BLACK MOUNTAIN BOULEVARD:

SR 51/Loop 101 Interchange to Cave Creek Road

DRAFT ENVIRONMENTAL ASSESSMENT

MARICOPA COUNTY, AZ | PROJECT NO. PHX-0(266)A | TRACS NO. 0000 MA PHX SS979 03D

LEAD FEDERAL AGENCY:

US Department of Transportation
Federal Highway Administration
Arizona Division
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JOINT LEAD AGENCIES:

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Arizona Department of Transportation
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COOPERATING AGENCIES:

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Phoenix, Arizona 85012-1939

US Bureau of Reclamation
6150 West Thunderbird Road
Glendale, AZ 85306-4001

Draft Environmental Assessment
Black Mountain Boulevard:
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June 2013
Version 7

ARIZONA DEPARTMENT OF TRANSPORTATION
Intermodal Transportation Division
Environmental Planning Group
1611 West Jackson Street
Phoenix, Arizona 85007

Draft Environmental Assessment
Black Mountain Boulevard:
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0000 MA PHX SS979 01R

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Federal Highway Administration

This draft environmental assessment has been prepared in accordance with provisions and requirements of Chapter 1, Title 23 U.S.C. and 23 CFR Part 774 relating to the implementation of the National Environmental Policy Act of 1969.

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List of Acronyms and Abbreviations

#	number
AADT	annual average daily traffic
ACM	asbestos-containing materials
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADT	average daily traffic
ADWR	Arizona Department of Water Resources
AGFD	Arizona Game and Fish Department
ALCP	Arterial Life Cycle Program
APE	area of potential effects
APS	Arizona Public Service Company
ARS	Arizona Revised Statute
ASLD	Arizona State Land Department
ASM	Arizona State Museum
ASTM	ASTM International (formerly, American Society for Testing and Materials)
AZPDES	Arizona Pollutant Discharge Elimination System
BE	biological evaluation
BMB	Black Mountain Boulevard
BMP	best management practice(s)
CAA	Clean Air Act
CAP	Central Arizona Project
CAWCD	Central Arizona Water Conservation District
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
Corps	US Army Corps of Engineers
CWA	Clean Water Act
dB	decibel
dBA	decibels in the range heard by the human ear

du/acre	dwelling units per acre
EA	environmental assessment
EIS	environmental impact statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FCDMC	Flood Control District of Maricopa County
FEMA	Federal Emergency Management Administration
FHWA	Federal Highway Administration
FIRM(s)	flood insurance rate map(s)
FMS	Freeway Management System
FTA	Federal Transit Administration
g/mi	grams per mile
GHG	greenhouse gas(es)
GRIC	Gila River Indian Community
HOA	homeowners' association
Hz	hertz
I-10	Interstate 10
I-17	Interstate 17
IP	Individual Permit(s)
JD	jurisdictional delineation
kV	kilovolt
L	Loop
$L_{Aeq(h)}$	hourly "A"-weighted L_{eq}
L_{eq}	steady-state noise level
LBP	lead-based paint
MAG	Maricopa Association of Governments
MCAQD	Maricopa County Air Quality Department
Mgt	management
mph	miles per hour
MSAT	mobile source air toxic(s)
$\mu g/m^3$	microgram per cubic meter
NAAQS	National Ambient Air Quality Standards
n/a	not applicable

NAC	Noise Abatement Criteria
NAP	Noise Abatement Policy
NB	northbound
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NS	no standard
O_3	ozone
OAW	Outstanding Arizona Waters
Phoenix	City of Phoenix
PHS	Pinnacle High School
PISA	Preliminary Initial Site Assessment
PLZ	potential linkage zone
$PM_{2.5}$	fine particulate matter
PM_{10}	particulate matter
POM	polycyclic organic matter
ppm	parts per million
Reclamation	US Bureau of Reclamation
RFS	regional freeway system
RLUA	Recreation Land Use Agreement
ROW	right-of-way
RTP	Regional Transportation Plan
SAFETEA-LU	*Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users*
SB	southbound
SFH	single family home(s)
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulphur dioxide
SR	State Route
SRP	Salt River Project
SWPPP	Stormwater Pollution Prevention Plan

TAZ	Traffic Analysis Zone(s)
TI	traffic interchange(s)
TIP	Transportation Improvement Program
TNM	Traffic Noise Model
US	United States
U.S.C.	United States Code
USDOT	United States Department of Transportation
USFWS	US Fish and Wildlife Service
VA	Department of Veterans Administration
VMT	vehicle miles traveled
Waters	Waters of the United States
Western	Western Area Power Administration

Mitigation Measures

The following are measures that would be implemented to avoid, minimize, or otherwise mitigate environmental impacts associated with the proposed project. These mitigation measures and commitments are not subject to change without prior written approval from the Federal Highway Administration.

City of Phoenix Responsibilities:

- The acquisition of right-of-way would be performed in accordance with 42 U.S.C. Chapter 61 and the Real Property Acquisition Policies Act of 1970 and A.R.S. 12-1111 et seq. (Special Actions and Proceedings Relating to Property). (Refer to pages 61, 69, 72)
- During final design, coordination would be conducted with the Bureau of Reclamation to ensure design is compatible with the *Reach 11 Recreation Master Plan*, the Reach 11 flood detention and protection function, and Reach 11 mitigation requirements. (Refer to page 61)
- During final design, the City of Phoenix would design Black Mountain Boulevard to accommodate the future planned trails in the *Phoenix General Plan* and *Reach 11 Recreation Master Plan*. (Refer to page 90)
- During final design, project designers would coordinate the design of any new points of access to the Reach 11 Recreation Area, rerouting of existing trails, and any potential construction-related temporary trail closures with the City of Phoenix Parks and Recreation Department. (Refer to page 90)
- During final design, the City of Phoenix would evaluate strategies that reduce engine activity or reduce emissions per unit of operating time to reduce construction impacts on air quality. (Refer to page 108)
- During final design, the City of Phoenix would coordinate relocation of utilities with the affected utility companies. (Refer to page 119)
- If service disruption would be required for utility relocation, the City of Phoenix would coordinate with the utility companies to ensure customers are notified 14 days prior to service disruption. (Refer to page 119)

- During final design of each construction phase, the floodplain managers with local jurisdiction would be provided an opportunity to review and comment on the design plans. (Refer to page 128)
- For project phases occurring within Reach 11, coordination with the Bureau of Reclamation would be done during design to ensure that the flood detention capacity and flood protection purposes of Reach 11 are maintained. (Refer to pages 128, 135)
- During design the City of Phoenix would prepare and submit a jurisdictional delineation and an application to the US Army Corps of Engineers for a Clean Water Act Section 404 permit. (Refer to page 134)
- No work would occur within jurisdictional waters of the US until the appropriate Clean Water Act Section 401 certification and 404 permits are obtained. (Refer to page 134)
- The City of Phoenix and the contractor would adhere to all terms and conditions of the Azara (Corps File Number SPL-2005-01170-SDM) and Desert Ridge (Corps File Number 984-0030-RWF) Section 404 permits, and avoid the mitigation site (mesquite bosque) located in the southwest quadrant of the State Route 51/State Route Loop 101 Traffic Interchange. (Refer to page 134)
- The City of Phoenix Street Transportation Department Environmental Quality Specialist (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) would review the resumes of the biologist(s) employed by the contractor to verify that the biologist(s) possess the necessary qualifications to implement the biological resources mitigation measures. (Refer to pages 147, 149)
- During final design and prior to construction, the City of Phoenix, in coordination with the Arizona Department of Transportation and Federal Highway Administration, would re-evaluate potential project-related effects to species protected by the federal Endangered Species Act. (Refer to page 147)
- Protected native plants within the project limits would be impacted by this project; therefore, the City of Phoenix would determine if Arizona Department of Agriculture notification is needed. If notification is needed, the City of Phoenix would send the notification at least 60 calendar days prior to the start of construction. (Refer to page 149)

- During final design, the Project Manager would contact the City of Phoenix Street Transportation Department at (602.262.6284) to arrange for qualified personnel to review and update the Preliminary Initial Site Assessment. (Refer to page 152)
- During final design, the Project Manager would contact the City of Phoenix Street Transportation Department at (602.262.6284) to determine the need for additional hazardous materials site assessment. (Refer to page 152)
- During final design, the Project Manager would coordinate with the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) to complete testing for asbestos and lead-based paint within the limits of Arizona Department of Transportation right-of-way and, if necessary, recommend remediation measures. For portions of projects not involving Arizona Department of Transportation right-of-way, the Project Manager would contact the City of Phoenix Street Transportation Department at (602.262.6284) to complete testing for asbestos and lead-based paint within the limits of City of Phoenix right-of-way and, if necessary, recommend remediation measures. (Refer to page 153)
- The City of Phoenix would coordinate with the Arizona Department of Transportation for any required National Emissions Standards for Hazardous Air Pollutants notifications. This measure would not apply to projects that would not involve modifications to Arizona Department of Transportation ramp structures. (Refer to page 153)

Contractor Responsibilities:

- Access to businesses in the project vicinity would be maintained during construction. (Refer to page 72)
- If archaeological, historical, human remains or paleontological features are encountered or discovered during any activity related to the construction of the project, the contractor would stop work immediately at that location and would take all reasonable steps to secure the preservation of those features and notify the City of Phoenix Archaeology Office (602.495.0901). (Refer to page 77)

- Construction of Black Mountain Boulevard within the Tatum Highlands East-West (Azara) planning area would be monitored for archaeological resources during construction. Archaeologist(s) performing this work would be required to hold an Arizona State Museum blanket permit, or be under the supervision or employment of an institution, organization, or business holding a blanket permit. (Refer to page 77)
- Trails in place at the time of construction would be kept open through the duration of construction except in instances where public safety could not be reasonably maintained. (Refer to page 90)
- Fugitive dust generated from construction activities would be controlled in accordance with Maricopa County Rule 310, special provisions, as well as other local rules and ordinances. (Refer to page 108)
- Equipment would be maintained on a regular basis; new equipment would be subject to new product noise emission standards. (Refer to page 117)
- Stationary equipment would be located as far away from sensitive receivers as possible. (Refer to page 117)
- The public would be adequately notified of construction operations; methods such as construction alert publications would be provided to handle complaints in an expeditious manner. (Refer to page 117)
- The contractor would adhere to all terms and conditions of the Azara (Corps File Number SPL-2005-01170-SDM), Desert Ridge (Corps File Number 984-0030-RWF), and SR 51 Bell Road to Pima Freeway (Corps File Number 2000-01470-LSF) Section 404 permits as applicable. (Refer to page 134)
- The contractor would obtain the most current copy of the City of Phoenix Best Management Practices for incorporation in the Stormwater Pollution Prevention Plan. (Refer to page 134)
- The contractor would prepare and implement a Stormwater Pollution Prevention Plan with Stormwater Monitoring Plan. The contractor would also prepare a Notice of Intent and a Notice of Termination meeting the terms and conditions of the Arizona Pollutant Discharge Elimination System general permit. (Refer to page 134)

- Upon approval of the Stormwater Pollution Prevention Plan and Stormwater Monitoring Plan by the Arizona Department of Environmental Quality, the contractor would file a Notice of Intent to the Arizona Department of Environmental Quality. Upon final acceptance of the project by the City of Phoenix, the contractor would file a Notice of Termination for the project to the Arizona Department of Environmental Quality. The contractor shall provide copies of the completed final Stormwater Pollution Prevention Plan, Stormwater Monitoring Plan and Notice of Intent and Notice of Termination to the City of Phoenix. (Refer to page 134)
- The contractor would employ a biologist qualified to implement a Sonoran desert tortoise awareness training program. The biologist would present the training to all personnel who would be onsite, including but not limited to contractors, contractors' employees, supervisors, inspectors, and subcontractors. The program would contain information concerning desert tortoise identification; biology and distribution; legal status and occurrence in the project area; measures to avoid impacts to the species; and procedures to be implemented if tortoises are encountered during project activities, including a review of the *Arizona Game and Fish Department's Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects* (Appendix A). (Refer to page 146)
- At least 30 days prior to construction, the contractor would submit resume(s) of all contractor-employed biologist(s) to the City of Phoenix Street Transportation Department Environmental Quality Specialist (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) for approval. (Refer to page 146)
- In the event that Sonoran desert tortoises are encountered during construction, the contractor would adhere to the Arizona Game and Fish Department's *Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects* (Appendix A). (Refer to page 147)
- The contractor would plan to complete all tree and columnar cacti removal activities on the site between September 1st and February 28th to avoid harming any active bird nests. (Refer to page 147)

- If tree or columnar cacti removal would occur between March 1st and August 31st, the contractor would employ a biologist(s) qualified to conduct a migratory bird nest search of all trees and columnar cacti that would be removed between March 1st and August 31st. The bird nest search would be conducted within 10 days prior to tree/cacti removal, and would include a search for visible nests, as well as observation of the trees and cacti to determine the potential presence of cavity nests. Upon completion of the nest search, the biologist would contact the City of Phoenix Street Transportation Department Environmental Quality Specialist (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) to provide nest search results. (Refer to page 148)
- The contractor would not remove any trees or columnar cacti between March 1st and August 31st unless a biologist approved by the City of Phoenix has conducted a bird nest search of those trees/cacti and has determined that no active bird nests are present. Trees and cacti may be removed if they have been surveyed within 10 days prior to removal as long as only inactive bird nests, if any, are present, or if relocation of active nests and their inhabitants can be accomplished by an avian wildlife rehabilitator holding the appropriate permits from the US Fish and Wildlife Service and the Arizona Game and Fish Department. Between September 1st and February 28th, tree/columnar cacti removal is not subject to this restriction. (Refer to page 148)
- The contractor would employ a biologist to complete a preconstruction survey for burrowing owls 10 days prior to construction in all suitable habitat that would be disturbed. The biologist would possess a burrowing owl survey protocol training certificate issued by the Arizona Game and Fish Department. Upon completion of the surveys, the contractor would contact the City of Phoenix Street Transportation Department Environmental Quality Specialist at (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) to provide survey results. (Refer to page 148)
- If any burrowing owls are located during preconstruction surveys or construction, the contractor would employ a wildlife rehabilitator holding a permit from the US Fish and Wildlife Service and Arizona Game and Fish Department to relocate the birds from the study area, as appropriate. (Refer to page 148)

- If burrowing owls or active burrows are identified during the preconstruction surveys or during construction, no construction activities would take place within 100 feet of any active burrow until the owls are relocated. (Refer to page 148)
- At least 30 days prior to construction, the contractor would submit resume(s) of all contractor-employed biologist(s) to the City of Phoenix Street Transportation Department Environmental Quality Specialist (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) for approval. (Refer to page 149)
- All disturbed soils that would not be landscaped or otherwise permanently stabilized by construction would be seeded using species native to the project vicinity. (Refer to page 149)
- To prevent the introduction of invasive species seeds, all construction equipment would be washed at the contractor's storage facility prior to entering the construction site. (Refer to page 149)
- To prevent invasive species seeds from leaving the construction site, the contractor would inspect all construction equipment and remove all attached plant/vegetation and soil/mud debris prior to allowing that equipment to leave the construction site. (Refer to page 149)
- If asbestos-containing materials are found, no activities associated with the demolition or removal of asbestos-containing materials would be allowed to occur until the Asbestos Removal and Disposal Plan is approved. (Refer to page 153)
- The contractor would complete a National Emissions Standards for Hazardous Air Pollutants notification for work associated with the modification of Arizona Department of Transportation ramp structures and submit it to the Engineer for review and approval. Upon approval, the contractor would file the notification with the Maricopa County Air Quality Department at least 10 working days prior to the modification of ramp structures. This measure would not apply to projects that would not involve modifications to Arizona Department of Transportation ramp structures. (Refer to page 153)

- If asbestos-containing materials are found, an approved contractor would develop and implement an Asbestos Removal and Disposal Plan for the demolition and removal of asbestos-containing materials. The plan would be submitted to the Engineer for review and approval at least 10 working days prior to implementation. The contractor would follow all applicable local, state, and federal codes and regulations related to the treatment, handling, and disposal of asbestos. (Refer to page 153)
- If regulated amounts of asbestos are found, no demolition or removal of load-bearing concrete would occur until the Asbestos Removal and Disposal Plan is approved and implemented. (Refer to page 154)
- If lead-based paint is found on any surfaces that would be disturbed during construction, an approved contractor would 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 construction limits. The contractor would follow all applicable local, state and federal codes and regulations related to the treatment and handling of lead-based paint. (Refer to page 154)
- If lead-based paint is found, no disturbance of the lead-based paint would occur until the lead-based paint abatement plan is approved and implemented. (Refer to page 154)
- If suspected hazardous materials are encountered during construction, work would cease at the location and the City of Phoenix Street Transportation Department at (602.262.6284) would be contacted to arrange for proper assessment, treatment, or disposal of the suspect materials. (Refer to page 154)

I. Introduction

The purpose of this study is to evaluate alternatives for a north-south oriented major arterial street located in the north Phoenix metropolitan area (Figure 1). The purpose of a future project, if undertaken, would be to provide direct access to and from areas of existing and future development and State Route (SR) 51; address a gap that exists in north-south oriented streets between Cave Creek Road and Tatum Boulevard; increase efficiency of the transportation network by reducing congestion and travel times for motorists; and provide greater regional mobility and improved access to other subregions within the Phoenix metropolitan area.

A. Explanation of Environmental Assessment

This environmental assessment (EA) for Black Mountain Boulevard (BMB) between SR 51 and Cave Creek Road was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) with the Federal Highway Administration (FHWA) acting as the lead federal agency. The Arizona Department of Transportation (ADOT) and City of Phoenix (Phoenix) participated with FHWA as joint lead agencies in the planning, preparation, and review of all technical and environmental documents. For the preparation of the EA, the United States (US) Army Corps of Engineers (Corps) and US Bureau of Reclamation (Reclamation) accepted FHWA's invitation to be cooperating agencies. The Corps accepted the invitation because of potential impacts to ephemeral washes that may require Clean Water Act (CWA) Section 404 permitting. Reclamation accepted the invitation due to potential impacts to their lands resulting from the range of alternatives being considered for SR 51-to-BMB ramp alignments, and to verify that the integrity of their facilities would remain intact and continue to function adequately and efficiently as flood-control facilities.

