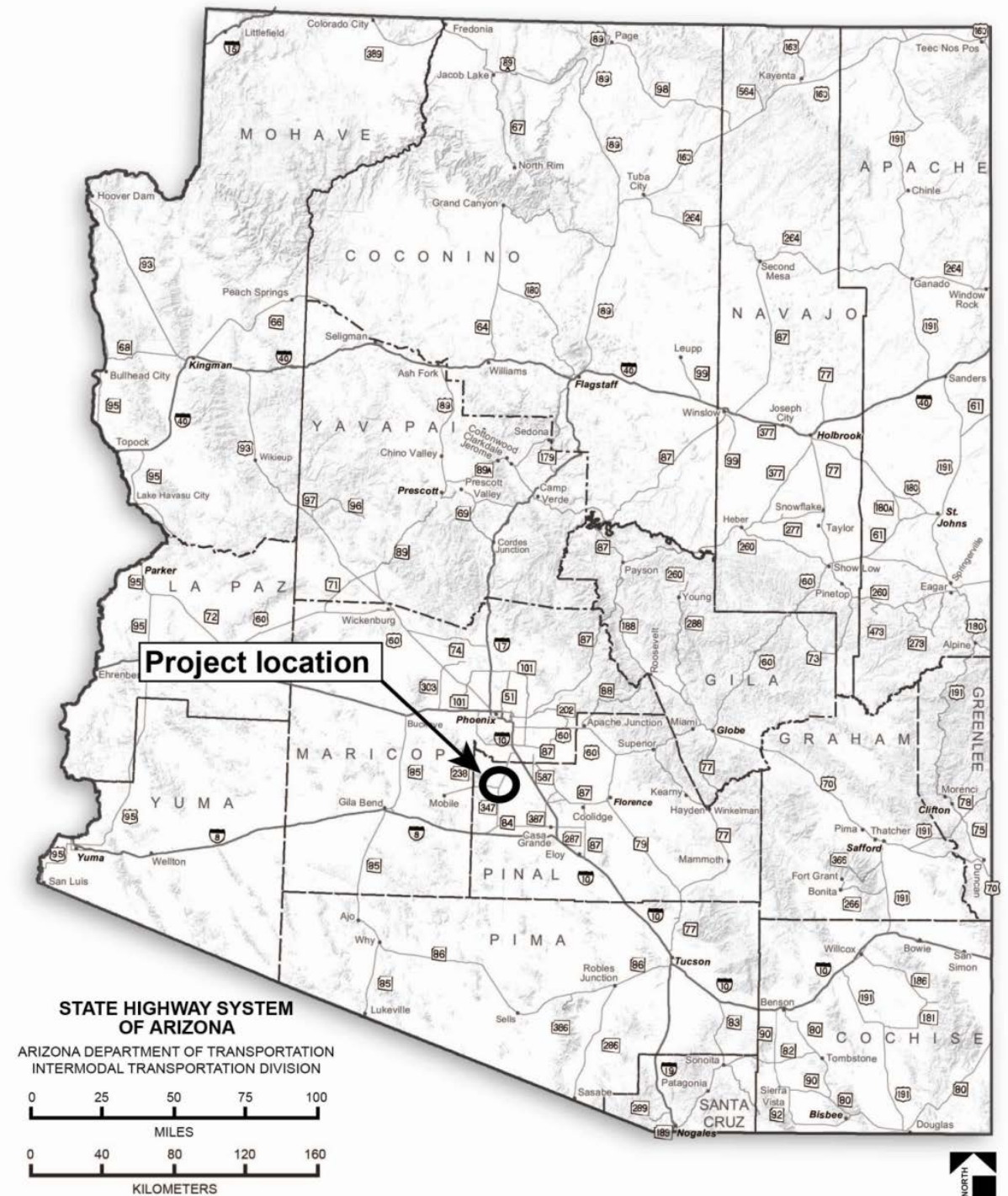
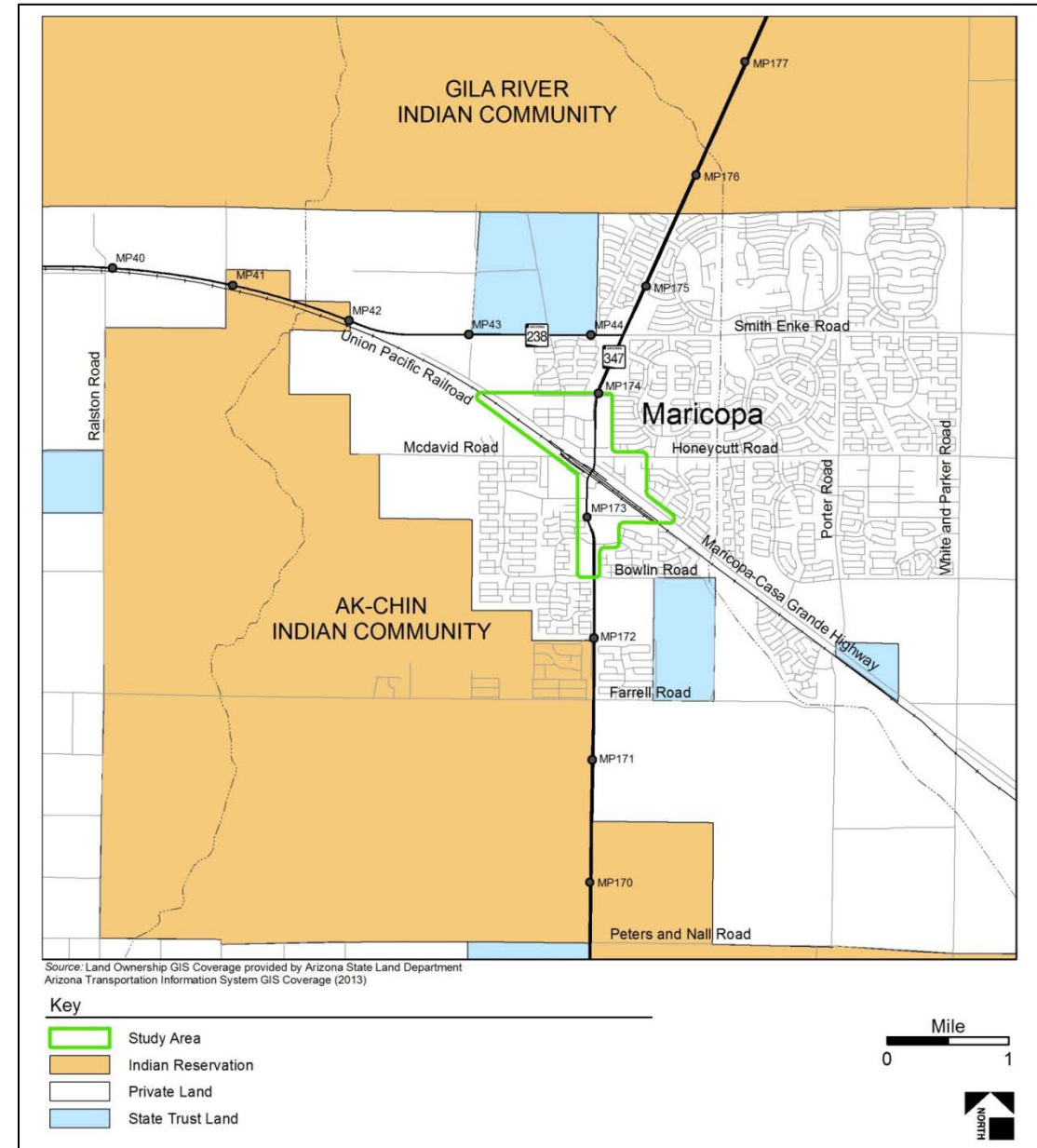


Figure 1-1: Location Map

crossings are at Porter Road, approximately 2.5 miles southeast, and at White and Parker Road, approximately 3.75 miles southeast of SR 347. Daily traffic on SR 347 is 31,000 vehicles per day with 2040 traffic projections for SR 347 showing as many as 84,000 vehicles per day. With growth in the area anticipated to continue, resolving congestion and train-caused traffic delays has become a high priority for the City, ADOT, and regional transportation officials.

Rapid regional growth and increasing traffic congestion at the SR 347/UPRR intersection prompted the City of Maricopa and ADOT to complete a Feasibility Study and Environmental Overview in 2007 to investigate feasible concepts for an SR 347 a grade separation. Both overpass and underpass alternatives were considered and three overpass alignment concepts were recommended for further consideration. These three concepts will be evaluated as a part of this DCR.



**Figure 1-2: Vicinity Map**

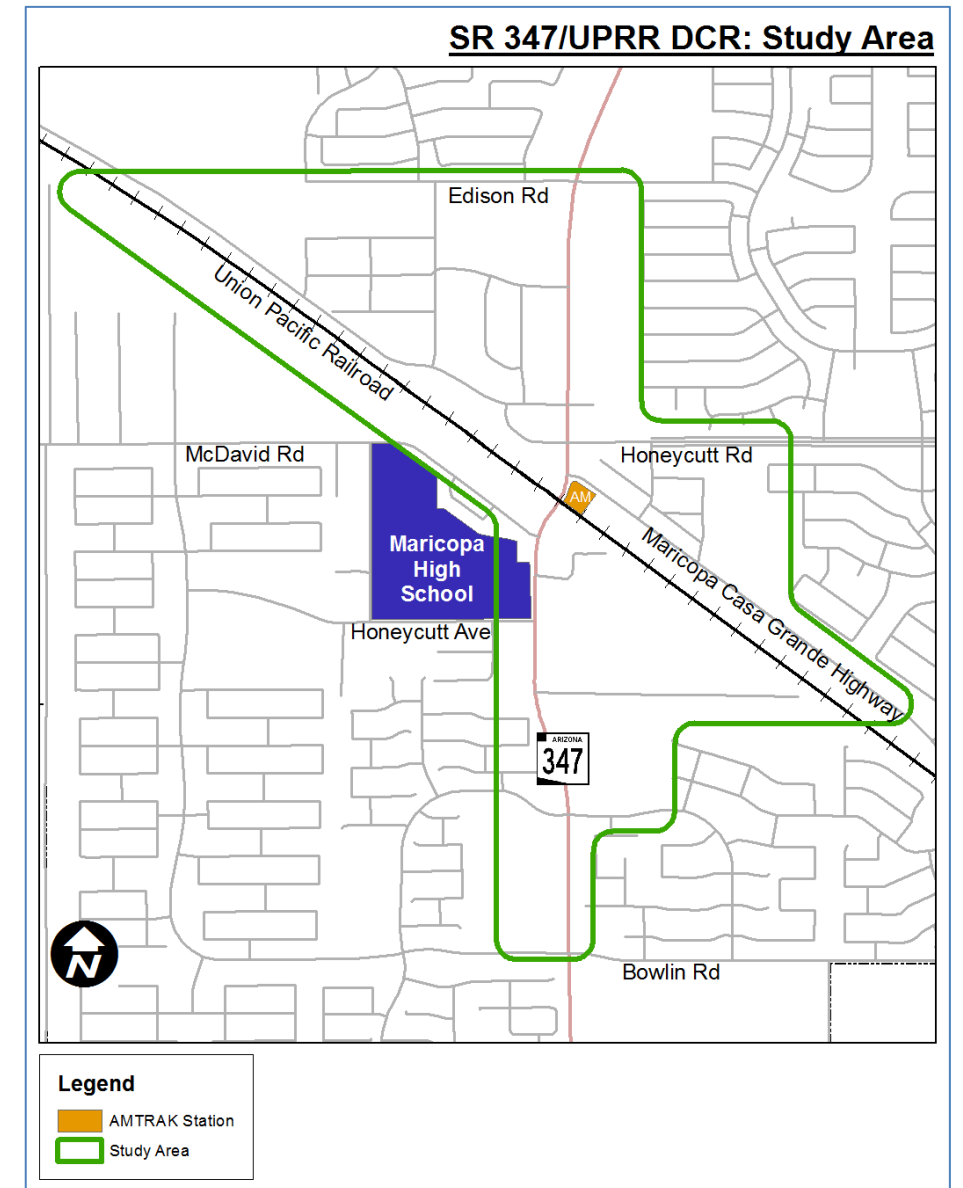
Additionally, in 2008 the City of Maricopa completed a Regional Transportation Plan (RTP) that identified roadway improvements to address the long-range transportation needs of the entire City. The RTP recognized the need for alternate crossings of the railroad tracks and identified eight (8) potential locations where bridges across the UPRR tracks would be required. One of these was at SR 347.

Approximately 40 - 60 trains cross the SR 347 intersection daily; with plans for additional tracks, railroad representatives have projected as many as 100 trains per day in the future may occur (communication between Zoe Richmond, UPRR with EPS Group 2010). In addition to freight train traffic, Amtrak's Maricopa Station is located adjacent to, and to the east of, the SR 347 and UPRR intersection. When Amtrak trains are stopped to load and unload passengers, they extend into the SR 347 intersection, routinely stopping vehicle traffic on SR 347 for 10 to 30 minutes and resulting in substantial traffic queuing. Due to the limited existing north-south alternatives to SR 347, train-caused delays interfere not only with local and commuter traffic but also reduce emergency vehicle response times.

Improvements are needed to alleviate current and future traffic congestion on SR 347 and to address operational concerns created by the roadway's at-grade intersection with the UPRR tracks. The proposed project would accommodate existing and projected local and regional travel demands; provide a roadway level of service that meets ADOT goals for a state highway to 2040; and conform with local and regional plans. The vision for the roadway improvements is to develop the most feasible alternative that allows traffic to flow without undue hindrance or delay and to minimize impacts to local businesses and residences.

### 1.3 Project Objectives

The purpose of this design concept report is to identify and recommend specific solutions to provide a grade separated crossing of the UPRR tracks that will improve mobility and alleviate congestion on SR 347 while limiting and/or mitigating environmental and socioeconomic impacts.



**Figure 1-3: Study Area Map**

## 1.4 Description of the Project

The study area for this project is in the City of Maricopa, Arizona in Pinal County in the vicinity of the SR 347 and MCGH. The study area is located within the City of Maricopa to either side of SR 347 between Edison Rd. and Bowlin Rd. (approximate mileposts 174.0 and 172.5). See **Figure 1-3** for the project study limits.

## 1.5 Characteristics of the Corridor

### 1.5.1 Existing Roadway

SR 347 is the primary north-south corridor in the City of Maricopa and serves as a direct route to the Phoenix area.

MCGH is an urban principal arterial which runs southeasterly and serves as a direct route between the City of Maricopa and the City of Casa Grande.

Honeycutt Road is an east-west principal arterial roadway which serves several residential areas east of SR 347.

The main roadways within the study limits are described in more detail as follows:

#### SR 347

- This state route includes a 64ft wide paved roadway.
- There are two 12-foot travel lanes for both NB and SB SR 347, and a striped 12-foot two-way left turn lane for a total of five lanes.
- NB and SB SR 347 have 2-foot paved shoulders adjacent to curb and gutter.
- SR 347 has a 35 mph posted speed limit.

#### MCGH

- MCGH is an urban principal arterial roadway with a 44ft to 52ft wide paved roadway section.
- It has one 12-foot travel lane in each direction plus a striped 12-foot turn-lane down the center of the roadway for a total of three lanes.
- It has paved outside shoulders in each direction which vary from 4 feet to 8 feet in width.
- The posted speed limit on MCGH is 35 mph.

#### Honeycutt Road

- Honeycutt Road is a principal arterial roadway with a 28ft to 68ft wide paved roadway section.
- Honeycutt Road has one 12-foot travel lane in each direction from SR 347 to approximately 600 feet east of the intersection. Honeycutt Road has one 12-foot travel lane in each direction and a westbound right turn lane from approximately 600 feet to 1500 feet east of SR 347. East of this location it has two lanes in each direction (14-foot inside lane, 12-foot outside lane).
- Honeycutt Road has 2-foot paved shoulders.
- The posted speed limit on Honeycutt Road is 40 mph.

The table below provides a listing of previously completed projects on SR 347 within the study limits.

**Table 1-1: Previous SR 347 Projects Within Study Limits**

PROJECT #	BEGIN MP	END MP	AS BUILT DATE	DESCRIPTION
347 PN 173	173.37	173.52	2008	(SR 347/ MCGH) Install Traffic Signal
S-347(1)	173.5	184.3	1955	(SR 347) Construct 26' wide road
S-347(3)	160.9	173.5	1955	(SR 347) Construct 26' wide road
347 PH PPN	7.6	13.7	1997	(SR 347) Reconstruct and pave

### 1.5.2 Existing Land Use and Ownership

Land ownership in the study area includes private and municipal lands, and falls within the jurisdictional boundaries of the City (refer to **Figure 1-4** for Land Ownership and Jurisdictional boundaries). Private lands within the study area include residential and commercial areas, utility right-of-way, and UPRR right-of-way. Land ownership in the vicinity of the study area includes tribal and State Trust land. The Ak-Chin Indian Community is located 0.50 mile south of Bowlin Road and west of SR 347. State Trust lands are located 0.50 mile east of SR 347 south of Bowlin Road and 0.25 mile west of SR 347 north of SR 238.

Existing land uses within and around the study area include:

- Residential
- Commercial
- Employment/Industrial
- Public/Institutional/Educational
- Recreational
- Undeveloped

Much of the residential development located within the study area and its vicinity consists of single-family homes, including: Acacia Crossings north of Edison Road and west of SR 347, Villages at Rancho El Dorado south of Edison Road and east of SR 347, Senita south of Honeycutt Road and north of MCGH, Desert Cedars east of SR 347 and north of Bowlin Road, and Alterra west of SR 347 between Bowlin Road and Honeycutt Avenue. Several smaller clusters of residences are located west of SR 347 along Garvey, Hathaway, and Wilson avenues, and east of SR 347 south of Honeycutt Road.

The commercial development in the study area is located primarily along SR 347 and includes retail, restaurants, and gas stations. Employment/industrial properties in the study area include tire, towing, and auto repair facilities; Maricopa Business Barn; and Amtrak's Maricopa Station and associated rail facilities. Public/institutional properties include Maricopa High School; the City's Department of Public Works buildings at the intersection of Wilson and Garvey avenues; and the Pinal County Maricopa/Stanfield Justice Court, and the City of Maricopa City Court.

Recreational land uses within the study area and its vicinity include the Copa Center on Honeycutt Road, the Maricopa High School track and sports fields west of SR 347, the Rotary Park and associated pool north of MCGH, and the Multigenerational Regional Park and Aquatic Center currently under construction east of SR 347 and south of Bowlin Road. A large plot of undeveloped land is located east of SR 347 north of Desert Cedars Drive and south of West Tapps Road and the UPRR tracks.

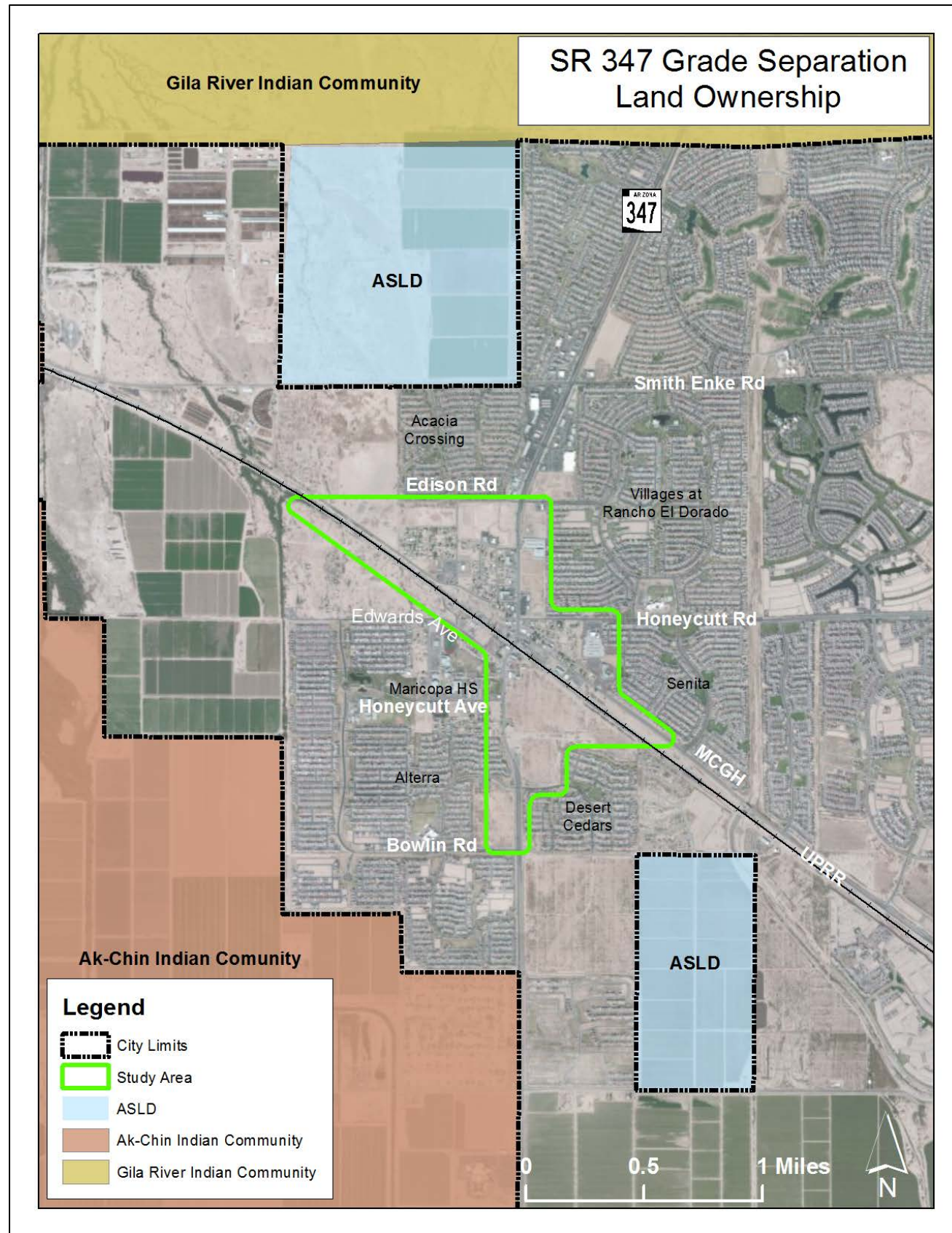


Figure 1-4: Existing Land Ownership

### 1.5.3 Existing Horizontal and Vertical Alignments

Four horizontal curves are present along SR 347 within the study area. The degree of curvature of the horizontal curves ranges from 4° to 8°. The SR 347 vertical profile grades range from 0.20% to 1.20%.

### 1.5.4 Existing Right-of-Way

The existing right-of-way for SR 347 is of variable width within the study limits and ranges from 80 feet to 175 feet. The existing right-of-way for MCGH is of variable width within the study limits and ranges from 66 feet to 150 feet. Access from business driveways and local streets is currently allowed on SR 347 within the study limits.

### 1.5.5 Drainage

Appendix C contains a Drainage Memorandum that was prepared to document the existing and proposed drainage conditions for the SR 347 grade separation. This section summarizes the existing drainage conditions for the study area.

Figure 1-5 presents the existing drainage features of the study area. A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) indicate that the study area falls within Zones A, AO and X (per map # 04021C0745E). The floodplain delineations for the areas south of the UPRR were revised by the City of Maricopa and Pinal County through a Letter of Map Revision (LOMR) appeal approved by FEMA in December 2012. The LOMR defines an AE flood Zone for the Vekol Wash Tributary that flows across existing SR 347. The flood zones within the study area have the following definitions:

- *Zone A*: Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown.
- *Zone AO*: Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. An average flood depth of 1ft was indicated on the FIRM for the SR 347 study area.
- *Zone AE*: Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown.
- *Zone X (shaded)*: Area of moderate flood hazard, usually the area between the limits of the 100- year and 500-year floods.

The City is nearing completion of the Copper Sky Regional Park (near the southeast corner of SR 347 and Bowlin Road). The park's detention/retention basins will attenuate runoff from the 100-yr design storm and eliminate the Zone AE floodplain south of the UPRR when completed in early 2014.

The study area's drainage features are divided into north and south halves by the UPRR tracks. The two halves are connected to each other by two 48" pipe culverts that cross the UPRR and MCGH. The easternmost pipe culvert discharges into a linear retention basin that runs parallel to the north side of MCGH. The linear retention basin has a small outflow pipe at its northwest end. The westernmost pipe culvert that crosses the UPRR and MCGH conveys stormwater runoff into Rotary Park. From there, the stormwater flows north to Honeycutt Road, then west to a sag in Honeycutt Road that is approximately 300 feet east of the existing SR 347. There is a specially designed catch

basin in the sag that spans the entire roadway. This catch basin connects to the storm drain system for SR 347 that is designed for the 25-year event. The drainage system daylights into an open channel just north of Hathaway Avenue along the east side of SR 347.

Historic flow patterns indicate that stormwater runoff entered the southern portion of the study area from the south, flowed through existing farm fields and residential communities, over the top of existing SR 347, and then to the northwest.

The Copper Sky Regional Park will detain runoff from the 100 yr design storm event and route stormwater west to Vekol Wash via an existing drainage channel that runs parallel to the south side of Bowlin Road. A new LOMR will be processed when the regional park is officially completed in early 2014 that will remove the Zone AE floodplain from the southern portion of the study area. It is highly likely that this LOMR will be approved prior to any construction for this grade separation. For this reason, the proposed drainage improvements will assume that the regional retention basins are in place.

### 1.5.6 Utilities

Potential conflicts between existing utilities and future roadway improvements must be identified during the planning stage of the SR 347 realignment study. This information is needed to evaluate corridor alternatives and to determine which alignments are feasible.

Arizona Blue Stake was contacted to identify the utility stakeholders within the study area. **Table 1-2** contains a list of the utility owners/types of utilities identified by Blue Stake within the study area. This table also includes fiber optic and irrigation providers not listed by Blue Stake.

**Table 1-2: Study Area Utility Stakeholders Identified by Blue Stake**

Utility Stakeholder	Type of Utility
Ak-Chin Indian Community	Fiber, Sewer, Water
Arizona Department of Transportation	Culvert, Storm Drain, Electric
Arizona Public Service-Main State office	Electric
Electrical District No. 3	Electric
Global-Palo Verde Utilities/Santa Cruz Water	Reclaimed Water, Sewer, Water
Kinder Morgan Energy / Phx	Petroleum
Orbitel Communications, LLC	CATV, Fiber
Century Link	COAXIAL, Fiber
Southwest Gas	Gas, High Pressure Gas

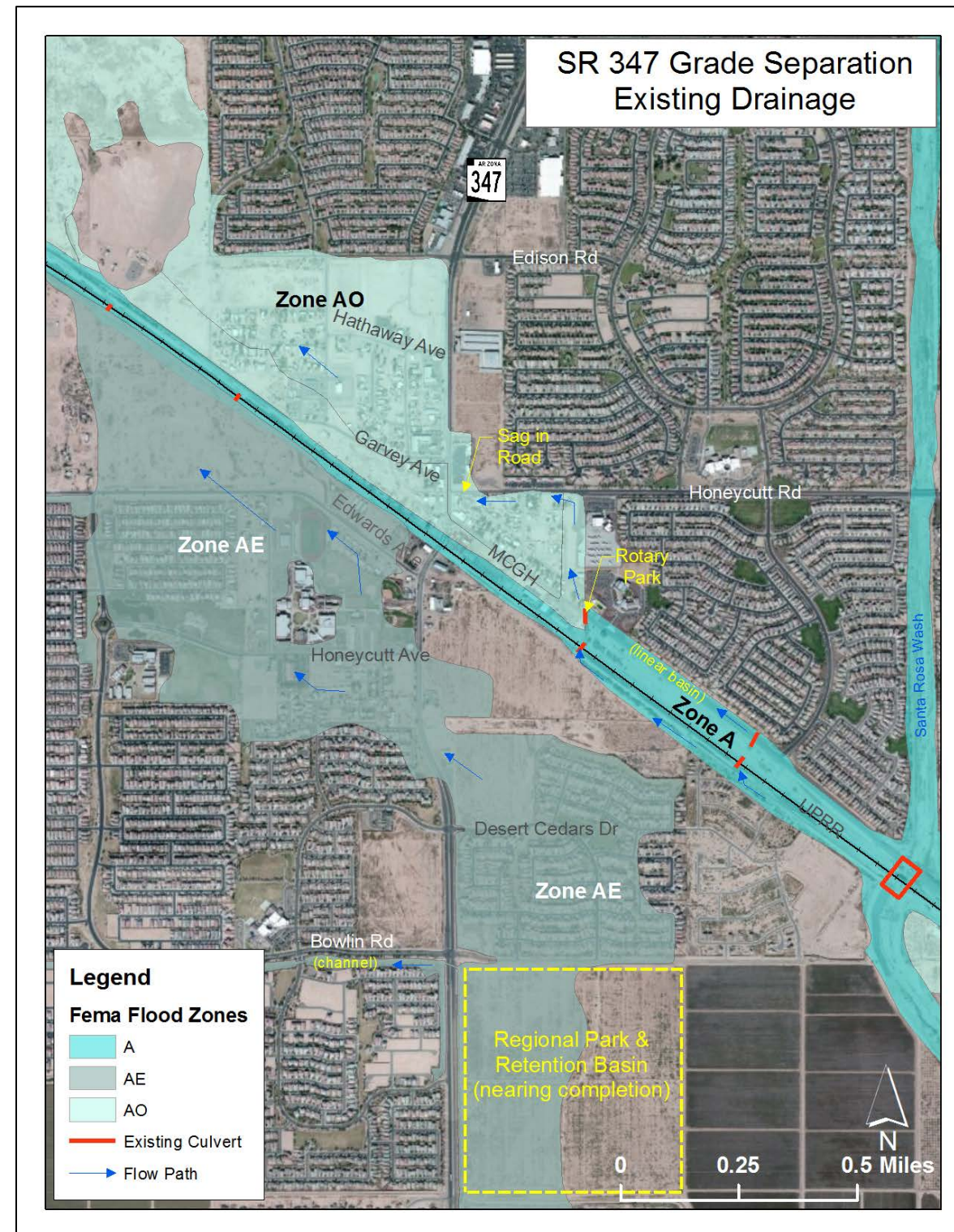
Additional Potential Utility providers not identified by Blue Stake

Utility Company	Type of Utility
Maricopa Broadband	CATV, Fiber
Maricopa Water Improvement District	Water
Maricopa-Stanfield Irrigation & Drainage District	Irrigation

The utility stakeholders identified by Blue Stake were contacted to determine what facilities fall within the study area and to request mapping. Orbital Communications, the Maricopa-Stanfield Irrigation & Drainage District, Century Link, and the Ak-Chin Indian Community indicated that there were no conflicts with their utilities in the study area.

### Electric Facilities

Electric District No. 3 (ED3) owns multiple 69 kV and 12 kV overhead distribution lines within the study area (see **Figure 1-6**). These facilities include a 69 kV transmission line along the north side of



**Figure 1-5: Drainage Area Features**

Honeycutt Road from SR 347 to the east. At the intersection of Honeycutt Road and Garvey Road, the transmission line turns to the northwest and follows the Union Pacific Railroad.

ED3 also operates numerous overhead 12kV distribution power lines within the study area, including along SR 347 and the Union Pacific Railroad. ED3 also operates multiple buried lines along local roads.

In addition, ADOT owns buried conduits for use in street lighting and traffic signals along SR 347.

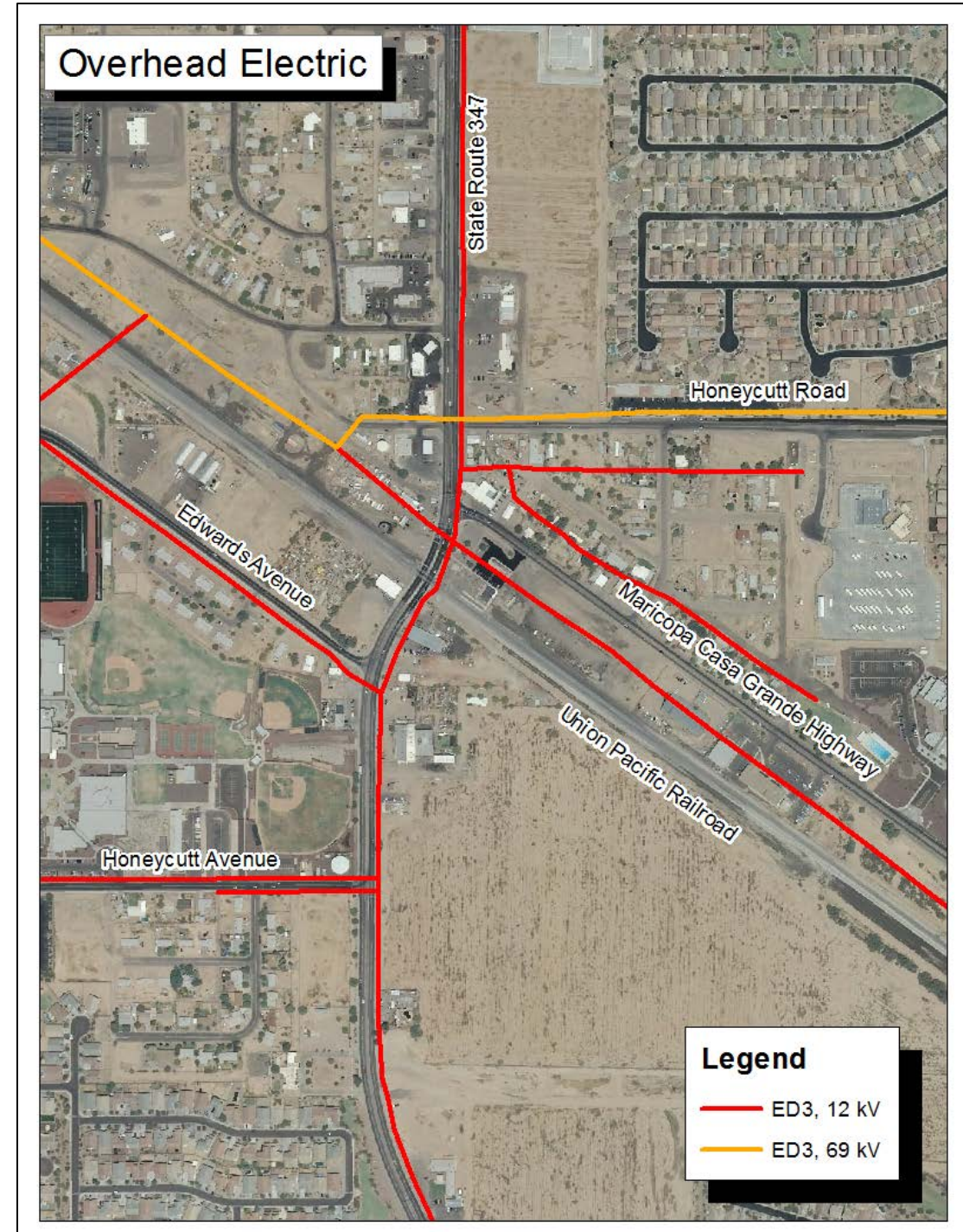


Figure 1-6: Overhead Electric Facilities

Wet Utilities

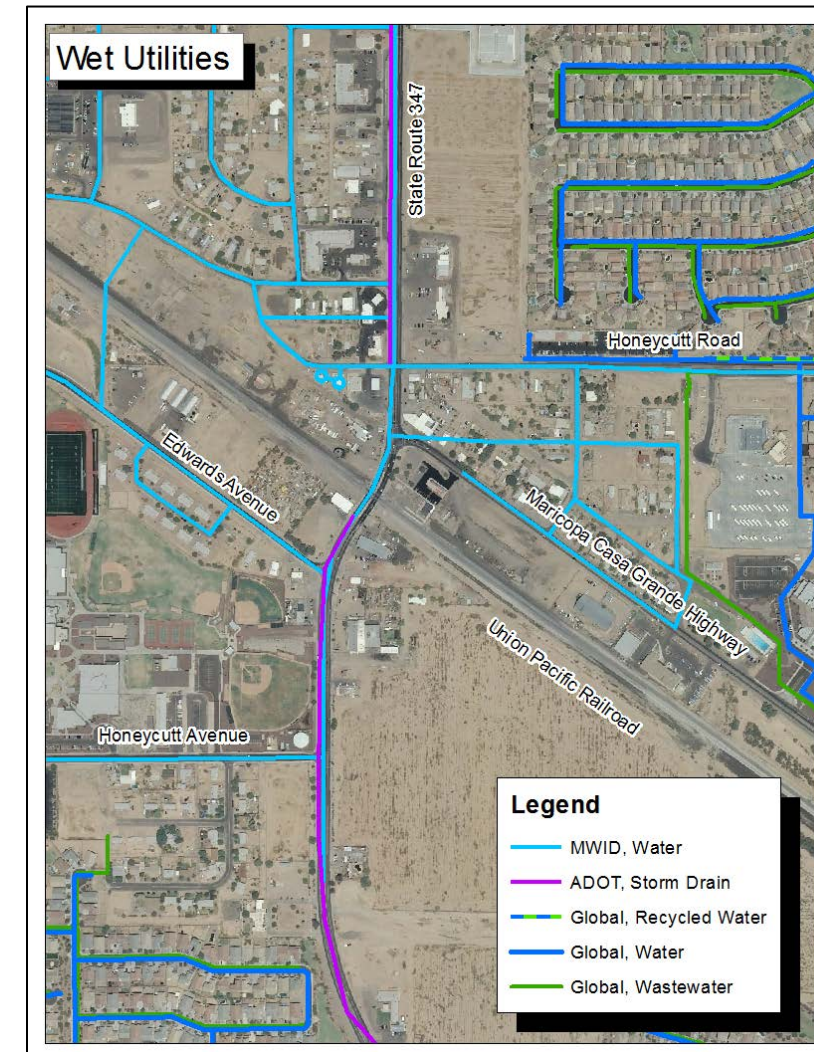


Figure 1-7: Wet Utilities

Numerous wet utilities are located in the study area including storm drain, potable water, recycled water, and wastewater. **Figure 1-7** depicts their locations.

Maricopa Water Improvement District (MWID) has potable water facilities located within the study area. This includes a 12" line along SR 347, and 4" to 12" waterlines along Honeycutt Road, the Maricopa-Casa Grande Highway, and local roads. The MWID also owns and operates two reservoirs (combined volume of 550,000 gallons) and a booster station at the intersection of Honeycutt Road and the Union Pacific Railroad.

ADOT owns concrete storm drain lateral pipes and trunk lines along SR 347 from approximately Jackrabbit Road to Edison Road. Lateral pipes are typically 24" in diameter, while trunk lines vary from 30" to 68".

Global Water operates water, wastewater, and recycled water facilities within the study area. These are primarily located on local streets.

Gas/Petroleum Facilities

Kinder Morgan Energy owns and operates a 12" high-pressure gas main that parallels the UPRR south of the MCGH, approximately 75 feet south of the railroad tracks. Kinder Morgan also owns an abandoned 8" gas main located south of MCGH and north of the railroad tracks. Both lines generally run in a northwesterly direction along the tracks until Wilson Avenue, where they turn to the north and continue past Edison Road.

Southwest Gas operates multiple distribution gas mains within the study area. These include a 4" gas line along SR 347 from Honeycutt Road to the south, as well as 2" gas lines along Garvey Road from SR 347 to the west, along Honeycutt Road from SR 347 to the east, and within local roads. **Figure 1-8** depicts the locations of the gas/petroleum pipelines within the study area.

**1.5.7 Structures**

There are no existing bridge structures within the project limits.



Figure 1-8: Gas/Petroleum Pipelines

### 1.5.8 Site Topography and Geology

The project area is located within the Sonoran Desert Ecoregion, which has high summer temperatures, mild winters, and a characteristic bimodal rainfall pattern. The City of Maricopa is situated in the Gila River Valley south of Phoenix at elevations from 1,160 to 1,180 feet. The topography in this area is flat, though there are several mountain ranges located within 10–20 miles of the project area. The topography in the vicinity of the study area generally slopes from the southeast to the northwest.

### 1.5.9 Future Land Use

The Projected Land Use Map in the City of Maricopa's General Plan (2006) shows increased commercial and industrial development within the center of the study area (Figure 1-9). Other land uses within or adjacent to the study area include medium density residential development (which is largely in place) and public or institutional uses.

### 1.5.10 Transit Facilities

As described previously, the Maricopa AMTRAK passenger train station serves as a major transit facility that provides regional connectivity within the southwestern United States. The station is located on the northeast corner of the SR 347/UPRR intersection.

The City of Maricopa operates a demand-based transit program for the general public. For a small fee, this service provides transportation to destinations within Maricopa or to regional medical facilities.

There are currently no inter-city bus routes between the Phoenix metropolitan area and the City of Maricopa.

## 1.6 Agency and Public Scoping

ADOT held public/agency scoping and information meetings at convenient, local venues within the City of Maricopa to facilitate agency and public participation. These meetings offered the public and attending organizations the opportunity to speak one-on-one with ADOT officials, project planners, and engineers. In addition, the meetings allowed ADOT officials, project engineers, and planners the opportunity to hear firsthand the concerns of those who might be affected by the project. The following key personnel were involved in the scoping/study process:

- Asadul Karim, ADOT Project Manager
- Danny Granillo, ADOT Tucson District
- Jennifer Greutz, ADOT Communication and Community Partnerships
- Dan Gabiou, ADOT Environmental Planning Group
- Kazi Haque, City of Kingman
- Aryan Lirange, FHWA Area Engineer
- Rebecca Yedlin, FHWA Environmental Coordinator
- Celeste Pemberton, Pinal County



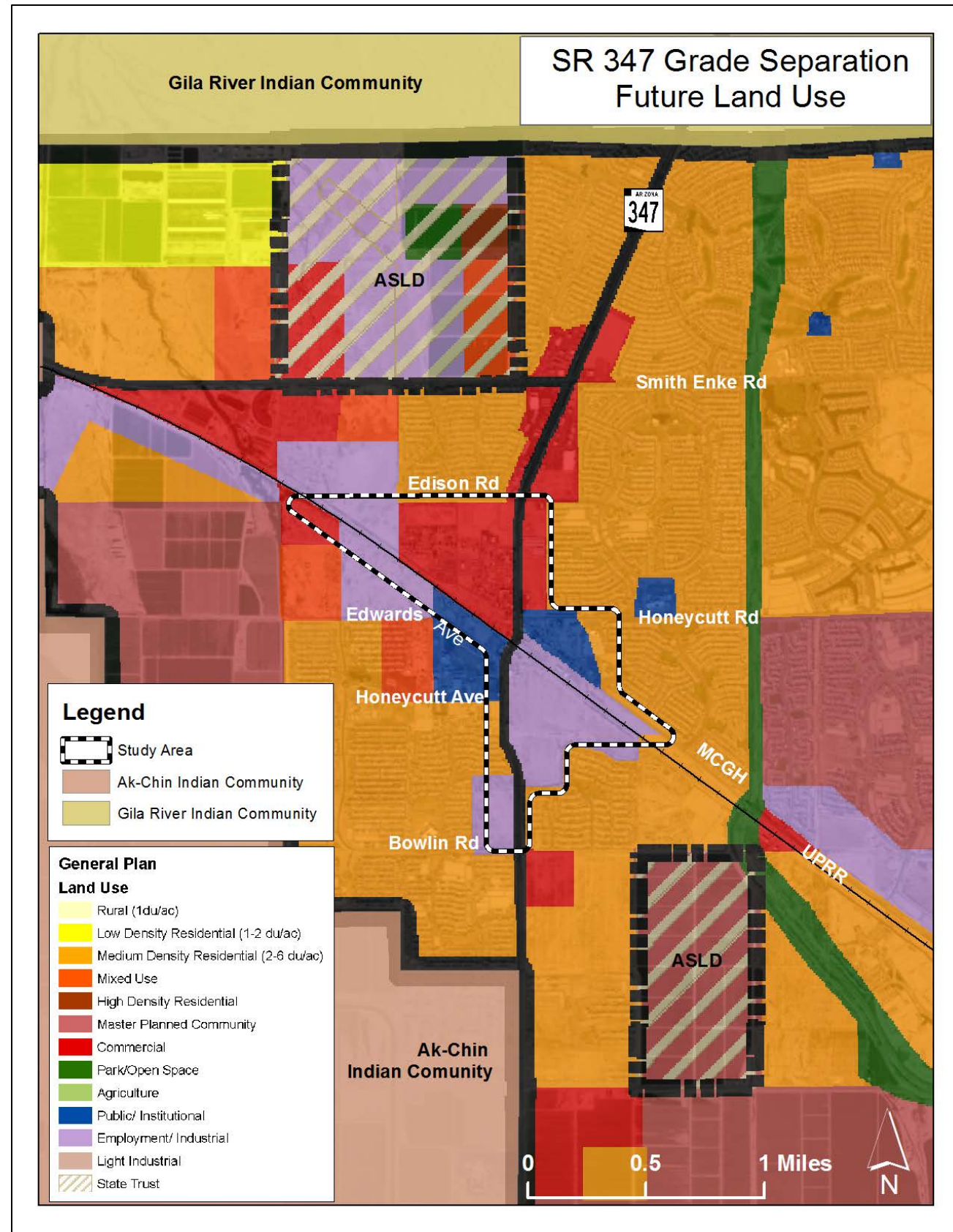


Figure 1-9: Future Land Use

Agency and public scoping meetings were held in July 2012 to provide preliminary study information and gather feedback from agency stakeholders and the public. A detailed summary of the agency and public information meetings may be found in the Agency and Public Scoping Summary (November 2012).

Additional agency and public Information meetings were held in June 2013 to provide an update on the study progress and to receive feedback on candidate alignment alternatives. A detailed summary of the agency and public information meetings may be found in the Agency and Public Scoping Summary (July 2013).

### 1.6.1 Agency Involvement

*Agency Scoping Meeting (July 10, 2012):* This meeting was held at the City of Maricopa Unified School District Administrative Offices. The agency scoping meeting was held to discuss issues, concerns, and opportunities to be addressed during development and evaluation of the SR 347 UPRR Crossing alternatives. Study vicinity maps, information handouts, and meeting exhibits were also available for examination and commentary.

*Agency Alternatives Overview Meeting (June 6, 2013):* This meeting was held at the City of Maricopa Unified School District Administrative Offices. The purpose of this meeting was to introduce and provide an overview of the alternatives to agency representatives and to seek insight regarding the three candidate alignments recommended for further consideration.

### 1.6.2 Public Involvement

*Public Scoping Meeting (July 10, 2012):* The public scoping meeting was held at the City of Maricopa Unified School District Administrative Offices. The public scoping meeting was held to introduce the study to community members and to provide an opportunity for attendees to ask questions and submit comments. Fifty-two people were in attendance.

*Public Alternatives Overview Meeting (June 6, 2013):* This meeting was held at the City of Maricopa Unified School District Administrative Offices. The purpose of this meeting was to provide a review of the project purpose and need, provide an overview of the alternatives, discuss the alternative evaluation criteria, and present the three candidate alignments recommended for further consideration. One hundred four people were in attendance.

## 2.0 Traffic and Crash Data

### 2.1 Traffic Analysis

#### 2.1.1 Source of Data

The ADOT Multimodal Planning Division (MPD) provided traffic volume data (see **Table 2-1**) for the existing and future design year conditions. ADOT also provided the peak hour factors (K), directional splits (D) and truck percentages (T).

In addition, Traffic Research and Analysis conducted extensive traffic data collection for five (5) separate days of the week. The counts were collected on Tuesday, 25 September 2012, Wednesday, 26 September 2012, Thursday, 27 September 2012, Saturday, 29 September 2012, and Sunday, 30 September 2012. The approach and departure counts, including vehicle classification, were obtained in fifteen-minute intervals for 120 total hours. Turning movement counts were also obtained on Tuesday, 25 September 2013 in fifteen-minute intervals during the morning, midday, and evening peak nine (9) hours of traffic; and on Saturday, 29 September 2012 during the midday peak four (4) hours of traffic.

#### 2.1.2 Traffic Data

**Table 2-1** contains the traffic data provided by ADOT.

**Table 2-1: ADOT Traffic Data**

Roadway	Section ID#	BMP	EMP	AADT			K	D	T
				2010	2020	2040			
SR 347	1389	171.50	173.46	9,315	16,450	30,700	9	73	5
SR 347	1157	173.46	174.56	17,334	27,650	48,300	9	73	5

The data provided by Traffic Research and Analysis was collected at the locations indicated in **Figure 2-1**. The complete existing traffic volume data can be found in the Traffic Analysis Report (**Appendix D**). The data includes fifteen-minute and hourly counts by time of day and tables determining the peak hourly volumes. It also includes approach and departure counts, turning movement counts, and vehicle classification data.

**Table 2-2** contains the existing daily traffic volumes counted on Tuesday, 25 September 2012 through Thursday, 27 September 2012, as well as daily traffic volumes counted Saturday, 29 September 2012 and Sunday, 30 September 2012.



**Figure 2-1: Traffic Count Locations**

**Table 2-2: Existing Daily Traffic Volumes**

	Count Location							
	A		B		C		D	
	NB	SB	NB	SB	NB	SB	NB	SB
<b>TUESDAY 9/25/12</b>	9,940	8,021	10,693	9,890	12,160	10,900	12,769	11,832
<b>WEDNESDAY 9/26/12</b>	9,800	7,915	9,620	9,381	11,535	10,271	12,444	11,578
<b>THURSDAY 9/27/12</b>	9,620	8,067	9,620	10,087	12,498	10,836	13,023	12,196
<b>SATURDAY 9/29/12</b>	8,053	8,242	10,585	10,181	12,045	10,688	12,487	11,942
<b>SUNDAY 9/30/12</b>	6,622	6,843	8,758	8,360	9,666	8,650	9,946	9,476

	Count Location							
	E		F		G		H	
	NB	SB	NB	SB	EB	WB	EB	WB
<b>TUESDAY 9/25/12</b>	15,420	14,233	15,260	15,377	5,332	5,456	4,628	4,125
<b>WEDNESDAY 9/26/12</b>	15,257	14,009	15,448	15,158	5,275	5,489	4,539	4,240
<b>THURSDAY 9/27/12</b>	16,043	14,540	14,316	15,621	5,697	5,541	4,794	4,386
<b>SATURDAY 9/29/12</b>	16,910	13,567	11,702	14,774	4,934	5,032	4,172	4,090
<b>SUNDAY 9/30/12</b>	11,254	11,211	Malfunction	11,693	3,784	3,841	3,224	2,957

## 2.2 Crash Analysis

### 2.2.1 Source of Data

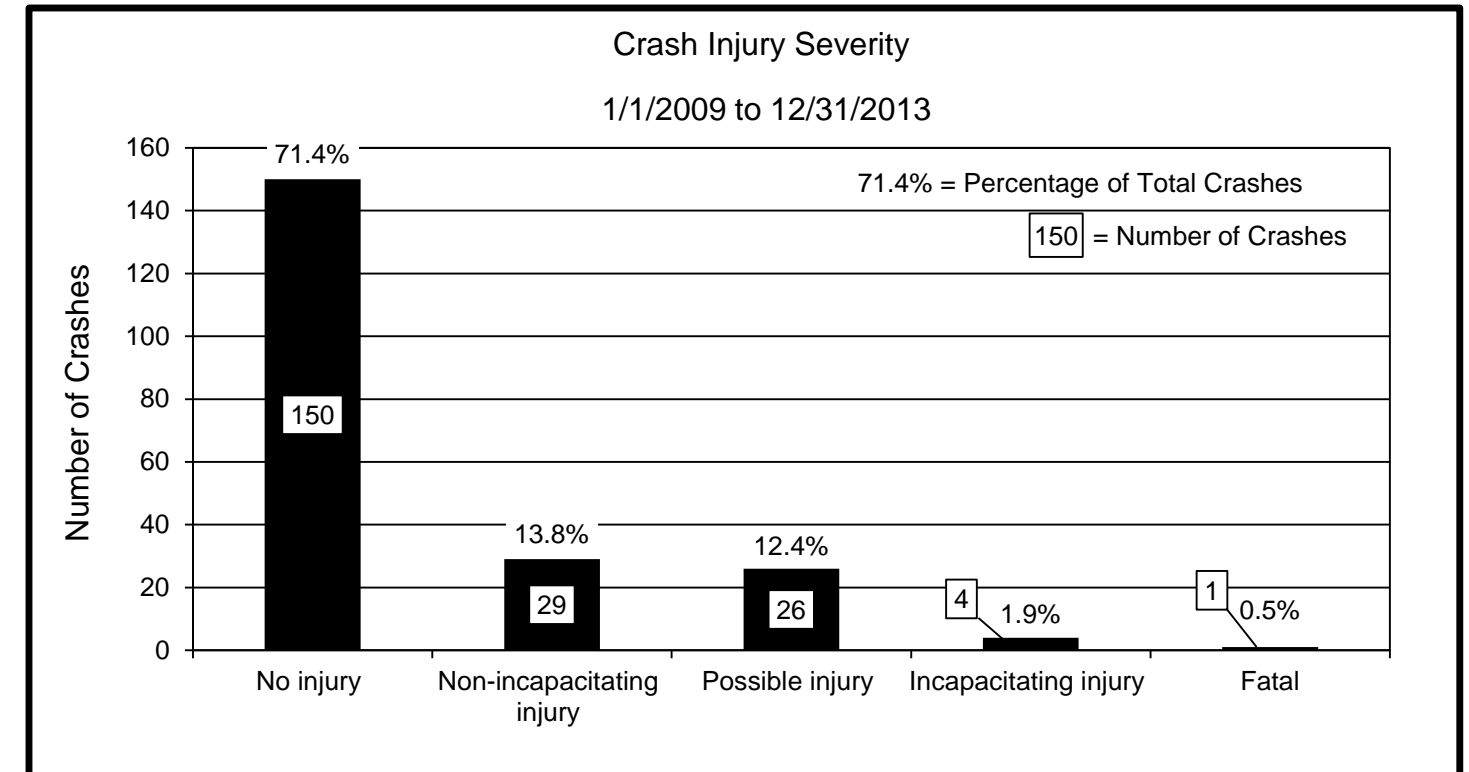
The ADOT Traffic Safety Section (TSS) provided crash data from January 1, 2009 to December 31, 2013 for the study area. All crash data was collected from the ADOT Traffic Records, Safety Data Mart (SDM). It was noted that compilation of the 2013 crash data is still underway. The most recent crash reported occurred in October 2013.

### 2.2.2 Crash Data

ADOT crash data was provided for SR 347 between MP 172.50 and MP 174.00. A total of 210 crashes occurred within these limits during the period. **Figure 2-2** indicates that 71 percent of the crashes resulted in no physical injury. There was one fatal crash reported during the period. Per the United States Department of Transportation accident/incident reports, there have been 4 vehicle/train collisions resulting in 6 fatalities over the past 25 years.

## 2.3 Future Traffic Projections

Assessment of the performance of the transportation system during the design life of an improvement requires forecasting the anticipated future travel demand. The TransCAD® model provided the basis for determining future travel demand and related traffic volumes on study area roadways. Inputs to drive the software include estimates of future population and employment that will generate trips on the study area roadway network.



**Figure 2-2: Crash Data - Injury Severity**

### 2.3.1 Socioeconomic Data

As a rule, the Federal Highway Administration requires major roadway improvements be designed for at least 20 years beyond opening of the project to qualify for Federal Aid. Construction of the grade separation at State Route 347 may not occur for another 10 years (by year 2020); therefore, the year 2040 was selected as the long-range planning horizon for the future travel demand analysis.

The first step in modeling future travel demand involves establishing socioeconomic data for the future (year 2040) conditions in the Municipal Planning Area within which the project resides, which is referred to as the Model Study Area. It was determined at the outset that the dataset developed for use in the White & Parker Major Investment Study (MIS) prepared for the City of Maricopa provided the most relevant socioeconomic data applicable to travel demand modeling for this study.

This dataset was developed previously from two applicable sources: the Regional Transportation Plan Update (RTP Update) completed by the City of Maricopa in September, 2008, and subsequent population projections prepared by Central Arizona Governments (CAG) for the years 2030 and 2040. When developing the dataset for the White & Parker MIS, it was determined that the City's 2020 projections are comparable to the CAG 2040 projections. It was further determined that the CAG 2040 projection of dwelling units and population effectively represented build-out conditions in the Northeast Sector of the Municipal Planning Area – the location of the State Route 347 intersection with the Union Pacific Railroad. It was concluded that adopting the CAG 2040 projections would be a reasonable approach for assessing traffic impacts associated with the proposed grade separation of this intersection. Therefore, a review of CAG socioeconomic data was conducted to verify the expected number of dwelling units relative to the RTP Update Transportation Analysis Zone structure, reflecting full potential for travel demand in the

Northeast Sector of the Municipal Planning Area. Emphasis was placed on the Northeast Sector, because the RTP Update notes that this area is expected to be fully developed prior to substantial development occurring in other portions of the Municipal Planning Area. Details regarding the development of this dataset are provided in the Traffic Analysis Report (**Appendix D**).