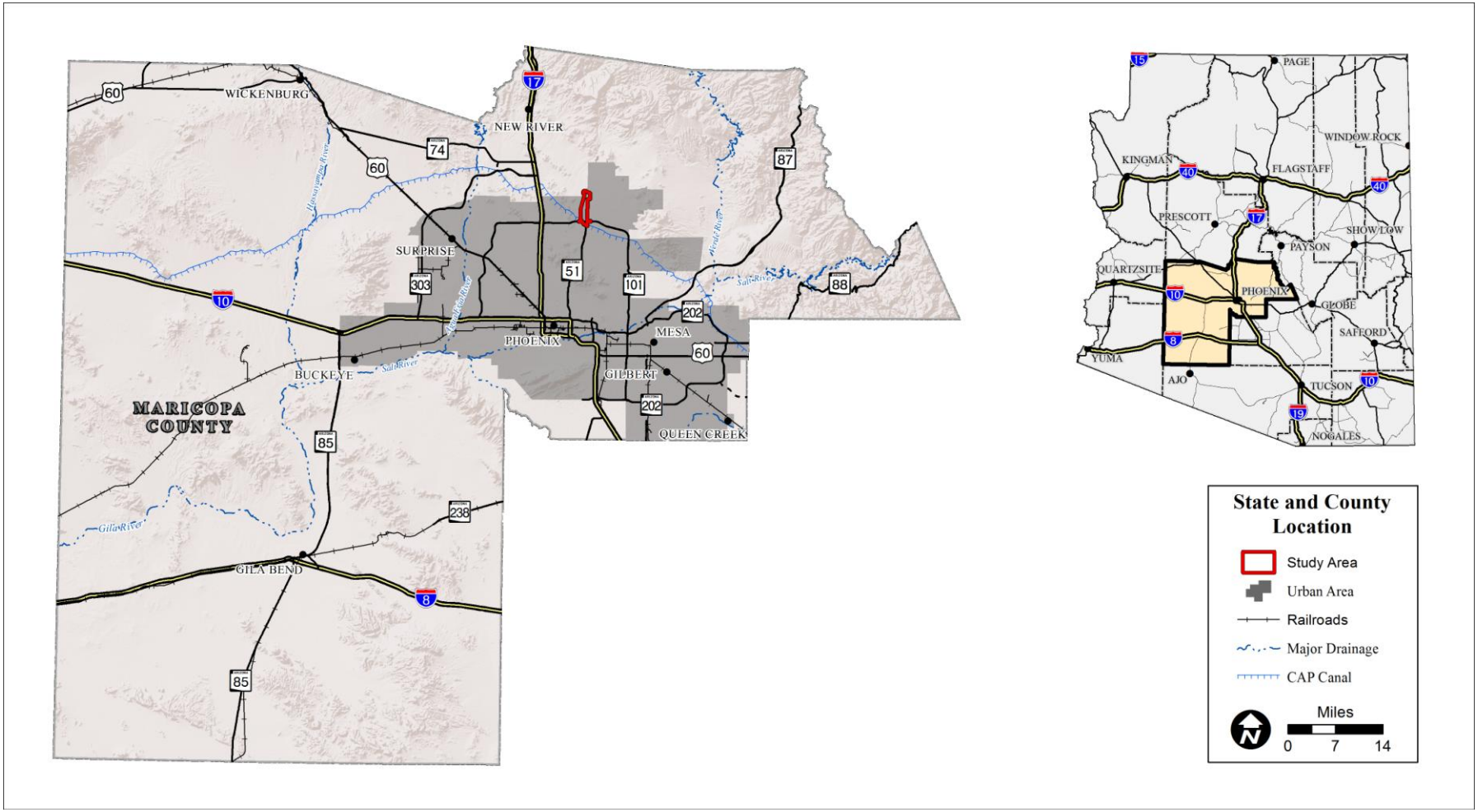

FIGURE 1. STATE AND COUNTY LOCATION MAPS.

According to Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] §1508.9), the basic function of the EA is to describe the need for the proposed action, the alternatives for implementing or constructing the proposed action, and the environmental impacts of the proposed action and alternatives. The EA also provides a listing of agencies and persons consulted. This document would serve as a tool for FHWA, ADOT, and Phoenix for the identification of potentially significant impacts to social, economic, and environmental resources and measures that can mitigate these impacts.

B. Project Location

The study area is located in north Phoenix (refer to Figure 1) and is roughly bounded by the Central Arizona Project (CAP) Canal to the south, the 32nd Street alignment to the west, the 40th Street alignment to the east, and Pinnacle Vista Drive to the north (Figure 2). The study area is located entirely within portions of the city of Phoenix and unincorporated portions of Maricopa County. Ownership of the majority of the study area is split between State Trust lands managed by the Arizona State Land Department (ASLD) and private holdings. The southern portion of the area paralleling the CAP Canal is federal land with the primary rights belonging to Reclamation. The portion of the study area between Deer Valley Road and Pinnacle Peak Road also is federal land managed by the Department of Veterans Affairs (VA), which operates the National Memorial Cemetery of Arizona (Figure 3).

To adequately account for potential project impacts that may have consequences for the subregion commonly known as north Phoenix or the Desert View Village, some aspects of the environment were examined beyond the study area boundaries described above. Certain data, for example population projections and future traffic conditions, were studied for a larger area bounded by Bell Road to the south, Cave Creek Road to the west, Tatum Boulevard to the east, and Dynamite Boulevard to the north (as discussed in subsequent chapters and shown in Figures 4 and 5 on pages 11 and 16, respectively).

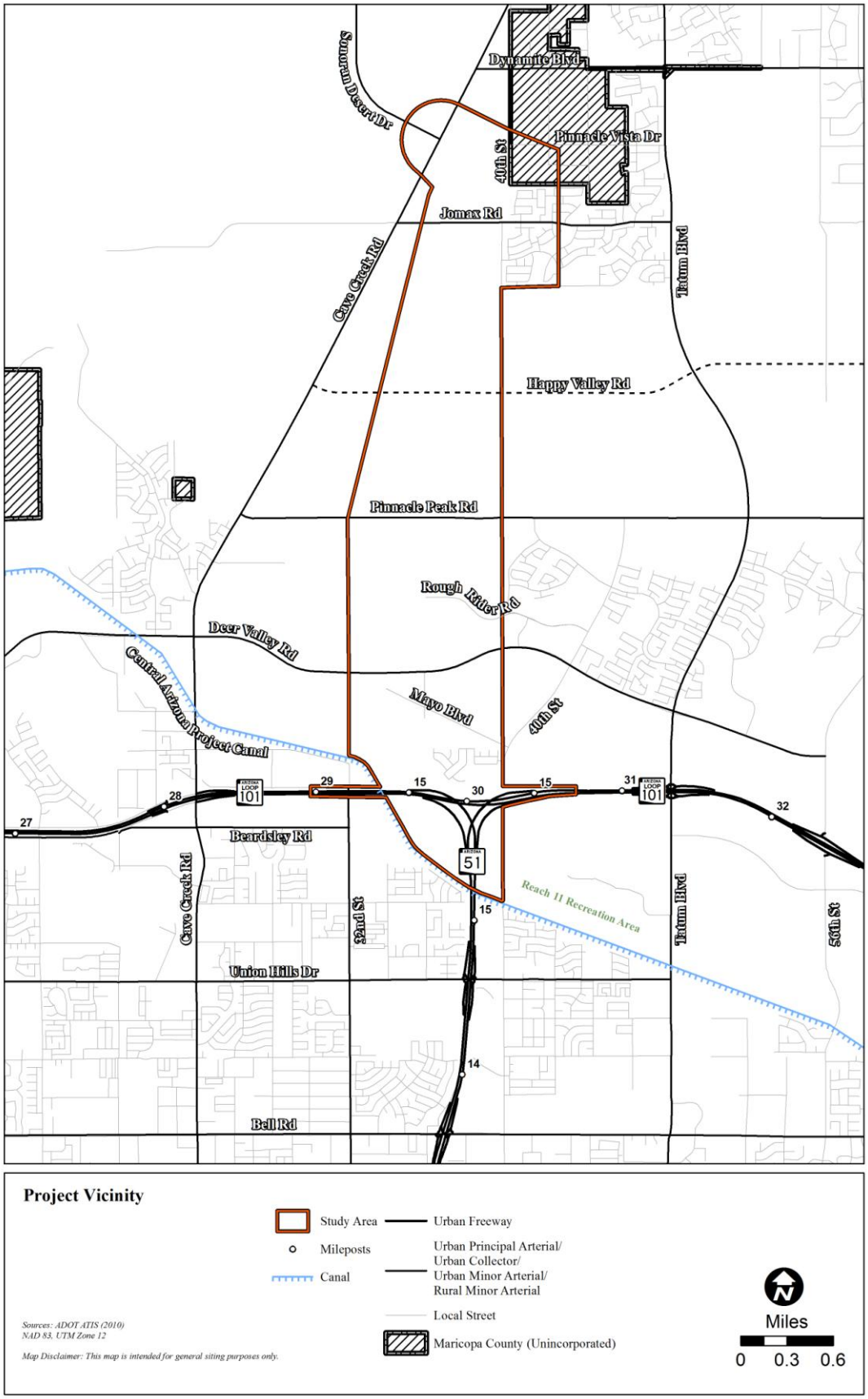

FIGURE 2. PROJECT VICINITY MAP.

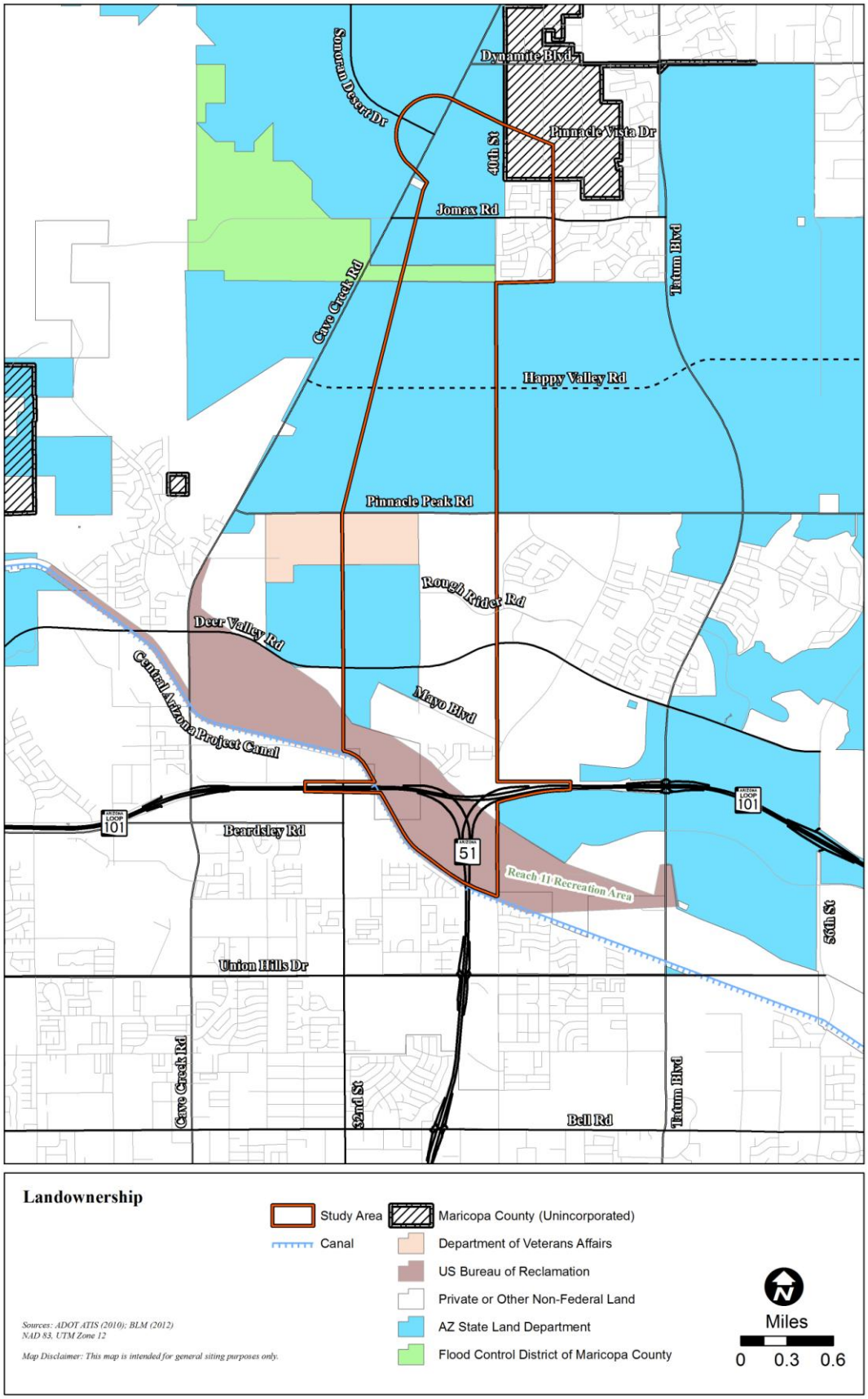

FIGURE 3. LANDOWNERSHIP MAP.

This area encompasses approximately 8,000 acres or about 13 square miles. In this EA, project construction area refers to the footprint of construction disturbance that would be created by the implementation of the Build Alternative. Study area refers to the project construction limits and the adjacent areas as depicted by the red-bordered shape in Figure 2. Project vicinity refers to the area beyond the study area boundaries and may include the broader subregional context of north Phoenix.

C. Project Background and Overview

Phoenix was incorporated in 1881 and remained a small city until World War II and the following economic boom (Phoenix 2012). The expansion beyond the original city limits to the north reached unincorporated Sunny Slope by the 1950s and the CAP Canal alignment by 1990 (Maricopa Association of Governments [MAG] 2008). Throughout this time and into the present, Phoenix published general plans with regular updates to specify the future land uses and zoning, as well as the transportation network to serve the expanding city. MAG, the entity responsible for regional transportation planning, also contributes to the planning of transportation networks in Phoenix through the adoption of the Regional Transportation Plan (RTP) that includes regional funding for the Arterial Life Cycle Program (ALCP).

The component of the Phoenix *General Plan* that outlines the development of the City's arterial street network, known as the Street Classification Map, identified plans for BMB in 1994 (Phoenix 2010). BMB was originally conceived as a north-south parkway connecting the future SR 51 with Cave Creek Road at an intersection between the Jomax Road and Dynamite Boulevard alignments. BMB would connect with east-west running arterial routes including Deer Valley, Pinnacle Peak, Happy Valley, and Jomax roads forming a leg of the irregular but approximately one-mile spaced future arterial grid network. Updates to the *General Plan* in 2002 better defined the BMB concept, abandoning the term "parkway" in favor of boulevard to avoid public confusion caused by the historic use of "parkway" to

describe freeways. Ultimately, BMB was adopted into the street classification map as a six-lane divided roadway (three lanes in each direction) with a landscaped median (Phoenix 2010).

As documented in the *Outer Loop Freeway Specific Plan* (Phoenix 1995), BMB was integrated with the planning efforts of the RTP, and ramp connections between BMB and northbound and southbound SR 51 were incorporated into plans for the future system interchange connecting SR 51 and SR 101 Loop (L). When the SR 51/SR 101L System Interchange was constructed in 2003, the connection points were included to provide for future ramps between SR 51 and BMB. When the new RTP was approved in 2004, the construction of the ramps connecting SR 51 and BMB, including the segment of BMB from the ramps to Deer Valley Road, was incorporated into the ALCP and became eligible for funding through regional revenue sources. Along with regional revenue, the ramps and BMB segment terminating at Deer Valley Road also would be eligible to receive federal funding upon completion and approval of the Environmental Assessment process. The remaining planned segment of BMB between Deer Valley Road and Cave Creek Road is not part of the ALCP or currently eligible for regional funding under the RTP, but would be eligible for federal-aid funding in the future. Future projects between Deer Valley and Cave Creek roads would most likely be funded by private parties as land adjacent to the BMB alignment is developed. These future projects would be required to follow the requirements outlined in mitigation measures contained herein.

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II. Project Purpose and Need

This purpose and need was prepared in accordance with 40 CFR §1502.13, 23 CFR §450.212, the FHWA/Federal Transit Administration's (FTA) *Interim Guidance on Purpose and Need*, dated August 21, 2003, and the FHWA/FTA *Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Environmental Review Process Final Guidance*, dated November 15, 2006. This section provides a baseline for the development of alternatives that will help evaluate and select a preferred project alternative. Lands within the study area and vicinity have been developed or are committed to future development and populations are projected to more than double over the next 20 years. Insufficient access to existing and future development, and lack of mobility within these areas, is caused by gaps in the arterial street grid. The gaps in the grid, especially the lack of a north-south oriented street between Cave Creek Road and Tatum Boulevard, requires circuitous routes through bottlenecked access points for motorists to reach SR 51. The inefficiencies in the transportation network for projected future conditions would result in diminished quality of life and economic impacts from excessive trip times and traffic delays. The lack of direct access to and from the study area and SR 51 would hamper motorists' access to subregions within the Phoenix metropolitan to the south and the associated employment and cultural centers, shopping, education, recreation and entertainment facilities.

The purpose of a future project, if undertaken, would be to increase efficiency of the transportation network, reduce congestion and travel times for motorists, provide direct access to and from SR 51 and areas of future development, and provide greater regional mobility and improved access to other subregions within the Phoenix metropolitan area.

A. Project Need

Population and Employment Growth

Phoenix experienced significant population increases in the twentieth century. By 1950, Phoenix had 106,000 residents and was ranked the 99th largest US city by population (Phoenix 2012). By 1990, the population had grown to 987,220. The population reached 1,324,016 in 2000 and 1,451,966 by 2010 (Arizona Office of Employment and Population Statistics 2012). Phoenix is currently ranked the 6th largest incorporated area in the US by population.

Population data specific to the study area and project vicinity was provided by MAG and is used as the basis for their traffic models and projections of future travel demand. The Traffic Analysis Zones (TAZ) are the smallest units for which MAG prepares projections and have boundaries that are defined using major streets and landmarks (Figure 4). Existing population and estimates for 2035 were provided and are summarized in Table 1.

Based on the projections presented in Table 1, the population for all of the TAZs of the study area and vicinity are expected to increase. This is largely due to the availability of currently undeveloped land that has been committed to residential development, as demonstrated in the Phoenix *General Plan* and ASLD master plans such as Desert Ridge, Paradise Ridge, and Azara (Tatum East-West). These planned developments, which are discussed in a subsequent section of this chapter, are zoned for between 2 and 10 dwelling units (homes) per acre. Current and projected employment data for the TAZ areas are also provided by MAG and summarized in Table 2.

In most TAZ employment is expected to increase or stay consistent with present-day values. Similar to the reasons for predicted increases in population of the study area and vicinity, employment is expected to increase due to the availability of land that has been committed to future development. Development

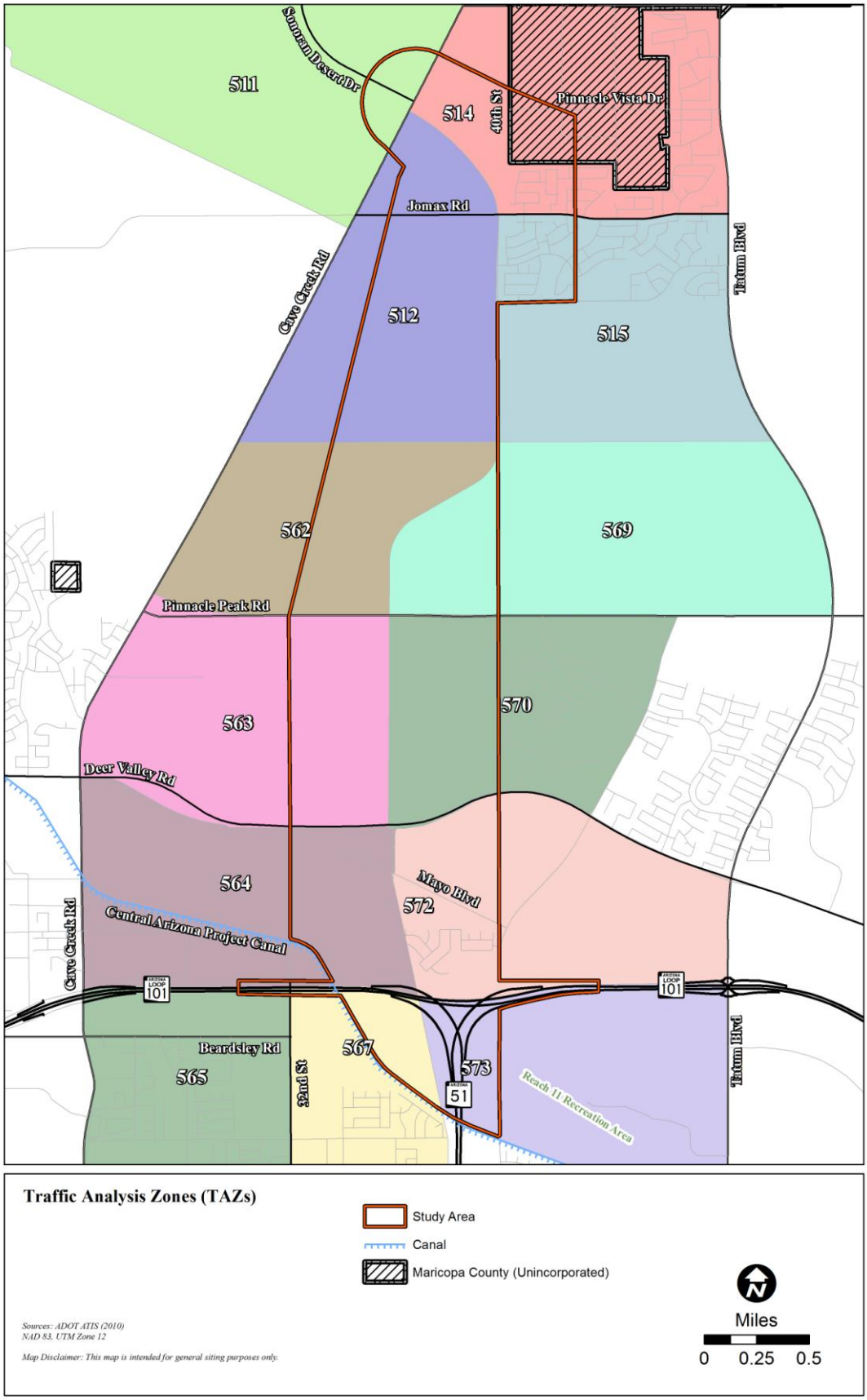

FIGURE 4. PROJECT VICINITY MAP SHOWING TRAFFIC ANALYSIS ZONES.

TABLE 1. CURRENT AND ESTIMATED POPULATION OF THE PROJECT VICINITY BY TRAFFIC ANALYSIS ZONES.

TAZ	2011 Population	2035 Estimated Population	Percent Change
511	41	4,573	11,054%
512	132	7,523	5,599%
514	2,760	4,480	62%
515	3,126	9,068	190%
562	260	7,536	2,799%
563	203	3,007	1,381%
564	411	990	141%
565	6,665	7,287	9%
567	5348	5,387	1%
569	823	10,417	1,166%
570	3,592	4,991	39%
572	5,172	9,912	92%
573	107	109	2%
TOTAL	**28,640**	**75,280**	**163%**

Note: Population values include resident population dwelling in households, populations dwelling in group quarters (dormitories, for example), transient population defined as those living in the project vicinity for two weeks or less, and seasonal population defined as those living in the project vicinity for between two weeks and six months.
Source: MAG 2011

plans include a large commercial node to be constructed near the center of the study area and would provide additional employment opportunities. Although the major employment centers of the Phoenix metropolitan area would remain outside the study area and vicinity, portions of this area that are currently or would be developed into non-residential uses would provide thousands of additional jobs by 2035.

TABLE 2. CURRENT AND ESTIMATED EMPLOYMENT IN THE PROJECT VICINITY BY TRAFFIC ANALYSIS ZONES.

TAZ	2011 EMPLOYMENT	2035 ESTIMATED EMPLOYMENT	PERCENT CHANGE
511	0	62	n/a
512	40	1,268	3,070%
514	257	664	158%
515	173	1,612	832%
562	366	366	0%
563	68	80	18%
564	972	1,010	4%
565	688	688	0%
567	380	380	0%
569	408	2,503	514%
570	655	1,002	53%
572	1,084	1,165	8%
573	2,218	4,092	85%
TOTAL	**7,309**	**14,892**	**104%**

Note: Employment figures include public, retail, office, industrial, and other employment not categorized (hospitals, airports, churches, for example). The numbers do not include work-at-home or construction employment.
Source: MAG 2011

Local Transportation Network and System Linkages

To accommodate the population and employment growth and the transportation needs of the burgeoning population, Phoenix has generally developed an arterial street system that forms a grid of major streets with one-mile spacing along section lines (Phoenix 2010). As the urban freeway system in the Phoenix metropolitan area continues to be developed, the traffic interchanges (TIs, or the points of access to and from the freeway) follow this general pattern of development, and TIs have been constructed at the existing or planned major arterial streets with one-mile spacing.

Outside the urban core, the development and planning of the grid system has been impacted by topography and geophysical obstacles requiring segments of the system to deviate from the grid pattern.

The lack of a contiguous arterial street network with consistent spacing impacts local access for existing development and would continue to impede access as future development occurs. Without a grid of major arterial streets, the future roadway network would resemble a dense and incomprehensible system of secondary residential streets. No routes within a network lacking major arterial streets would be capable of handling the traffic demands generated by the projected number of residents in the study area and vicinity.

Irregularities in the arterial street network also influence the placement of TIs along freeways and can create gaps in excess of one mile. Currently, there is a lack of access to a continuous north-south arterial route between Cave Creek Road and Tatum Boulevard; a gap tapering from approximately 3.5 miles in the south portion of the study area to 1.5 miles in the north portion of the study area. This gap in the arterial street network at the south end of the study area also corresponds to lack of freeway access for approximately 3.5 miles between access points at Cave Creek Road and Tatum Boulevard. The gap in access points causes motorist to funnel in and out of the project vicinity at a limited number of locations, and results in circuitous routes and increased travel times. Motorists traveling to SR 51 from the study area are currently required to travel on an east-west arterial to access Cave Creek Road or Tatum Boulevard, and then backtrack a similar distance along SR 101L to access SR 51 through the SR 51/SR 101L System TI. Access to SR 51 is important to the present and future residents of the study area and vicinity because SR 51 provides direct access to the Phoenix metropolitan area to the south. Destinations include downtown Phoenix and the associated employment and cultural centers, shopping, education, recreation and entertainment facilities. SR 51 also connects the project vicinity to Sky Harbor International Airport and provides connectivity to the Interstate Highway System at Interstate 10 (I-10).

Travel Mobility and System Efficiency

To illustrate the predicted changes in traffic volumes and congestion that would occur as a result of population growth in the study area and vicinity, a computer-generated traffic model was employed to simulate the elapsed time for segments of typical trips that a motorist would take through the study area or the project vicinity. The origins and destinations are shown in Figure 5 as lettered points A through F. The trips are divided between southbound (SB) trips in the morning (a.m.) peak hour and northbound (NB) trips in the afternoon (p.m.) peak hour. Peak hour represents the busiest one-hour period with the highest traffic volumes that typically corresponds to commuter traffic, or rush hour. The morning SB trips originate in various locations (points B through F) in the study area and vicinity and terminate at the intersection of SR 51 and Bell Road (point A). These trips would represent the first leg of a typical commute for a resident of the study area that works in downtown Phoenix, for example. The NB afternoon trips originate at point A and arrive at various destinations (points B through F). These trips represent the last leg of a commute or similar travel from locations such as downtown Phoenix or Sky Harbor Airport.

To illustrate the worsening traffic conditions projected to occur over the next 20 years, Table 3 and Table 4 provide the modeled trip times for the current conditions (2012) and for the year 2035. The elapsed times are provided in minutes and seconds along with the percent change. For most of the a.m. trips (Table 3), the elapsed time is predicted to increase by more than 50 percent. The least change would be a 39 percent increase and the greatest change would be 68 percent. Extrapolated over a year of morning commutes (assuming 235 commuting days), the time spent in a car is predicted to increase by approximately 21 to 30 hours per year, depending on the route, when 2012 travel times are compared with 2035. Similarly, most of the p.m. modeled trip times are also expected to increase by 50 percent or more (Table 4). The least change would be 37 percent and the greatest 91 percent. Assuming 235 commuting days annually, these increases would require motorists to drive an additional 27 hours for the

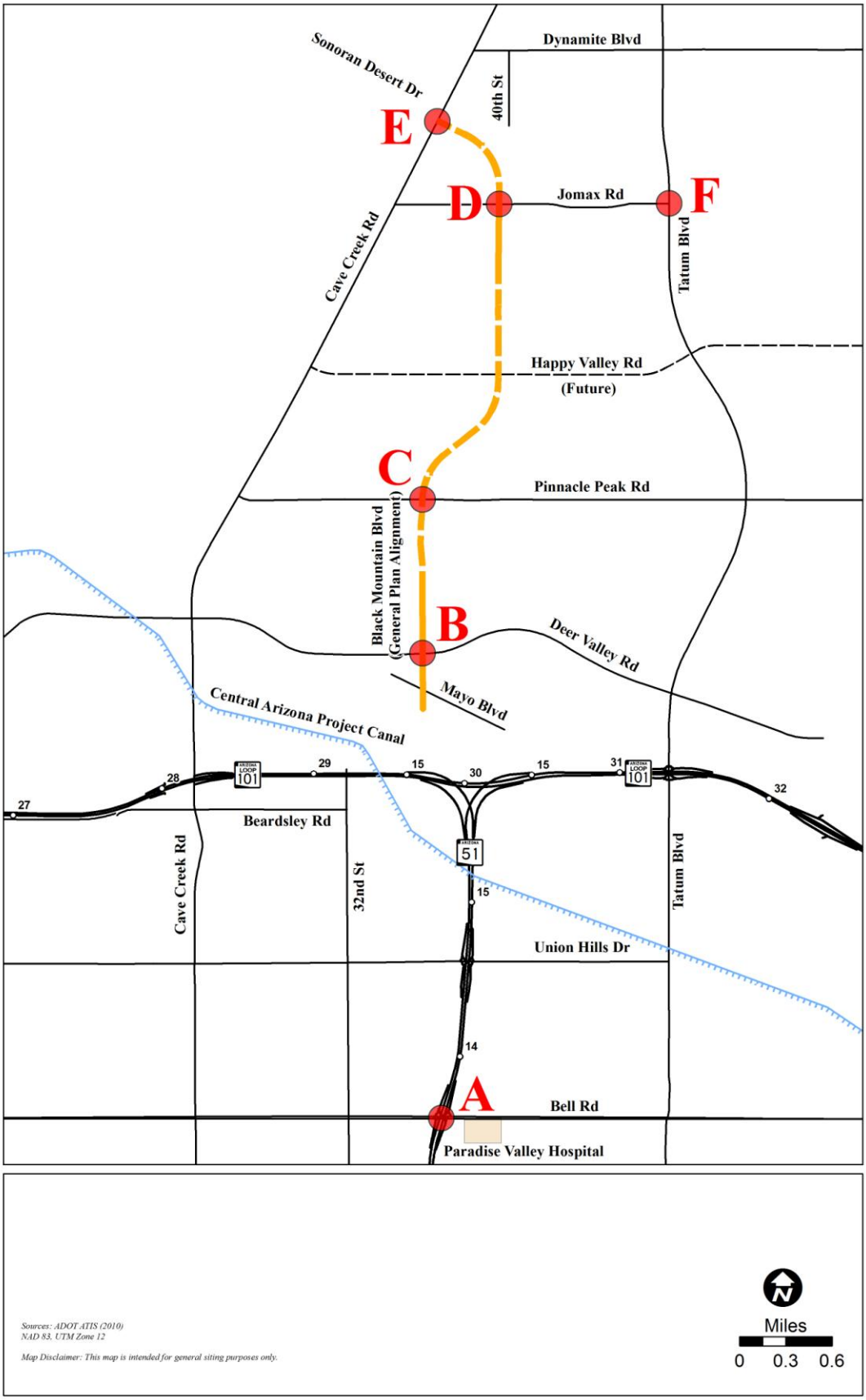

FIGURE 5. TRAVEL ROUTES MAP.

TABLE 3. MORNING PEAK HOUR TRAVEL TIME COMPARISON FOR SOUTHBOUND TRAFFIC.

TRAVEL ROUTE	2012 TRAVEL TIME (MINUTES)	2035 TRAVEL TIME (MINUTES)	CHANGE (MINUTES)	CHANGE (PERCENTAGE)	COST OF DELAY (2035)	COST OF DELAY (2015 - 2035)
B → A (via Cave Creek Rd)	10:40	17:16	6:36	62%	$534,000	$1,393,000
B → A (via Tatum Blvd)	9:16	15:36	6:20	68%	$918,000	$4,364,000
C → A (via Cave Creek Rd)	11:13	18:52	7:39	68%	$142,000	$1,548,000
C → A (via Tatum Blvd)	10:55	17:22	6:26	59%	$446,000	$3,751,000
D → A (via Cave Creek Rd)	13:43	20:34	6:51	50%	$158,000	$687,000
D → A (via Tatum Blvd)	12:28	17:20	4:52	39%	$384,000	$1,414,000
E → A	12:23	19:36	7:13	58%	$70,000	$5,218,000
F → A	10:18	15:16	4:58	48%	$145,000	$8,977,000
				Total	**$2,797,000**	**$27,352,000**

TABLE 4. AFTERNOON PEAK HOUR TRAVEL TIME COMPARISON FOR NORTHBOUND TRAFFIC.

TRAVEL ROUTE	2012 TRAVEL TIME (MINUTES)	2035 TRAVEL TIME (MINUTES)	CHANGE (MINUTES)	CHANGE (PERCENTAGE)	COST OF DELAY (2035)	COST OF DELAY (2015 - 2035)
A → B (via Cave Creek Rd)	14:27	27:34	13:07	91%	$135,000	$1,324,000
A → B (via Tatum Blvd	9:16	14:19	5:03	54%	$254,000	$2,486,000
A → C (via Cave Creek Rd)	15:30	26:59	11:30	74%	$46,000	$446,000
A → C (via Tatum Blvd)	12:02	16:27	4:25	37%	$159,000	$1,550,000
A → D (via Tatum Blvd)	17:29	31:27	13:58	80%	$50,000	$488,000
A → D (via Tatum Blvd)	13:01	18:36	5:35	43%	$115,000	$1,126,000
A → E	16:51	26:55	10:04	60%	$317,000	$3,103,000
A → F	10:52	16:35	5:43	53%	$853,000	$8,345,000
				Total	**$1,929,000**	**$18,868,000**

least change and 51 hours for the route with the greatest change. In the worst case scenario, a motorist using the route between points A and E during a round trip commute 235 days per year would experience a 68 hour-per-year increase by 2035. Increases in trip times would result in decreased quality of life for residents of the study area as more time is spent driving on congested routes and experiencing the aggravation of dense and slow-moving traffic.

The increases in trip times by 2035 are also expected to incur economic costs as people delayed by traffic congestion are unable to pursue productive activities or participate in commerce, and waste fuel idling or in stop-and-go conditions. These costs are based on ADOT-provided values of $16.16 per hour of delay for passenger cars and $30.16 per hour of delay for trucks. Table 3 and Table 4 list these costs for each route for the year 2035 and for the 20-year period between 2015 and 2035. These costs are derived from the peak morning and afternoon travel periods that equate to the busiest 3-hour periods in the morning and afternoon on weekdays. The single-year cost for 2035 in the a.m. is $2.8 million and for the p.m. is $1.9 million. Calculated over a 20-year period from 2015 to 2035, the costs are $27.4 million for the a.m. and $18.9 million for the p.m. It is important to note that these costs only represent a sample of the possible routes through the study area, and if delays for the entire street network were totaled, the calculated costs would be considerably greater.

In 2035, the projected congestion and inefficiency in the street network would also affect the travel times for emergency services, especially between the study area and Paradise Valley Hospital located near the intersection of SR 51 and Bell Road. Paradise Valley Hospital, south of the project limits, operates the nearest emergency room to the study area. Similarly, the response time for law enforcement also could be affected by the predicted congestion on the arterial street network in the 2035 scenario.

B. Conformance with Regulations, Land Use Plans, and Other Plans

A north-south arterial street between SR 51 and Cave Creek Road with ramp connections to SR 51 has been adopted in the following transportation and land use plans. A composite of future land uses based on these plans is shown in Figure 6.

- *General Plan: A Vision for the Future* (Phoenix [updated] 2011)
- *Street Classification Map* (Phoenix [updated] 2010)
- *Regional Transportation Plan Executive Summary* (MAG [updated] 2010)
- *Desert Ridge Specific Plan: Master Plan and Development Regulations* (ASLD and Northeast Phoenix Partners 1990, as revised)
- *Desert Ridge, Paradise Ridge, and Tatum East-West (Azara) Infrastructure Masterplan* (ASLD [revised] 2008)
- *Central Arizona Project Reach 11 Recreation Master Plan: Final Environmental Impact Statement (EIS)* (Bureau of Reclamation 2002)
- *Outer Loop Freeway Specific Plan: Agua Fria and Pima Freeways (Loop 101)* (Phoenix 1995)

The majority of lands in the study area are currently part of the State Land Trust managed by ASLD (refer to Figure 3). The purpose of the State Trust is "to enhance value and optimize economical return for the Trust beneficiaries, consistent with sound stewardship, conservation, and business management principles supporting socioeconomic goals for citizens here today and generations to come" (ASLD 2012). On a continual basis, Trust land is sold to fund beneficiaries such as public schools and state hospitals. These sales frequently occur in places where land is most valued and market demand is high, as maximizing economic benefit for its beneficiaries is a goal of the Trust (ASLD 2012). The State Trust land in the study area is one such location where land has high market value and demand is expected to be high in conjunction with population growth. ASLD has planned accordingly for the anticipated future

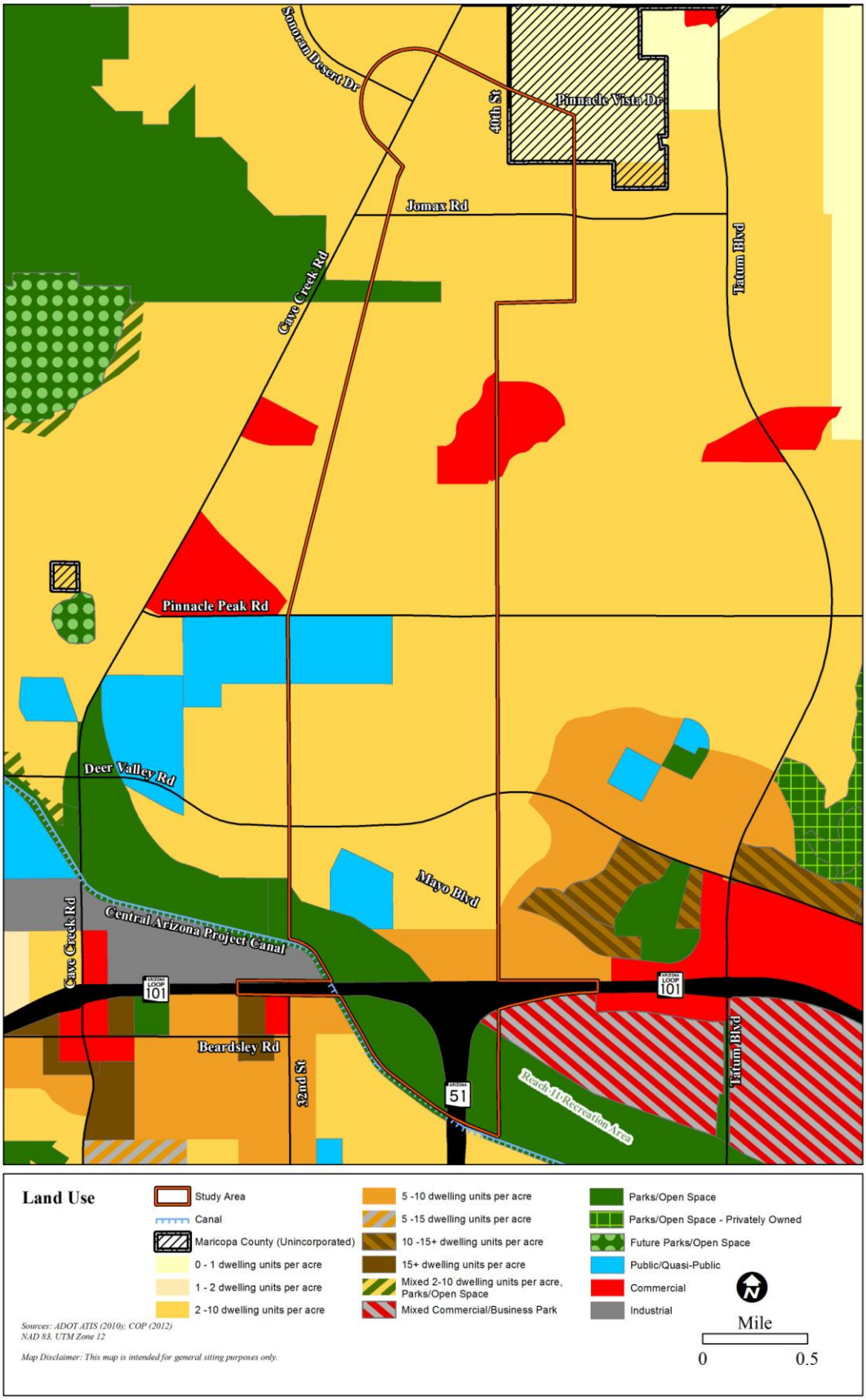

FIGURE 6. FUTURE LAND USE MAP.

demand for land in the study area and vicinity and is prepared to sell it for the maximum potential economic benefit. The sale of the State Trust land within the study area and vicinity and its planned conversion to mostly private residential use is described in detail in the Desert Ridge Specific Plan: Master Plan and Development Regulations and Desert Ridge (ASLD 1990) and the Paradise Ridge, and Tatum East-West (Azara) Infrastructure Masterplan (ASLD 2008).