To confirm the applicability of this dataset for use in this State Route 347 Union Pacific Railroad Crossing study, the tabular data were reviewed with the City of Maricopa planning staff to ensure the most recent information was applied in determining the magnitude and location of dwelling units and employment in the Northeast Sector. As a result of this review, changes were made to the number of dwelling units and/or employment in five Transportation Analysis Zones, as documented in **Table 2-3**.

**Table 2-3: Summary of Modified Socioeconomic Data**

TAZ	Location	Initial SED Inputs		Modified SED Inputs	
		Dwelling Units	Employment	Dwelling Units	Employment
1487	Northwest of McDavid Road and Hogenes Road	874	1500	1500	1500
1733	Southwest of McDavid Road and SR 347	1799	729	450	729
1739	Proposed City Hall site northeast of Bowlin Road and White & Parker Road	1937	535	1577	1851
1747	San Travesa/Central Arizona College site southwest of Bowlin Road and White & Parker Road	1577	259	1577	1718
1751	Southeast of Bowling Road and SR 347	1048	230	0	230

The final dataset was used in preparing traffic forecasts within the Municipal Planning Area. This process provided a basis for forecasting the full impacts of committed, planned, and proposed developments relative to the grade separation of State Route 347 at the Union Pacific Railroad.

### 2.3.2 Transportation Network

Key information required for the modeling process is socioeconomic inputs by Transportation Analysis Zone (as discussed above), knowledge of the existing roadway network, and descriptions of pending committed, programmed, and planned transportation network improvements.

#### Committed, Programmed, and Planned Transportation Improvements

As the City of Maricopa increases in size and population and development within the Municipal Planning Area progresses, the roadway network also must grow to meet additional travel demands. The roadway network of the Model Study Area and its capacity to move automobile and truck traffic must increase to accommodate increasing traffic volumes, particularly on major arterial facilities.

A number of major street improvements have already been identified to accommodate expected development and growth in traffic. These improvements are identified in the City's Capital Improvement Plan (CIP). Improvement projects included in the CIP that potentially would be implemented by the year 2040 were identified. There also are some roadway improvements being accomplished as part of the development process by those entities constructing new residential subdivisions and commercial centers. Thus, specific improvement projects for which development impact fee funds have been collected were identified. Further, specific linkages deemed appropriate or necessary by the City and Pinal County planning staff were added to the model network. Finally, roadway links were added to the model to achieve connectivity with the larger regional model inputs.

The improvement actions discussed above, when taken together with the existing roadway network, constitute the Existing-plus-Committed (E+C) Base Roadway Network. The E+C Base Roadway Network is the network of roadways most likely to be constructed and in place by the year 2040, given current knowledge of economic growth conditions, forecasts of resources available, and funding commitments. The E+C Base Roadway Network used in the analysis was previously developed in conjunction with the White & Parker Road MIS. A summary of all roadway improvements included in the State Route 347 study area E+C Base Roadway Network is provided in **Table 2-4**.

**Table 2-4: Summary of Existing-plus-Committed Base Roadway Network Improvements**

Roadway Name	From	To	Improvement Category	Total Lanes	Functional Class	Optimized Total Lanes	New Functional Class	Improvement Type
Bowlin Rd	SR 347	Karsten Dr	DIF	4	Minor Arterial			Widening
Garvey Rd	SR 347	Green Rd	DIF	4	Minor Arterial			Widening
Honeycutt Rd	SR 347	Fourth Street	DIF	4	Principal Arterial 2			Widening
Smith-Enke Rd	SR 347	Province Pkwy	DIF	6	Principal Arterial 2	6	Principal Arterial 1	Widening
SR 238	Warren-Ralston Pkwy	SR 347				4	Pkwy	Widening & Reclassify
SR 347	Rancho El Dorado Pkwy	North of Rancho El Dorado Pkwy				4	Pkwy	Widening & Reclassify
SR 347	Farrell Rd	Rancho El Dorado Pkwy				6	Principal Arterial 1	Widening

Prepared by Wilson & Company, September, 2010.

Notes:

MCGH = Maricopa-Casa Grande Highway  
DIF = Development Impact Fee  
Connectivity = Roadway Segments that are required to maintain network connectivity or provide access to future developments  
CIP = Capital Improvement Program

Source: White & Parker Road Major Investment Study

## 2.4 Level-of-Service Analysis – Existing Roadway Network

### 2.4.1 Traffic Operational Analysis – Existing Roadway Network

The Tuesday, 25 September 2012 traffic counts were observed to contain the highest weekday traffic volumes and the Saturday, 29 September 2012 traffic counts were observed to contain the highest weekend traffic volumes. Therefore, the traffic volumes from these days were utilized in the existing analysis.

The ability of a transportation system to transmit the transportation demand is characterized as its level-of-service (LOS). Level-of-service is a rating system from "A", representing the best operation, to "F", representing the worst operation. Typically, level-of-service "D" is considered the minimum acceptable operation. The appropriate reference for level-of-service operation is the *Highway Capacity Manual*, published by the Transportation Research Board.

This manual considers the average delay per vehicle as the measure to determine the level-of-service for both signalized and unsignalized intersections. For signalized intersections and for multi-way stop intersections, the delay and level-of-service are calculated for the intersection, each approach, and each turning movement. For unsignalized intersections the level-of-service is defined

for each minor movement for two-way stop controls, and is not defined for the major street approaches or for the entire intersection. **Table 2-5** and **Table 2-6**, respectively, list the level-of-service criteria for both signalized and unsignalized intersections as stated in the *Highway Capacity Manual*.

**Table 2-5: Level-of-Service Criteria for Unsignalized Intersections**

LEVEL-OF-SERVICE	AVERAGE DELAY (seconds-per-vehicle)
A	≤ 10
B	> 10 to 15
C	> 15 to 25
D	> 25 to 35
E	> 35 to 50
F	> 50

**Table 2-6: Level-of-Service Criteria for Signalized Intersections**

LEVEL-OF-SERVICE	AVERAGE DELAY (seconds-per-vehicle)
A	≤ 10
B	> 10 to 20
C	> 20 to 35
D	> 35 to 55
E	> 55 to 80
F	> 80

The existing vehicle classification counts were utilized for the level-of-service analysis. The truck percentage was calculated for each individual intersection approach and applied for each peak hour period.

The weekday morning and evening peak hours of traffic were observed to experience the highest traffic volumes. **Table 2-7** summarizes the delay and level-of-service results for the weekday morning and evening peak hours for the existing study area intersections.

The existing analysis results reveal that with existing traffic volumes most study area intersections will experience level-of-service “D” or better during the peak hours. The existing analysis results also yield a level-of-service “E” or better for individual movements. The intersection of State Route 347 / Honeycutt Road experiences level-of-service “F” for the eastbound and westbound approaches during the weekday evening peak hour.

**2.4.2 Traffic Operational Analysis – Future 2040 No-Build Condition**

Traffic analysis was also conducted for the future 2040 No-Build condition. For this analysis, the existing roadway network was assumed to remain unchanged. Predicted future 2040 intersection turning movement volumes were determined based upon the existing traffic count data and the future 2040 traffic demand model for the base condition.

Synchro software was utilized to calculate the average delay and level-of-service. The input and output for the future 2040 No-Build peak hour analyses are provided in the Traffic Analysis Report (**Appendix D**).

**Table 2-8** summarizes the delay and level-of-service results for the weekday morning and evening peak hours for the future 2040 No-Build study area intersections

The future 2040 No-Build analysis results reveal that with the existing roadway network and predicted 2040 traffic volumes most study area intersections will experience level-of-service “F” during the peak hours. The analysis results also yield a level-of-service “F” for numerous individual movements and approaches.

**2.4.3 Train Related Delays**

Traffic on SR 347 is regularly interrupted to allow passenger and freight trains to pass through the existing at-grade intersection. This sub-section estimates the existing/future train related traffic delays.

Passenger Train Delays

The existing AMTRAK station is located adjacent to the east side of SR 347. AMTRAK’s passenger trains regularly run behind their six scheduled arrivals times in Maricopa which are 5:30AM-5:40 AM (Mon, Thur, Sat) and 8:52PM-9:02PM (Tues, Fri, Sun). More often than not the Monday and Thursday trains arrive during the morning peak traffic hour. When this occurs SR 347 is closed for approximately 20-30 minutes forcing commuters to wait in line or drive to the nearest alternative crossing (approximately 8 mile detour).

AMTRAK passenger trains generally budget 10 minutes to unload/load passengers at each stop. The Maricopa Station load times are 2-3 times greater because the existing passenger platform is too short, forcing AMTRAK to unload/load each car individually instead of all at once as desired.

Time savings estimates were based upon 2012 traffic count volumes for the 6:00AM and 10:00PM hours. It was conservatively assumed that 1/3 of the hourly traffic volume would be impacted by a 20-30minute interruption in service. It was assumed that each vehicle incurred a 15minute delay when stopped by a passenger train. This is approximately equal to the travel time required to take the 8 mile detour (assuming 35mph average speed).

Based upon these assumptions, a single AMTRAK train causes approximately 117 vehicle hours of delay during the morning peak hour and 33.5 vehicle hours of delay during off-peak hours. If it is assumed that there are two peak-hour and four off-peak-hour delays each week, over 19,000 vehicle hours are lost each year waiting for passenger trains to unload/load passengers under existing conditions.

Assuming a 2.8% growth rate, the same AMTRAK train would cause approximately 245 and 70 vehicle hours of delay for the 2040 morning peak and off-peak hours, respectively. This would translate to over 40,000 vehicles hours of delay in the 2040 design year.

Freight Train Delays

UPRR averages 40-60 trains per day on their existing double tracks through the City of Maricopa. For the purpose of this analysis, it was assumed that 2 trains pass through the intersection each hour in 2013. On average, traffic is interrupted by UPRR gates for 1.5 minutes when a train passes through the intersection. Therefore, it is assumed that 5% of the ADT will be impacted by a 1.5 minute delay in 2013. Based upon these assumptions, freight train traffic leads to approximately 40 vehicle hours of delay each day (~15,000 vehicle hours of delay annually).

If a modest increase in rail traffic (+2 trains/year to account for UPRR's expansion plans) and a 2.8% growth rate in vehicular traffic are assumed, the daily and annual freight train related delays grow to approximately 180 vehicle hours/day and 66,000 vehicle hours/year respectively.

**Table 2-7: Delay and Level-of-Service Summary for Existing Intersections**

MOVEMENT	2012 AM PEAK		2012 PM PEAK		MOVEMENT	2012 AM PEAK		2012 PM PEAK		MOVEMENT	2012 AM PEAK		2012 PM PEAK		MOVEMENT	2012 AM PEAK		2012 PM PEAK	
	LOS	DELAY	LOS	DELAY		LOS	DELAY	LOS	DELAY		LOS	DELAY	LOS	DELAY		LOS	DELAY	LOS	DELAY
<b>1 - SR 347 and ALTERRA PKWY</b>					<b>3 - SR 347 and EDWARDS AVE</b>					<b>5 - SR 347 and HONEYCUTT RD</b>					<b>7 - SR 347 and HATHAWAY AVE</b>				
Eastbound Left	B	19.2	C	24.0	Eastbound Left-Thru-Right	D	29.3	D	31.7	Eastbound Left-Thru-Right	D	30.4	F	599.5	Eastbound Left	C	27.5	D	38.2
Eastbound Thru-Right	B	13.6	B	18.2	EASTBOUND	D	29.3	D	31.7	EASTBOUND	D	30.4	F	599.5	Eastbound Right	C	26.3	C	30.1
EASTBOUND	B	18.9	C	23.9	Northbound Left	B	10	B	11.8	Westbound Left-Thru-Right	B	14.5	F	57.6	EASTBOUND	C	27.0	D	36.2
Westbound Left	B	13.6	B	18.3	Northbound Thru	-	-	-	-	WESTBOUND	B	14.5	F	57.6	Northbound Left	A	2.0	B	16.2
Westbound Thru-Right	B	13.9	B	18.4	NORTHBOUND	-	-	-	-	Northbound Left	A	9.3	B	12.4	Northbound Thru	A	3.2	A	7.9
WESTBOUND	B	13.9	B	18.4	Southbound Thru-Right	-	-	-	-	Northbound Thru-Right	-	-	-	-	NORTHBOUND	A	3.2	A	8.2
Northbound Left	A	7.9	A	6.6	SOUTHBOUND	-	-	-	-	NORTHBOUND	-	-	-	-	Southbound Thru	A	4.7	B	12.7
Northbound Thru	A	9.5	A	7.9	<b>INTERSECTION</b>	-	-	-	-	Southbound Left	B	11.3	B	14.8	Southbound Right	A	3.3	A	4.9
Northbound Right	A	8.4	A	7.1	<b>4 - SR 347 and MARICOPA-CASA GRANDE HWY</b>					Southbound Thru-Right	-	-	-	-	SOUTHBOUND	A	4.6	B	12.4
NORTHBOUND	A	9.4	A	7.9	Eastbound Left-Thru	-	-	-	-	SOUTHBOUND	-	-	-	-	<b>INTERSECTION</b>	A	4.5	B	12.6
Southbound Left	A	6.9	A	3.8	Eastbound Right	-	-	-	-	<b>INTERSECTION</b>	-	-	-	-	<b>8 - SR 347 and EDISON RD</b>				
Southbound Thru	A	8.6	A	6.2	EASTBOUND	-	-	-	-	<b>6 - SR 347 and GARVEY RD</b>					Eastbound Left	E	56.1	D	43.3
Southbound Right	A	8.0	A	5.5	Westbound Left-Thru	C	25.9	C	24.7	Eastbound Left-Thru-Right	C	16.4	B	14.2	Eastbound Thru-Right	D	38.0	D	41.7
SOUTHBOUND	A	8.3	A	5.8	Westbound Right	C	25.6	C	22.5	EASTBOUND	C	16.4	B	14.2	EASTBOUND	D	46.1	D	42.2
<b>INTERSECTION</b>	B	10.8	A	8.5	WESTBOUND	C	25.8	C	23.6	Westbound Left-Thru	D	30.8	A	0.0	Westbound Left	D	35.3	D	38.7
<b>2 - SR 347 and HONEYCUTT AVE</b>					Northbound Left-Thru-Right	B	19.2	C	20.4	Westbound Right	B	12.5	B	11.2	Westbound Thru-Right	D	44.6	D	42.8
Eastbound Left	C	23.1	B	18.0	NORTHBOUND	B	19.2	C	20.4	WESTBOUND	B	14.6	B	11.2	WESTBOUND	D	43.2	D	42.1
Eastbound Right	B	10.8	B	12.7	Southbound Left	B	10.4	B	15.8	Northbound Left	B	10.5	B	14.7	Northbound Left	A	7.4	B	14.0
EASTBOUND	C	21.7	B	17.4	Southbound Thru-Right	A	6.6	B	14.6	Northbound Thru-Right	-	-	-	-	Northbound Thru	B	15.0	B	17.4
Northbound Left	A	8.8	A	6.5	SOUTHBOUND	A	7.6	B	14.8	NORTHBOUND	-	-	-	-	Northbound Right	B	11.9	B	12.3
Northbound Thru	A	9.6	A	6.2	<b>INTERSECTION</b>	B	17	B	18.2	Southbound Left	B	10.9	B	10.4	NORTHBOUND	B	13.9	B	16.7
NORTHBOUND	A	9.4	A	6.2						Southbound Thru-Right	-	-	-	-	Southbound Left	B	10.9	A	8.6
Southbound Thru-Right	B	13.9	B	12.5						SOUTHBOUND	-	-	-	-	Southbound Thru	B	14.0	B	18.4
SOUTHBOUND	B	13.9	B	12.5						<b>INTERSECTION</b>	-	-	-	-	Southbound Right	B	11.9	B	11.5
<b>INTERSECTION</b>	B	14.4	B	11.3											SOUTHBOUND	B	13.7	B	17.1
															<b>INTERSECTION</b>	C	21.4	C	20.9

**Table 2-8: Delay and Level-of-Service Summary for 2040 No Build Intersections**

MOVEMENT	2040 AM PEAK		2040 PM PEAK		MOVEMENT	2040 AM PEAK		2040 PM PEAK		MOVEMENT	2040 AM PEAK		2040 PM PEAK		MOVEMENT	2040 AM PEAK		2040 PM PEAK	
	LOS	DELAY	LOS	DELAY		LOS	DELAY	LOS	DELAY		LOS	DELAY	LOS	DELAY		LOS	DELAY	LOS	DELAY
<b>1 - SR 347 and ALTERRA PKWY</b>					<b>3 - SR 347 and EDWARDS AVE</b>					<b>5 - SR 347 and HONEYCUTT RD</b>					<b>7 - SR 347 and HATHAWAY AVE</b>				
Eastbound Left	C	26.5	D	38.0	Eastbound Left-Thru-Right	F	303.4	F	252.7	Eastbound Left-Thru-Right	F	> max	F	> max	Eastbound Left	C	26.1	D	54.8
Eastbound Thru-Right	B	12.5	B	17.2	EASTBOUND	F	303.4	F	252.7	EASTBOUND	F	> max	F	> max	Eastbound Right	C	24.7	C	27.6
EASTBOUND	C	25.6	D	37.2	Northbound Left	C	20.1	E	46.4	Westbound Left-Thru-Right	E	35.2	C	15.3	EASTBOUND	C	25.5	D	48.2
Westbound Left	B	12.5	B	17.4	Northbound Thru	-	-	-	-	WESTBOUND	E	35.2	C	15.3	Northbound Left	A	4.9	D	46.1
Westbound Thru-Right	B	13.0	B	17.7	NORTHBOUND	-	-	-	-	Northbound Left	C	18.5	F	289.2	Northbound Thru	A	9.5	B	17.1
WESTBOUND	B	13.0	B	17.7	Southbound Thru-Right	-	-	-	-	Northbound Thru-Right	-	-	-	-	NORTHBOUND	A	9.5	B	18.0
Northbound Left	B	11.7	A	8.7	SOUTHBOUND	-	-	-	-	NORTHBOUND	-	-	-	-	Southbound Thru	A	9.8	F	225.4
Northbound Thru	B	15.2	B	11.3	<b>INTERSECTION</b>	-	-	-	-	Southbound Left	F	154.9	B	407.9	Southbound Right	A	4.5	A	6.9
Northbound Right	B	12.2	A	9.2	<b>4 - SR 347 and MARICOPA-CASA GRANDE HWY</b>					Southbound Thru-Right	-	-	-	-	SOUTHBOUND	A	9.5	F	217.4
NORTHBOUND	B	15.1	B	11.3	Eastbound Left-Thru	-	-	-	-	SOUTHBOUND	-	-	-	-	<b>INTERSECTION</b>	A	9.9	F	136.5
Southbound Left	A	10.0	A	5.3	Eastbound Right	-	-	-	-	<b>INTERSECTION</b>	-	-	-	-	<b>8 - SR 347 and EDISON RD</b>				
Southbound Thru	B	12.7	A	8.4	EASTBOUND	-	-	-	-	<b>6 - SR 347 and GARVEY RD</b>					Eastbound Left	F	267.0	F	85.1
Southbound Right	B	11.2	A	6.8	Westbound Left-Thru	B	18.2	C	21.4	Eastbound Left-Thru-Right	C	21.0	F	> max	Eastbound Thru-Right	C	29.6	D	43.9
SOUTHBOUND	B	12.3	A	7.9	Westbound Right	F	97.5	B	19.8	EASTBOUND	C	21.0	F	> max	EASTBOUND	F	137.5	E	56.7
<b>INTERSECTION</b>	B	15.4	B	11.5	WESTBOUND	E	72.5	C	20.6	Westbound Left-Thru	F	120.3	A	0.0	Westbound Left	C	26.7	C	32.4
<b>2 - SR 347 and HONEYCUTT AVE</b>					Northbound Left-Thru-Right	F	423.1	F	480.0	Westbound Right	B	11.4	B	10.2	Westbound Thru-Right	D	46.3	D	44.2
Eastbound Left	F	160.0	D	35.7	NORTHBOUND	F	423.1	F	480.0	WESTBOUND	E	40.1	B	10.2	WESTBOUND	D	43.1	D	42.3
Eastbound Right	B	11.4	B	14.0	Southbound Left	F	328.3	F	135.1	Northbound Left	B	14.5	F	762.2	Northbound Left	D	35.5	C	20.4
EASTBOUND	F	140.2	C	33.3	Southbound Thru-Right	B	19.2	F	102.8	Northbound Thru-Right	-	-	-	-	Northbound Thru	F	149.7	F	354.5
Northbound Left	C	31.0	B	12.1	SOUTHBOUND	F	90.5	F	107.4	NORTHBOUND	-	-	-	-	Northbound Right	C	34.6	C	27.8
Northbound Thru	F	153.3	F	86.3	<b>INTERSECTION</b>	F	233.8	F	246.8	Southbound Left	C	16.1	C	15	NORTHBOUND	F	130.9	F	287.4
NORTHBOUND	F	139.7	F	84.2						Southbound Thru-Right	-	-	-	-	Southbound Left	C	25.7	C	26.8
Southbound Thru-Right	C	22.1	F	184.3						SOUTHBOUND	-	-	-	-	Southbound Thru	D	36.6	F	443.9
SOUTHBOUND	C	22.1	F	184.3						<b>INTERSECTION</b>	-	-	-	-	Southbound Right	C	24.6	C	24.7
<b>INTERSECTION</b>	F	114.8	F	120.4											SOUTHBOUND	D	35.5	F	384
															<b>INTERSECTION</b>	F	95	F	301.1

### 3.0 Design Concept Alternatives

#### 3.1 Introduction

Ten conceptual alignment alternatives and one “no build” alternative were considered to address the purpose and need identified for this study. These conceptual alignments were screened based upon a set of qualitative evaluation criteria, developed during the scoping process, to identify three candidate alignments to be considered in greater detail in this DCR. This section discusses the process used to select candidate alignments and identify a recommended alternative. All of the conceptual alignments were developed utilizing a grade separated crossing of SR 347 over the UPRR tracks. Preliminary analysis showed that alignment alternatives with an at-grade crossing of the UPRR tracks did nothing to alleviate the train related delays (refer to Section 2.4.3) and therefore did not address the purpose and need identified with this study. Additional at-grade crossings would not be permitted/endorsed by UPRR and the Arizona Corporation Commission (ACC).

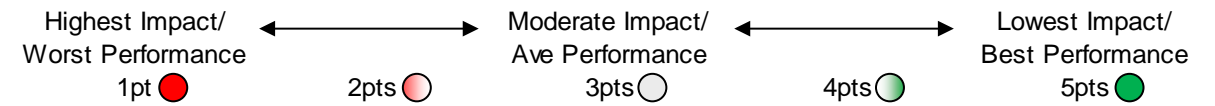
#### 3.2 Design Concept Alternatives Considered and Discontinued

The design team developed ten conceptual alignment alternatives to provide a grade separated crossing of SR 347 over the UPRR tracks (see Figure 3-1). These alignments included modified versions of three alternatives recommended by the 2007 Feasibility Study referenced in Section 1.2.

The conceptual alignments were screened using a series of qualitative evaluation criteria created in response to the issues, concerns and opportunities identified during the agency and public scoping meetings. The evaluation criteria developed are as follows:

- Maintenance of Traffic/Constructability – Evaluates impacts to traffic during construction, and the degree of complication in design construction.
- Minimum Design Speed - Evaluates the design speed of City roadways.
- Drainage/Floodplain Impacts – Evaluates impacts to the existing drainage conditions.
- Cultural Resources – Evaluates impacts to documented historical/archaeological sites.
- Physical and Natural Resources – Evaluates the potential impacts to protected wildlife species, water and air quality issues, and hazardous materials sites, etc.
- Lane Miles/Future Maintenance – Evaluates the total number of lanes miles which will require future roadway maintenance.
- Section 4(f) Resources –Evaluates impacts to 4(f) resources within the study area.
- Right-of-Way – Measures the anticipated right-of-way required.
- Utility Conflicts – Considers impacts to existing utilities
- Residential/Commercial Impacts –Evaluates possible impacts to existing residential and commercial properties (i.e. right-of-way, existing structures, noise impacts, access, etc.)
- Traffic Operations – Evaluates compatibility with future traffic conditions.
- Multi-Modal Transportation – Evaluates ability to accommodate pedestrians and bicyclists.
- Construction Cost Estimate – Evaluates the relative construction cost of each alternative.

Design alternatives were evaluated using one of five rankings based upon the perceived response to each evaluation criteria question. These rankings were used to screen the initial alternatives to determine which alternatives should be candidates for further study. The ranking levels are as follows:



**Table 3-1** summarizes the results of the qualitative screening of the conceptual alignment alternatives.

**Table 3-1: Results of Qualitative Analysis**

Evaluation Criteria	Alignment Alternatives									
	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F2	Alt F3	Alt F5	Alt G	Alt H
Maintenance of Traffic/Constructability	4	1	3	3	2	2	2	2	1	3
Minimum Design Speed (Other Arterials)	5	5	3	3	5	5	3	4	5	3
Drainage/Floodplain Impacts	3	3	3	3	3	3	3	2	3	3
Cultural Resources	5	5	5	5	5	5	5	5	5	5
Physical and Natural Resources	3	3	3	3	3	3	3	3	3	3
Lane Miles/Future Maintenance	3	3	3	3	4	4	4	3	2	3
Section 4(f) Resources	5	4	5	5	5	5	5	5	5	5
Right-of-Way	3	3	3	3	4	4	4	3	1	4
Utility Conflicts	2	1	3	3	3	3	3	3	3	3
Residential/Commercial Impacts	1	1	2	2	2	4	1	3	1	4
Traffic Operations	3	3	2	1	2	2	3	4	1	4
Multi-Modal Transportation	3	3	4	4	3	3	3	2	2	4
Preliminary Cost Estimate	3	2	3	3	3	4	3	3	1	3
<b>Total Score</b>	<b>43</b>	<b>37</b>	<b>42</b>	<b>41</b>	<b>44</b>	<b>47</b>	<b>42</b>	<b>42</b>	<b>33</b>	<b>47</b>

Alignments E, F2, and H were identified as candidate alternatives to be studied in greater detail. These three alternatives were presented to, and well received by City staff, members of the Ak-Chin Indian Community and the public at information meetings held in March – June of 2013. The following sub-sections describe the alternatives that were considered, but eliminated from further consideration



### 3.2.1 Alternative A

Alternative A was developed to provide an at-grade intersection of MCGH and SR 347, minimize impacts to traffic during construction, provide good intersection spacing, and meet minimum design speeds for SR 347, MCGH, and Honeycutt Road. In addition, Alternative A minimizes impacts to businesses south of the UPRR tracks. However, this alternative was eliminated from further consideration due to utility impacts as well as the large number of affected residential parcels and commercial business.

### 3.2.2 Alternative B

Alternative B was developed to provide an at-grade intersection of MCGH and SR 347, provide good intersection spacing, and meet minimum design speeds for SR 347, MCGH, and Honeycutt Road. In addition, Alternative B provides a more perpendicular crossing of the UPRR tracks, and more desirable horizontal and vertical geometry. However, this alternative was eliminated from further consideration due to impacts to the Maricopa High School athletic fields, a large number of residential/commercial parcel impacts, constructability issues and utility impacts.

### 3.2.3 Alternative C

Alternative C was developed to provide an at-grade intersection of MCGH and SR 347, and to provide arterial access to Garvey Avenue. In addition, Alternative C provides a more perpendicular crossing of the UPRR tracks. However, this alternative was eliminated from further consideration due to the large number of residential and commercial business impacts, and poor traffic operations.

### 3.2.4 Alternative D

Alternative D was developed to provide an at-grade intersection of MCGH and SR 347, and provide arterial access to existing businesses. In addition, Alternative D minimizes impacts to businesses south of the UPRR tracks. However, this alternative was eliminated from further consideration due to the large number of residential and commercial business impacts, and poor traffic operations.

### 3.2.5 Alternative F3

Alternative F3 is a modified version of Option 3 from the 2007 Feasibility Study. It was developed to provide an at-grade intersection of MCGH and SR 347 with reasonable intersection spacing and a more perpendicular crossing of the UPRR tracks. This alternative was eliminated from further consideration due to the large number of residential and commercial business impacts and impacts to traffic during construction requiring significant traffic control.

### 3.2.6 Alternative F5

Alternative F5 is a modified version of Option 5 from the 2007 Feasibility Study. Alternative F5 was developed to provide an at-grade intersection of MCGH and SR 347 south of the UPRR, and provides good east-west continuity with West Edwards Avenue. In addition, Alternative F5 minimizes impacts to businesses south of the UPRR tracks. However, this alternative was eliminated from further consideration due to floodplain impacts, impacts to traffic during construction requiring significant

traffic control, and due to poor ability to allow for multi-modal transportation. This alternative would also require a second MCGH bridge over the UPRR tracks to accommodate projected traffic volumes.

### 3.2.7 Alternative G

Alternative G incorporates a Single Point Urban Interchange (SPUI) for the connection of SR 347 and MCGH. It was developed to provide an at-grade intersection of MCGH and SR 347, and provide arterial access to existing businesses. In addition, Alternative F3 minimizes impacts to businesses south of the UPRR tracks. However, this alternative was eliminated from further consideration due to the large number of residential and commercial business impacts, poor traffic operations, large right-of-way requirements, impacts to traffic during construction requiring significant traffic control, poor ability to allow for multi-modal transportation, and high construction cost.

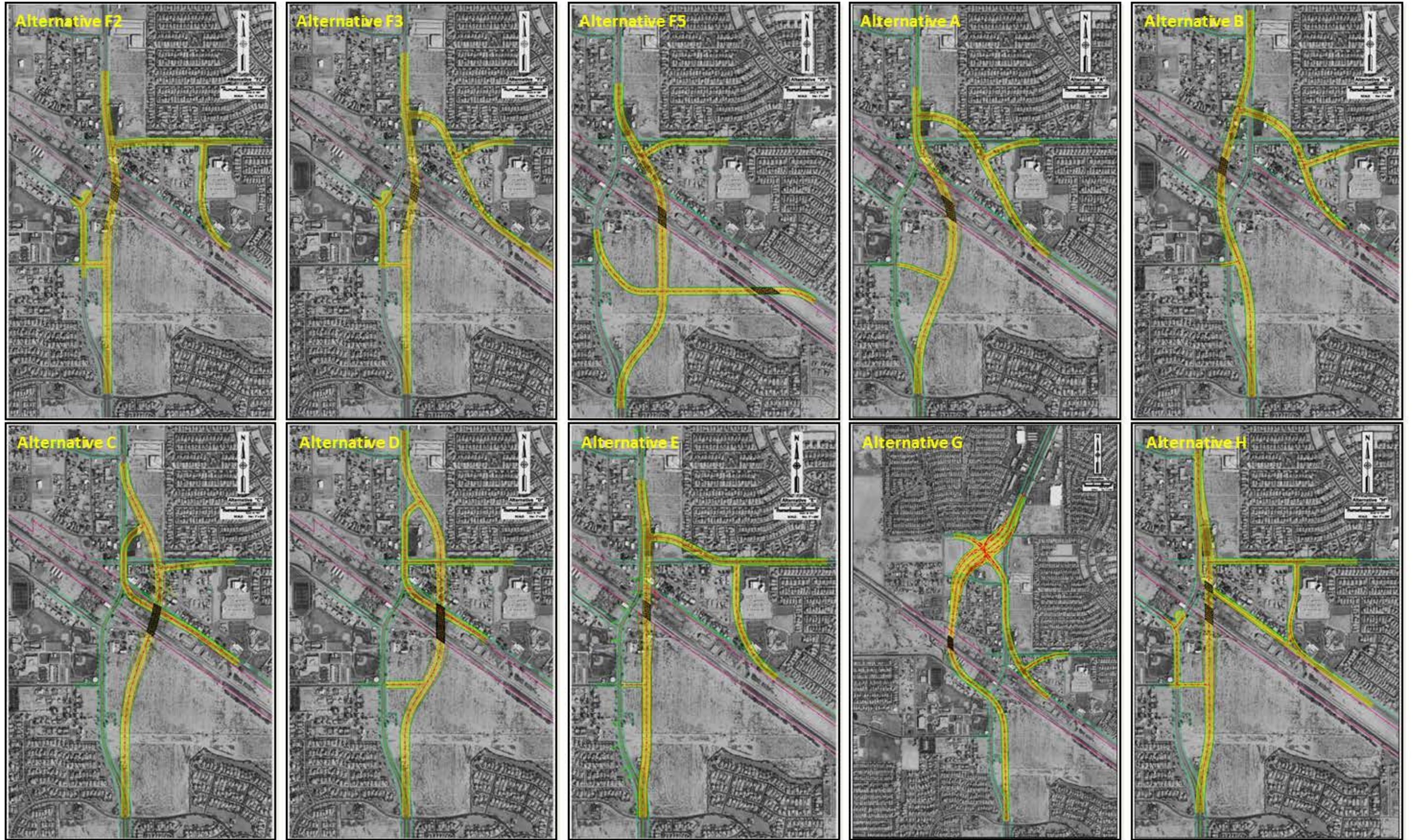


Figure 3-1: Conceptual Alignment Alternatives Considered

### 3.3 Design Concept Alternatives Studied in Detail

#### 3.3.1 No-Build Alternative

The No-Build Alternative proposes no improvements to the existing roadways and is included as a baseline reference to answer the question. “Should anything be constructed at this location?” The No-Build Alternative avoids direct impacts to the environment and community, and by definition has zero costs.

The No-Build Alternative does not address the purpose and need identified with this study and is not the recommended alternative. Current models project that traffic operations through the study area will fail on SR 347 in the 2040 design year.

- Six of the seven modeled intersections will have intersection levels LOS F during peak traffic hours.
- Traffic analysis yielded a LOS “F” for numerous individual turning movements and approaches.
- Does not address train related delays (refer to section 2.4.3).

#### 3.3.2 Alternative E

Alternative E was developed to create a new Honeycutt Road/SR 347 intersection aligned with Garvey Avenue at an elevation relatively close to existing ground. A layout drawing of Alternative E is shown in **Figure 3-2**. Like all three of the candidate alignments, Alternative E Shifts SR 347 to the east of its current location through much of the study area. This is done to maintain traffic on SR 347 during bridge construction.

Maricopa-Casa Grande Highway (MCGH) is also redirected into a new intersection with Honeycutt Road located approximately 1500 feet east of SR 347. West of this intersection, Honeycutt Road is shifted northward to the Garvey Avenue alignment. This shift to the north separates the Honeycutt Road intersection from the UPRR overpass bridge resulting in an SR 347 intersection that is close to existing ground. Alternative E meets minimum design speeds for SR 347, MCGH, and Honeycutt Road.

Within the project limits the proposed roadways are approximately 8.4 lane miles. Alternative E meets a 45 mph design speed for MCGH and Honeycutt Road. New right-of-way required for Alternative E is 30.4 acres.

Alternative E requires significant traffic control including the north and south terminus of the proposed SR 347 alignment, and at the eastern construction terminus of both MCGH and Honeycutt Road. In addition, traffic control will be required on SR 347 from just north of the UPRR tracks to Garvey Avenue. This is required due to the grade differences between and the close proximity of the proposed SR 347 alignment and existing SR 347.

Preliminary evaluation of the project area indicates that the habitat is suitable for burrowing owls. Properties with a high risk potential for hazardous materials which are impacted by Alternative E or in close vicinity of this alternative include: the NAPA Auto Parts and Repair facility, an above ground

storage tank on the Maricopa Unified School District Transportation property, the area within the UPRR right-of-way, the fire department, and a few gas stations.

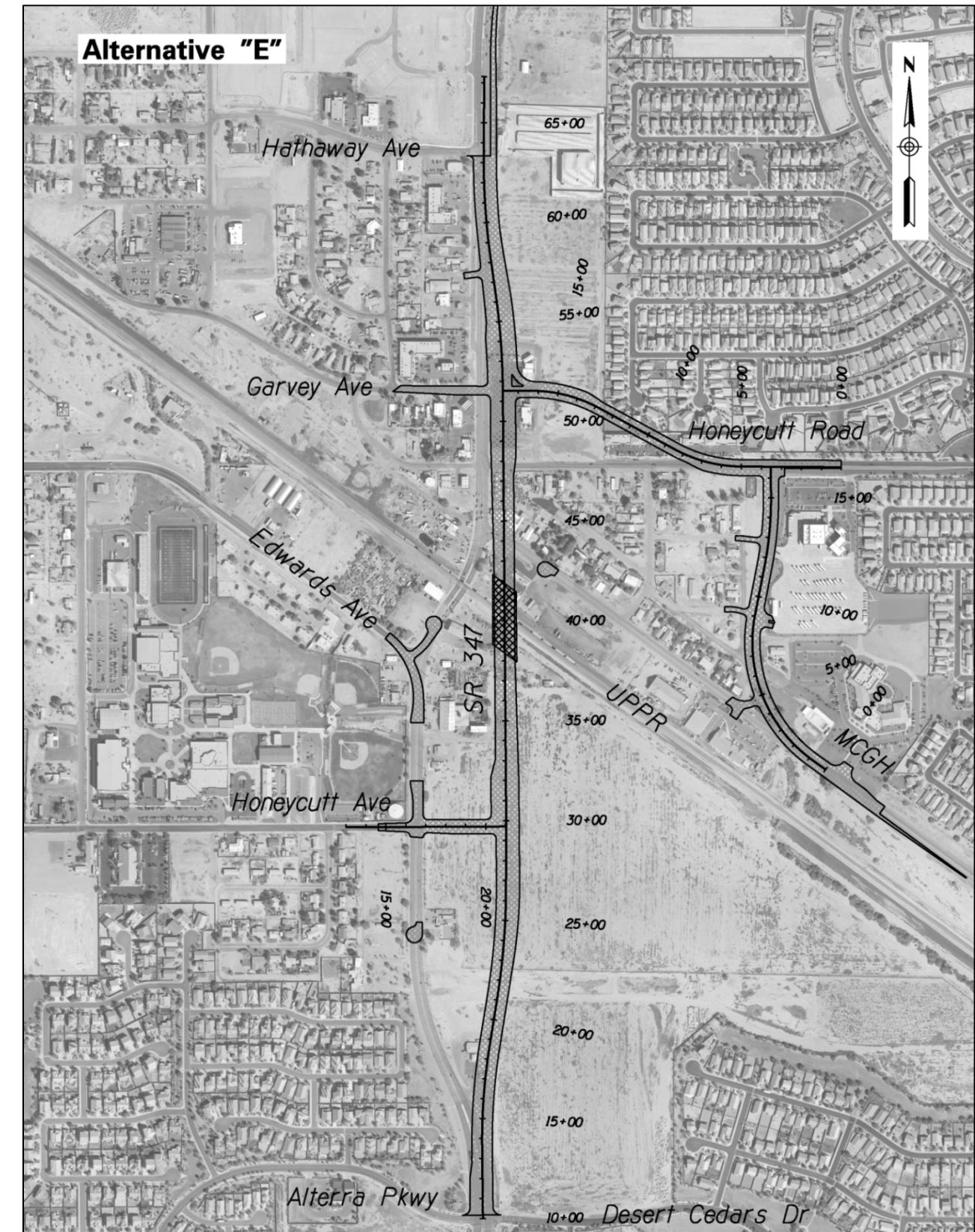


Figure 3-2: Alignment Alternative E

Alternative E requires one (1) crossing of existing floodplains, avoids impacts to any documented historical and/or archaeological sites. There are no impacts to 4(f) properties.

This alternative will require relocation of existing 69kV and 12kV overhead power lines. Alternative E impacts 5 residential properties and 16 commercial properties.

This alternative combines Honeycutt Road and Maricopa-Casa Grande Highway into one intersection, which reduces conflicts and congestion on SR 347. It also provides a separate intersection to the east between Maricopa-Casa Grande Highway and Honeycutt Road. However, it requires the large evening peak hour traffic volume from southbound SR 347 to south-eastbound MCGH to negotiate two left-turns.

The SR 347 proposed roadway typical section has a 17-foot shared use lane which can accommodate bicycle traffic. In addition, roadway profiles are designed to meet ADA requirements for sidewalks.

The estimated design and construction cost for this alternative is \$57.7 million.

### 3.3.3 Alternative F2

Alternative F2 is a modified version of Option 2 from the 2007 Feasibility Study. Alternative F2 was developed with the intent to create an intersection of Honeycutt Rd and SR 347 with minimal impacts to existing residential properties/subdivisions. The proposed Honeycutt Road/SR 347 intersection is approximately 9.5' above existing ground. A layout drawing of Alternative F2 is shown in **Figure 3-3**. Like Alternative E, SR 347 is also shifted to the east and a new intersection between MCGH and Honeycutt Road is created approximately 1500 feet east of SR 347. Unlike Alternative E, Honeycutt Road essentially remains on its current alignment. Alternative F2 also meets minimum design speeds for SR 347, MCGH, and Honeycutt Road. Within the project limits the proposed roadways are approximately 8.5 lane miles. New right-of-way required for Alternative F2 is 29.3 acres.

Alternative F2 requires significant traffic control. Traffic control is required at the north and south terminus of the proposed SR 347 alignment, and at the eastern construction terminus of both MCGH and Honeycutt Road. Traffic control will be required along Honeycutt Road as the profile will be reconstructed in conjunction with the proposed SR 347 profile. In addition, traffic control will be required on SR 347 from just north of the UPRR tracks to Garvey Avenue. This is required due to the grade differences between and the close proximity of the proposed SR 347 alignment and existing SR 347.

Preliminary evaluation of the project area indicates that the habitat is suitable for burrowing owls. Properties with a high risk potential for hazardous materials which are impacted by Alternative F2 or in close vicinity of this alternative include: the NAPA Auto Parts and Repair facility, an above ground storage tank on the Maricopa Unified School District Transportation property, the area within the UPRR right-of-way, the fire department, and a few gas stations.

Alternative F2 requires one (1) crossing of the existing floodplains, avoids impacts to any documented historical and/or archaeological sites. There are no impacts to 4(f) properties with this alternative.

This alternative will require relocation of existing 69kV and 12kV overhead power lines. Alternative F2 impacts 2 residential properties and 13 commercial properties.

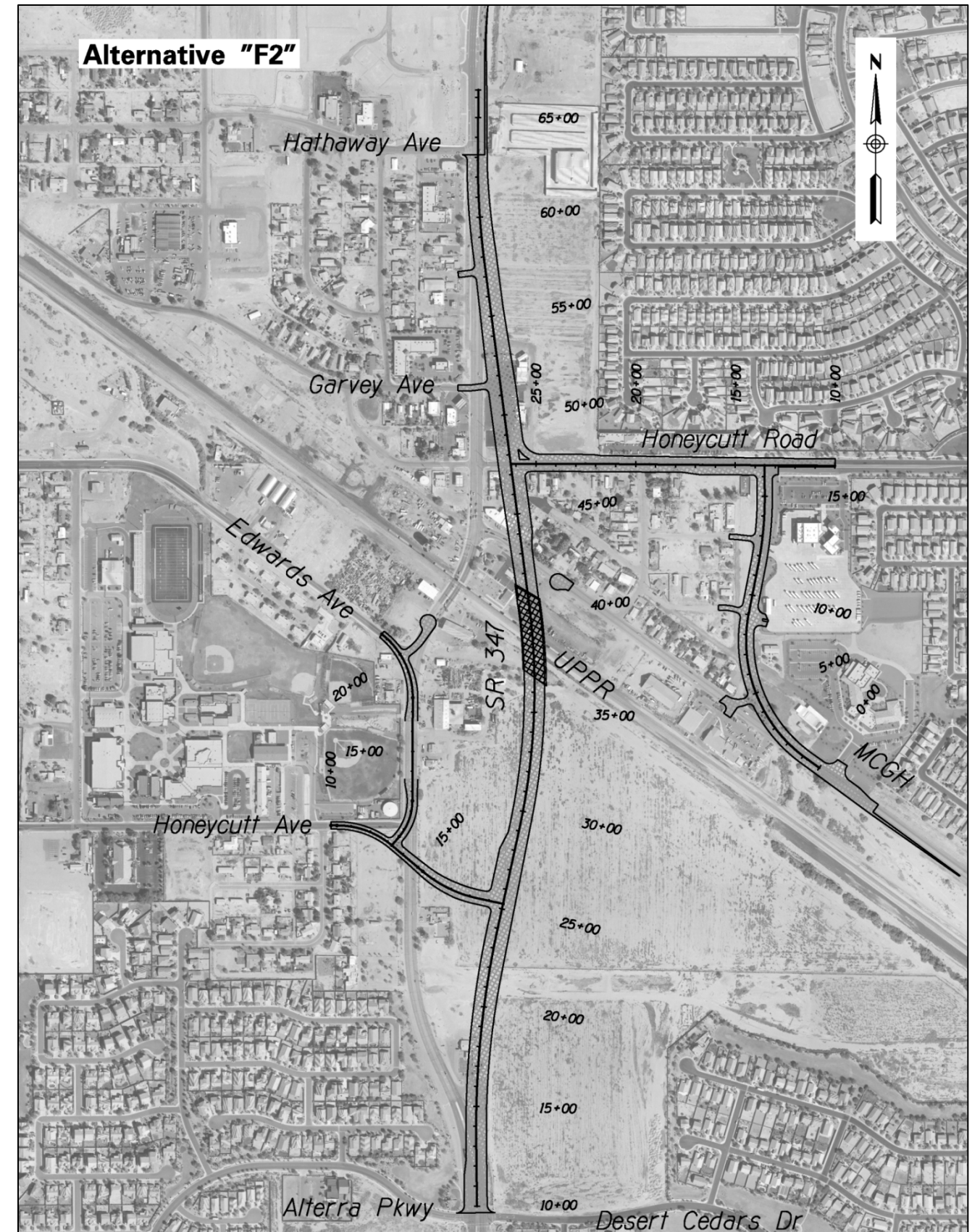


Figure 3-3: Alignment Alternative F2

This alternative combines Honeycutt Road and Maricopa-Casa Grande Highway into one intersection, which reduces conflicts and congestion on SR 347. It also provides a separate intersection to the east between Maricopa-Casa Grande Highway and Honeycutt Road. However, it also requires the large evening peak hour traffic volume from southbound SR 347 to south-eastbound MCGH to negotiate two left-turns.

The SR 347 proposed roadway typical section with a 17-foot shared use lane which can accommodate bicycle traffic. In addition, roadway profiles are designed to meet ADA requirements for sidewalks.

The estimated design and construction cost for this alternative is \$51.6 million.

### 3.3.4 Alternative H

Alternative H was developed to create an intersection of Honeycutt Road and SR 347 with minimal impacts to existing residential properties/subdivisions, and to create a separate southbound SR 347 to eastbound MCGH connection to better accommodate future traffic demands and local business access. The proposed Honeycutt Road/SR 347 intersection is approximately 9.5' above existing ground. The geometrics for this alternative are virtually identical to those of Alternative F2 with the exception of a two lane connector roadway that allows southbound SR 347 traffic to exit, pass beneath the new UPRR grade separation bridge, and merge directly onto eastbound MCGH. Alternative H also meets minimum design speeds for SR 347, MCGH, and Honeycutt Road. A layout drawing of Alternative H is included in **Figure 3-4**.

Within the project limits the proposed roadways are approximately 10.5 lane miles. Alternative H meets a 40 mph design speed for MCGH (westbound) and 35 mph (eastbound). Honeycutt Road meets a 45 mph design speed. New right-of-way required for Alternative H is 31.2 acres.

Alternative H requires traffic control at the north and south terminus of the proposed SR 347 alignment, and at the eastern construction terminus of both MCGH and Honeycutt Road. Traffic control will be required along Honeycutt Road as the profile will be reconstructed in conjunction with the proposed SR 347 profile. In addition, minor traffic control will be required on SR 347 from MCGH to Garvey Avenue for the construction of the eastbound MCGH connection.

Preliminary evaluation of the project area indicates that the habitat is suitable for burrowing owls. Properties with a high risk potential for hazardous materials which are impacted by Alternative H or in close vicinity of this alternative include: the NAPA Auto Parts and Repair facility, an above ground storage tank on the Maricopa Unified School District Transportation property, the area within the UPRR right-of-way, and the fire department.

Alternative H requires one (1) crossing of the existing floodplains, avoids impacts to any documented historical and/or archaeological sites. There are no impacts to 4(f) properties with this alternative.

This alternative will require relocation of existing 69kV and 12kV overhead power lines. Alternative H impacts 3 residential properties and 12 commercial properties.

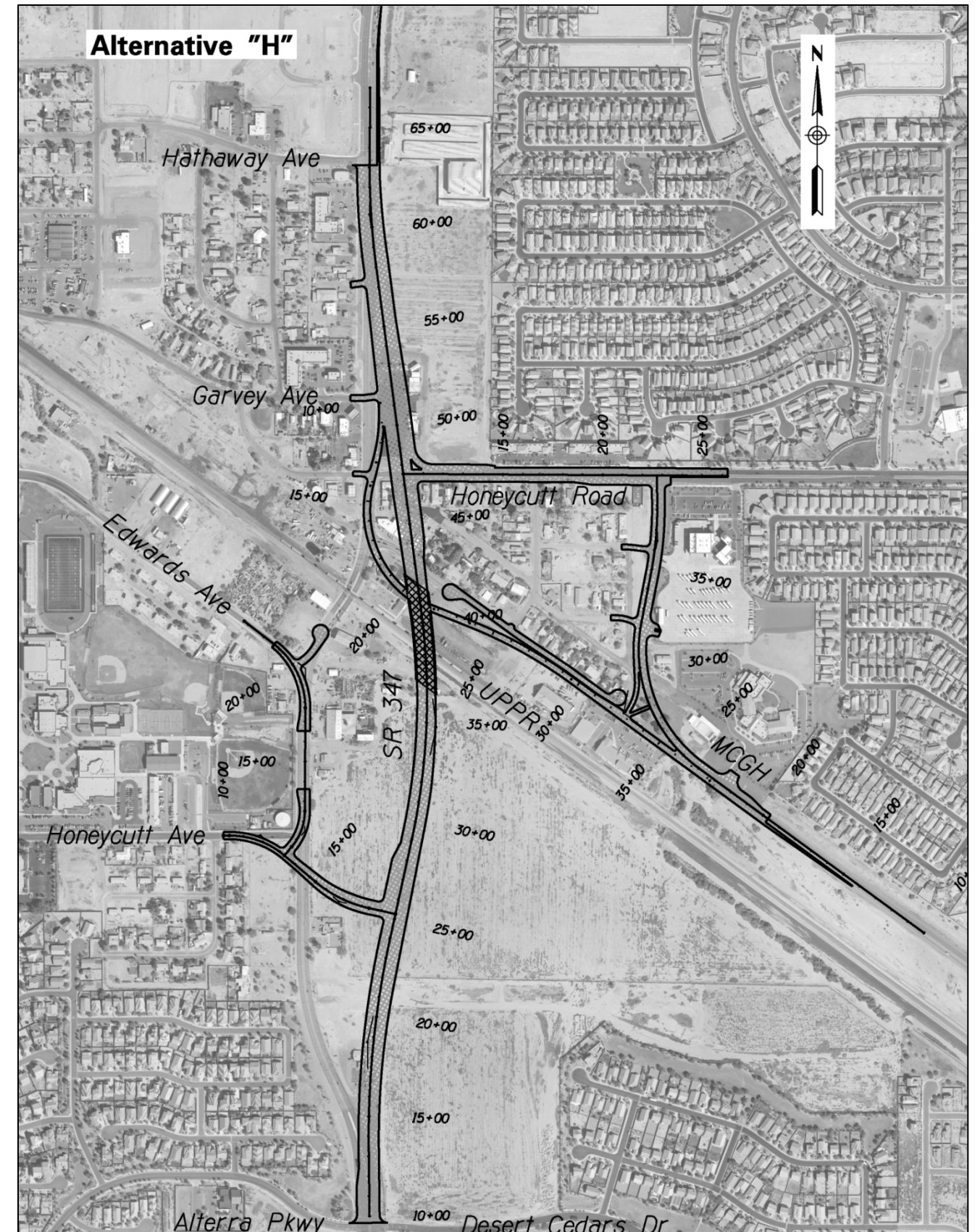


Figure 3-4: Alignment Alternative H

This alternative combines Honeycutt Road and Maricopa-Casa Grande Highway into one intersection with SR 347, which reduces conflicts and congestion on SR 347. It also removes the large evening peak hour left-turn traffic volume from southbound SR 347 to south-eastbound MCGH by providing a right-turn for this movement. This alternative also allows traffic between Maricopa-Casa Grande Highway and Honeycutt Road to avoid travel on SR 347. While it creates a left-turn for northbound Maricopa-Casa Grande Highway to northbound SR 347 at Honeycutt Road, it provides a separate channelized right-turn lane to complete access to northbound SR 347.

The SR 347 proposed roadway typical section with a 17-foot shared use lane which can accommodate bicycle traffic. In addition, roadway profiles are designed to meet ADA requirements for sidewalks. Alternative H allows for good bicycle/pedestrian connectivity with existing businesses and homes.

The estimated design and construction cost for this alternative is \$54.9 million.

### 3.4 Evaluation of Alternatives

The alternatives were analyzed based on several key factors including project cost, future maintenance, new right-of-way requirements, roadway features, level of service, maintenance of traffic, and environmental & socio-economic impacts.

The Alternatives Evaluation Matrix (**Table 3-2**) compares the alternatives with respect to each criterion. All three alternatives were similar with respect to impacts to the biological and cultural resources, noise and visual impacts, drainage and floodplain impacts, and construction costs.

While all three of the candidate alternatives require a similar quantity of right-of-way acres, Alternative E impacts more structures including three office buildings with over 25 commercial tenants and four homes within the master planned community of Rancho El Dorado. As such, the community impacts of Alternative E were considered more severe than the other candidate alternatives.

Alternative H had the most favorable traffic operations of the three candidate alternatives. Alternatives E and F2 had failing levels of service (i.e. excessive intersection delay) at the proposed Honeycutt Road/SR 347 intersection. Alternative H is the only candidate alternative with acceptable levels of service for all intersections within the study area.

### 3.5 Recommendations

Based upon the analysis summarized in the Evaluation Matrix, Alignment Alternative H is considered most favorable for the new SR 347 railroad crossing and is the Recommended Alternative.

**Table 3-2: Alternatives Evaluation Matrix**

ALTERNATIVES	Environmental Impacts	Community Impacts			
	PHYSICAL & NATURAL RESOURCE IMPACTS	TOTAL NEW RIGHT-OF-WAY	RESIDENTIAL STRUCTURES	COMMERCIAL / PUBLIC STRUCTURES	NOISE/VISUAL IMPACTS
<b>Alternative E</b>	<ul style="list-style-type: none"> <li>No critical habitat or impact to sensitive species in study area</li> <li>No cultural resources adversely affected by alignment</li> <li>No use of resources afforded protection under Section 4(f)</li> <li>Alignment would result in improved traffic operations resulting in an overall improvement in localized air quality</li> <li>There are no washes within the proposed project that would be considered potential Waters of the U.S.</li> </ul>	30.4 ACRES	5	16	<ul style="list-style-type: none"> <li>Based on the initial noise modeling, the anticipated noise levels associated with this alignment alternative are not anticipated to meet the ADOT noise abatement thresholds</li> <li>The visual character of the study area is predominantly urban with undeveloped fields visible to the center of the study area. The visual resources and potential effects will be addressed in further detail in the environmental document.</li> </ul>
<b>Alternative F2</b>	<ul style="list-style-type: none"> <li>No critical habitat or impact to sensitive species in study area</li> <li>No cultural resources adversely affected by alignment</li> <li>No use of resources afforded protection under Section 4(f)</li> <li>Alignment would result in improved traffic operations resulting in an overall improvement in localized air quality</li> <li>There are no washes within the proposed project that would be considered potential Waters of the U.S.</li> </ul>	29.3 ACRES	2	13	<ul style="list-style-type: none"> <li>Based on the initial noise modeling, the anticipated noise levels associated with this alignment alternative are not anticipated to meet the ADOT noise abatement thresholds</li> <li>The visual character of the study area is predominantly urban with undeveloped fields visible to the center of the study area. The visual resources and potential effects will be addressed in further detail in the environmental document.</li> </ul>
<b>Alternative H</b>	<ul style="list-style-type: none"> <li>No critical habitat or impact to sensitive species in study area</li> <li>No cultural resources adversely affected by alignment</li> <li>No use of resources afforded protection under Section 4(f)</li> <li>Alignment would result in improved traffic operations resulting in an overall improvement in localized air quality</li> <li>There are no washes within the proposed project that would be considered potential Waters of the U.S.</li> </ul>	31.2 ACRES	4	11	<ul style="list-style-type: none"> <li>Based on the initial noise modeling, the anticipated noise levels associated with this alignment alternative are not anticipated to meet the ADOT noise abatement thresholds</li> <li>The visual character of the study area is predominantly urban with undeveloped fields visible to the center of the study area. The visual resources and potential effects will be addressed in further detail in the environmental document.</li> </ul>
<b>No Build</b>	No new impacts	0 ACRES	0	0	No new impacts.