Land use plans from ASLD relevant to the study area represent a significant financial investment and expenditure of time from ASLD as planning entity, Phoenix as a partner that has approved these plans and incorporated changes to their *General Plan*, and agencies such as the Corps that have processed permits for compliance with Section 404 of the Clean Water Act. These land use plans have also been subjected to public scrutiny through a public involvement process that gathered and responded to public input. For example, the planning for Azara involved five meetings hosted by homeowners associations, five meetings of the Desert View Village Planning Committee, a neighborhood meeting, a Phoenix Planning Commission meeting, and a Phoenix City Council meeting that were all open to the public. Amendments to or the rejection of these plans would involve additional costs and/or the forfeiture of sunk costs for ASLD and Phoenix, and mutually agreed upon actions that the government and public have already committed to undertake would be abandoned. Furthermore, the processing of approvals by permitting agencies such as the Corps would also need to be repeated in the case of changes or amendments to existing plans.

C. Conclusion

Land within the study area and vicinity is largely undeveloped but has been committed to future urban development through the planning process by Phoenix and ASLD. These plans show the lands within the study area are zoned for between 2 and 10 homes per acre with a large commercial node to be constructed at the future location of BMB and Happy Valley Road. Population would increase as land is

subdivided and converted to residential uses, and employment within the study area and vicinity also is expected to increase. The population is projected to grow in the study area from 28,640 to 75,280 with employment increasing from 7,309 to 14,892. Corridors for arterial streets have been designated within the study area and vicinity to provide access to and from the areas of planned development. These arterial streets would serve to connect motorists with local destinations such as parks, schools, and neighborhoods, and are intended to provide efficient access to and from the regional freeway system (RFS).

Without a comprehensive network of arterial streets, especially the lack of a north-south oriented street between Cave Creek Road and Tatum Boulevard, motorists would be required to take circuitous routes through bottlenecked access points to reach SR 51. The predicted trip times that motorists would typically make to reach destinations south of the study area are expected to increase as traffic increases on the arterial grid and access to SR 51 remains circuitous and inefficient. These travel times are predicted to increase by 50 percent or more for most routes, with the worst-case scenario adding 68 hours of additional travel time per year by 2035. These delays would also have an economic cost that for the 20-year period between 2015 and 2035 is projected to be $46.3 million for 8 common routes through the study area and vicinity. Lack of direct access to the RFS would hamper motorists accessing other subregions within the Phoenix metropolitan area and important destinations such as downtown Phoenix and the associated employment and cultural centers, shopping, education, recreation and entertainment facilities. The deficient transportation network would negatively affect the implementation of land development plans and would decrease the quality of life and desirability of the area for prospective future residents.

The anticipated population and employment increases create the need for an improved and expanded transportation network that addresses travel demand and maintains consistency with the approved land use development plans that have been adopted by ASLD and Phoenix. The completion of a north-south

oriented major arterial street within the study area that provides direct access to and from SR 51 would provide access to the areas of future development, increase efficiency of the transportation network, reduce congestion and travel times for motorists, and provide greater regional mobility with improved access to the RFS.

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III. Alternatives

This section describes the alternatives that would provide access to and from SR 51 and the existing intersection of BMB Deer Valley Road (Alternatives 1-S, 1A-S, 2-S and 3-S; in previously prepared BMB study documents these alternatives where numbered 1, 1A, 2 and 3). Due to constraints created by the National Memorial Cemetery of Arizona and the existing residential development of the Aviano Subdivision, the only alignment considered between Deer Valley and Pinnacle Peaks roads would follow the 36th Street alignment where an existing two-lane segment of BMB is located between Deer Valley and Rough Rider roads. A separate set of alternative alignments is also described for constructing BMB between Pinnacle Peak and Cave Creek roads (Alternatives 1-N, 2-N and 3-N). For the consideration of build alternatives, a combination of any southern alternative (1-S, 1A-S, 2-S or 3-S) and any northern alternative (1-N, 2-N or 3-N) would be possible. There is also a No-Build Alternative for this study that is described in a subsequent section.

Evaluating an alternative for connecting BMB directly to eastbound and westbound SR 101L via ramps was not done for this study. MAG, acting as the designated Metropolitan Planning Organization for Maricopa County and in accordance with A.R.S. 28-6308 (Regional Planning Agency Transportation Policy Committee; Regional Transportation Plan; Plan Review Process), was responsible for the identification of ramps connecting SR 51 with BMB for inclusion in the ALCP. The decision to include only SR 51 ramp connections to BMB was made based on recommendations from the Transportation Policy Committee and Transportation Review Committee. Additional input for the development of the RTP came from public involvement that included public meetings with representation from various regions of the Phoenix Metropolitan Area and input that was solicited and gathered through mail surveys and the internet. Because the culmination of this transportation planning process did not identify a project for connecting BMB directly to SR 101L, it is not under consideration as part of the current

study. However, the implementation of alternatives currently under consideration would not preclude future studies for the consideration of BMB-to-SR 101L ramps, and if such a study or future project is desired, parties can contact MAG directly to make a recommendation for the RTP or ALCP to be amended.

A. Description of Alternatives

Lane Configurations that Would be Shared Across Multiple Build Alternatives

For the Alternatives 1-S, 1A-S, 2- S and 3-S that would involve the construction of ramps to connect BMB with SR 51, the northbound ramp would be two-lanes wide (Figure 7) and the southbound ramp would begin as a two-lane ramp and would taper to a single lane (Figure 8). Between the ramps and the normal arterial street network, a transitional segment comprised of four lanes would be constructed (Figure 9). The street segments excluding the ramps and the transitional four-lane segment for all alternatives would be constructed to include three travel lanes in each direction (six total), bicycle lanes in each direction, and detached sidewalks (separated from the bicycles and automobiles by a landscape strip) (Figure 10). Regardless of the alternative chosen for connecting SR 51 and BMB, or if no connection is established between SR 51 and BMB in the case of the No-Build Alternative, the six-lane configuration would represent the street cross section between Deer Valley and Pinnacle Peak roads, and would represent any of the three alternatives (1-N, 2-N, or 3-N) being considered between Pinnacle Peak and Cave Creek roads.

Required Improvements Shared across Multiple Build Alternatives

For Alternatives 1-S, 1A-S, 2-S, and 3-S that would involve the construction of ramps within the boundaries of Reach 11, any material imported into Reach 11 that displaces flood pool volume must be offset by removing the equivalent volume of material from the flood pool. The balancing of volumes would be accomplished by removing material from existing or new basins within Reach 11 and

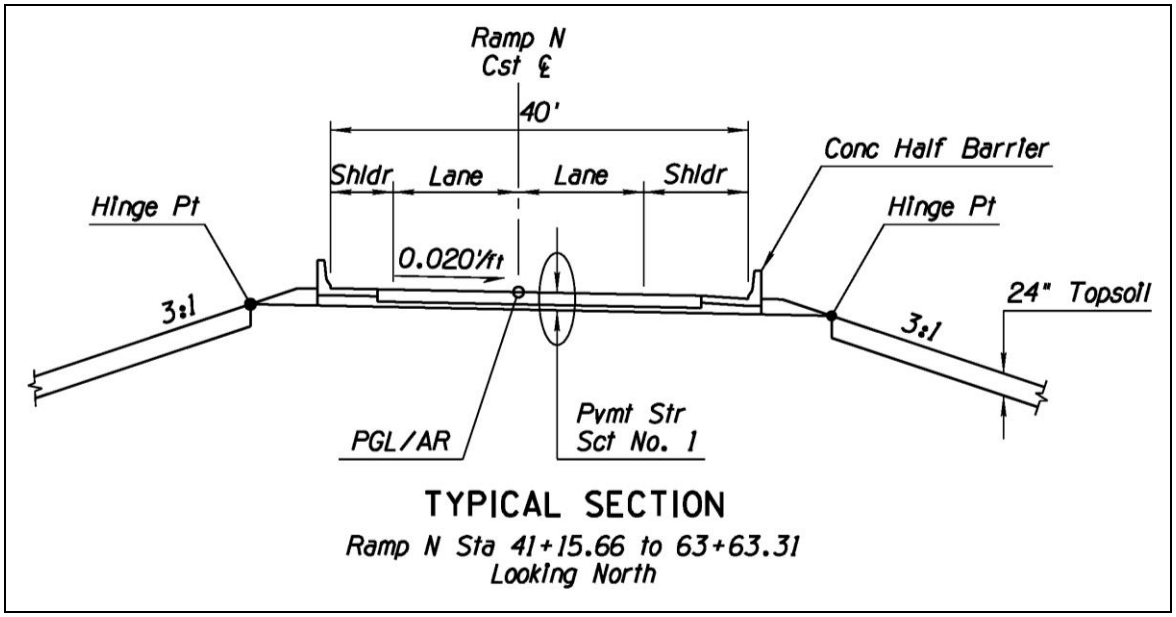

FIGURE 7. SCHEMATIC CROSS-SECTIONAL ILLUSTRATION OF THE TWO-LANE NORTHBOUND RAMP CONFIGURATION.

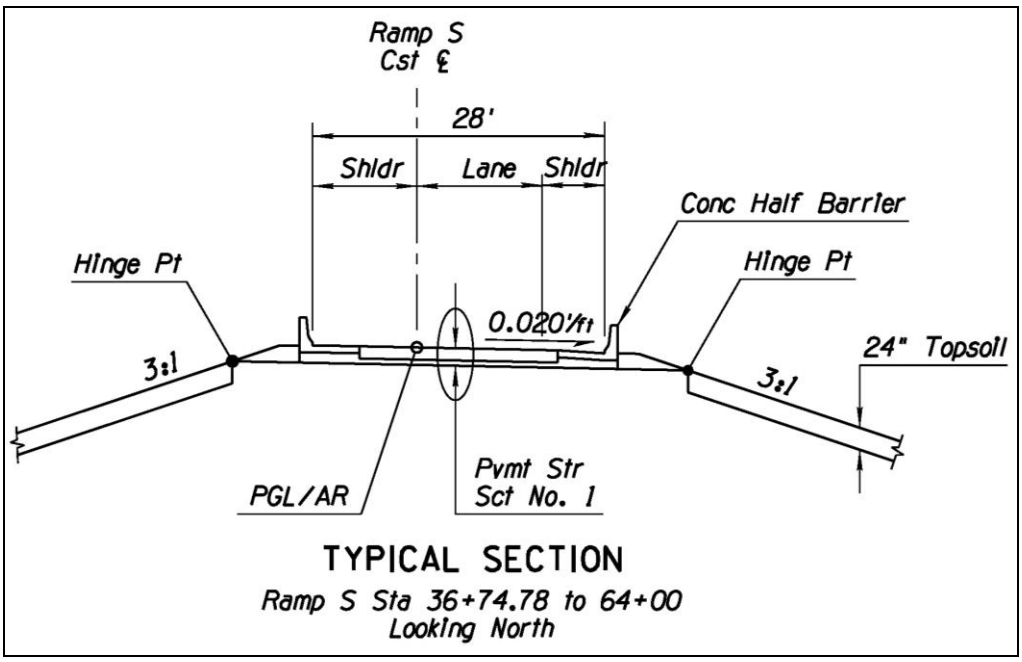

FIGURE 8. SCHEMATIC CROSS-SECTIONAL ILLUSTRATION OF THE SINGLE-LANE SOUTHBOUND RAMP CONFIGURATION.

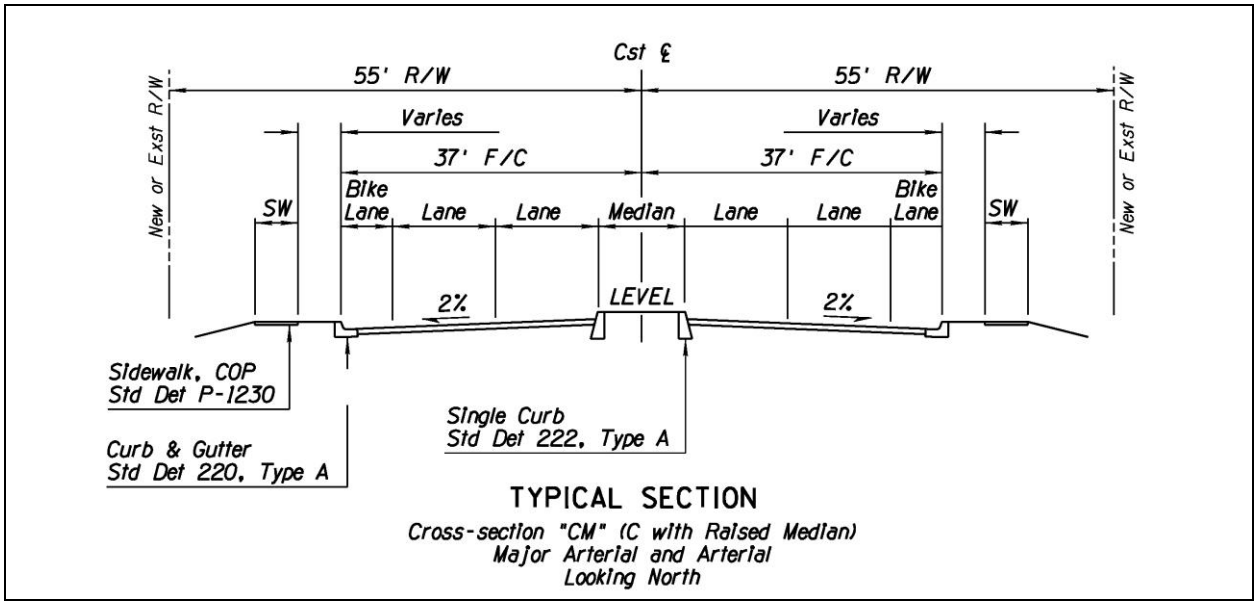

FIGURE 9. SCHEMATIC CROSS-SECTIONAL ILLUSTRATION OF THE TRANSITIONAL FOUR-LANE SEGMENT.

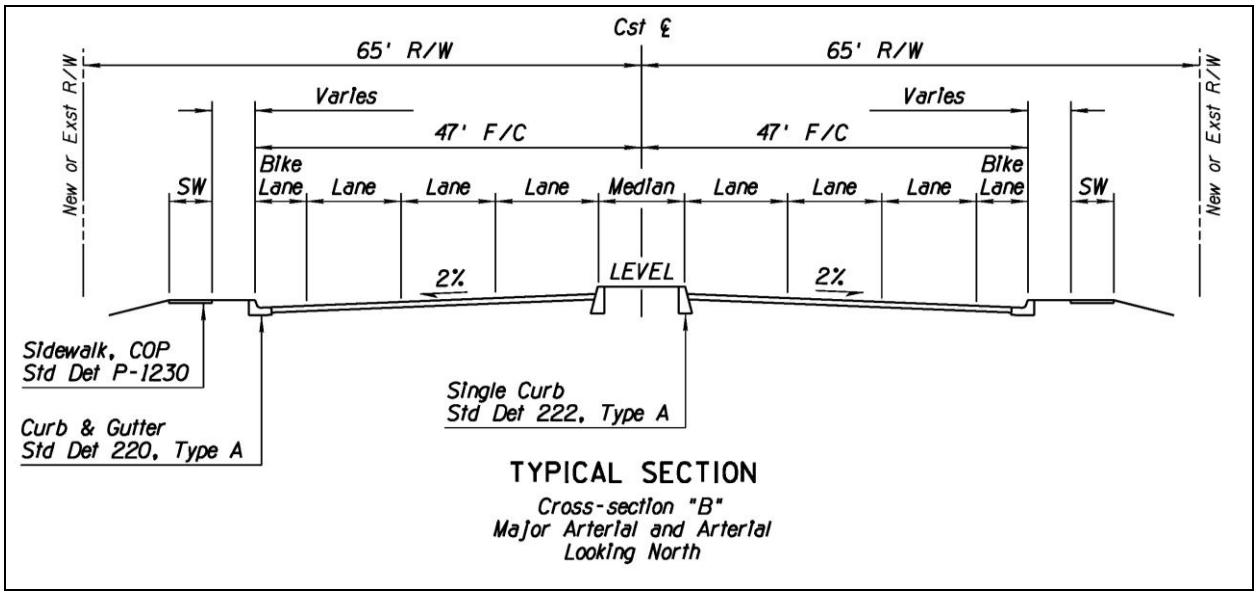

FIGURE 10. SCHEMATIC CROSS-SECTIONAL ILLUSTRATION OF THE SIX-LANE SEGMENTS.

using the material to build underlying earthen structure beneath the elevated ramps within Reach 11. Each alternative would be fine tuned by adjusting the length of bridges versus earthen structure to accomplish a net zero change in flood pool volume and to maintain unimpeded flow to the CAP low-

flow channel and outfall. For alternatives that would involve the construction of ramps in Reach 11, an underpass for pedestrians, other non-motorized users, and wildlife would be provided.