Table 3-2 (Continued)

ALTERNATIVES	Construction Costs	Engineering Criteria							
	CONSTRUCTION COST (2013 DOLLARS)	TRAFFIC OPERATIONS 2040 Level of Service		DRAINAGE/FLOODPLAIN IMPACTS	ACCESS	MAINTENANCE OF TRAFFIC/ CONSTRUCTABILITY	ROADWAY FEATURES	STRUCTURES	
		AM	PM						
<b>Alternative E</b>	\$57.7M	Honeycutt Rd/SR 347 Realigned MCGH /Honeycutt Rd Honeycutt Ave/SR 347	F B D	F C D	<ul style="list-style-type: none"> <li>Impacts floodplains north and south of UPRR tracks.</li> <li>Requires additional retention areas beyond roadway R/W.</li> <li>Requires new storm drain system.</li> </ul>	<ul style="list-style-type: none"> <li>Very limited to no access for businesses on existing SR 347 south of Garvey Ave.</li> <li>Side street access only for businesses south of MCGH west of realigned MCGH.</li> <li>SR 347 is median access controlled.</li> <li>Limited access to business southwest of Honeycutt Ave.</li> </ul>	<ul style="list-style-type: none"> <li>Provides for reasonable traffic maintenance on SR 347. Some lane restrictions south of Honeycutt Rd likely.</li> <li>Will require reroute of MCGH traffic to Honeycutt Rd.</li> </ul>	<ul style="list-style-type: none"> <li>The SR 347/ Honeycutt Rd intersection is 2.0' above existing ground.</li> <li>0.8% downhill NB approach grade to Honeycutt Rd Intersection.</li> <li>Indirect connection to MCGH from SR 347.</li> <li>Direct Connection to Garvey Ave.</li> </ul>	<ul style="list-style-type: none"> <li>Requires 370' long 32.5' high bridge over UPRR tracks.</li> </ul>
<b>Alternative F2</b>	\$51.6M	Honeycutt Rd/SR 347 Realigned MCGH /Honeycutt Rd Honeycutt Ave/SR 347	E B D	F C D	<ul style="list-style-type: none"> <li>Impacts floodplains north and south of UPRR tracks.</li> <li>Requires additional retention areas beyond roadway R/W.</li> <li>Requires new storm drain system.</li> </ul>	<ul style="list-style-type: none"> <li>Very limited to no access for businesses on existing SR 347 south of Garvey Ave.</li> <li>Side street access only for businesses south of MCGH west of realigned MCGH.</li> <li>SR 347 is median access controlled</li> </ul>	<ul style="list-style-type: none"> <li>Provides for good traffic maintenance on SR 347.</li> <li>Will require reroute of Honeycutt Rd traffic to MCGH and vice versa.</li> </ul>	<ul style="list-style-type: none"> <li>The SR 347/ Honeycutt Rd intersection is 9.5' above existing ground.</li> <li>3% downhill NB approach grade to Honeycutt Rd Intersection.</li> <li>Indirect connection to MCGH from SR 347.</li> <li>Slightly skewed SR 347/Honeycutt Rd Intersection</li> </ul>	<ul style="list-style-type: none"> <li>Requires 385' long 33.5' high bridge over tracks.</li> </ul>
<b>Alternative H</b>	\$54.9M	Honeycutt Rd/SR 347 Realigned MCGH /Honeycutt Rd Honeycutt Ave/SR 347	C B D	C B D	<ul style="list-style-type: none"> <li>Impacts floodplains north and south of UPRR tracks.</li> <li>Requires additional retention areas beyond roadway R/W.</li> <li>Requires new storm drain system.</li> </ul>	<ul style="list-style-type: none"> <li>One way access for businesses on existing SR 347 south of Garvey Ave.</li> <li>One way access for the industrial business on MCGH.</li> <li>SR 347 is median access controlled</li> </ul>	<ul style="list-style-type: none"> <li>Provides for good traffic maintenance on SR 347.</li> <li>Will require reroute of Honeycutt Rd traffic to MCGH and vice versa.</li> </ul>	<ul style="list-style-type: none"> <li>The SR 347/ Honeycutt Rd intersection is 9.5' above existing ground.</li> <li>3% downhill NB approach grade to Honeycutt Rd Intersection.</li> <li>Includes a one-way road.</li> <li>Slightly skewed SR 347/Honeycutt Rd Intersection</li> </ul>	<ul style="list-style-type: none"> <li>Requires 494' long 33.5' high bridge over UPRR tracks and Connector Rd.</li> </ul>
<b>No Build</b>	\$0	Honeycutt Rd/SR 347 MCGH /SR 347 Honeycutt Ave/SR 347	F F F	F F F	<ul style="list-style-type: none"> <li>No new impacts</li> </ul>	<ul style="list-style-type: none"> <li>No SR 347 access control.</li> </ul>	N/A	<ul style="list-style-type: none"> <li>Very close arterial intersection proximity</li> <li>Sharply skewed MCGH/SR 347 intersection</li> <li>Tight horizontal curves on SR 347</li> <li>At-grade railroad crossing</li> <li>Close intersection proximity to UPRR tracks.</li> </ul>	N/A

## 4.0 Major Design Features of the Recommended Alternative

### 4.1 Design Controls

**Table 4-1** contains the Design Controls that were used in the development of the Recommended Alternative. The proposed roadways will be designed to meet current ADOT and AASHTO design criteria.

**Table 4-1: Design Controls**

Description	Desirable Design Control(s)	Source
<b>Design Year</b>	2040	Scoping Document
<b>Pavement Design Life</b>	20 years	Scoping Document
<b>Roadway Classification</b>		
SR 347	Minor Arterial	ADOT Functional Classification Maps (Pinal County Map)
MCGH	Urban Principal Arterial	City of Maricopa Classification
Honeycutt Road	Principal Arterial	City of Maricopa Classification
Local Streets	Per COMRTP	COMRTP
Connector Road	Custom	Design Parameters Report
<b>Terrain</b>		
SR 347/Local Streets	Level	
<b>Design Speed</b>		
SR 347	50 mph	ADOT RDG Table 101.3
MCGH	45 mph	COMRTP Table 10.1
Honeycutt Road	45 mph	COMRTP Table 10.1
Local Streets	30 mph	COMRTP Table 10.1
Connector Road	40 mph	Design Parameters Report
<b>Roadway Typical Section</b>		
SR 347	UA: 6-Lane with Curbed Median	ADOT RDG Fig. 306.4 UA (modified to a 6-lane facility)
MCGH	Minor Arterial	COMRTP Figure 8.10
Honeycutt Road	Minor Arterial	COMRTP Figure 8.10
<b>Roadway Right-of-way</b>		
SR 347	180 feet (Desirable), 120 feet (Minimum)	ADOT RDG Fig. 306.4 UA (modified to a 6-lane facility)
MCGH	110 feet	COMRTP
Honeycutt Road	110 feet	COMRTP
Local Streets	80 feet	COMRTP
Connector Road	Varies	Custom
<b>Access Control</b>	No Full Access Control (Opportunities for combining driveways will be evaluated)	
<b>Median</b>		
SR 347	16 feet	ADOT RDG Fig. 306.4 UA
MCGH	14 feet	COMRTP Figure 8.10
Honeycutt Rd	12 feet	Matches existing roadway section
<b>Design Vehicle</b>	WB-62	ADOT RDG Table 407.2
<b>Horizontal Alignment</b>		
Control Location	Roadway Centerline	ADOT RDG Fig. 306.2 & Fig. 306.3 ADOT RDG Section 203.1
Stopping Sight Distance	Dependent on Grade and Design Speed	ADOT RDG Fig. 201.2
<b>Degree of Curvature</b>		
<b>Max. Degree of Curvature</b>		
SR 347	6 degrees, 11 minutes	ADOT RDG Table 202.3A
MCGH/Honeycutt Rd	8 degrees, 04 minutes	ADOT RDG Table 202.3A

Connector Road	10 degrees, 45 minutes	AASHTO Table 3-13b ADOT RDG Table 202.3A AASHTO Table 3-13b
<b>Min. Degree of Curvature</b>	0 degrees, 15 minutes	ADOT RDG Section 203.2
<b>Minimum Horizontal Curve Length</b>	500 feet for central angle of 5 degrees, increase 100 feet for each 1 degree decrease in central angle. 300ft for low speed connector road.	ADOT RDG Section 203.5
<b>Superelevation</b>		
SR 347	0.04 ft/ft	ADOT RDG Table 202.3A
<b>Superelevation Runoff</b>	Dependent on Horizontal Curve Radius and Design Speed	ADOT RDG 202.3A
<b>Vertical Alignment</b>		
Control Location	Roadway Centerline	ADOT RDG Fig. 306.2 ADOT RDG Section 204.2
<b>Maximum Gradient</b>		
SR 347	6%	ADOT RDG Table 204.3
MCGH/Honeycutt Rd	5%	AASHTO Table 7-2
Connector Road	5%	AASHTO Table 7-2
<b>Minimum Gradient</b>	0.40% (Curb & Gutter Section)	RDG Section 204.3
<b>Max. Grade Break</b>	0.2% (Design Speeds >=50mph), 0.4% (Design Speeds <= 45mph)	RDG Section 204.4
<b>Minimum Vertical Curve Length</b>		
SR 347/Local Streets	3 times Design Speed	ADOT RDG Table 204.4
<b>Vertical Clearance</b>		
Railroad Overpass	23.5 feet	Bridge Group Design Guidelines, Section 2
Roadway Overpass/Underpass	16.5 feet	Bridge Group Design Guidelines, Section 2
<b>Cross Sectional Elements</b>		
<b>Lane Widths</b>		
SR 347	12 feet	ADOT RDG Section 301.3
Other Roadways	12 feet	COMRTP Figure 8.10
<b>Shoulder Widths</b>		
SR 347	5 feet (17 feet shared use lane for bicycle use)	Design Parameters Report
MCGH	6.5 feet	COMRTP Figure 8.10
Local Streets	Varies	COMRTP, MAG, and AASHTO
<b>Cross Slope (Lane &amp; Shoulder)</b>	2% (Standard Cross Slope)	ADOT RDG Section 301.2
<b>Side Slopes</b>		
SR 347	C-02.20	ADOT C-Standards
<b>Clear Zone Width</b>	See ADOT RDG Table 303.2A	ADOT RDG Table 303.2A
<b>Lane drop</b>	Design Speed (mph) to 1	ADOT RDG Section 207
<b>Lane Add</b>	25 to 1	ADOT RDG Section 207
<b>Shoulder Taper</b>	15 to 1 (Narrower to Wider); Design Speed (mph) to 1 (Wider to Narrower)	ADOT RDG Section 302.5
<b>Intersections</b>		
<b>Intersection Sight Distance</b>	See ADOT RDG Section 408.4	ADOT RDG Section 408.4A and 408.4B
<b>Max. Skew Angle</b>	15 degrees	ADOT RDG Section 403.4
<b>Max. Approach Grade</b>	3% Desirable (6% Maximum)	ADOT RDG Section 408.8
<b>Left and Right Turn Channelization</b>	See ADOT Traffic Engineering Group PGP Section 430	PGP Section 430

Note: No full access control means that ingress/egress access will be preserved at existing driveways.



## 4.2 Horizontal and Vertical Alignment

The following sections give an overview of the horizontal and vertical geometry proposed by the Recommended Alternative. The horizontal and vertical alignments of each proposed roadway segment are shown on the conceptual plan and profile sheets included in **Appendix B**.

### 4.2.1 SR 347

For the Recommended Alternative H, the realignment of SR 347 begins at the intersection of Desert Cedars Drive. From this southern study terminus SR 347 is realigned to the east through a set of reversing curves. Another curve begins north of Honeycutt Avenue and continues beyond the bridge over the UPRR, and a final curve ties the Recommended Alternative alignment into the existing SR 347 alignment just south of Hathaway Avenue.

The vertical geometry of the realigned SR 347 segment consists of five sag vertical curves, and an 820-foot crest vertical curve which provides a minimum of 23.5 feet of clearance over the railroad. In addition, the SR 347 profile provides more than the minimum 16.5 feet of clearance over the proposed Connector Road. The maximum longitudinal slope is 4.9% which is less than the 5% maximum to accommodate pedestrians per the Americans with Disabilities Act (ADA) criteria. The profile grade is 3% in the vicinity of the intersection of SR 347 with Honeycutt Road. In addition, this intersection is approximately 9.5 feet above the existing ground. The vertical design provides adequate sight distances throughout the alignment.

### 4.2.2 Maricopa-Casa Grande Highway (MCGH)

Westbound MCGH will be realigned to intersect Honeycutt Road instead of connecting directly to SR 347. Westbound traffic will travel northwesterly, continue through a horizontal curve, and head northbound to Honeycutt Road.

The vertical geometry of the realigned MCGH roadway alignment consists of one crest vertical curve and one sag vertical curve. The maximum longitudinal slope is 2%. The vertical design provides adequate sight distances throughout the alignment.

### 4.2.3 Connector Road

The southbound SR 347 to eastbound MCGH connection will be established with the use of a new ramp. This ramp utilizes reversing curves to depart SR 347 just south of Garvey Avenue then continues east as it crosses under the proposed SR 347 overpass. Another horizontal curve ties the ramp into existing MCGH.

The vertical geometry of the realigned MCGH roadway alignment consists of two crest vertical curves and two sag vertical curves. The maximum longitudinal slope is 2.5%. The vertical design provides adequate sight distances throughout the alignment.

### 4.2.4 Honeycutt Road

The Honeycutt Road alignment for the Recommended Alternative closely follows the existing Honeycutt Road centerline. The proposed intersection of SR 347 and Honeycutt Road has a skew of 7 degrees, and 30 minutes.

The vertical geometry of the realigned MCGH roadway alignment consists of one crest vertical curve and one sag vertical curve. The maximum longitudinal slope is 2%. The vertical design provides adequate sight distances throughout the alignment.

### 4.2.5 Honeycutt Avenue

The Recommended Alternative realigns Honeycutt Avenue to the south utilizing a set of reversing curves. The terminus of Honeycutt Avenue has a short tangent at the intersection of SR 347 and there is no skew. The purpose of the realignment of Honeycutt Avenue is to provide an intersection which closely matches the existing ground.

The vertical geometry of the realigned MCGH roadway alignment consists of one crest vertical curve and one sag vertical curve. The maximum longitudinal slope is 2%. The vertical design provides adequate sight distances throughout the alignment.

### 4.2.6 Garvey Avenue

The Garvey Avenue horizontal alignment will remain unchanged. However, the eastern terminus of Garvey Avenue will no longer connect to SR 347 and will connect just north of the SR 347. Garvey Avenue will only have right-in, right-out access.

### 4.2.7 Edwards Avenue

Edwards Avenue will not access SR 347 directly. Edwards Avenue will connect with Honeycutt Avenue utilizing a southeasterly horizontal curve and then will follow the existing SR 347 alignment south to Honeycutt Avenue.

### 4.2.8 Local Access Road

The properties that currently front MCGH between SR 347 and Fourth Street will be accessed via a local access road. The local access road will have an alignment and profile which closely match the existing westbound MCGH.

## 4.3 Access

Access from SR 347 will be provided to Honeycutt Avenue, Honeycutt Road, Hathaway Avenue, and access to businesses will be provided at designated locations. Garvey Avenue will have right-in, right-out access to and from the Connector Road.

Access from MCGH to residences will be changed from SR 347 to Plainview Street. MCGH will provide access to this neighborhood at both Arizona Avenue and Maricopa Avenue. The properties that currently front MCGH from SR 347 to Plainview Street will be accessed via a local access road.

#### 4.4 Right-of-Way

A total of 31.2 acres of new right-of-way will be required with the recommended alternative. This includes the acquisition of twelve (11) commercial/public structures and four (4) residential structures. **Table 4-2** summarizes a preliminary assessment of the parcels potentially impacted to create the right-of-way required by the recommended alignment alternative. Land use designations were estimated by field observations. Final right-of-way impact determinations for each parcel will be made during final design. The parcels with structures that will need to be acquired have been highlighted in **Table 4-2**.

**Table 4-2: Right-of-Way Parcel Acquisition Summary**

Acquisition No.	Parcel No.	Type of Acquisition	Current Land Use	Acquisition No.	Parcel No.	Type of Acquisition	Current Land Use
<b>1*</b>	<b>51027022A</b>	<b>Full</b>	<b>Commercial</b>	29	510260130	Partial	Residential
2	510270210	Partial	Undeveloped	30	51026014B	Partial	Residential
3	51236328F	Partial	Residential	31	51026015A	Partial	Residential
4	51238877F	Partial	Public	32	510260160	Partial	Residential
5	51238877B	Partial	Commercial	33	510260170	Partial	Undeveloped
6	510290010	Partial	Undeveloped	34	51026018B	Partial	Undeveloped
7	51029047B	Partial	Undeveloped	35	51026018A	Full	Public
8	51025009D	Partial	Undeveloped	<b>36*</b>	<b>51026020A</b>	<b>Full</b>	<b>Public</b>
9	51028018B	Partial	Commercial	<b>37*</b>	<b>51026021A</b>	<b>Full</b>	<b>Commercial</b>
10	51025014C	Partial	Public	38	51026022A	Full	Commercial
<b>11*</b>	<b>510260510</b>	<b>Full</b>	<b>Residential</b>	<b>39*</b>	<b>51026022B</b>	<b>Full</b>	<b>Commercial</b>
12	510260630	Partial	Commercial	40	510280340	Partial	Commercial
13	51025009C	Partial	Undeveloped	41	51022005A	Full	Public
<b>14*</b>	<b>510260610</b>	<b>Full</b>	<b>Residential</b>	42	510220060	Full	Public
<b>15*</b>	<b>510260370</b>	<b>Full</b>	<b>Commercial</b>	43	510220070	Full	Undeveloped
<b>16*</b>	<b>510260380</b>	<b>Full</b>	<b>Residential</b>	44	510220140	Full	Undeveloped
17	51025001B	Partial	Commercial	45	51022015B	Full	Undeveloped
18	510260390	Partial	Residential	46	512040070	Full	Undeveloped
19	510280300	Partial	Commercial	<b>47*</b>	<b>510220090</b>	<b>Full</b>	<b>Public</b>
<b>20*</b>	<b>51026052B</b>	<b>Partial</b>	<b>Residential</b>	<b>48*</b>	<b>510220100</b>	<b>Full</b>	<b>Public</b>
21	510260620	Partial	Commercial	<b>49*</b>	<b>512040080</b>	<b>Full</b>	<b>Public</b>
<b>22*</b>	<b>51026052C</b>	<b>Full</b>	<b>Commercial</b>	50	510220010	Full	Public
23	51026053A	Full	Commercial	<b>51*</b>	<b>510220020</b>	<b>Full</b>	<b>Public</b>
<b>24*</b>	<b>510260540</b>	<b>Full</b>	<b>Commercial</b>	52	51022015D	Partial	Commercial
25	510260010	Partial	Undeveloped	53	512049090	Partial	Undeveloped
26	510260050	Partial	Undeveloped	54	512049080	Partial	Undeveloped
27	510260060	Partial	Residential	55	512049070	Partial	Undeveloped
28	51026007A	Partial	Residential	56	512049110	Full	Undeveloped

\* Indicates parcels with structures that will also have to be acquired.

#### 4.5 Drainage

This section summarizes the proposed drainage improvements for the recommended alignment alternative.

##### 4.5.1 Hydrology

The hydrology of the contributing watershed is modeled using the US Army Corps of Engineers' HEC-1 Program, v4.1, utilizing methods and procedures outlined in the ADOT Highway Drainage Design Manual – Hydrology (rev 1994), hereafter referred to as the ADOT Hydrology Manual

Specifically, precipitation was input using the hypothetical distribution (PH records). Site specific point rainfall data were obtained from the NOAA Atlas 14, Arizona. The rainfall losses were modeled utilizing the Green and Ampt Method (LG card). Synthetic unit hydrographs for each sub basin were developed using the Clark unit hydrograph. Drainage areas for the existing and proposed conditions were delineated using 1-ft contour strip mapping provided by ADOT. CAD software was used to measure the polygon area for each sub-basin.

**Figure 4-1** presents the delineated drainage basins and corresponding HEC 1 drainage network that was used to develop the proposed drainage improvements. This model assumes that the regional retention facilities associates with the Copper Sky Regional Park (discussed in Section 1.5.5) are in place. The offsite flows that affect SR 347 are therefore restricted to undeveloped and residential basins adjacent to the roadway and downstream of the regional park. The peak flows at key locations for the proposed conditions are summarized in **Table 4-3**.

**Table 4-3: Summary of Peak Flows - Proposed Conditions**

HEC-1 ID	10-year Peak Flow (cfs)	25-year Peak Flow (cfs)	100-year Peak Flow (cfs)
CP2	29	71	221
RW4A	0	0	27
CP3A	19	27	63
CP3B1	36	95	250
CP3B	20	87	272
CP4B	20	48	102
CP5	20	48	102
CP7B	74	95	128
CP8	19	25	33

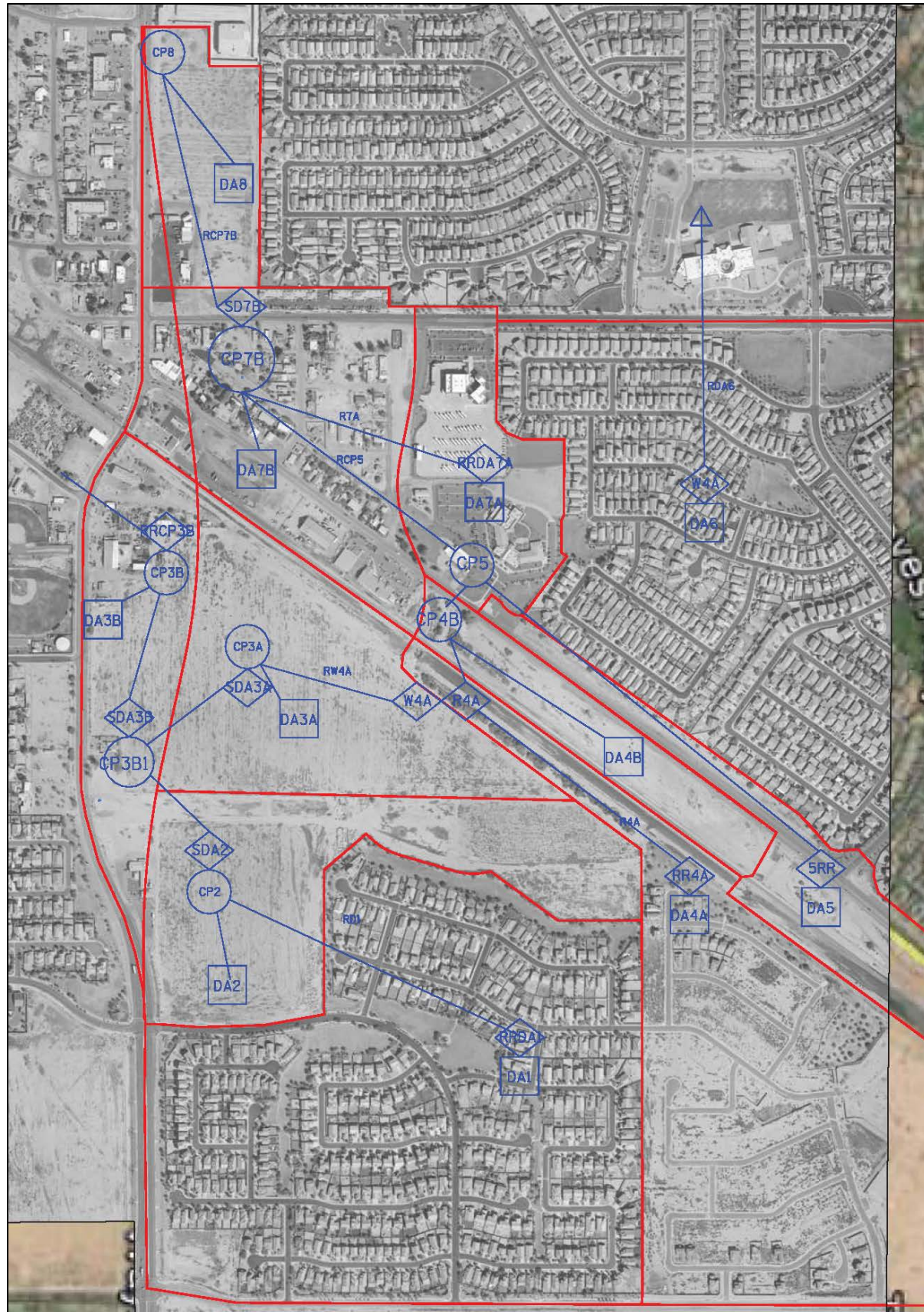


Figure 4-1: Drainage Basins and HEC-1 Network

#### 4.5.2 Proposed Drainage Improvements

Figure 4-2 presents the proposed drainage improvements for the Recommended Alternative.

The recommended alignment, Alternative H, shifts SR 347 to the east into an existing Zone AO floodplain (1 ft ponding) north of the UPRR. In order to preserve base flood elevations, FEMA requires that any floodplain storage volume displaced by roadway embankments be offset/replaced with new retention basins of equal capacity. The proposed drainage improvements include two new retention basins (see Basins 1 & 2 in Figure 4-2) to mitigate floodplain volume displaced by the proposed grade separation.

Drain pipes will be installed between Basins 1 & 2 and the storm drain that currently terminates approximately 300ft east of the existing SR 347 alignment (refer to Section 1.5.5). A new 48" storm drain is proposed along the south side of MCGH to convey stormwater runoff (48cfs) between the existing 48" culvert that currently discharges into Rotary Park and Basin 2.

SR 347 is designated as an operational drainage frequency class 3 facility per ADOT's Roadway Design Guidelines. This classification requires that the drainage structures for SR 347 be capable of conveying stormwater runoff generated during the 25-year storm event. Two, 36" culverts are proposed to convey the 25yr runoff (71cfs) across SR 347 near a sag in the roadway by the south end of the project. The 36" culverts will discharge into a level pool basin to replicate historic flow patterns.

Collector and level pool basins, connected by three 30" pipes, are proposed to intercept and disperse sheet flow (27cfs) beneath the elevated portion of SR 347 south of the tracks. These proposed drainage features are intended to preserve historic drainage patterns through the area.

On-site street drainage was addressed by a series of catch basins, storm drains, and retention basins. Catch basin and storm drain locations were determined based upon street capacities, low points, intersection locations, and to minimize pipe runs. Proposed on-site storm drains were designed to tie into existing storm drains or proposed retention basins. The proposed retention basins are anticipated to drain via dry wells or bleed-off pipes into existing storm drains.

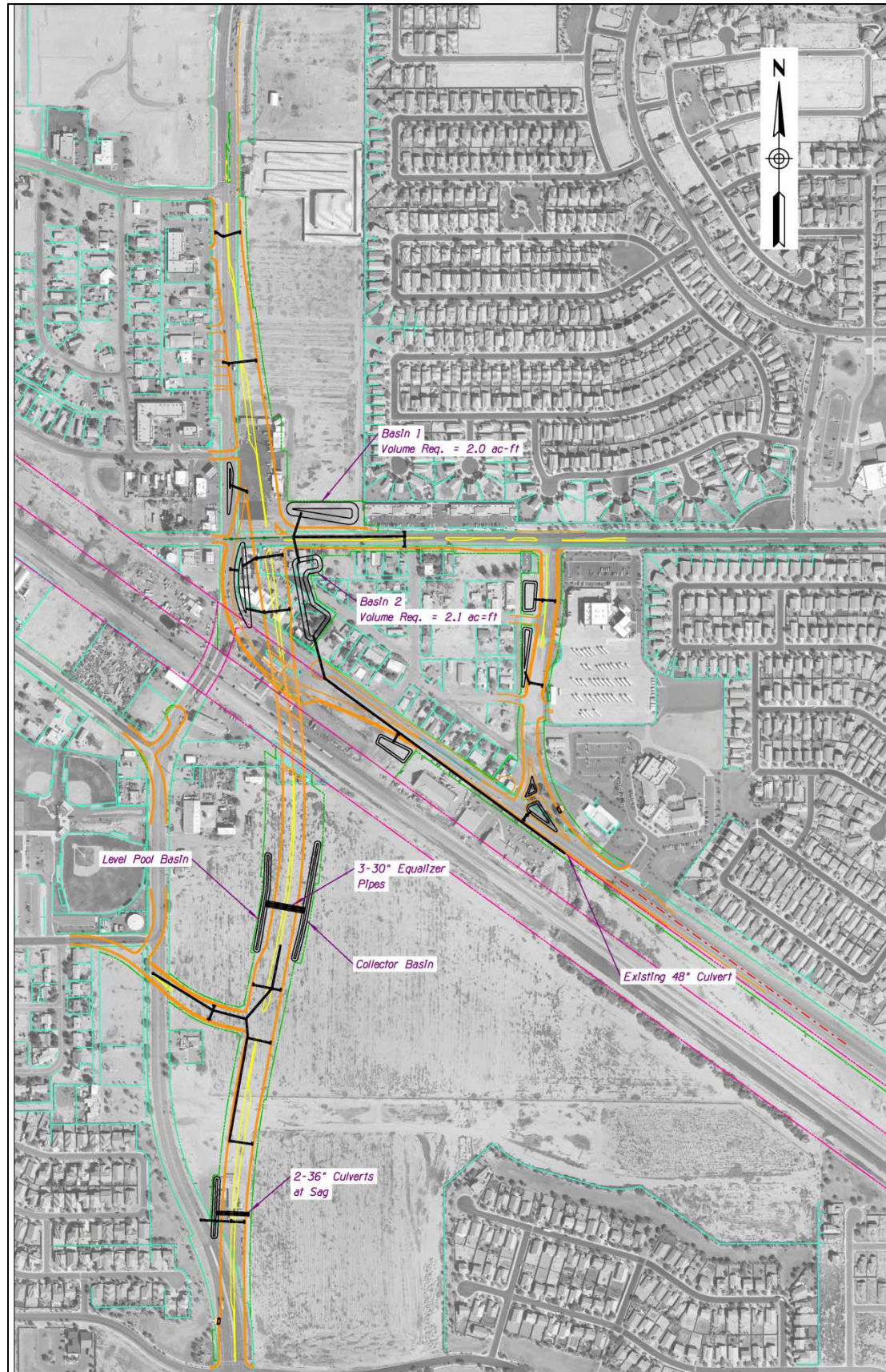


Figure 4-2: Proposed Drainage Structures

### Interim Drainage Improvements

Section 4.8 discusses potential phasing opportunities for construction of the recommended alignment alternative. The second phase of construction modifies the existing arterial roadway network to create a connection between MCGH and Honeycutt Rd in advance of the proposed grade separation. This second phase of construction places roadways within historic flow paths prior to the construction of the proposed 48" storm drain and retention basins recommended with the ultimate drainage solution. For this reason, an interim drainage solution is required to compliment the phased construction approach.

The proposed interim drainage improvements involve connecting to the existing 48" culvert via a manhole and discharging the drainage into a retention basin that is north of existing MCGH and west of the proposed connection between MCGH and Honeycutt Road. When the basin is overtopped the stormwater will flow to the north to Honeycutt Road following the historic drainage path.

Catch basins with accompanying storm drains and retention basins will be utilized to capture roadway drainage along the MCGH to Honeycutt Road connection. A catch basin and storm drain will be constructed in Honeycutt Road to capture roadway drainage and deliver it via storm drain to an existing grate structure which conveys the drainage north of Honeycutt Road.

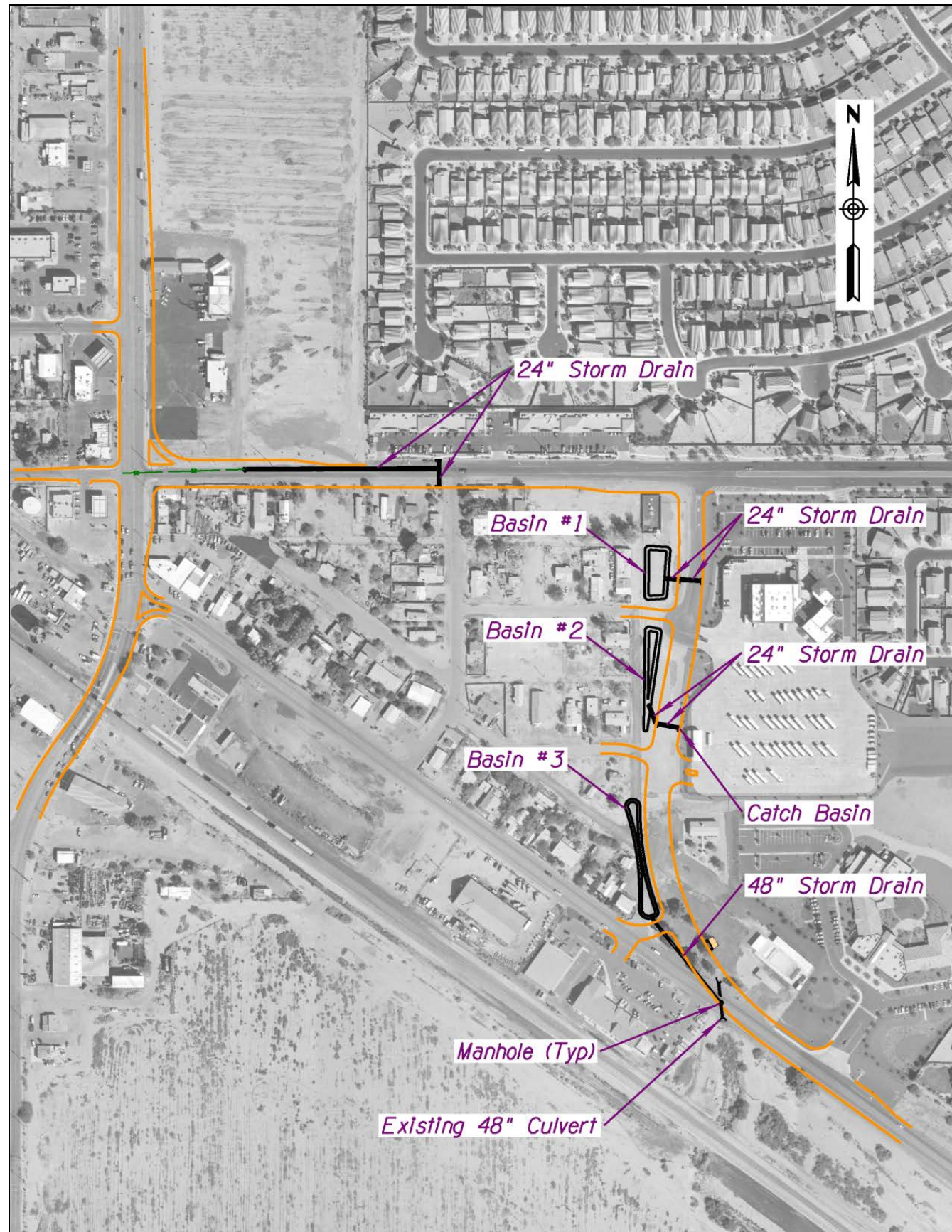


Figure 4-3 : Interim Drainage Improvements

#### 4.6 Geotechnical

A preliminary geologic and geotechnical assessment of the project was performed in order to address cut slope geometries, bridge foundation types, embankments, and earthwork factors (see **Appendix E**). The soil units found in the area include various forms of clay loam, sandy loam, and silt loam.

Areas of potentially collapsible and/or expansive soils should be anticipated within the project area. Soil improvement measures may be necessary for excavated material that is to be used for roadway subgrade, structure backfill, etc.

It is recommended that cut slopes be no steeper than 2:1 (H:V) and embankment fill slopes be no steeper than 2.5:1 (H:V). A preliminary shrinkage factor of 15 to 20 percent is recommended for soils in the area.

Shallow spread footings or drilled shafts may be used to support piers and/or abutments. Shallow spread footing proportioned for low to moderate bearing pressures may be an acceptable foundation system. However, overexcavation of the supporting soils will be needed to limit settlements to acceptable levels. Alternatively, deep drilled shaft foundations could be used for support of bridge pier and/or abutment foundations. Drilled shaft foundations may call for temporary casing of the drilled shaft during construction.

#### 4.7 Earthwork

Earthwork estimates for the Recommended Alternative were based on aerial mapping and the associated digital terrain model (DTM) developed for this study by the ADOT Photogrammetry and Survey Section.

The improvements proposed by the Recommended Alternative create a substantial borrow condition. Most of the borrow material is associated with the construction of SR 347 over the UPRR.

The estimated earthwork volumes per roadway segment are given in **Table 4-4**. A shrink factor of 20% was applied to all excavation quantities. Although adequate for this level of study and for comparison purposes, these earthwork estimates should be verified and refined during final design based upon the findings of a future, more comprehensive geotechnical study.

Table 4-4: Estimated Earthwork Volumes for the Recommended Alternative

Location	Excavation Including 20% Shrink (Cu. Yds.)	Embankment (Cu. Yds.)	Net Earthwork (Cu. Yds.)
SR 347	3,524	180,351	-176,827
Honeycutt Road	478	11,302	-10,824
MCGH	2,922	4,932	-2,010
Honeycutt Avenue	446	824	-378
Connector Road	421	4,737	-4,316
Drainage Excavation	8,770	0	8,770
<b>Totals:</b>	16,561	202,146	185,585

The project will require approximately 185,600 cubic yards of borrow material. No borrow sites have been identified at this time.

#### 4.8 Construction Phasing and Traffic Control

Traffic control will be specified by a traffic control plan or procedures and guidelines in the ADOT Traffic Control Manual for Highway Construction and Maintenance. This section suggests possible solutions to maintenance of traffic, constructability, and construction phasing issues associated with the implementation of the Recommended Alternative. Access to adjacent properties will be maintained during construction.

It is recommended that the proposed improvements be built in three phases (refer to Section 6.0). The first phase will relocate the existing AMTRAK passenger station to the northwest. The second phase will modify the existing arterial roadway network to accommodate the proposed grade-separation. The third phase will construct the SR 347 grade separated crossing over the tracks. The following sub-sections describe each of these construction phases in greater detail.

##### 4.8.1 Phase I: Relocate AMTRAK Passenger Station

AMTRAK's Maricopa Station is the only regional passenger train station servicing the Phoenix Metropolitan area. As an important regional transportation facility, it must be relocated prior to construction of the proposed SR 347 grade separation. Relocating/reconstructing the passenger station will benefit AMTRAK by creating an off-line parallel track and passenger platform that will comply with current standards and ADA requirements.

By relocating the AMTRAK station in the first phase of construction, the City realizes immediate relief from regular, 20-30 minute stoppages to traffic on SR 347 that occur when AMTRAK trains unload and load passengers.

The City has identified a site on City-owned property for the relocated AMTRAK station approximately three quarters of a mile to the northwest of the SR 347/UPRR intersection. By relocating the passenger station to City owned property, they mitigate schedule delay risks associated with right-of-way acquisition.

Phase I construction activities include the following tasks:

- Construct new segment parallel tracks to allow trains to unload/load passengers offline of UPRR's existing double tracks.
- Construct new passenger platform.
- Construct new passenger station and parking lot.
- Demolish the existing AMTRAK Maricopa Station and passenger platform.



#### 4.8.2 Phase II: Improvements to Arterial Roadway Network

A second infrastructure challenge that contributes to traffic congestion through the area is the presence of two arterial roadway intersections (Honeycutt Rd and MCGH) within 600ft of the existing SR 347/UPRR at-grade crossing. When traffic backs up on SR 347, it also clogs two major east-west arterial roadways bringing all traffic through the area to a halt. These two arterial intersections do not function well so close to each other. (Currently Honeycutt Rd has a level of service of F during the PM peak traffic hour.)

The long term benefits of proposed grade separation will require modifications to the existing arterial roadway network. Phase II of construction addresses the needed arterial roadway improvements north of the UPRR and provides the added short term benefit to the City of consolidating two adjacent intersections into a single intersection optimized to accommodate the highly directional traffic movements. This consolidated intersection improves short term traffic safety by removing a busy, unsignalized intersection from a congested portion of SR 347.

It should be noted that the consolidated intersection at Honeycutt Rd only provides temporary relief to traffic operations on SR 347. AM and PM peak traffic volumes at this intersection are highly directional (i.e. west-to-north movements in the morning and south-to-east movements in the evening). As anticipated growth occurs, the highly directional combined traffic volumes of Honeycutt Rd and MCGH will outgrow the capacity of a conventional intersection. An innovative solution to this traffic challenge is provided to address this issue in Phase III of this project.

The proposed arterial roadway improvements have been located within existing City rights-of-way or on City owned parcels as much as possible to limit project costs and expedite the right-of-way acquisition process.

Phase II of construction includes the following tasks:

- Widen SR 347 to accommodate additional Honeycutt Road auxiliary turn lanes.
- Construct a three-lane arterial roadway connection between MCGH and Honeycutt Rd.
- Install a new 3-way traffic signal at the new intersection of Honeycutt Rd and MCGH.
- Improve/widen Honeycutt Rd between SR 347 and the new intersection with MCGH.
- Construct a new signalized intersection between SR 347 and Honeycutt Road with optimized signal timing and turning lanes to accommodate the highly directional traffic movements (SB SR 347 to EB Honeycutt Road). Additionally, left turn lanes will be included to facilitate WB to SB turns at this intersection.
- Construct a raised median at the existing SR 347/MCGH intersection to restrict all traffic movements to right-in, right-out at this intersection.
- Remove the existing SR 347/MCGH traffic signal.

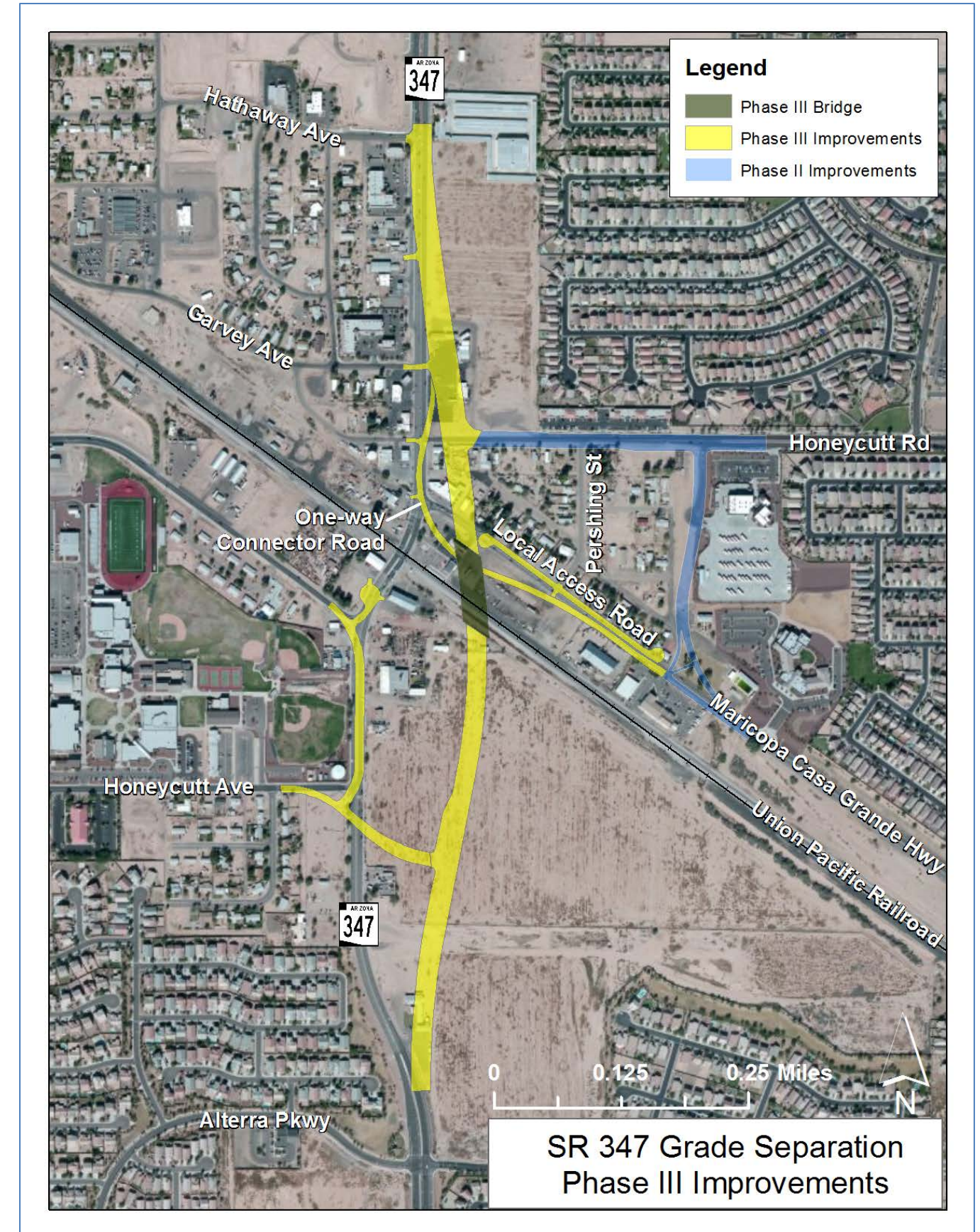


### 4.8.3 Phase III: Construct the Grade Separation

The final phase of construction builds the new SR 347 grade-separation over the UPRR tracks.

Phase III of construction includes the following tasks:

- The SR 347 grade separation will be realigned to the east to preserve local and regional traffic operations during the anticipated 8-12 month construction schedule.
- Construct a one-way roadway between the realigned SR 347 and MCGH to alleviate congestion from the peak directional (southbound to eastbound) traffic movements and to preserve access to existing businesses.
- Construct channelized free right-turn lanes on Honeycutt Rd for westbound-to-northbound traffic movements.
- Extend Honeycutt Avenue to connect with realigned SR 347.
- A signalized intersection will be constructed for Honeycutt Ave (south of the UPRR).
- Close the existing at-grade crossing of the the UPRR, and construct a cul-de-sac for access to the business in the northeast corner of existing SR 347 and Edwards Avenue.
- Converting the existing MCGH alignment between the new SR 347 and new MCGH alignments to a two-way, cul-de-sac local access road to access residences and businesses.





#### 4.9 Traffic Design

The proposed improvements along SR 347 generally consist of 3 travel lanes in both the NB and SB directions throughout the project limits. NB dual left turn lanes are provided at Honeycutt Avenue. A dedicated NB right turn lane is provided at Honeycutt Road and a NB left turn lane is proposed at Hathaway Ave. A 4th SB lane is added south of Hathaway Avenue. This lane becomes the departure lane for the connector roadway. Dual SB left turn lanes are proposed on SR 347 at the Honeycutt Road intersection. SB right turn lanes are provided at Honeycutt Avenue and Alterra Parkway.

MCGH is realigned just west of the Maricopa Unified School District Administration Building and becomes a north-south roadway that eventually connects to Honeycutt Road. An additional NB lane is added on the realigned portion. The roadway consists of two NB lanes, one SB lane and a center shared left turn lane. Dual NB Left turn lanes and a single NB right turn lane are provided at the Honeycutt Road intersection. The SB lane diverts from the roadway to form a “T” intersection with the connector roadway.

The connector roadway departs from SB 347 using a 1-lane exit approximately 360 feet north of Honeycutt Road. The road is widened to 2 lanes before curving to the southeast and passing beneath the SR 347 overpass bridge. The road eventually aligns with existing SB MCGH, as the outside lane is removed using a 540-foot taper.

Honeycutt Road will be modified to include two travel lanes in each direction with a raised center median. Dual WB left turn lanes are proposed at the SR 347 intersection and dual WB right turn lanes are provided as free-flow lanes to NB SR 347.

Edwards Avenue consists of one travel lane in each direction with a center shared left turn lane. The roadway is shifted to the existing 347 alignment to eventually connect to Honeycutt Avenue.

Honeycutt Avenue is a two lane roadway west of the intersection with Edwards Avenue. East of Edwards Avenue, the roadway consists of two westbound travel lanes and one EB travel lane. Dual EB left turn lanes are provided at the intersection with SR 347.

Once Alternative H was identified as the preferred alternative, a detailed microsimulation analysis using the VISSIM modeling software was conducted to confirm and/or refine the recommended intersection geometry to assure acceptable operations would be provided in the 2040 forecast year. The analysis focused on the weekday evening peak period, which represents the worst case volume condition in the study area. **Figure 4-4** illustrates the intersections that were subject to the detailed analysis. **Figure 4-5** provides the intersection lane configurations utilized in the analysis. All intersections were analyzed with traffic signal control except for Intersection #10 which has stop sign control for the southbound Maricopa-Casa Grande Highway approach.

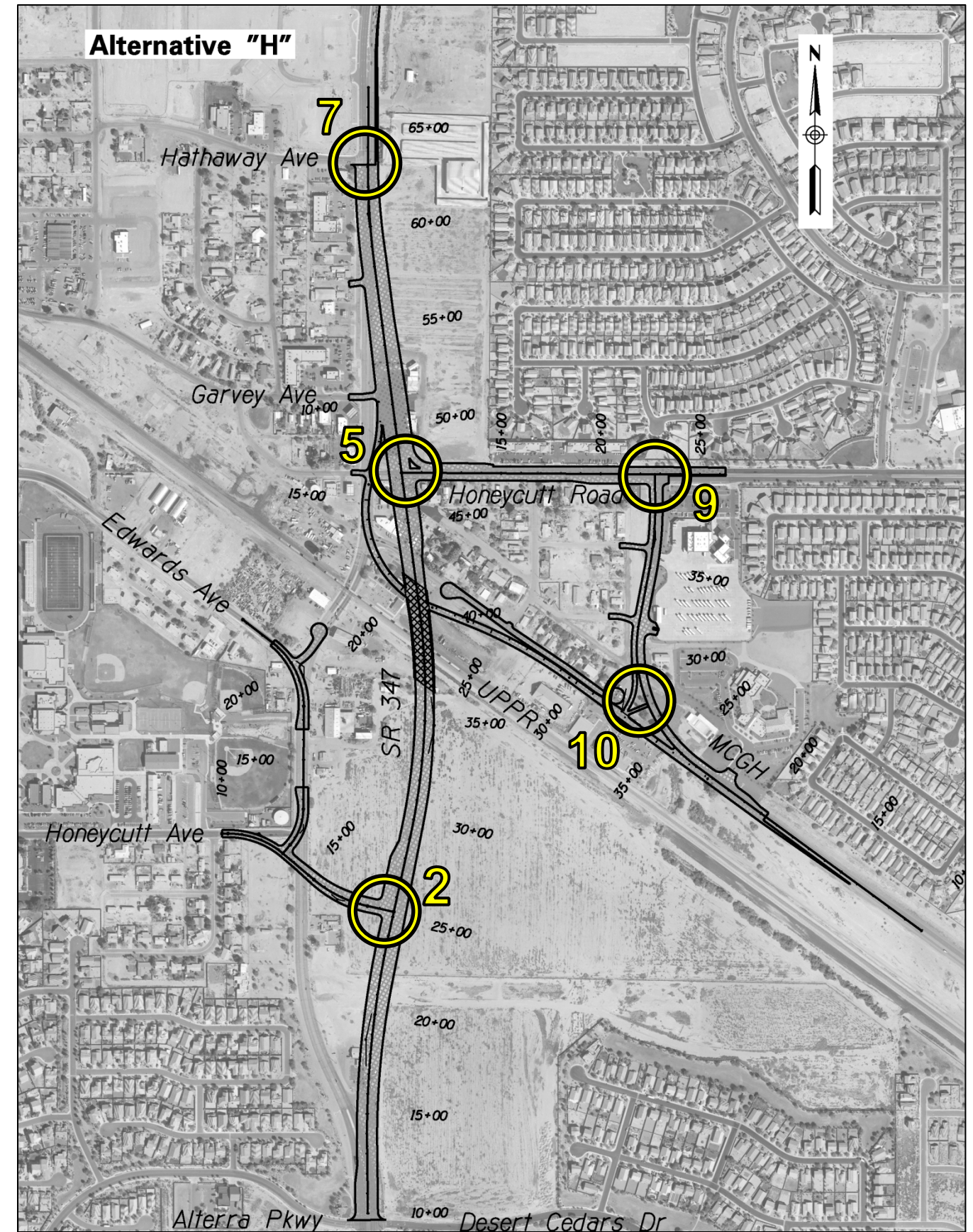


Figure 4-4 : Analyzed Intersections for VISSIM Analysis

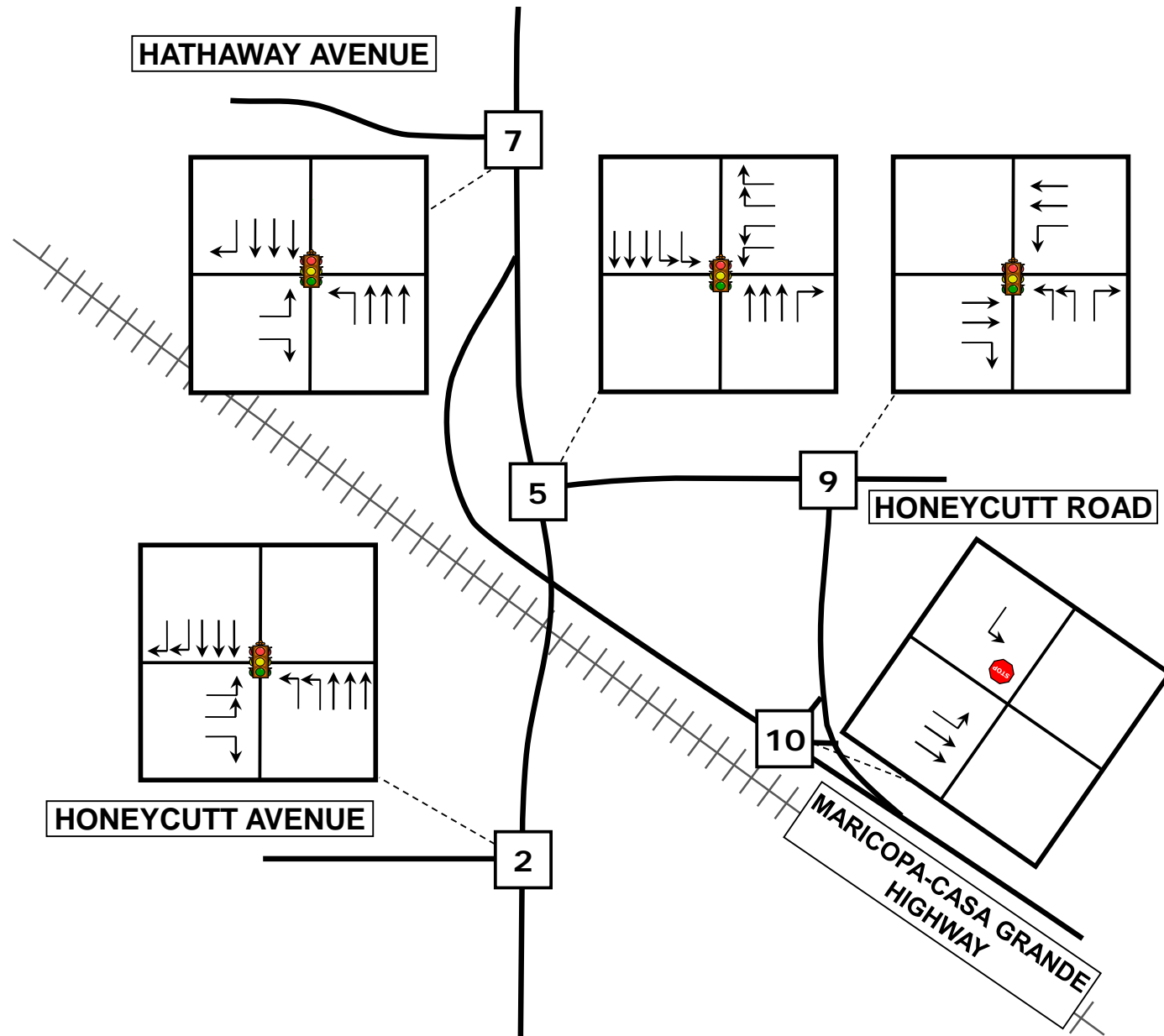


Figure 4-5 : Intersection Lane Configurations for VISSIM Analysis

Level-of-service results for each intersection were calculated based on the criteria set forth in Section 2.4.1. Results are summarized in Table 4-5.