Adjustments to the locations of buried utilities would be required for all build alternatives under consideration, including north of Pinnacle Peak Road (Alternatives 1-N, 2-N, and 3-N). Similarly, structures for conveyance of stormwater drainage including box culverts and pipes would need to be enlarged, extended, reconstructed or added for all build alternatives.

Alternatives South of Deer Valley Road

Alternative 1-S

Alternative 1-S was the result of a concept developed for BMB ramp connections to SR 51 in 1999 and published the following year (ADOT 2000) (Figure 11). Ramp alignments and geometric layouts were designed with a minimum design speed of 50 miles per hour (mph). As depicted in Figures 7 and 8, the northbound ramp would be two lanes and the southbound ramp would taper from two to a single lane. The four-lane cross section roadway (refer to Figure 9) would be constructed north of Reach 11 and would transition into the six-lane cross section (refer to Figure 10) at the existing BMB segment between Mayo Boulevard and Deer Valley Road. Alternative 1-S would include the construction of a center median between the ramps and Deer Valley Road that would restrict access to and from two PHS driveways and the northbound BMB lanes.

Alternative 1A-S

Alternative 1A-S would connect BMB to SR 51 via ramps as depicted by Figures 7 and 8. The northbound ramp would incorporate a curve with a design speed of 40 mph to slow traffic. The southbound ramp would have the same design speed as Alternative 1-S (50 mph). Immediately north of the Reach 11 boundary line, a 200-foot outside diameter roundabout would be incorporated into the

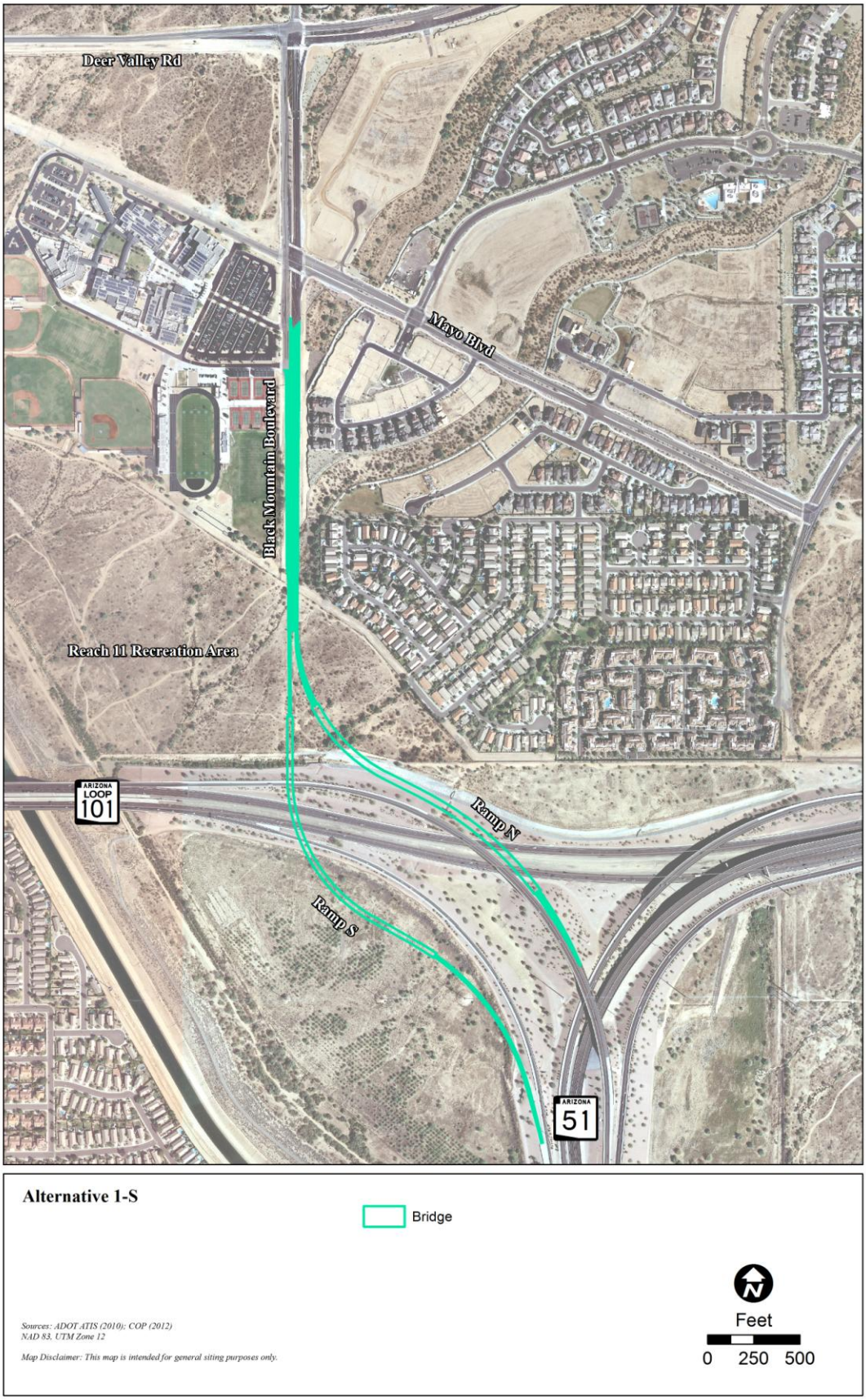

FIGURE 11. ALTERNATIVE 1-S.

street to provide traffic calming, future access to portions of the Reach 11 Recreation Area south of PHS, and would allow southbound BMB traffic to switch directions to northbound prior to entering the southbound freeway ramp (Figure 12). Between the roundabout and Mayo Boulevard, a four-lane cross section roadway (refer to Figure 9) would be constructed and would include the construction of a center median that would restrict access to and from the PHS driveways and the northbound BMB lanes. This median would also include a fence to prevent jaywalking. Motorists leaving PHS that would be prevented from turning left onto northbound BMB by the median would be able to use the roundabout to make a u-turn to access the northbound direction.

To further address changes to PHS ingress and egress that would be required by the implementation of Alternative 1A-S, a new access point would be constructed between Deer Valley Road and the north entrance to PHS along Mayo Boulevard. This connector roadway would coincide with the 34th Street alignment and would eliminate the cul-de-sac that currently exists at the west terminus of Mayo Boulevard. The ability for traffic to circulate would allow drop-off and pick-up traffic to queue on Mayo Boulevard, moving this traffic and queuing away from BMB and Deer Valley roads. In conjunction with the 34th Street connector, Deer Valley Road between the new connector road and BMB would be widened to handle the additional traffic and to accommodate the construction of new turn lanes.

Alternative 1A-S would also include the construction of a pedestrian bridge spanning the segment of BMB between the roundabout and Mayo Boulevard to provide pedestrian/student access between neighborhoods such as the Wildcat Ridge Subdivision and PHS. The pedestrian bridge overpass would also serve pedestrian access to future Reach 11 Recreation Area improvements south of PHS.

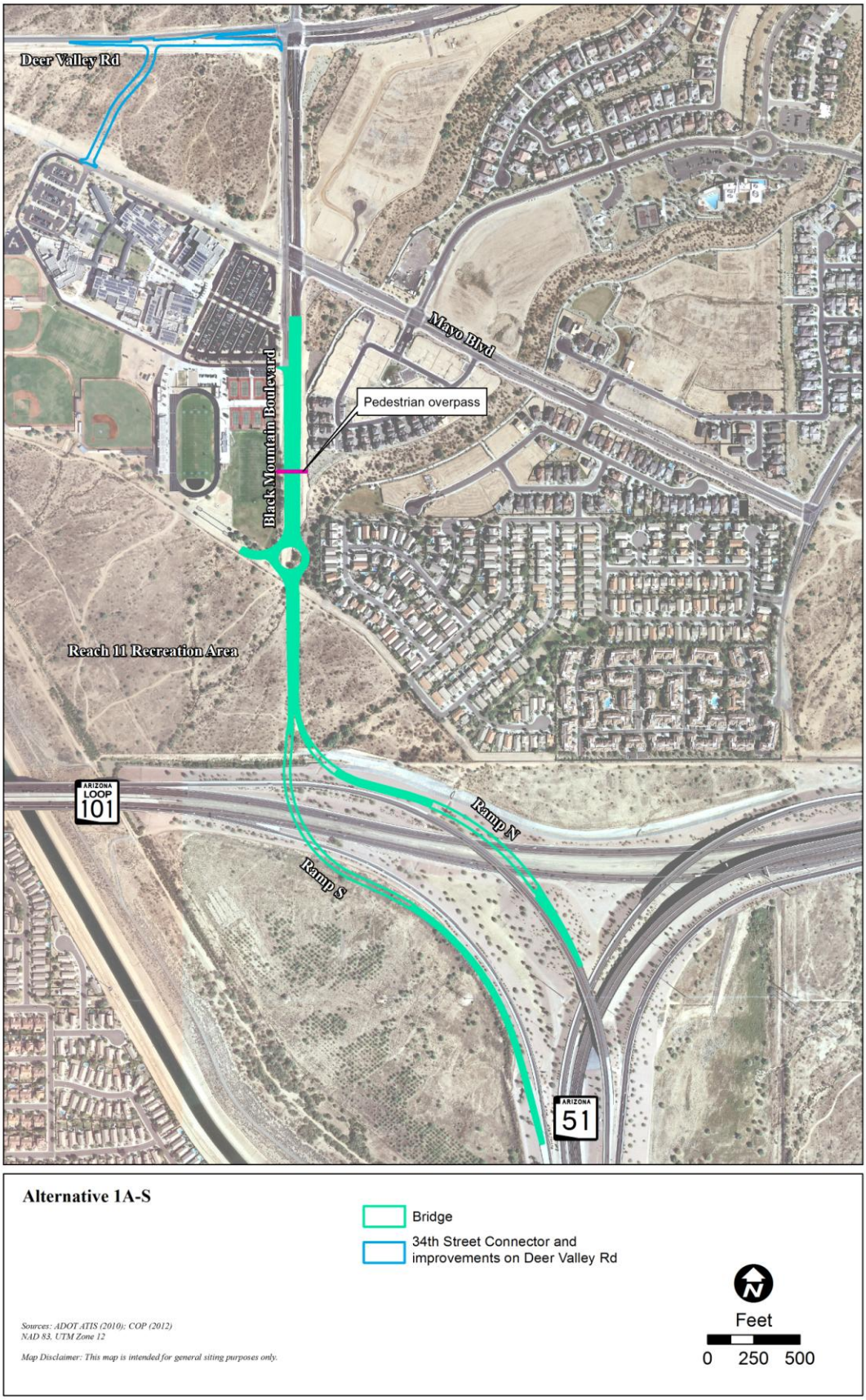

FIGURE 12. ALTERNATIVE 1A-S.

Alternative 2-S

Alternative 2-S was derived from public input requesting lower traffic speeds and would have ramp geometries incorporating 90 degree curves designed to slow traffic to 20 mph (Figure 13). Other than the ramps, this alternative is similar to Alternative 1A-S and would include a roundabout and other aforementioned improvements to ingress, egress and traffic circulation changes for PHS, and would also include the pedestrian bridge.

Alternative 3-S

Alternative 3-S was derived from public input that suggested the study team evaluate an alignment for ramps west of PHS that would connect to Deer Valley Road, allowing traffic coming to or from SR 51 to bypass the segment of BMB located along the east side of PHS (Figure 14). The ramps connecting SR 51 to Deer Valley Road would include a continuous bridge through the Reach 11 Recreation Area to keep the flood pool volume balanced and would meet Deer Valley Road at the 32nd Street alignment. Access to and from SR 51 ramps and the existing and future segments of BMB north of Deer Valley Road would be accomplished by having traffic travel one-half mile east or west along Deer Valley Road.

Alternatives Between Deer Valley and Pinnacle Peak Roads

The National Memorial Cemetery of Arizona to the west and the existing houses of the Aviano Subdivision to the east would constrain BMB to the 36th Street alignment to avoid impacting these properties. A two-lane segment of BMB has already been constructed on this alignment between Deer Valley and Rough Rider roads. Because of commitments made by the study team to avoid direct impacts to existing residences and the Cemetery, the 36th Street alignment is the only alternative under consideration in this area.

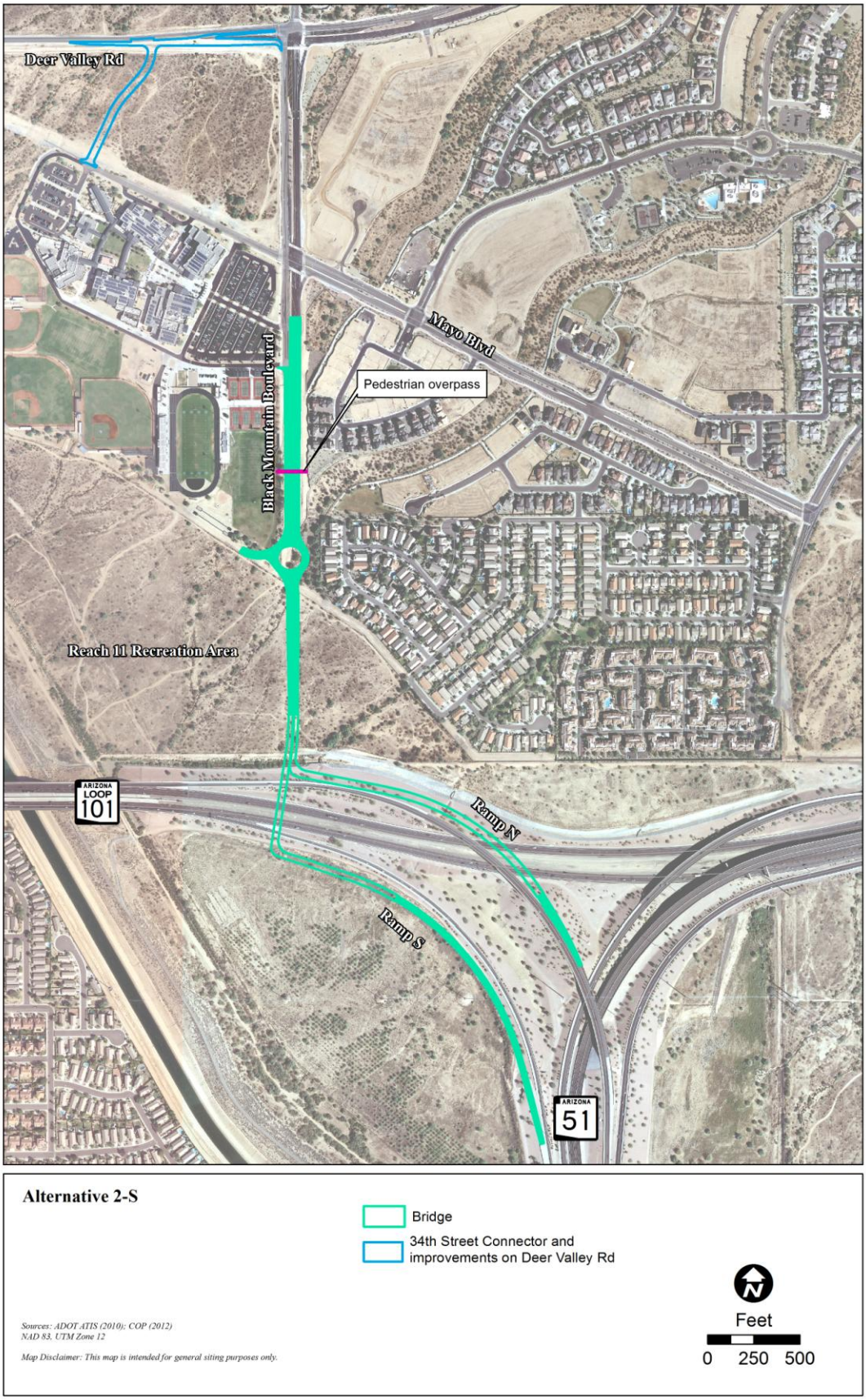

FIGURE 13. ALTERNATIVE 2-S.

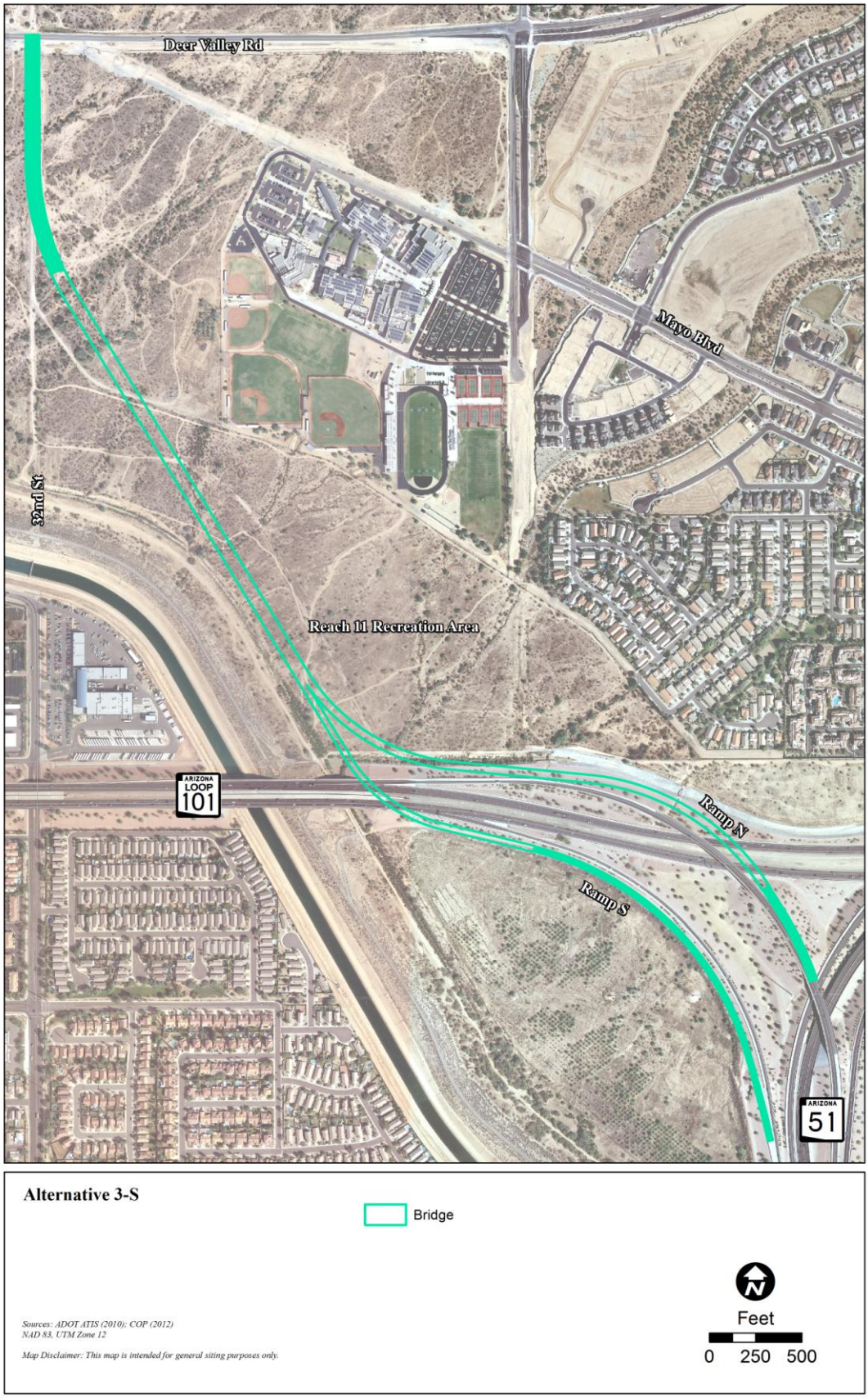

FIGURE 14. ALTERNATIVE 3-S.

Alternatives Between Pinnacle Peak and Cave Creek Roads

Alternative 1-N

This alternative would follow the alignment shown in the *General Plan: A Vision for the Future* (2002, as amended) and *Desert Ridge, Paradise Ridge, and Tatum East-West (Azara) Infrastructure Masterplan* (2008). North of Pinnacle Peak Road, the alignment would curve to the east and would coincide with the 40th Street alignment. A connection would be made with the existing segment of BMB west of the Tatum Highlands Subdivision in the vicinity of Jomax Road. Between Jomax and Cave Creek roads, a curve would be constructed to connect BMB with Cave Creek Road at the intersection of Cave Creek and Sonoran Desert Drive.

Alternative 2-N

Alternative 2-N follows the basic *General Plan* alignment with the exception that near the Tatum Highlands Subdivision, the alignment is shifted 150 feet west (Figure 15, shown in yellow). Evaluating this alignment shift was requested by the public who desire greater distance between the BMB alignment and the residences of Tatum Highlands than would be provided with the implementation of Alternative 1-N. As with Alternative 1-N, Alternative 2-N would intersect with Cave Creek Road as the opposite leg of the Sonoran Desert Drive intersection.

Alternative 3-N

Similar to Alternative 2-N, this alternative was developed based on public feedback requesting a greater buffer between the residences of the Tatum Highlands Subdivision and the BMB alignment. Shown in purple on Figure 15, this alignment would be offset 0.25 mile to the west of Alternative 1-N. This alignment would require the Cave Buttes Dike #2 to be spanned by the alignment as flood-control

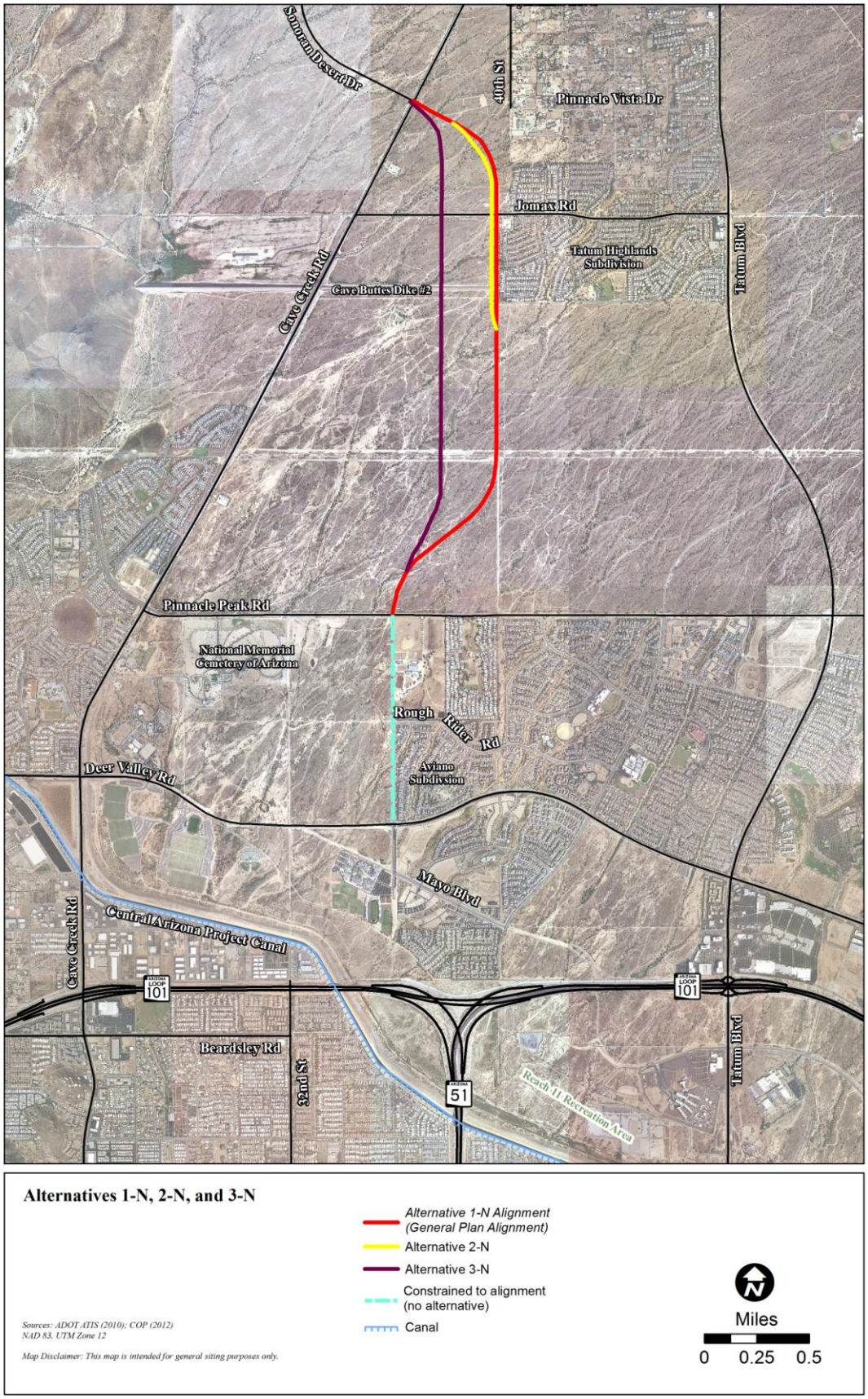

FIGURE 15. ALTERNATIVES 1-N, 2-N, AND 3-N.

requirements do not allow the Dike to be breached. Consistent with the other alternatives for this area, Alternative 3-N would intersect with Cave Creek Road as the opposite leg of the Sonoran Desert Drive intersection.

Figure 16 provides a composite of all build alternatives under consideration for this study for both south and north of Deer Valley Road.

No-Build Alternative

The No-Build Alternative (previously referred to as Alternative 4 in Appendix B) is the baseline used for comparing potential environmental impacts with those of each build alternative. The No-Build Alternative for this project would involve the construction of a north-south street between Deer Valley and Cave Creek roads that would have no direct connection with SR 51. This street, as depicted in the Phoenix *General Plan*, would follow the 36th and 40th Street alignments and curve towards Cave Creek Road to form the east leg of intersection between Cave Creek Road and Sonoran Desert Drive. All improvements under the No-Build Alternative would mostly be done by private developers as parcels of State Trust land are sold. Phoenix policy would require developers to build standard half-street improvements in accordance with the *General Plan* and development guidelines. These improvements would not be eligible for federal funding unless future environmental documentation commensurate with NEPA was completed.

B. Alternatives Considered But Eliminated From Further Study

Each alternative was evaluated using criteria developed through research and recommendations by the study team including ADOT, Phoenix, and their engineering and environmental consultants, as well as issues, concerns, and opportunities identified during agency coordination and public involvement. The

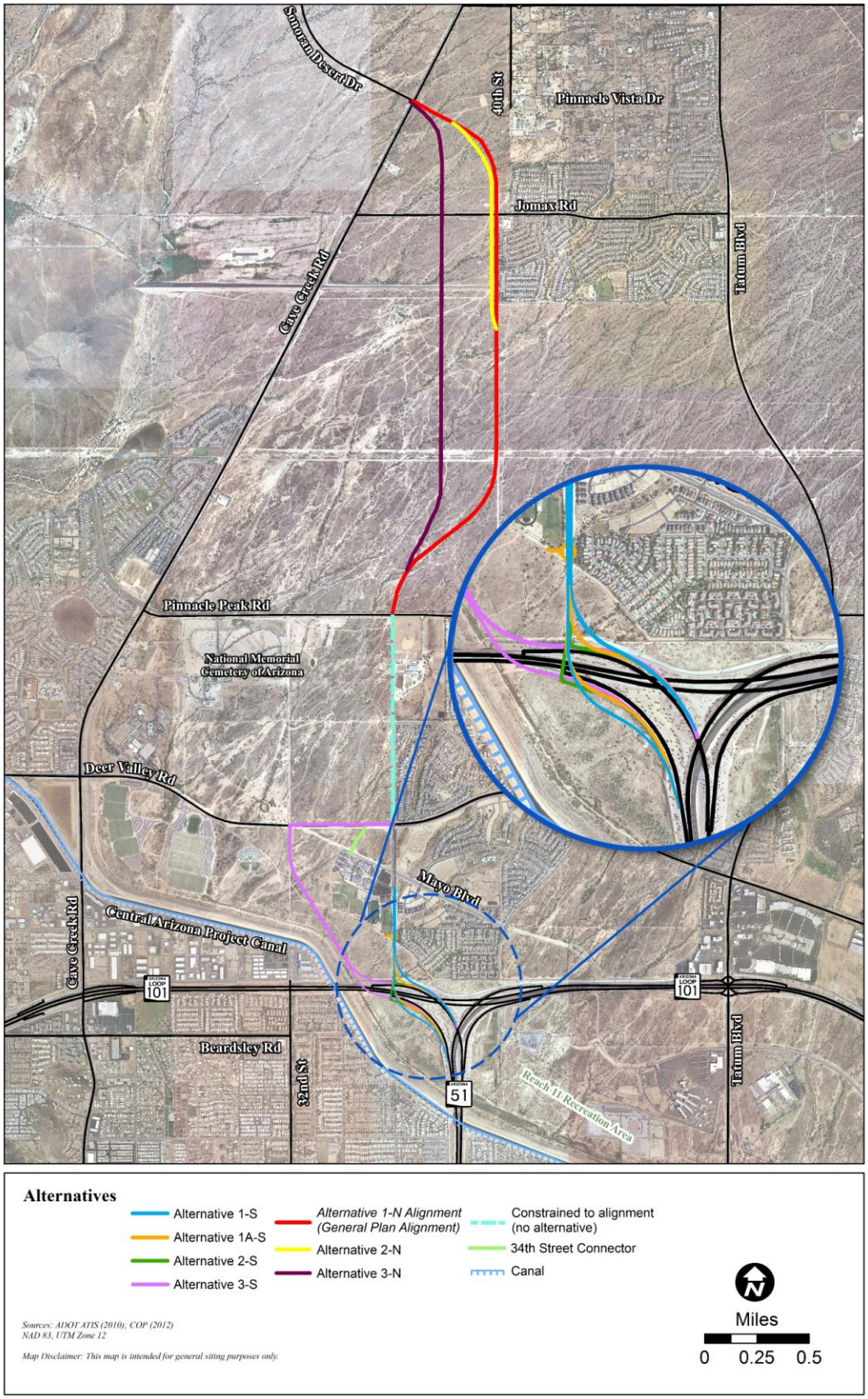

FIGURE 16. COMPOSITE OF ALL BUILD ALTERNATIVES UNDER CONSIDERATION.

criteria were developed by including aspects of the natural, physical, and socioeconomic environment that could be potentially impacted by future projects as well as the engineering and design, feasibility, and cost attributes that would factor into the development of alternatives. The draft criteria were developed based in part on feedback gathered and discussions held at the following places and dates:

- HOA meetings attended by the study team between October 2011 and January 2012
- Desert View Village Planning Committee held December 6, 2011
- Stakeholder Group (members of local homeowner associations, the Paradise Valley Unified School District, ASLD, Phoenix Parks and Recreation Department, the Phoenix Desert View Village planner, Reclamation, and the study team) workshops held on January 10 and March 13, 2012
- Agency coordination meetings held on January 23 and 24, 2012
- Public scoping meetings held on January 25 and 26, 2012
- Three public open-house meetings on March 27 and 28, and April 3, 2012

Additions to the criteria and refinements to the evaluations were made as additional information and feedback from the Stakeholder Group and the public were received at these meetings and gathered through the written comments submitted by mail and through the comment form on the study website (http://www.blackmountainblvd.com). The evaluation process was the basis for eliminating or recommending a given alternative to be carried forward. The criteria included:

- Public input
- Agency input
- Regional mobility and linkage to the arterial and freeway roadway systems
- Local access
- City of Phoenix *General Plan* consistency
- *Reach 11 Recreation Master Plan* consistency
- ASLD development plans consistency

- Section 4(f) resources
- Traffic noise
- Air quality
- Visual resources
- Construction and right-of-way (ROW) costs
- Geometry
- Traffic operations of existing ramps of the SR 51/SR 101L TI
- Drainage (outside the Reach 11 Recreation Area)
- Drainage (within the Reach 11 Recreation Area)
- Utility conflicts
- Opportunity for additional parking at PHS
- Water resources (floodplains and jurisdictional Waters of the US [Waters])
- Biological resources
- Cultural resources
- Hazardous materials
- Neighborhood continuity and community cohesion
- Civil Rights Act of 1964: Title VI and environmental justice
- Connectivity to existing or future employment centers
- Public transit

A copy of the matrix summary is included in Appendix B. The matrix summary was presented to the public on August 30, 2012 and has been made available on the project website (http://www.blackmountainblvd.com). The summary provides the scoring of each alternative based on the respective criterion and summarizes the results.

Alternatives South of Deer Valley Road

Although the scoring of Alternatives 1-S, 1A-S, and 2-S are tightly clustered with Alternative 1A-S having a slight advantage, it was decided by the study team including both joint lead agencies (ADOT and Phoenix) that the scoring advantage held by Alternative 1A-S is sufficient in carrying this alternative forward as the sole build alternative south of Deer Valley Road. Given the similarity of these three alternatives and their ability to meet the purpose and need, it was only differences in scoring of pedestrian and motorist safety, public input, local access, potential Section 4(f) impacts, and accommodations for public transit that factored into the decision to eliminate Alternatives 1-S and 2-S. Feedback specific to safety concerns and vehicle speeds adjacent to PHS was gathered from public input at the January 25 and 26, March 27 and 28, and April 3, 2012, public meetings and workshops (Appendix G, Public Scoping Meetings Summary and Public Workshop Summary). Concerns for motorist and pedestrian safety related to PHS and traffic speeds were sufficiently documented through the public involvement process and became a decisive factor in dropping Alternative 1-S from further consideration, but also factored in the development of Alternative 1A-S which would incorporate a roundabout to slow traffic in the vicinity of PHS. Although many high schools in the Phoenix Metropolitan Area are located along major arterial streets, the public perception that freeway ramps without a terminus requiring substantial slowing or stopping before leading directly onto a roadway adjacent to a high school was a unique scenario that required speed abatement measures beyond what would be provided by Alternative 1-S.

Although public opinion on Alternative 2-S was mixed with some acknowledgement that it would slow traffic and address safety concerns related to PHS, others expressed concern that the ramp configurations would create potential safety concerns that would offset any potential benefit related to PHS and pedestrians (Appendix G, Public Workshop Summary). This public feedback was a decisive factor in dropping Alternative 2-S from further consideration.

Alternative 3-S was developed based on public requests to bypass the segment of BMB located along the east side of PHS. Although this alternative would satisfy the public's request to isolate traffic from PHS, it scored poorly in regards to most of the criteria. Noteworthy are the inconsistencies with land-use planning that has been adopted by the City of Phoenix, ASLD, Reclamation, and the direct impacts to the Reach 11 Recreation Area. The estimated costs for Alternative 3-S are approximately double the estimated costs for the other alternatives between SR 51 and Deer Valley Road. The majority of the cost increases associated with Alternative 3-S would be attributable to the bridge length required to span the Reach 11 flood pool (refer to Figure 14). Therefore, Alternative 3-S has been eliminated from further consideration.

Alternatives North of Deer Valley Road

Alternative 2-N was eliminated from further consideration because of the impacts to current plans developed by the ASLD. ASLD has completed initial planning for most of the land occurring south of Tatum Highlands Subdivision as part of the Azara Master Plan. Many of the current roadway alignments were jointly developed with the future residential developments planned for State Trust lands. It is understood by parties including ASLD, Phoenix, permitting agencies such as the Corps, and the public, that these streets will be constructed in the mutually agreed upon location as reflected in the *General Plan*. Under the implementation of Alternative 2-N, substantial changes to these plans would be required. Furthermore, ASLD would not meet its fiduciary duties to optimize economical return due to the sunk costs of previous plans that would be abandoned or amended, and ASLD and Phoenix would be required to shoulder the additional costs of permitting and conducting public involvement efforts for revised or new plans. In addition, the fracturing of State Trust land parcels in the study area would diminish their sale values and create conflicts with the already constructed overhead and buried utilities that follow the BMB *General Plan* alignment in anticipation of its planned construction.

Similar to Alternative 2-N, Alternative 3-N would substantially impact the approved development plans for State Trust lands as described above for Alternative 2-N. In addition, it would have greater potential to impact the Cave Buttes Dike #2 and would need to comply with specific requirements to not breach the dike or alter the capacity of its stormwater impoundment.

C. Alternatives Considered for Further Study

The No-Build Alternative, as previously described, was carried forward for further study. Based on the screening and evaluation of alternatives, the highest scoring alternative is the hybrid of Alternatives 1A-S and 1-N. The combination of 1A-S and 1-N will subsequently be referred to as the Build Alternative (Figure 17).

D. General Project Schedule, Right-of-way, and Funding

The Build Alternative would be constructed in phases. The first phase would include the portion of the Build Alternative previously described as 1A-S including the 34th Street connector, the pedestrian overpass, and the partial completion of BMB between Rough Rider and Pinnacle Peak roads. Initially, only two of the six lanes would be constructed in the segment between Rough Rider and Pinnacle Peak roads. The first phase has funding currently available through the MAG ALCP, Phoenix, and federal funds. The remaining BMB improvements associated with Alternative 1-N would be constructed as development of State Trust lands occurs. No schedule for the auction of these lands by ASLD is available. Each land developer would be responsible for the dedication of ROW and constructing street improvements adjacent to their development. Phoenix would oversee this in the future. No federal funding for these future improvements is anticipated.