Results indicate that each of the analyzed intersections are anticipated to operate at acceptable level-of-service “D” or better during the evening peak period under future year 2040 volume conditions. However, several movements are anticipated to operate with level-of-service “E” delays:

Table 4-5 : 2040 Alternative H Peak Hour Level-of-Service - VISSIM Analysis

INTERSECTION NUMBER	INTERSECTION NAME	MOVEMENT	MOVEMENT DELAY	LOS	APPROACH DELAY	LOS	INTERSECTION DELAY	LOS
7	SR 347/ HATHAWAY AVE	NBL	45	D	6	A	8	A
		NBT	6	A				
		EBL	59	E	34	C		
		EBR	4	A				
		SBT	9	A	9	A		
		SBR	8	A				
5	SR 347/ HONEYCUTT RD	NBT	36	D	34	C	24	C
		NBR	28	C				
		SBL	46	D	16	B		
		SBT	8	A				
		WBL	52	D	25	C		
		WBR	14	B				
9	MCGH/ HONEYCUTT RD	NBL	33	C	31	C	27	C
		NBR	13	B				
		EBT	28	C	27	C		
		EBR	7	A				
		WBL	27	C	21	C		
		WBT	21	C				
10*	SR 347 SBL RAMP/MCGH	EBL	8	A	2	A	1	A
		EBT	1	A				
		SBL	12	A	12	B		
		WBR	0	A				
2	SR 347/ HONEYCUTT AVE	NBL	64	E	26	C	40	D
		NBT	16	B				
		EBL	61	E	57	E		
		EBR	43	D				
		SBT	49	D	41	D		
		SBR	26	C				

\*Analysis for unsignalized control

#### 4.10 Utilities, Railroads, and Irrigation Systems

The majority of the existing utilities within the project area are located along the existing SR 347, Honeycutt Road and adjacent to the UPRR (see Section 1.5.6). The majority of utility impacts with the Recommended Alternative will be to overhead 12kV and 69kV facilities. Impacts to sewer, water, gas, and fiber optics is anticipated to be minimal including relocations of valves, manholes, and other ancillary facilities. Existing traffic signals will be relocated or removed at Alterra Parkway, Honeycutt Avenue, the UPRR at-grade crossing, MCGH, and Hathaway Avenue.

Accurate horizontal and vertical locations of all utility facilities will be determined in conjunction with final design to evaluate the need for utility relocation or removal. This will include Subsurface Utility Engineering (SUE) Phase I (utility designation) and Phase II (potholing).

Prior Rights will be researched during final design for all utilities requiring relocation. In addition, utilities requiring relocation during seasonal outages will be coordinated during final design and incorporated into the project specifications.

#### 4.11 Structures

An initial bridge concept report was prepared in conjunction with this DCR and included as **Appendix F** to this report. The purpose of the bridge concept memo identifies and studies structure types that satisfy the functional requirements while meeting the applicable standards of UPRR and ADOT as well as complying with the American Association of State Highway and Transportation Officials (AASHTO) bridge design standards.

The recommend four-span structure consists of precast pre-stressed AASHTO girders with a composite 8-inch cast-in-place concrete deck. The four-span structure will have a total structure length of approximately 494 feet (back to back of abutments) with the following span configuration: Span 1 of 100 feet – 6 inches, Span 2 of 163 feet - 3.5 inches, Span 3 of 103 feet – 0 inches and Span 4 of 120 feet – 0 inches. The proposed bridge has a 51,800 square foot surface area and an estimated cost of \$6,940,000. **Figure 4-6** presents a 3D rendering of the recommended bridge structure.



**Figure 4-6: 3D Rendering of Recommended Bridge Structure**

##### 4.11.1 Bridge Aesthetics

At the time of this report there are no recommendations regarding bridge aesthetics; circular columns and regular pier caps are assumed for this study. Some of the aesthetics elements found on the Maricopa Heritage District Design Guidelines are considered and incorporated into the 3D modeling of the preferred alternative (see **Figure 4-6**), such as a mixture of materials (combining concrete, structural steel, expanded metal and stone), provisions for a pedestrian friendly environment with stained sidewalks on each side of the bridge, use of an ADOT standard fence with expanded metal

instead of chain link fence over the UPRR, implementation of a stone façade on the substructure, a brick median, and the incorporation of at least two paint colors from the recommended color palate.



The bridge painting cost is considered to be incidental to the superstructure and substructure costs. The cost for the other aesthetic elements that are considered will be included as separate items in the construction cost estimates. Further evaluations will need to be done during final design in order to determine any modification to or addition of aesthetic treatments for the proposed SR 347 structure, as well as the architecture of the piers, abutments and other bridge elements.

Potential bridge and wall graphics may reflect the importance of the railroads contributions to the City of Maricopa. Mockups of these patterns would be created for ADOT's and the City of Maricopa concurrence that the bridge and wall aesthetics meets with their approval prior to initiating any bridge or wall aesthetics.

#### 4.12 Preliminary Pavement Design

Preliminary pavement sections were developed for the roadways associated with the Recommended Alternative. **Table 4-6** details the pavement section for SR 347, MCGH, Honeycutt Road, and the Connector Roadway. The pavement section for Honeycutt Avenue and Edwards Avenue consists of 5" AC over 10" AB with 0.5" AR-ACFC.

**Table 4-6: Preliminary Pavement Sections**

Pavement Component	Thickness (Inches)	Structural Coefficient	Drainage Coefficient	Structural Number
AR-ACFC	0.5	NA	NA	NA
AC (¾-Inch, End Product)	6.5	0.44	NA	2.86
AB (Class 2)	12.0	0.14	1.0	1.68
<b>Structural Number</b>				<b>4.54</b>

NA = not applicable

The ½ -inch asphalt rubber - asphalt concrete friction course (AR-ACFC) was recommended due to its smoothness, safety (frictional) properties, ability to reduce spray of water on the pavement surface, and noise-reduction capabilities.

#### 4.13 Multimodal Considerations

Currently, pedestrian sidewalks are present on both sides of SR 347 throughout most of the study limits. Realigned SR 347 will have sidewalks on both sides of the road. Existing sidewalks are also present on Alterra Parkway, Honeycutt Avenue, Edwards Avenue, Garvey Avenue, and Hathaway Avenue. Sidewalks will remain on these roadways. There are no existing sidewalks on MCGH and Honeycutt Road. Bike lanes do not exist on the existing SR 347 facility or any of the other adjacent

roadways within the study limits. Bicycle facilities are proposed with the Recommended Alternative on SR 347 with a 17-foot shared use lane (12-foot lane, 5-foot bike lane).

#### **4.14 Design Exceptions**

Following the construction of the Recommended Alternative all design elements will meet AASHTO requirements. Therefore, no design exceptions will be required for this project.

#### **4.15 Intergovernmental Agreements**

Coordination will be required between the City of Maricopa, Arizona Department of Transportation, and the Maricopa Association of Governments to determine how best to program and fund the proposed improvements.

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## 5.0 Itemized Cost Estimate

### 5.1 Cost Estimate of the Preferred Alternative

A detailed construction cost estimate was prepared for the Recommended Alternative and is shown in **Table 5-1**. Unit prices were based on ADOT's construction costs database for recent projects of similar size and/or location. **Appendix G** illustrates the conceptual alignment alternatives and corresponding pavement areas.

**Table 5-1: Itemized Cost Estimate for the Recommended Alternative**

Item Number	Item Description	Unit	Quantity	Unit Price	Amount
2010011	Clearing and Grubbing	Acres	17	\$2,000.00	\$34,000
2020021	Removal Of Concrete Curb And Gutter	LF	14084	\$5.00	\$70,420
2020025	Removal Of Concrete Sidewalk	Sq. Ft.	55000	\$3.00	\$165,000
2020036	Removal Of Asphaltic Concrete Pavement	Sq. Yd.	62696	\$4.00	\$250,784
2030301	Roadway Excavation	Cu. Yd.	9743	\$12.00	\$116,916
2030401	Drainage Excavation	Cu. Yd.	8770	\$8.00	\$70,160
2030901	Borrow	Cu. Yd.	187364	\$9.00	\$1,686,276
3030022	Aggregate Base (Class 2)	Cu. Yd.	36234	\$25.00	\$905,850
404X014	Asphalt Binder (PG XX-XX)	Ton	1897	\$600.00	\$1,138,200
4040111	Bituminous Tack Coat	Ton	76	\$550.00	\$41,800
4040116	Apply Bituminous Tack Coat	Hour	152	\$150.00	\$22,800
4060026	Mineral Admixture (For 3/4" Mix)	Ton	379	\$90.00	\$34,110
4140040	AR-ACFC	Ton	3263	\$48.00	\$156,624
4140042	Asphalt Rubber Material (For AR-ACFC)	Ton	293	\$700.00	\$205,100
4140044	Mineral Admixture (For AR-ACFC)	Ton	33	\$90.00	\$2,970
4160002	Asphaltic Concrete (3/4" mix)(End Product)	Ton	37902	\$40.00	\$1,516,080
5012524	Storm Drain Pipe, 24" - RGRCP	LF	3703	\$75.00	\$277,725
5012530	Storm Drain Pipe, 30" - RGRCP	LF	543	\$90.00	\$48,870
5012536	Storm Drain Pipe, 36" - RGRCP	LF	290	\$110.00	\$31,900
5012548	Storm Drain Pipe, 48" - RGRCP	LF	1556	\$150.00	\$233,400
5030236	Storm Drain Catch Basin	EA	30	\$2,200.00	\$66,000
5041996	Drainage Structure (Headwall)	EA	18	\$6,000.00	\$108,000
5050089	Storm Drain Manhole	EA	10	\$3,500.00	\$35,000
6080101	Miscellaneous Work (Signs)	Lsum	1	\$85,000.00	\$85,000
7041501	Pavement Markings	Lsum	1	\$55,000.00	\$55,000
7330031	Traffic Signal	EA	4.5	\$400,000.00	\$1,800,000
7360104	Luminaire	EA	47	\$5,000.00	\$235,000
80100XX	Landscaping	Lsum	1	\$460,000.00	\$460,000
9050202	Guard Rail (Nested Steel W Beam)	LF	4006	\$16.00	\$64,096
9050026	Guard Rail Terminal (Tangent Type)	EA	6	\$2,500.00	\$15,000

**Table 5-1 (Continued)**

Item Number	Item Description	Unit	Quantity	Unit Price	Amount
9050038	Guard Rail Anchor Assembly	EA	6	\$1,000.00	\$6,000
9080081	Concrete Curb and Gutter (C-05.10) (Type G)	LF	40118	\$10.00	\$401,180
9080201	Concrete Sidewalk (C-05.20)	SF	106459	\$3.00	\$319,377
9080296	Concrete Sidewalk Ramp (C-5.30, Type A)	EA	35	\$2,000.00	\$70,000
9080512	Scupper	EA	2	\$2,750.00	\$5,500
999X004	New Bridge (Over UPRR)	Sq. Ft.	51791	\$134.00	\$6,940,000
<b>SUBTOTAL =</b>					<b>\$17,674,138</b>
	Miscellaneous Work	Cost	20%		\$3,534,828
<b>SUBTOTAL =</b>					<b>\$21,208,966</b>
	Construction Surveying & Layout	Cost	2%		\$424,179
	Erosion Control & Pollution Prevention	Cost	1%		\$212,090
	Contractor Quality Control	Cost	2%		\$424,179
	Dust Palliative & Furnish Water	Cost	2%		\$424,179
	Maintenance & Protection of Traffic	Cost	6%		\$1,272,538
<b>SUBTOTAL =</b>					<b>\$23,966,131</b>
	Mobilization	Cost	10%		\$2,396,613
<b>SUBTOTAL =</b>					<b>\$26,362,744</b>
	Design	Cost	9%		\$2,372,647
	Construction Engineering	Cost	15%		\$3,954,412
	AR-ACFC Smoothness Incentive	Lane Mile	11	\$11,000.00	\$121,000
	Asphaltic Concrete (End Product) Materials Quality Incentive	Ton	37902	\$3.00	\$113,706
	Utility Relocation	Lsum	1	\$1,000,000.00	\$1,000,000
	Right-of-Way Acquisition - Residential	Acres	8.5	\$50,000.00	\$430,000
	Right-of-Way Acquisition - Commercial	Acres	22.7	\$170,000.00	\$3,860,000
	Residential Building Acquisition	Each	4	\$100,000.00	\$400,000
	Commercial Building Acquisition	Each	11	\$475,000.00	\$5,610,000
	Amtrak Station Relocation	Lsum	1	\$4,423,353.00	\$4,423,353
	Contingency		5%		\$1,318,137
<b>SUBTOTAL</b>					<b>\$49,965,999</b>
	Indirect Cost Allocation Plan (ICAP)		10%		\$4,996,600
<b>PROJECT TOTAL =</b>					<b>\$54,962,599</b>

## 5.2 Estimate of Future Maintenance Costs

Annual maintenance costs for the Recommended Alternative were estimated as shown in **Table 5-2**. The total pavement width shown is an equivalent pavement width for the improved roadways calculated with the following equation:

$$PW = \frac{\text{Total Additional Lane Miles}}{\text{Total Additional Length (mi)}} \times \frac{12 \text{ feet}}{1 \text{ Lane}}$$

$$PW = \frac{10.82 \text{ Lane Miles}}{2.58 \text{ Miles}} \times \frac{12 \text{ feet}}{1 \text{ Lane}}$$

$$PW = 50.33 \text{ feet}$$

**Table 5-2: Estimated Cost of Future Maintenance**

Annual Maintenance Cost Per Lane Mile Using PeCoS Latest FY Data <sup>1</sup>	
Category	Other Locations
1. Paved Surfaces & Shoulders	420
2. Roadside	230
3. Drainage & Environmental	100
4. Rest Areas	230
5. Traffic Operations - Signal & Lighting; Signing & Striping - ITS	935
6. Landscaping	85
7. Winter Storms	155
8. Emergency Response	30
9. Miscellaneous Maintenance <sup>2</sup>	300
10. Support and Other Operating Expenses	1165
11. Other Specialty Items <sup>3</sup>	
<b>MCL = Maintenance Cost per Lane Mile</b>	<b>\$3,650</b>
Total Estimated Annual Maintenance Costs of Project at PA/DCR Phase and at Maintenance Phase	
Annual Maintenance Cost of Project at PA/DCR Phase	Other Locations - SR 347 <sup>6</sup>
PW = Additional Pavement Width <sup>4</sup>	50.33
NL = Number of 12-ft Wide Lanes	4.194
LP = Length of Project in Miles	2.58
<b>PMC = Current Project Maintenance Cost</b>	<b>\$39,493</b>
Annual Maintenance Cost of Project at Beginning of Maintenance Phase	Other Locations - SR 347 <sup>6</sup>
IF = Inflation Factor <sup>5</sup>	1.058
N = Number of Years to Maintenance Phase	3
<b>PMCI = Project Maintenance Cost including Inflation</b>	<b>\$46,771</b>

- Notes:
- Lane mile width is 12 ft, Total maintenance lane miles = 27,722 miles  
Metropolitan Phoenix maintenance lane miles = 2016 miles, Other Locations = 25,706 miles
  - Miscellaneous maintenance include building and yard training, material handling, vegetation control and contract considered in the maintenance cost breakdown
  - For Other Specialty Items, contact Central Maintenance.
  - Additional Pavement width includes the main line, ramps and shoulders **(Only the newly constructed or added pavement width)**.  
Additional Pavement Width = New Pavement Width - Existing Pavement Width
  - Based on increase in maintenance costs of 76% over the last 10 years
  - Numbers for maintenance cost at PA/DCR Phase and Beginning of Maintenance Phase represent an Example Project, 24 feet wide, 2 miles long, going into the maintenance phase 3 years later.

**Only Gray Areas require manual entry**

$$NL = PW / 12$$

$$PMC = MCL \times NL \times LP$$

$$PMCI = PMC \times (IF^N)$$

### 5.3 Detailed Cost Estimates of Other Alternatives Considered

Table 5-3 and Table 5-4 contain the detailed cost estimates for Alternatives E and F2, respectively.

**Table 5-3: Detailed Cost Estimate for Alternative E**

Item Number	Item Description	Unit	Quantity	Unit Price	Amount
2010011	Clearing and Grubbing	Acres	17	\$2,000.00	\$34,000
2020021	Removal Of Concrete Curb And Gutter	LF	13824	\$5.00	\$69,120
2020025	Removal Of Concrete Sidewalk	Sq. Ft.	42435	\$3.00	\$127,305
2020036	Removal Of Asphaltic Concrete Pavement	Sq. Yd.	48453	\$4.00	\$193,812
2030301	Roadway Excavation	Cu. Yd.	7545	\$12.00	\$90,540
2030401	Drainage Excavation	Cu. Yd.	8770	\$8.00	\$70,160
2030901	Borrow	Cu. Yd.	182125	\$9.00	\$1,639,121
3030022	Aggregate Base (Class 2)	Cu. Yd.	35652	\$25.00	\$891,300
404X014	Asphalt Binder (PG XX-XX)	Ton	1867	\$600.00	\$1,120,200
4040111	Bituminous Tack Coat	Ton	72	\$550.00	\$41,800
4040116	Apply Bituminous Tack Coat	Hour	144	\$150.00	\$21,600
4060026	Mineral Admixture (For 3/4" Mix)	Ton	373	\$90.00	\$33,570
4140040	AR-ACFC	Ton	3203	\$48.00	\$153,744
4140044	Asphalt Rubber Material (For AR-ACFC)	Ton	288	\$700.00	\$201,600
4140044	Mineral Admixture (For AR-ACFC)	Ton	32	\$90.00	\$2,880
4160002	Asphaltic Concrete (3/4" mix)(End Product)	Ton	37325	\$40.00	\$1,493,000
5012524	Storm Drain Pipe, 24" - RGRCP	LF	2536	\$75.00	\$190,200
5012530	Storm Drain Pipe, 30" - RGRCP	LF	620	\$90.00	\$55,800
5012536	Storm Drain Pipe, 36" - RGRCP	LF	415	\$110.00	\$45,650
5012548	Storm Drain Pipe, 48" - RGRCP	LF	2050	\$150.00	\$307,500
5030236	Storm Drain Catch Basin	EA	18	\$2,200.00	\$39,600
5041996	Drainage Structure (Headwall)	EA	5	\$6,000.00	\$30,000
5050089	Storm Drain Manhole	EA	11	\$3,500.00	\$38,500
6080101	Miscellaneous Work (Signs)	Lsum	1	\$85,000.00	\$85,000
7041501	Pavement Markings	Lsum	1	\$55,000.00	\$55,000
7330031	Traffic Signal	EA	4.5	\$400,000.00	\$1,800,000
7360104	Luminaire	EA	41	\$5,000.00	\$205,000
80100XX	Landscaping	Lsum	1	\$435,000.00	\$435,000
9050202	Guard Rail (Nested Steel W Beam)	LF	4006	\$16.00	\$64,096
9050026	Guard Rail Terminal (Tangent Type)	EA	6	\$2,500.00	\$15,000
9050038	Guard Rail Anchor Assembly	EA	6	\$1,000.00	\$6,000
9080081	Concrete Curb and Gutter (C-05.10) (Type G)	LF	34014	\$10.00	\$340,140

Item Number	Item Description	Unit	Quantity	Unit Price	Amount
9080201	Concrete Sidewalk (C-05.20)	SF	98481	\$3.00	\$295,443
9080296	Concrete Sidewalk Ramp (C-5.30, Type A)	EA	26	\$2,000.00	\$52,000
9080512	Scupper	EA	2	\$2,750.00	\$5,500
999X004	New Bridge (Over UPRR)	Sq. Ft.	38790	\$134.00	\$5,200,000
<b>SUBTOTAL =</b>					<b>\$15,446,981</b>
	Miscellaneous Work	Cost	20%		\$3,089,396
<b>SUBTOTAL =</b>					<b>\$18,536,378</b>
	Construction Surveying & Layout	Cost	2%		\$370,728
	Erosion Control & Pollution Prevention	Cost	1%		\$185,364
	Contractor Quality Control	Cost	2%		\$370,728
	Dust Palliative & Furnish Water	Cost	2%		\$370,728
	Maintenance & Protection of Traffic	Cost	7%		\$1,297,546
<b>SUBTOTAL =</b>					<b>\$21,131,471</b>
	Mobilization	Cost	10%		\$2,113,147
<b>SUBTOTAL =</b>					<b>\$23,244,618</b>
	Design	Cost	9%		\$2,092,016
	Construction Engineering	Cost	15%		\$3,486,693
	AR-ACFC Smoothness Incentive	Lane Mile	10	\$11,000.00	\$110,000
	Asphaltic Concrete (End Product) Materials Quality Incentive	Ton	37325	\$3.00	\$111,975
	Utility Relocation	Lsum	1	\$1,000,000.00	\$1,000,000
	Right-of-Way Acquisition - Residential	Acres	10.2	\$50,000.00	\$510,000
	Right-of-Way Acquisition - Commercial	Acres	20.2	\$170,000.00	\$3,430,000
	Residential Building Acquisition	Each	5	\$175,000.00	\$880,000
	Commercial Building Acquisition	Each	16	\$750,000.00	\$12,000,000
	Amtrak Station Relocation	Lsum	1	\$4,423,353.00	\$4,423,353
	Contingency		5%		\$1,162,231
<b>SUBTOTAL =</b>					<b>\$52,450,885</b>
	Indirect Cost Allocation Plan (ICAP)		10%		\$5,245,088
<b>PROJECT TOTAL =</b>					<b>\$57,695,973</b>



**Table 5-4: Detailed Cost Estimate for Alternative F2**

Item Number	Item Description	Unit	Quantity	Unit Price	Amount
2010011	Clearing and Grubbing	Acres	16	\$2,000.00	\$32,000
2020021	Removal Of Concrete Curb And Gutter	LF	13175	\$5.00	\$65,875
2020025	Removal Of Concrete Sidewalk	Sq. Ft.	42560	\$3.00	\$127,680
2020036	Removal Of Asphaltic Concrete Pavement	Sq. Yd.	50794	\$4.00	\$203,176
2030301	Roadway Excavation	Cu. Yd.	7077	\$12.00	\$84,924
2030401	Drainage Excavation	Cu. Yd.	8770	\$8.00	\$70,160
2030901	Borrow	Cu. Yd.	181152	\$9.00	\$1,630,368
3030022	Aggregate Base (Class 2)	Cu. Yd.	32321	\$25.00	\$808,025
404X014	Asphalt Binder (PG XX-XX)	Ton	1690	\$600.00	\$1,014,000
4040111	Bituminous Tack Coat	Ton	68	\$550.00	\$37,400
4040116	Apply Bituminous Tack Coat	Hour	136	\$150.00	\$20,400
4060026	Mineral Admixture (For 3/4" Mix)	Ton	338	\$90.00	\$30,420
4140040	AR-ACFC	Ton	2917	\$48.00	\$140,016
4140042	Asphalt Rubber Material (For AR-ACFC)	Ton	262	\$700.00	\$183,400
4140044	Mineral Admixture (For AR-ACFC)	Ton	29	\$90.00	\$2,610
4160002	Asphaltic Concrete (3/4" mix)(End Product)	Ton	33781	\$40.00	\$1,351,240
5012524	Storm Drain Pipe, 24" - RGRCP	LF	2786	\$75.00	\$208,950
5012530	Storm Drain Pipe, 30" - RGRCP	LF	620	\$90.00	\$55,800
5012536	Storm Drain Pipe, 36" - RGRCP	LF	415	\$110.00	\$45,650
5012548	Storm Drain Pipe, 48" - RGRCP	LF	1600	\$150.00	\$240,000
5030236	Storm Drain Catch Basin	EA	18	\$2,200.00	\$39,600
5041996	Drainage Structure (Headwall)	EA	8	\$6,000.00	\$48,000
5050089	Storm Drain Manhole	EA	10	\$3,500.00	\$35,000
6080101	Miscellaneous Work (Signs)	Lsum	1	\$78,000.00	\$78,000
7041501	Pavement Markings	Lsum	1	\$52,000.00	\$52,000
7330031	Traffic Signal	EA	4.5	\$400,000.00	\$1,800,000
7360104	Luminaire	EA	35	\$5,000.00	\$175,000
80100XX	Landscaping	Lsum	1	\$430,000.00	\$430,000
9050202	Guard Rail (Nested Steel W Beam)	LF	4006	\$16.00	\$64,096
9050026	Guard Rail Terminal (Tangent Type)	EA	6	\$2,500.00	\$15,000
9050038	Guard Rail Anchor Assembly	EA	6	\$1,000.00	\$6,000
9080081	Concrete Curb and Gutter (C-05.10) (Type G)	LF	39063	\$10.00	\$390,630

Item Number	Item Description	Unit	Quantity	Unit Price	Amount
9080201	Concrete Sidewalk (C-05.20)	SF	92058	\$3.00	\$276,174
9080296	Concrete Sidewalk Ramp (C-5.30, Type A)	EA	24	\$2,000.00	\$48,000
9080512	Scupper	EA	2	\$2,750.00	\$5,500
999X004	New Bridge (Over UPRR)	Sq. Ft.	40363	\$134.00	\$5,410,000
<b>SUBTOTAL =</b>					<b>\$15,225,094</b>
	Miscellaneous Work		20%		\$3,045,019
<b>SUBTOTAL =</b>					<b>\$18,270,113</b>
	Construction Surveying & Layout		2%		\$365,402
	Erosion Control & Pollution Prevention		1%		\$182,701
	Contractor Quality Control		2%		\$365,402
	Dust Palliative & Furnish Water		2%		\$365,402
	Maintenance & Protection of Traffic		6%		\$1,096,207
<b>SUBTOTAL =</b>					<b>\$20,645,227</b>
	Mobilization		10%		\$2,064,523
<b>SUBTOTAL =</b>					<b>\$22,709,750</b>
	Design		9%		\$2,043,878
	Construction Engineering		15%		\$3,406,463
	AR-ACFC Smoothness Incentive	Lane Mile	10	\$11,000.00	\$110,000
	Asphaltic Concrete (End Product) Materials Quality Incentive	Ton	33781	\$3.00	\$101,343
	Utility Relocation	Lsum	1	\$1,000,000.00	\$1,000,000
	Right-of-Way Acquisition - Residential	Acres	8.5	\$50,000.00	\$430,000
	Right-of-Way Acquisition - Commercial	Acres	20.8	\$170,000.00	\$3,540,000
	Residential Building Acquisition	Each	2	\$100,000.00	\$200,000
	Commercial Building Acquisition	Each	13	\$600,000.00	\$7,800,000
	Amtrak Station Relocation	Lsum	1	\$4,423,353.00	\$4,423,353
	Contingency		5%		\$1,135,488
<b>SUBTOTAL =</b>					<b>\$46,900,274</b>
	Indirect Cost Allocation Plan (ICAP)		10%		\$4,690,027
<b>PROJECT TOTAL =</b>					<b>\$51,590,301</b>

## 6.0 Implementation Plan

### 6.1 Introduction

It is proposed that the improvements to SR 347 be implemented using separate individual projects as priorities and funding permits. The Recommended Alternative has been divided into three logical improvement projects or phases, based upon the guidelines and evaluations presented in this section.

### 6.2 Implementation Guidelines

The following guidelines were established and used in evaluating and recommending the sequence of projects for improving SR 347.

- Priority was given to projects that improve traffic operations and safety.
- Priority was given to project segments that improve capacity consistent with need.
- Priority was given to projects that minimize the cost and time required for the acquisition of right-of-way.
- Priority was given to projects based upon construction costs.

### 6.3 Implementation Issues

Each improvement project will require the resolution of one or more issues prior to construction. Typically, these issues are related to clearances for right-of-way, utilities, or environmental mitigation, and regulatory agency coordination and approval. The following list of implementation issues must be considered for every project.

- On-site geotechnical investigations will be required for all projects.
- The drainage analysis for the corridor was limited to design concept level only.
- For each project, maintenance of traffic issues and construction sequencing will need consideration. Each project should be constructed in a manner that impacts traffic as little as possible.
- Permits and approvals will be required for work performed within the Union Pacific Railroad right-of-way.