The implementation of the entire Build Alternative would require 59.4 acres of new ROW (Figure 18) and 6.3 acres of permanent easement. The cost of ROW acquisition for the Build Alternative between

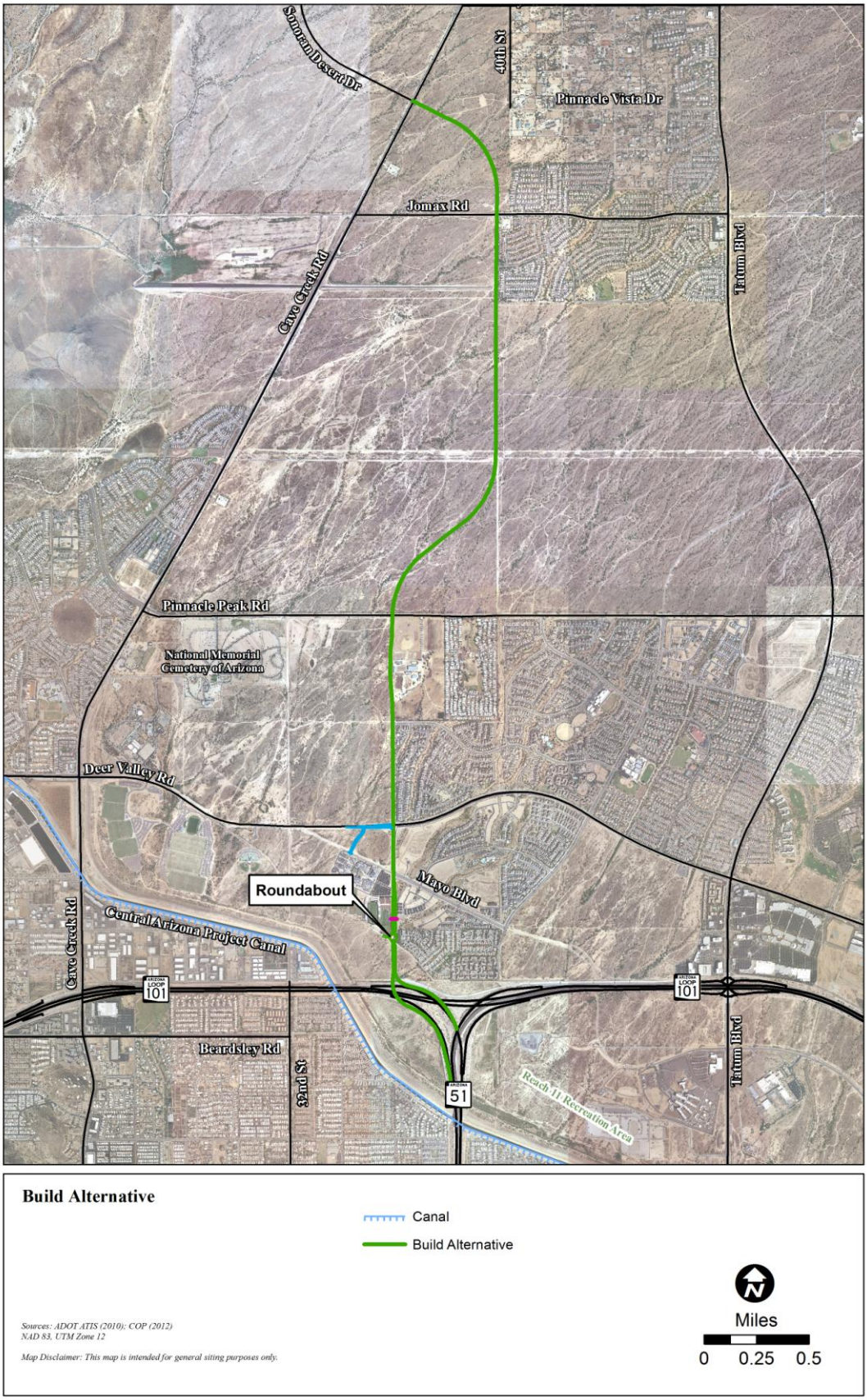

FIGURE 17. BUILD ALTERNATIVE.

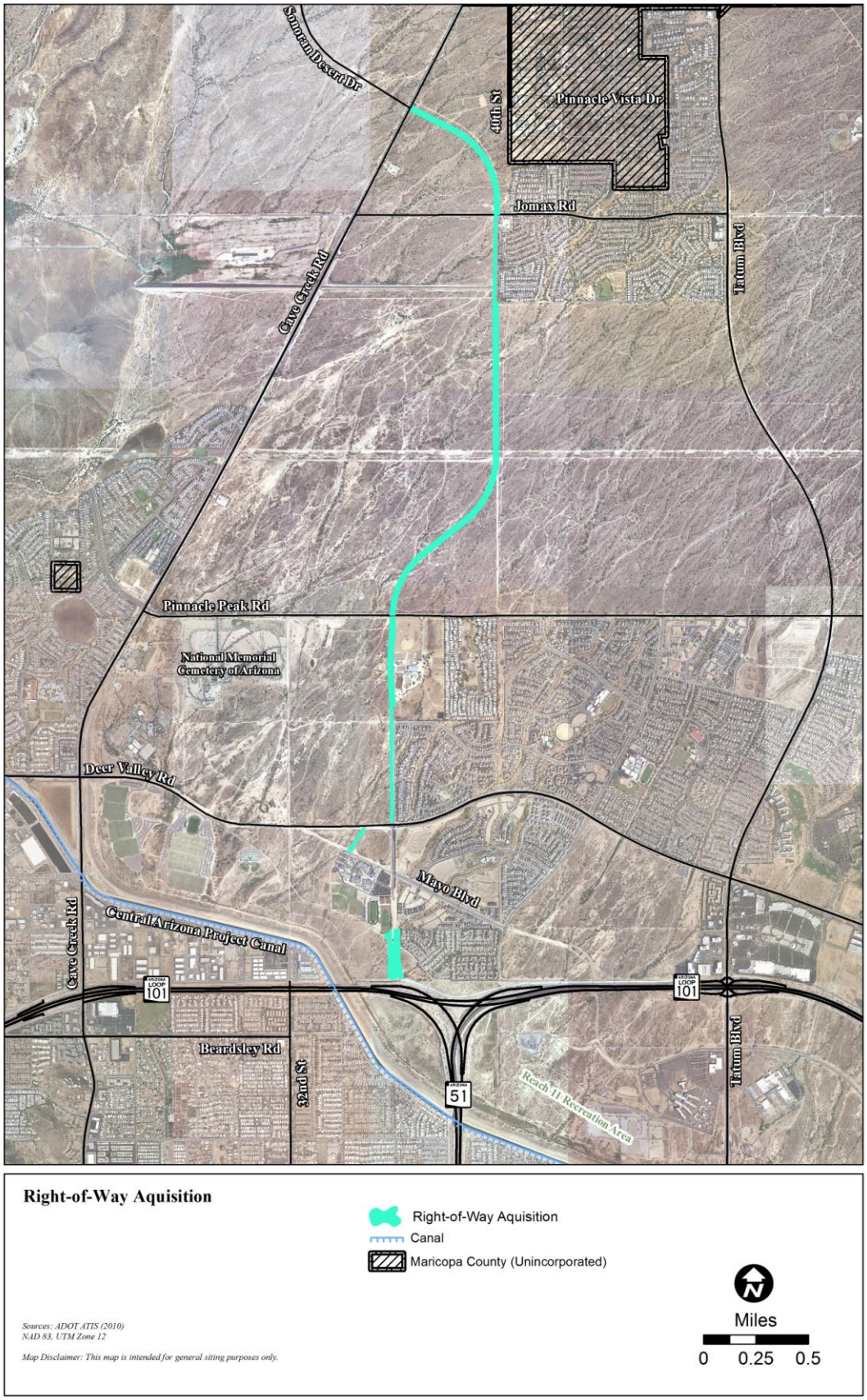

FIGURE 18. NEW RIGHT-OF-WAY REQUIRED FOR THE BUILD ALTERNATIVE.

SR 51 and Pinnacle Peak Road is programmed in the MAG RTP as $3,600,000. Construction for the Build Alternative Portion between SR 51 and Pinnacle Peak Road is programmed at $24,900,000. Approximately 70 percent of the project would be funded federally and by MAG, with the remaining 30 percent funded by Phoenix.

The schedule for design and construction of the currently funded portion of the Build Alternative would be:

Design and ROW Acquisition	2013
Construction	2014
Open To Traffic	2015

The remaining BMB improvements from Pinnacle Peak Road to the northern terminus at Cave Creek Road, as stated earlier, do not have any public funding programmed and are planned to be built as adjacent land parcels are developed.

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IV. Affected Environment, Environmental Consequences, and Mitigation Measures

This section describes the study area environment, potential environmental impacts associated with the Build and No-Build Alternatives, and potential mitigation measures associated with the Build Alternative.

The following resources or issues either do not occur in the study area or are not relevant to this project evaluation and, therefore, are not discussed in this Draft EA: prime or unique farmland, wild and scenic rivers, wilderness areas, sole-source aquifers, and Land and Water Conservation Fund Act properties.

A. Landownership, Jurisdiction, and Land Use

Jurisdiction and Landownership

Jurisdiction refers to the political entities that have legal authority over a given geographic area. The study limits fall entirely within Maricopa County. With the exception of a portion in the northeast, the study area is within the incorporated boundaries of Phoenix (refer to Figure 3).

Landownership is defined by two basic categories: privately held lands and government lands. In the study area, the CAP Canal and the SR 51/SR 101L TI are located on federal land with the underlying rights belonging to Reclamation. The primary purpose of this land is for conveying water through the canal and protecting the canal structure from floodwaters. The Central Arizona Water Conservation District (CAWCD) has an agreement with Reclamation to operate and manage the canal. ADOT has permission from Reclamation to operate and maintain their freeway facilities within this portion of the CAP that is known as Reach 11. Because the upslope area above the canal is maintained primarily for the detention of floodwaters, there are restrictions on its development. Reclamation has granted rights to

the Phoenix Parks and Recreation Department to develop and maintain recreational facilities in the Reach 11 Recreation Area that are not inconsistent with its primary purposes of flood detention and protection.

North of Reach 11, the landownership is mixed between the Paradise Valley Unified School District (i.e., PHS), private lands, and State Trust land managed by the ASLD. Between Rough Rider and Pinnacle Peak roads, there is a parcel of federal land managed by the VA as the National Memorial Cemetery of Arizona. To the north of Pinnacle Peak Road, the land is mostly State Trust with a pocket of private land east of the Jomax Road and 40th Street intersection. To the west of this block of private parcels, there is a strip of land owned by the Flood Control District of Maricopa County (FCDMC), an agency charged with the responsibility of providing flood-control facilities throughout the county.

Existing Land Use

Much of the southern portion of the study area, especially east of BMB between Reach 11 and Pinnacle Peak Road, is developed land with the northern portion undeveloped for the most part. The following sections describe the existing land use in broad categories.

Residential

Residential areas within the study area listed from south to north include Wildcat Ridge, Fireside, and Aviano subdivisions located between Reach 11 and Pinnacle Peak Road. There is also a manufactured home community known as Paradise Peak West located along Pinnacle Peak Road. In the north portion of the study area, the Tatum Highlands subdivision is located east of 40th Street and a portion of the unincorporated community north of Tatum Highlands lies partially within the study area. The majority of residential development within the study area is single-family homes. A pocket of multi-unit housing, the La Verne Condominiums, is located in the southeast corner of the study area adjacent to SR 101L.

Commercial/Industrial

The Pinnacle West Equestrian Center located along Pinnacle Peak Road within the study area is a commercial facility that offers training and boarding of horses, rider lessons, and horse sales. There are no other commercial properties in the study area. There is no existing industrial property in the study area.

Agriculture

There is no cultivated land within the study area.

Other Considerations

Other than the basic categories of land use, there are also special sites within the study area and surrounding area that are noted below.

Parks

Portions of Reach 11 have been developed for recreation and are operated and maintained by the Phoenix Parks and Recreation Department. Within the study area (Figure 19), there are no developed recreation facilities other than trails within the Reach 11 Recreation Area. However, portions of the study area have been designated for the future development of recreation facilities in accordance with the *Reach 11 Recreation Master Plan* and *Final EIS* and are discussed in subsequent sections of this EA.

Schools

PHS and Fireside Elementary School are located in the study area (Figure 19). Both schools are part of the Paradise Valley Unified School District. There are seven additional schools within one mile of the study area.

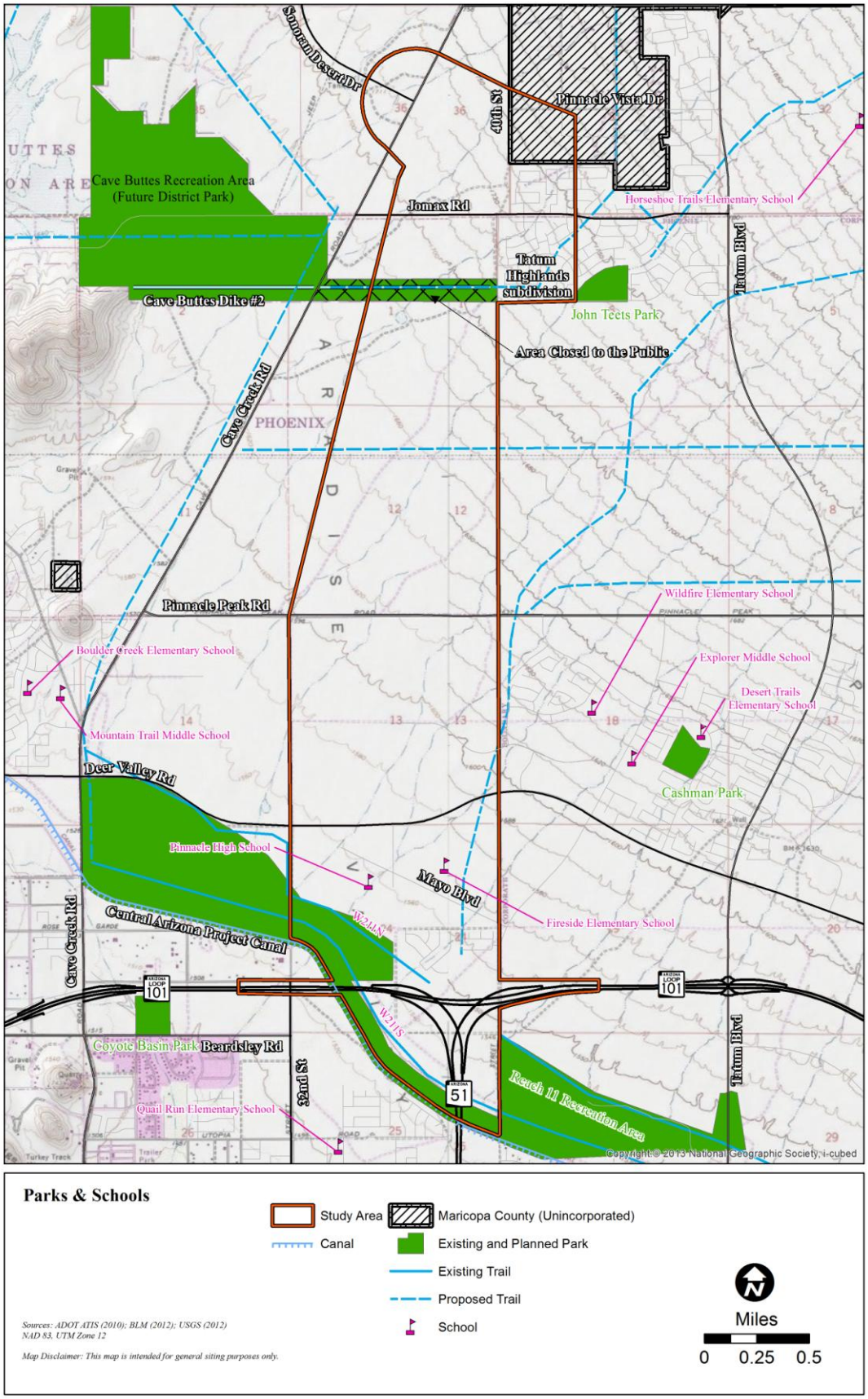

FIGURE 19. PARKS AND SCHOOLS.

Trails

Trail W211S parallels the CAP Canal within the Reach 11 Recreation Area and crosses the study area near its southern boundary. This trail provides a connection to several recreation developments located outside the study area (Horse Lover's Park and the Reach 11 Sports complex, for example) and also connects with the multi-use trail that parallels SR 51. Several unofficial trails not part of the *Reach 11 Recreation Master Plan* are in use between PHS/Wildcat Ridge Subdivision and SR 101L.

Other Uses

An area within Reach 11 (Basin A located in the southwest quadrant of the SR 51/SR 101L TI) was constructed as a mitigation site to offset impacts to Waters from the original construction of the freeway TI. Additionally, several other Section 404 Individual Permits (IP) have prescribed mitigation corridors throughout the study area. These mitigation areas are restricted from development and are discussed in greater detail in subsequent sections of this EA.

A large portion of Reach 11 within the study area has been set aside for transportation use (known as Zone 2) in accordance with the *Reach 11 Recreation Master Plan* and *Final EIS*. Most of this set-aside is occupied by the freeway TI, the aforementioned mitigation site, and other drainage facilities associated with the freeways.

West of the Tatum Highlands Subdivision, there is a linear FCDMC parcel between Cave Creek Road and 40th Street that is occupied by the Cave Buttes Dike #2. This parcel is designated as part of the Cave Buttes Recreation Area (refer to Figure 19) and identified in the recreation element of the Phoenix *General Plan* as a future district park. However, public access to this facility is blocked by fences and no-trespassing signs, and currently functions solely for the purpose of flood control. A portion of the Cave Buttes Recreation Area outside of the study area and west of Cave Creek Road is currently used as a landing strip for remote-control model aircraft.

Planned Uses

Planned uses were derived from the Phoenix *General Plan*, as amended, ASLD's Desert Ridge and Azara master plans, and the *Reach 11 Recreation Master Plan* (refer to Figure 6). In the south portion of the study area, there are plans for further development of recreation facilities within Reach 11. These include facilities for court games, a parking area, and maintenance facilities to be constructed south of PHS. There are plans to provide access to these facilities from the BMB alignment specified in the Phoenix *General Plan*.

In undeveloped areas north of PHS, Phoenix and ASLD plans indicate future residential development occurring. The VA intends to expand the National Memorial Cemetery of Arizona into the undeveloped eastern half of their property. The developed portions of the cemetery will reach capacity in less than five years and expansion of the facilities is necessary to accommodate future requests for interment.

Between Pinnacle Peak Road and the northern study area terminus, the future land use for the tracts of undeveloped State Trust land is residential. Amendments to the Phoenix *General Plan* and the Azara Master Plan show a commercial node to be constructed at the intersection of the 40th Street and Happy Valley Road alignments.

Zoning

Zoning in the developed portions of the study area matches the existing development. Reach 11 and the Cave Buttes Dike #2 are zoned as parks/open space (publically owned) and PHS and the National Memorial Cemetery of Arizona are zoned as public/quasi public. The existing residential development is mixed between multi-unit dwellings such as condominiums and townhomes with densities of up to 12 dwelling units per acre and single-family homes (SFH) on traditional lots with densities that are typically between 3 and 5 dwelling units per acre. Zoning for the Pinnacle West Equestrian Center is by special permit that allows livestock to be housed on the land and for training of riders and horses. Within

the equestrian center, there is also special zoning for radio transmission towers located on the property. The adjacent Paradise Peak West Subdivision also has a special permit for zoning that allows for its manufactured housing.

In the undeveloped portions of the study area, the zoning is mostly Suburban 1 (S-1), a general overlay that describes areas "where semi-rural residential and agricultural uses can be maintained without impairment from industrial, commercial or higher density residential development"(Phoenix Code §603). Within the S-1 areas, specific zoning exists for various residential and commercial developments. Near PHS, there is residential zoning for the development of multi-unit condominiums and single or attached townhomes with densities of between 5 and 12 units per acre. There is also zoning for SFH adjacent to PHS with a density of 5 to 6 dwelling units per acre. To the west of the existing segment of BMB between Deer Valley Road and the National Memorial Cemetery of Arizona property, there is no specific zoning for this State Trust parcel other than the general S-1 designation.