### 6.4 Recommended Implementation Plan

The following recommendations have been made in accordance with the previously stated implementation guidelines. Each improvement project corresponds to a construction phase of the Recommended Alternative.

Based on the implementation guidelines it is recommended that the projects be constructed in the following order:

- Phase I:
  - Construct new segment parallel tracks to allow trains to unload/load passengers' offline of UPRR's existing double tracks.

- Construct new passenger platform.
- Construct new passenger station and parking lot.
- Demolish the existing AMTRAK Maricopa Station and passenger platform.

- Phase II:
  - Widen SR 347 to accommodate additional Honeycutt Road auxiliary turn lanes.
  - Construct a three-lane arterial roadway connection between MCGH and Honeycutt Rd.
  - Install a new 3-way traffic signal at the new intersection of Honeycutt Rd and MCGH.
  - Improve/widen Honeycutt Rd between SR 347 and the new intersection with MCGH.
  - Construct a new signalized intersection between SR 347 and Honeycutt Rd with optimized signal timing and turning lanes to accommodate the highly directional traffic movements (SB SR 347 to EB Honeycutt Road). Additionally, left turn lanes will be included to facilitate WB to SB turns at this intersection.
  - Construct a raised median at the existing SR 347/MCGH intersection to restrict all traffic movements to right-in, right-out at this intersection.
  - Remove the existing SR 347/MCGH traffic signal.
- Phase III:
  - The SR 347 grade separation will be realigned to the east to preserve local and regional traffic operation during the anticipated 8-12 month construction schedule.
  - Construct a one-way roadway between the realigned SR 347 and MCGH to alleviate congestion from the peak directional (southbound to eastbound) traffic movements and to preserve access to existing businesses.
  - Construct channelized free right-turn lanes on Honeycutt Road for westbound-to-northbound traffic movements.
  - A signalized intersection will be constructed for Honeycutt Avenue (south of UPRR).
  - Close the existing at-grade crossing of the UPRR.

### 6.5 Implementation Costs

Preliminary cost estimates were prepared for each improvement project and are included. The unit prices for the implementation projects were based upon the most recent ADOT bid results. The total combined cost for all phases is slightly greater than the estimated construction cost shown in Section 5.1. This is primarily due to the costs of temporary improvements at the SR347/Honeycutt Road intersection associated with Phase II that will not remain as part of the final roadway configuration.

- Phase I Cost: \$4,423,353
- Phase II Cost: \$11,880,023
- Phase III Cost: \$39,832,582

The SR 347 at UPRR DCR was programmed into the *Fiscal Year 2015-2019 State Transportation Improvement Program* in June. The following bullets highlight the allocated funds in the upcoming years.

- FY 2015: \$5.5 million allocated for design and \$500,000 allocated for right of way.
- FY 2016: \$5.5 million allocated for right of way.
- FY 2017: \$7.3 million allocated for right of way.
- FY 2020: \$36.2 million for construction (note that this portion of the project is in the 2020-2024 Development Program).

### **6.6 Implementation Schedule**

It is recommended that the identified improvement projects for the Recommended Alternative be constructed in the order noted. Additional consideration should be given to the interim improvements as needed. The State Transportation Board will determine the programming of the designs, R/W acquisitions, and construction.

## 7.0 Environmental Documentation

An Environment Assessment (EA) has been prepared in conjunction with study. A Finding of No Significant Impact (FONSI) was issued by FHWA on March 18<sup>th</sup>, 2015.

### 7.1 Biology

The US Fish and Wildlife Service's (USFWS) list of threatened, endangered, proposed, and candidate species occurring in Pinal County (dated August 21, 2013) was reviewed to determine the potential presence of special-status species occurring in the project vicinity. An evaluation of the species that may be present or affected by the proposed project was conducted and reported in the Biological Evaluation completed for this project. No habitat suitable for any of the listed species is present within the project vicinity.

There are no critical habitats that have been designated or proposed under the Endangered Species Act (16 U.S.C. 1531–1544, as amended) in the project area; therefore, no critical habitats would be affected by this project.

The Arizona Game and Fish Department (AGFD) On-line Environmental Review Tool was accessed to determine if special status species known to occur in the project vicinity, and a letter describing the project was sent to AGFD to inform them of the project and to solicit comments. The AGFD On-line Environmental Review Tool included a list of special status species known to occur in the project vicinity, and the AGFD returned two response letters. The AGFD's letter responses indicated that no significant adverse impacts to wildlife resources are anticipated as a result of this project (Chip Young, June 4, 2012; Kelly Wolff-Krauter, June 18, 2013). The AGFD On-line Environmental Review Tool indicated that the western burrowing owl has been documented as occurring within 3 miles of the project area. While no burrowing owls were observed during the site visit on January 9, 2013, there is potentially suitable habitat for this species in the project area, and it is known to occur in the project vicinity. The project would incorporate measures to address potential impacts to burrowing owls during construction that include performing a preconstruction survey for owls, relocation of owls if necessary, and prohibiting construction until owls are relocated.

### 7.2 Hazardous Materials

A Preliminary Initial Site Assessment (PISA) was performed for the proposed project area. Eight locations that pose potential risks due to hazardous materials were identified. They include the fire department, school district facility, gas stations, UPRR tracks and associated lots, auto repair facilities, storage yards, the public pool, a reported incident, and a reported leaking underground storage tank. Of these potential risks, additional investigations to identify the need for remediation are recommended for all identified sites with the exception of the fire department, school district facility, and the public pool.

### 7.3 Cultural Resources

A Class III cultural resources survey and historic building survey was conducted for the SR 347 project. The Class III survey identified four previously recorded sites, three newly recorded sites, and one historic structure. In addition, nine isolated occurrences were documented. The historic building

survey documented 48 historic buildings, all constructed prior to 1968. A report detailing the results of the surveys has been prepared (Jones, Gregory, and Schilling 2013) which includes recommendations for the sites' potential eligibility on the National Register of Historic Places (NRHP). A prehistoric site identified during the survey consists of an artifact scatter (recommended eligible under Criterion D). This prehistoric site will not be impacted by the recommended alignment alternative. Historic sites include Maricopa Road/SR 347 (non-contributing element), the current alignment of the MCGH (recommended as contributing under Criterion A), the historic Southern Pacific Railroad (SPRR) (eligible under Criterion A) and associated features including a water tower (recommended eligible under Criterion C), a trash scatter (recommended not eligible), a period farmstead (recommended not eligible), and a late Historic period cotton gin property (additional research required). One historic structure, the Silver Horizon railcar, was identified. It is recommended eligible under Criterion C. The proposed project would relocate this feature to the new Amtrak station, but it was recommended that the relocation would not result in an adverse effect on this resource.

A Traditional Cultural Property (TCP) was identified near the existing SR 347/UPRR at-grade intersection and proposed grade separation. This site will be avoided by all construction activities.

An inventory of historic buildings was undertaken during the cultural evaluation of the project area. One building was recommended as eligible for the NRHP; however, the building is outside the project area and would not be affected. No historic district was recommended at this time.

### 7.4 Section 4(f) Resources

Section 4(f) of the Department of Transportation Act of 1966 (49 U.S.C. 303) restricts the use of any publicly owned park, recreation area, or wildlife and waterfowl refuge, or any significant historic site that is either listed or is eligible for listing in the NRHP under Criteria A, B or C. No publicly owned parks or recreation areas occur within or within 0.25 mile of the project area. In addition, no wildlife or waterfowl refuge occurs. The MCGH and UPRR (formerly the SPRR) were identified during the cultural evaluation as potentially eligible under Criterion A, and the historic water tower and the Silver Horizon railcar were recommended eligible under Criterion C. While these cultural resources may be considered resources afforded protection under Section 4(f), the project is not anticipated to result in an adverse effect on these resources.

### 7.5 Social and Economic Impacts

Residential, commercial, institutional, agricultural, and industrial land uses are located adjacent to the project. The build alternative will require new right-of-way and displacements. Potential access restrictions; pedestrian, bicycle, and vehicular traffic impacts; impacts to protected populations; right-of-way requirements; and displacements will be addressed in further detail in the environmental document developed for this project.

### 7.6 Air Quality

According to the EPA, "Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. 'Inhalable coarse particles,' such as those found near roadways and dusty industries,

are larger than 2.5 micrometers and smaller than 10 micrometers in diameter. 'Fine particles,' such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air" (EPA 2013). The project is located within an area that is in nonattainment for particulate matter less than ten and less than two and a half micrometers in diameter (PM10 and PM2.5, respectively [2006 standard]) but in attainment for all other criteria pollutants.

West Pinal County is currently in air quality conformity lapse for PM10. Maricopa Association of Governments is preparing documentation to resolve this lapse. As a result of this process, the proposed project would be included in the Transportation Improvement Program once the process is complete.

This project would take measures to reduce queuing and traffic delays due to trains and improve vehicle movement within the project area. As such, it is anticipated that the proposed project would result in an overall improvement in localized air quality and reduced emissions of PM2.5 emitted from vehicles due to improved traffic movement and reduced idle times. During construction, minor increases in both PM10 and PM2.5 would be anticipated due to the operation of construction equipment, earth moving activities, and construction-related traffic delays. However, best management practices would be employed to minimize construction-related particulate emissions. No long-term adverse impacts to air quality are anticipated.

Citation:  
Environmental Protection Agency. 2013. Particulate Matter (PM), Basic Information. <http://epa.gov/airquality/particlepollution/basic.html> accessed 11/07/2013.

## 7.7 Noise

Sensitive noise receptors, such as residences, churches, a school, etc., are located adjacent to the project limits. Existing peak-hour traffic noise levels modeled at sensitive receiver sites ranged from 40 to 61 weighted decibels (dBA). Peak-hour traffic noise levels modeled at sensitive receiver sites for under both the Build and No Build conditions ranged from 54 to 62 dBA. Based on initial modeling, the anticipated noise levels with or without the proposed project are not anticipated to meet the ADOT noise abatement thresholds.

## 7.8 Visual Quality

Elements in a landscape such as landform, water features, vegetation types, and cultural modifications primarily define visual resources. The attributes of these visual resources include form, line, color, and texture and contribute to the overall visual pattern of landscape. The ability to discern these elements and patterns is primarily a function of distance.

The visual character of the study area is predominantly an urban and built environment. Agricultural fields are visible to the southeast of the project area are open areas associated with the railroad and its right-of-way. Commercial and residential buildings are adjacent to SR 347 and residential and the railroad are adjacent to MCGH. The visual resources and potential effects will be addressed in further detail in the environmental document.

## 7.9 Utilities

Utilities are present within the project area, and utility work would be required to accommodate the proposed improvements. Potential impacts to utilities will be documented in the environmental document developed for this project.

## 7.10 Section 401/404 of the Clean Water Act

Based on a review of the project area, there are no washes within the proposed project that would be considered potential Waters of the U.S. under the jurisdiction of the US Army Corps of Engineers; no Section 404/401 permit would be required. Since more than 1 acre of land would be disturbed, a National Pollutant Discharge Elimination System permit would be required for the project.

## 7.11 Mitigation Measures

These mitigation measures are not subject to change without prior written approval from the Federal Highway Administration.

### Design Responsibilities

- The Arizona Department of Transportation will perform any right-of-way acquisition in accordance with 49 Code of Federal Regulations 24 and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.
- Prior to construction, the Project Engineer will contact the Ak-Chin Indian Community Cultural Resource Specialist (Caroline Antone at 520.568.1372) to arrange for the temporary removal of the roadside memorial if so desired by the family that maintains it. If arrangements cannot be made, the site will be flagged and avoided during construction.
- During final design, the project manager will contact the Arizona Department of Transportation Environmental Planning Group Noise Coordinator (602.712.6161 or 602.712.7767) to arrange for qualified personnel to review and update the noise analysis.
- During final design, the Arizona Department of Transportation Project Manager will coordinate relocation of utilities with the affected utility companies and residents where necessary. If service disruption will be required for utility relocation, the Arizona Department of Transportation will coordinate with the utility companies to ensure customers are notified prior to service disruption.
- The City of Maricopa Floodplain Manager at 520.316.6951 and the Pinal County Floodplain Manager at 520.509.3555 will be provided an opportunity to review and comment on the design plans.
- All disturbed soils not paved that will not be landscaped or otherwise permanently stabilized by construction will be seeded using species native to the project vicinity.
- Relocation of burrowing owls will be added to the contract documents as a pay item.
- During final design, the Arizona Department of Transportation Project Manager will contact the Environmental Planning Group Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) to arrange for a follow-up assessment (Preliminary Site Investigations - Phase I, II, and/or III) at the high-risk sites and moderate-risk sites to determine specific locations and severity of impacts on the design and construction of the project.

- The Arizona Department of Transportation Project Manager will contact the Arizona Department of Transportation Environmental Planning Group (602.712.7767 or the respective planner for the project) 30 (thirty) days prior to bid advertisement to verify that the environmental clearance is still valid.

#### City of Maricopa Responsibilities

- The City of Maricopa shall perform any right-of-way acquisition involved with Phase 1 in accordance with 49 CFR 24 and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.
- Prior to final design of Phase 1, the City of Maricopa Project Manager shall contact the Arizona Department of Transportation Environmental Planning Group Noise Coordinator (602.712.6161 or 602.712.7767) to arrange for qualified personnel to review the project design plans and determine the need for additional noise analysis. If additional noise analysis is warranted, the City of Maricopa shall be responsible for preparing and submitting a noise analysis to the Arizona Department of Transportation Environmental Planning Group Noise Coordinator.
- If tree or shrub removal will occur from February 15 through August 31, the City of Maricopa shall contact the Department Environmental Planning Group Biologist (602.712.8635 or 602.712.7767) at least 14 days prior to tree pruning or removal activities to arrange for a biologist experienced in bird surveys to conduct a bird nest search of all trees that will be removed. The bird nest search shall be conducted within 10 days prior to tree or shrub removal and will include a search for visible nests as well as observation of the trees to determine the potential presence of cavity nests.
- Prior to advertising for construction for Phase 1, the City of Maricopa Project Manager shall contact the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) to arrange for the Preliminary Initial Site Assessment to be updated. If additional assessment is warranted, the City of Maricopa shall be responsible for preparing and submitting the appropriate documentation to the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator.
- Prior to final design of Phase 1, the City of Maricopa shall provide the Arizona Department of Transportation Environmental Planning Group Environmental Planner (602.712.7973 or 602.712.7767) a copy of the project design plans to determine the need for an Environmental Assessment Re-evaluation. If a Re-evaluation is warranted, the City of Maricopa shall be responsible for preparing and submitting the Re-evaluation to the Arizona Department of Transportation Environmental Planning Group Environmental Planner.

#### Tucson District Responsibilities

- Access to adjacent businesses and residences will be maintained throughout construction.
- Prior to construction, the Project Engineer will contact the Ak-Chin Indian Community Cultural Resource Specialist (Caroline Antone at 520.568.1372) to arrange for the temporary removal of the roadside memorial if so desired by the family that maintains it. If arrangements cannot be made, the site will be flagged and avoided during construction.
- The Engineer will review and approve the contractor's Stormwater Pollution Prevention Plan, Notice of Intent, and Notice of Termination prior to submission of the Notice of Intent and Notice of Termination to the Arizona Department of Environmental Quality.

- At least 21 days prior to construction or any preconstruction ground disturbing activities, the Engineer will contact the Arizona Department of Transportation Environmental Planning Group Biologist (602.712.8635 or 602.712.7767) to arrange for a qualified biologist to present an environmental awareness program to all personnel who will be on-site, including, but not limited to, contractors, contractors' employees, supervisors, inspectors, and subcontractors. This program will contain information concerning the western burrowing owl, its occurrence in the study area, and procedures to be implemented in case of western burrowing owl encounters.
- If any burrowing owls are located in the work area, no construction activities will take place within 100 feet of any active burrow until the owls have been relocated.
- If burrowing owls or active burrows are located in the work area, the Engineer will contact the Arizona Department of Transportation Environmental Planning Group Biologist (602.712.8635 or 602.712.7767) to arrange for a qualified biologist to evaluate the situation. The Engineer and qualified biologist will determine whether the owls can be avoided or if a biologist holding a permit from the U.S. Fish and Wildlife Service is needed to relocate burrowing owls from the project area.
- If tree or shrub removal will occur from February 15 through August 31, the Engineer will contact the Department Environmental Planning Group Biologist (602.712.8635 or 602.712.7767) at least 14 days prior to tree pruning or removal activities to arrange for a biologist experienced in bird surveys to conduct a bird nest search of all trees that will be removed. The bird nest search will be conducted within 10 days prior to tree or shrub removal and will include a search for visible nests as well as observation of the trees to determine the potential presence of cavity nests.
- If regulated amounts of asbestos are found, no demolition or removal of load-bearing concrete will occur until the Asbestos Removal and Disposal Plan is approved and implemented.
- If asbestos-containing material is identified, the Engineer, in association with the contractor, will complete the National Emission Standard for Hazardous Air Pollutants documentation and submit it to the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) for review 5 (five) working days prior to being submitted to the regulatory agency.
- If lead-based paint is found on any surfaces that will be disturbed during construction, an approved contractor will develop and implement a lead-based paint abatement plan for the removal of the lead based paint, Toxicity Characteristic Leaching Procedure testing of the generated waste stream, and proper disposal of the waste stream derived from the removal of the lead-based paint within the project limits. The contractor will follow all applicable local, state and federal codes and regulations related to the treatment and handling of lead-based paint.
- If lead-based paint is found, the contractor will submit a lead-based paint removal and disposal plan for the removal of lead-based paint within the project limits to the Engineer for review and approval at least 10 working days prior to disturbing the painted surface.
- If lead-based paint is found, no disturbance of the lead-based paint will occur until the lead-based paint abatement plan is approved by the Department Hazardous Material Coordinator and implemented.

#### Roadside Development Responsibilities

- Protected native plants within the project limits will be impacted by this project; therefore, the Arizona Department of Transportation Roadside Development Section will determine if Arizona

Department of Agriculture notification is needed. If notification is needed, the Arizona Department of Transportation Roadside Development Section will send the notification at least 60 (sixty) calendar days prior to the start of construction.

- The Arizona Department of Transportation Roadside Development Section will provide special provisions for the control of noxious and invasive plant species during construction that may require treatment and control within the project limits. The Arizona Department of Transportation Roadside Development Section will review and approve or reject the Noxious and Invasive Plant Species Treatment and Control Plan prepared by the contractor and submitted to the Engineer as required in the specifications within 10 (ten) working days of receipt. Once approved the Arizona Department of Transportation Roadside Development Section will return the plan to the Engineer.

### Environmental Planning Group Responsibilities

- The Environmental Planning Group will test for asbestos prior to the start of construction activities on any structures to be demolished or modified. If asbestos-containing materials are found, no activities associated with the demolition or removal of asbestos-containing materials will be allowed to occur until the Asbestos Removal and Disposal Plan is approved by the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator.
- During final design, Environmental Planning Group will test for lead-based paint prior to the start of construction activities on any painted surfaces.

### Contractor's Responsibilities

- Access to adjacent businesses and residences shall be maintained throughout construction.
- If the roadside memorial is not relocated during construction, the contractor shall contact the Arizona Department of Transportation Historic Preservation Team (602.712.8636 or 602.712.7767) at least 10 (ten) business days prior to the start of ground-disturbing activities to arrange for a qualified archaeologist to flag avoidance areas.
- If flagging is required, the contractor shall avoid all flagged and/or otherwise designated sensitive resource areas within or adjacent to the study area.
- If previously unidentified cultural resources are encountered during activity related to the construction of the project, the contractor shall stop work immediately at that location notify the Engineer and shall take all reasonable steps to secure the preservation of those resources. The Engineer shall contact the Arizona Department of Transportation Environmental Planning Group, Historic Preservation Team, (602.712.8636 or 602.712.7767) immediately, and make arrangements for proper treatment of those resources.
- The contractor shall comply with all local air quality and dust control rules, regulations and ordinances which apply to any work performed pursuant to the contract.
- The contractor shall develop a Stormwater Pollution Prevention Plan, Notice of Intent, and Notice of Termination, and submit it to the Engineer for approval.
- The contractor, upon approval from the Engineer, shall submit the Stormwater Pollution Prevention Plan, Notice of Intent, and Notice of Termination to the Arizona Department of Environmental Quality.
- The contractor shall develop a Noxious and Invasive Plant Species Treatment and Control Plan in accordance with the requirements in the contract documents. Plants to be controlled shall include those listed in the State and Federal Noxious Weed and the State Invasive

Species list in accordance with State and Federal Laws and Executive Orders. The plan and associated treatments shall include all areas within the project right of way and easements as shown on the project plans. The treatment and control plan shall be submitted to the Arizona Department of Transportation Roadside Development Section for review and approval prior to implementation by the contractor.

- Prior to the start of ground-disturbing activities, the contractor shall arrange for and perform the control of noxious and invasive species in the project area.
- To prevent the introduction of invasive species seeds, the contractor shall inspect all earthmoving and hauling equipment at the equipment storage facility and the equipment shall be washed prior to entering the construction site.
- To prevent invasive species seeds from leaving the site, the contractor shall inspect all construction equipment and remove all attached plant/vegetation and soil/mud debris prior to leaving the construction site.
- All disturbed soils not paved that shall not be landscaped or otherwise permanently stabilized by construction shall be seeded using species native to the project vicinity.
- No construction work, including ground disturbing activities, shall begin prior to presentation of the environmental awareness program to all personnel who shall be on-site, including, but not limited to, contractors, contractors' employees, supervisors, inspectors, and subcontractors working at project locations.
- The contractor shall employ a biologist to complete a pre-construction survey for burrowing owls 96 hours prior to any construction in all suitable habitats that shall be disturbed. The biologist shall possess a burrowing owl survey protocol training certificate issued by the Arizona Game and Fish Department. Upon completion of the surveys, the biologist shall contact the Arizona Department of Transportation Biologist at (602.712.8635 or 602.712.7767) to provide survey results.
- If any burrowing owls or active burrows are identified in the work area, the contractor shall stop work immediately at that location and immediately notify the Engineer. No construction activities shall take place within 100 feet of any active burrow. If owls cannot be avoided, the contractor shall employ a biologist holding a permit from the U.S. Fish and Wildlife Service to relocate burrowing owls from the project area, as appropriate.
- If asbestos-containing material is identified, no demolition of existing building or structures shall occur until the Asbestos Removal and Disposal Plan is approved by the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator and implemented.
- If lead-based paint is identified, the contractor shall submit a Lead-Based Paint Removal and Abatement Plan for the removal or demolition of any buildings or structures within the project limits to the Engineer and the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) for review and approval at least 10 (ten) working days prior to demolition activities.
- If lead-based paint is identified, no demolition of buildings or structures shall occur until the Lead-Based Paint Removal and Abatement Plan is approved by the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator and implemented.
- If suspected hazardous materials are encountered during construction, work shall cease at that location and the Engineer shall be notified. The Engineer shall contact the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) immediately, and make arrangements for assessment, treatment and disposal of those materials.

### Standard Specifications included as Mitigation Measures

- According to Arizona Department of Transportation's Standard Specifications for Road and Bridge Construction, Section 104 Scope of Work, Subsection 08 Prevention of Air and Noise Pollution (2008), "the contractor shall control, reduce, remove or prevent air pollution in all its forms, including air contaminants, in the performance of the contractor's work. The contractor shall comply with applicable requirements of Arizona Revised Statutes Section 49-401 et seq. (Air Quality) and with the Arizona Administrative Code, Title 18, Chapter 2 (Air Pollution Control)."
- According to Arizona Department of Transportation's Standard Specifications for Road and Bridge Construction, Section 104.08 (2008), special provisions, and local rules or ordinances, including Arizona Administrative Code Title 18, Chapter 2 (Air Pollution Control)," the contractor shall comply with all air pollution ordinances, regulations, orders, etc., during construction. All dust-producing surfaces shall be watered or otherwise stabilized to reduce short-term impacts associated with an increase in particulate matter attributable to construction activity"
- According to Arizona Department of Transportation's Standard Specifications for Road and Bridge Construction, Section 104 Scope of Work, Subsection 08 Prevention of Air and Noise Pollution (2008), "the contractor shall comply with all local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the contract. Each internal combustion engine used for any purpose on the work or related to the work shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the work without its muffler being in good working condition"
- According to Arizona Department of Transportation's Standard Specifications for Road and Bridge Construction, Section 810-1.02, Other-Pollutants Controls (2008), "the work shall include implementing controls to eliminate the discharge of pollutants, such as fuels, lubricants, bitumens, dust palliatives, raw sewage, wash water, and other harmful materials; into storm and other off-site waters. The work shall include the implementation of spill prevention and material management controls and practices to prevent the release or washoff of pollutants. These controls and practices shall be specified in the Stormwater Pollution Prevention Plan and shall include storage procedures for chemicals and construction materials, disposal and cleanup procedures, the Contractor's plan for handling of potential pollutants, and other pollution prevention measures as required."
- The contractor shall control sedimentation associated with construction in compliance with erosion-control measures stipulated in Arizona Department of Transportation's Standard Specifications for Road and Bridge Construction (2008). Erosion associated with the removal of vegetation shall also be controlled in accordance with Arizona Department of Transportation's Standard Specifications for Road and Bridge Construction (2008).
- The work shall include implementing controls to eliminate the discharge of pollutants, such as fuels, lubricants, bitumens, dust palliatives, raw sewage, wash water, and other harmful materials; into storm and other off-site waters. The work shall include the implementation of spill prevention and material management controls and practices to prevent the release or washoff of pollutants. These controls and practices shall be specified in the SWPPP and shall include storage procedures for chemicals and construction materials, disposal and cleanup procedures, the contractor's plan for handling of potential pollutants, and other pollution prevention measures as required. The contractor shall follow all applicable federal, state, and local codes and regulations, including Arizona Department of Transportation Standard

Specifications for Road and Bridge Construction (2008 Edition), related to the discharge, handling, and disposal of pollutants.

- If asbestos-containing material is identified, an approved contractor shall develop and implement an Asbestos Removal and Disposal Plan for the removal of the asbestos or asbestos-containing material from any building or structure being demolished. The plan shall be submitted to the Arizona Department of Transportation's Environmental Planning Group hazardous materials coordinator (602.920.3882 or 602.712.7767) and Engineer for review and approval at least 10 (ten) working days prior to implementation. A list of approved asbestos abatement contractors shall be attached to the special provisions. The contractor shall follow all applicable federal, state, and local codes and regulations, including Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (2008 Edition), related to the treatment, handling, and disposal of asbestos.
- If lead-based paint is identified, an approved contractor shall develop and implement a Lead-Based Paint Removal and Abatement Plan for the removal of the lead-based paint, Toxicity Characteristic Leaching Procedure testing of the generated waste stream, and proper disposal of the waste stream derived from the removal or demolition of buildings or structures within the project limits. The contractor shall follow all applicable federal, state, and local codes and regulations, including Arizona Department of Transportation's Standard Specifications for Road and Bridge Construction (2008 Edition), related to the treatment and handling of lead-based paint.
- According to Arizona Department of Transportation's Standard Specifications for Road and Bridge Construction, Section 107.11, Protection and Restoration of Property and Landscape (2008), "materials removed during construction operations, such as trees, stumps, building materials, irrigation and drainage structures, broken concrete, and other similar materials, shall not be dumped on either private or public property unless the contractor has obtained written permission from the owner or public agency with jurisdiction over the land. Written permission shall not be required, however, when materials are disposed of at an operating, public dumping ground." Excess waste material and construction debris shall be disposed of at sites supplied by the contractor, at a municipal landfill approved under Title D of the Resource Conservation and Recovery Act, at a construction debris landfill approved under Article 3 of the Arizona Revised Statutes 49-241 (Aquifer Protection Permit) administered by Arizona Department of Environmental Quality, or at an inert landfill.



# **APPENDIX A**

## **RECOMMENDED ALTERNATIVE TYPICAL SECTIONS**

# **APPENDIX B**

## **RECOMMENDED ALTERNATIVE PLAN & PROFILE SHEETS**

# **APPENDIX C**

## **DRAINAGE MEMORANDUM**

# **APPENDIX D**

## **TRAFFIC ANALYSIS REPORT**

# **APPENDIX E**

# **GEOTECHNICAL EVALUATION**

# **APPENDIX F**

## **BRIDGE CONCEPT REPORT**

# **APPENDIX G**

## **CONCEPTUAL ALIGNMENT LAYOUTS**

# **APPENDIX H**

## **AGENCY AND PUBLIC MEETING REPORTS**



# **APPENDIX I**

## **QUALITATIVE SCREENING**