North of Pinnacle Peak Road where the majority of the study area remains undeveloped, the residential zoning is for SFH with densities ranging from 4 to 6 dwelling units per acre. The commercial node that will be developed at the intersection of the 40th Street and Happy Valley Road alignments will be a medium-density district of mostly retail businesses. In the area north of the Cave Buttes Dike #2, there is no specific zoning for this State Trust parcel other than the general S-1 designation.

Plans, Policies, and Zones that Affect the Analysis Area

Phoenix, the primary planning authority for the study area, determines the future land use and zoning through their *General Plan*. In addition to showing the existing and future land use, the *General Plan* also has a transportation element that is used for planning the future roadway network. The *General Plan* prescribes mostly new residential development in the undeveloped portions of the study area with a system of arterial streets constructed on a roughly one-mile grid to serve new populations. The *General*

Plan Street Classification Map (Phoenix 2010) shows BMB planned on alignment as depicted in Alternative 1-S of this EA including the ramp connections to SR 51.

ASLD plans for Desert Ridge and Azara were developed in conjunction with Phoenix and mirror the Phoenix *General Plan* for future land use and zoning. Similar to the Phoenix *General Plan* Transportation Element, ASLD planning for Desert Ridge and Azara has adopted BMB on the alignment corresponding to the City's *General Plan* with the assumption that a connection with SR 51 would be included.

The *Outer Loop Freeway Specific Plan* (Phoenix 1995) included the future BMB with NB and SB connections to the future extension of SR 51. The ramp connections between BMB and NB and SB SR 51 were incorporated into the RTP and plans for the future system interchange connecting SR 51 and SR 101L. When the new RTP was approved in 2004, funding for the construction of the ramps connecting SR 51 and BMB was included.

The *Reach 11 Recreation Master Plan* divided the Reclamation lands associated with the CAP Canal into zones with corresponding themes and uses. The current study area coincides with this Master Plan's Zones 1 and 2. The portion of Zone 1 (sports fields) within the study area shows future development of game courts, parking, and maintenance facilities. Zone 2 (freeway interchange) is the area within Reach 11 that was set aside for the construction of the SR 51/SR 101L TI. In the *Master Plan*, the ramps and connections from SR 51 to and from BMB are planned within Zone 2.

Environmental Consequences

Build Alternative

Under the implementation of the Build Alternative, land use would remain the same as the current conditions with few exceptions. There would be some conversion of land to transportation use due to the acquisition of new ROW for the Build Alternative (Table 5, refer to Figure 18).

TABLE 5. NEW RIGHT-OF-WAY AND EASEMENT REQUIREMENTS FOR BUILD ALTERNATIVE.

Land Owner	Acreage of New ROW
Alternative 1A-S (including the segment between Deer Valley and Pinnacle Peak Roads)	
Reclamation	6.35*
Paradise Valley Unified School District	1.93
Wildcat Ridge HOA	1.53
Fireside HOA	0.17
ASLD	5.46
VA (National Memorial Cemetery of Arizona)	4.38
Pinnacle West Equestrian Center	2.16
Alternative 1A-S Subtotal	**21.98**
Alternative 1-N	
ASLD	43.37
FCDMC	0.79
Alternative 1-N Subtotal	**44.16**
Build Alternative Total	**66.14**

*Permanent easement rather than ROW.

The Build Alternative would require the construction of ramps within the Reach 11 Recreation Area. This would occur entirely within Zone 2, the area that is designated for transportation facilities. The excavation of shallow basins within Reach 11 to offset the loss of stormwater capacity would occur within both Zones 1 and 2. Zone 1 is the site of existing and future recreation facilities and, as described above, Zone 2 is reserved for transportation use. Although temporary impacts to Zone 1 would include closing existing recreational trails that are in direct conflict with excavations, these trails and the vegetation would be restored to the preconstruction conditions. The only permanent impacts would be slight changes to the topographic contours and elevations. These changes to the topography would be slight, resulting in uniform and gently sloping areas that would remain suitable for the eventual construction of the planned recreation facilities described in the *Reach 11 Recreation Master Plan*.

During final design, coordination would be conducted with Phoenix and Reclamation to ensure design is compatible with the *Reach 11 Recreation Master Plan*.

New ROW would include 2.32 acres from the Wildcat Ridge Homeowners' Association (HOA) and PHS for the construction of BMB at the location of the roundabout. Land that would be acquired from the HOA is a drainage easement used as a common area within the subdivision; no property from any residential lot would be required. The property that would be needed from PHS is a portion of a landscaped strip adjacent to their athletic field. The property from the high school would not directly impact their athletic field or its functioning. Portions of the pedestrian bridge spanning BMB near the boundary of the Wildcat Ridge and Fireside subdivisions would be constructed within the new ROW to be acquired from PHS (0.27 acre) and the Fireside HOA (0.17 acre).

The 34th Street connector between Deer Valley Road and Mayo Boulevard would require new ROW (2.08 acres) from currently undeveloped State Trust land that is zoned for future residential development. This connector would function as a local street and would not differ from streets that typically service neighborhoods such as the ones planned at this location. Therefore, the acquisition of ROW and construction of 34th Street connector would not impact the planned development of residential properties on the surrounding parcel.

For the portion of the Build Alternative to be constructed between Deer Valley and Pinnacle Peak roads, new ROW encompassing 5.78 acres would be required from State Trust land to construct the west half of BMB between Deer Valley Road and the National Memorial Cemetery of Arizona. Because this acquisition would be from the undeveloped land west of BMB, it would not impact existing land use or affect the future development of the State Trust parcel. Between Rough Rider and Pinnacle Peak roads, the Build Alternative would be constructed on portions of VA land and land acquired from the Pinnacle West Equestrian Center. Phoenix is currently negotiating with the VA to abandon their rights to 4.38

acres of the 32nd Street alignment in favor of those rights being transferred to the BMB alignment as specified in the *Street Classification Map* (refer to Table 5). The VA supports these rights being transferred between the two alignments (refer to Appendix C, Agency Correspondence) and has indicated the construction of BMB as specified in the Build Alternative would not interfere with the expansion of the National Memorial Cemetery of Arizona into undeveloped portions of their property. The new ROW required from the equestrian center would total 2.16 acres (refer to Table 5). The alignment of the Build Alternative at this location would avoid the structures at the equestrian center but would require the partial displacement of some horse pens on the property. The acquisition ROW from this property would be done in accordance with 42 US Code (U.S.C.) Chapter 61 and the Real Property Acquisition Policies Act of 1970 and Arizona Revised Statute (A.R.S.) 12-1111 et seq. (Special Actions and Proceedings Relating to Property).

North of Pinnacle Peak Road, the ROW for the Build Alternative would be acquired in the future by land developers from the State Trust, BMB segments would be constructed, and the ROW dedicated to Phoenix. The total ROW required for this segment would be 44.16 acres. The exception would be a portion of the FCDMC land associated with the Cave Buttes Dike #2. The portion of FCDMC land required would encompass 0.79 acres (Refer to Table 5); construction of BMB would not require modifications to the Dike or interfere with its function.

Other than the abovementioned ROW acquisitions, the Build Alternative would not interfere with the existing or planned land use of the study area. The plans relevant to this project include the *General Plan: A Vision for the Future* (Phoenix [updated] 2011), *Regional Transportation Plan Executive Summary* (MAG [updated] 2010), *Desert Ridge Specific Plan: Master Plan and Development Regulations* (ASLD and Northeast Phoenix Partners 1990, as revised), *Desert Ridge, Paradise Ridge, and Tatum East-West (Azara) Infrastructure Masterplan* (ASLD [revised] 2008), and *Central Arizona Project Reach 11 Recreation Master Plan: Final Environmental Impact Statement* (Reclamation 2002).

These plans have all been formulated and adopted with the foreknowledge that BMB would be constructed along the Phoenix *Street Classification Map* alignment and would connect with SR 51.

No-Build Alternative

The No-Build Alternative would still entail the completion of BMB between Deer Valley and Cave Creek roads in accordance with the *General Plan.* However, the ROW requirements would be different from the Build Alternative (Table 6), and no acquisitions would be required for the roundabout, pedestrian bridge, or 34th Street connector, as none of these features would be constructed. Without the ramps being built, there would be no encroachment into Zone 2 of Reach 11. The ROW exchange on VA property and the acquisitions from the Pinnacle Equestrian Center, State Trust, and the FCDMC would be required. As stated for the Build Alternative, these acquisitions would not affect the existing or planned land use in the study area.

TABLE 6. NEW RIGHT-OF-WAY AND EASEMENT REQUIREMENTS FOR NO-BUILD ALTERNATIVE.

Land Owner	Acreage of New ROW
ASLD	45.48
Pinnacle West Equestrian Center	2.16
VA (National Memorial Cemetery of Arizona)	4.38
FCDMC	0.79
No-Build Alternative Total	**52.81**

Although the No-Build Alternative would not directly interfere with the planned land use of the study area, the resulting deficiencies in the transportation network and congestion caused by lack of direct access to and from SR 51 would result in less desirability of the area for prospective developers and residents. This may require land-use plans to be revised or abandoned in favor of plans with less density.

Mitigation Measures

- The acquisition right-of-way would be performed in accordance with 42 U.S.C. Chapter 61 and the Real Property Acquisition Policies Act of 1970 and A.R.S. 12-1111 et seq. (Special Actions and Proceedings Relating to Property).
- During final design, coordination would be conducted with the Bureau of Reclamation to ensure design is compatible with the *Reach 11 Recreation Master Plan*, Reach 11 flood detention and protection function, and Reach 11 mitigation requirements.

Conclusion

The existing land use in the study area would be minimally affected by both Build and No-Build Alternatives. New ROW would be acquired under the implementation of either alternative, with slightly greater acreage required from a greater number of properties for the implementation of the Build Alternative. However, acquisitions for either alternative would not result in changes to the use of individual properties that would be directly affected. For future land use and development in accordance with adopted plans for the area, the implementation of the Build Alternative satisfies the transportation and mobility element that these plans rely upon for their implementation. The No-Build Alternative would not directly affect future land use, but the deficiencies it would create would require revisions to plans and lower densities for new development.

B. Social Environment

Selection and analysis of data are determined by the level of detail necessary to determine potential impacts to protected populations as well as the availability of recent socioeconomic and demographic data. Data from the decennial census prepared by the US Census Bureau is released in several stages. The most detailed information currently available is the Summary Tape File 1 release. The smallest

geographic resolution available in Summary Tape File 1 is at the census tract level. Census tracts are relatively permanent statistical subdivisions of a county for tallying census information and do not cross county boundaries. Summary Tape File 3 for the 2010 Census, which contains more detailed information at smaller geographic resolutions (block and block group level) has not yet been published for the study area. Therefore the sharpest resolution of data available from the 2010 Census for the study area is the census tract level and was used to determine most of the socioeconomic characteristics of the study area. Poverty information for the study area was obtained from the 2010 American Community Survey data produced by the US Census Bureau. Information on disabled populations is not included in the 2010 decennial census and has not been released in the American Community Survey for the study area. Therefore, data on disabled populations within the study area was obtained from the 2000 decennial census.

Existing Conditions

Race and Ethnicity

According to the US Census Bureau 2010 data, the study area is comprised primarily of populations identified as white, representing approximately 88.7 percent of the 28,685 individuals recorded within the five tracts (Table 7). This percentage is higher than census data recorded for Maricopa County (73%) and Phoenix (65.9%). No other substantial populations, meaning those populations that comprise greater than 50 percent of a population, are located within the study area.

Title VI and Environmental Justice

Title VI of the Civil Rights Act of 1964 and related statutes ensure, under any program or activity receiving federal financial assistance, that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination on the basis of race, color, national origin, age, sex, or disability. Executive Order 12898 of 1994, *Environmental Justice,* directs that programs, policies, and

activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations. The rights of women, the elderly, and low-income populations are protected under related statutes. A comparison of disabled, low-income, elderly, female head-of-household, and minority population percentages by census tracts (Figure 20) between the study area and the surrounding municipalities and counties is shown in Table 7 and Table 8.

Disabled Populations

As defined by the US Census Bureau, the disabled population consists of civilian, non-institutionalized persons over the age of 5 that have a sensory, physical, mental, self-care, "going outside of home," or employment disability. Based on year 2000 US census data, 13.3 percent of the population within the census tracts analyzed is classified as disabled (Table 9). This is less than the Phoenix and Maricopa County figures of 22.3 percent and 20.8 percent, respectively.

Low Income Populations

The poverty thresholds are revised annually to allow for changes in the cost of living as reflected in the Consumer Price Index. The average poverty threshold for a family of four persons was $23,000 in 2011. The percentage of households living below the poverty level for the study area (5.3%) is considerably lower than found in the surrounding communities (refer to Table 8).

Elderly Populations

Elderly refers to individuals who are older than 60 years of age. While the percentage of elderly populations vary among the tracts in the study area from 7.6 percent to 22.8 percent, the percentage of elderly for the combined tracts is 14.8 percent, which is lower than the percentages found in the surrounding communities (refer to Table 8).

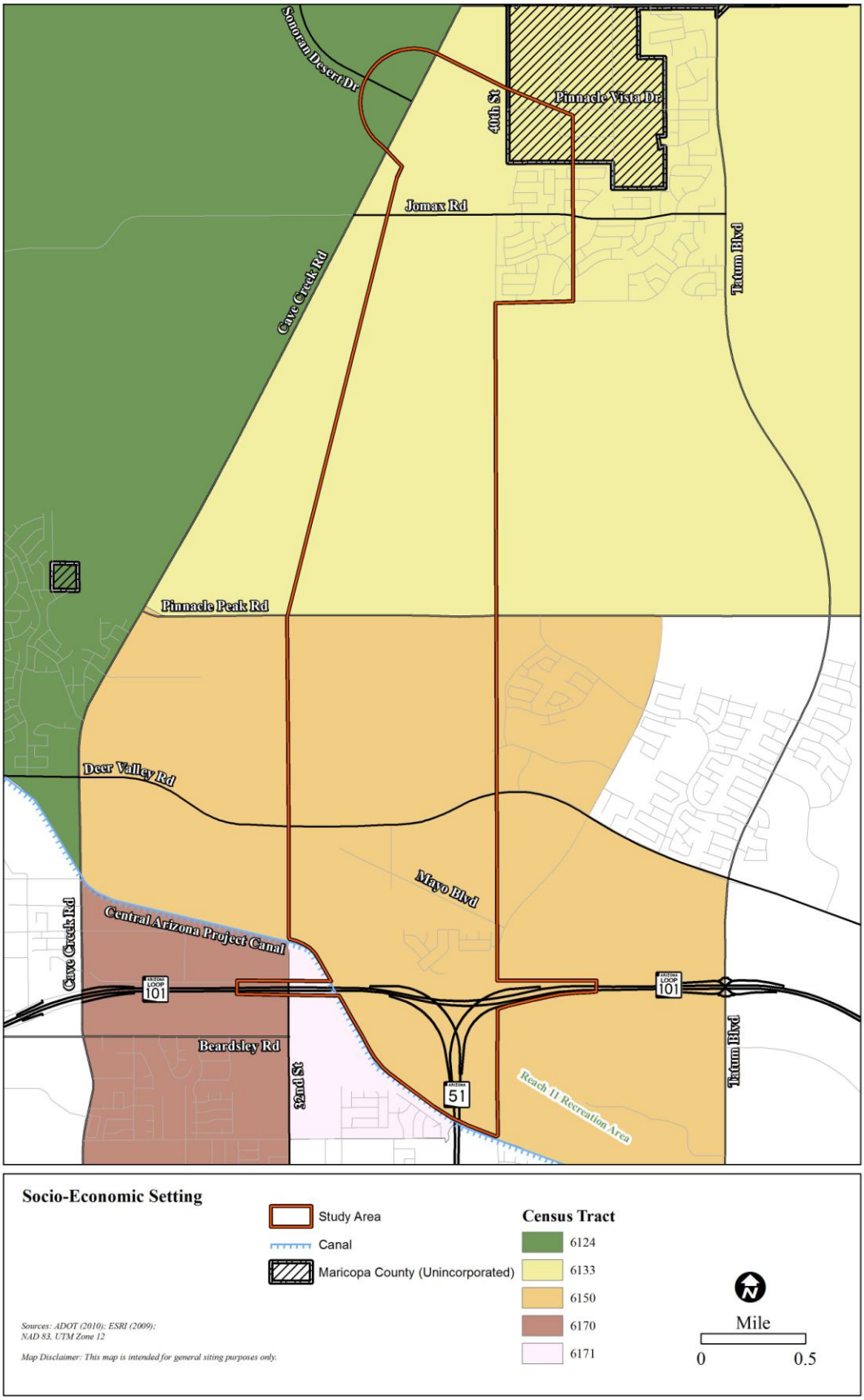

FIGURE 20. PROJECT VICINITY CENSUS TRACTS.

TABLE 7. MINORITY DEMOGRAPHIC COMPARISONS.

Area	Total Population	White Alone		Black or African American Alone		American Indian and Alaska Native		Asian		Native Hawaiian and Other Pacific Islander		Some Other Race Alone		Two or More Races		Hispanic or Latino*		Total Minority**	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Census Tract 6124	6,840	6,047	88.4	104	1.5	10	0.1	350	5.1	12	0.2	113	1.7	204	3.0	436	6.4	1,208	17.7
Census Tract 6133	7,102	6,591	92.8	81	1.1	20	0.3	188	2.6	1	0.0	67	0.9	154	2.2	436	6.1	868	12.2
Census Tract 6150	6,630	5,672	85.6	140	2.1	19	0.3	542	8.2	0	0.0	74	1.1	183	2.8	491	7.4	1,319	19.9
Census Tract 6170	5,891	5,157	87.5	135	2.3	39	0.7	151	2.6	4	0.1	254	4.3	151	2.6	850	14.4	1,267	21.5
Census Tract 6171	2,222	1,987	89.4	39	1.8	8	0.4	63	2.8	1	0.0	61	2.7	63	2.8	198	8.9	352	15.8
All Census Tracts	28,685	25,454	88.7	499	1.7	96	0.3	1,294	4.5	18	0.1	569	2.0	755	2.6	2,411	8.4	5,014	17.5
City of Phoenix	1,445,632	951,958	65.9	93,608	6.5	32,366	2.2	45,597	3.2	2,555	0.2	267,214	18.5	52,334	3.6	589,877	40.8	773,059	53.5
Maricopa County	3,817,117	2,786,781	73.0	190,519	5.0	78,329	2.1	132,225	3.5	7,790	0.2	489,705	12.8	131,768	3.5	1,128,741	29.6	1,577,062	41.3

Source: US Census Bureau, Census 2010 Summary File 1

The summation between percentages of the racial categories and those of the ethnicity categories—some other race alone, two or more races, and Hispanic or Latino—may equal more than 100% of the total population. This is because some respondents that identify themselves as "white" or of another race may also be of Hispanic decent and consider themselves under both criteria.

**Total minority is determined by summation of all races other than white-alone and white-Hispanic ethnicity.

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TABLE 8. ENVIRONMENTAL JUSTICE POPULATIONS BY CATEGORY.

Area	Total Population	Age 60 Years and Over		Low Income		Female Head of Household	
		#	%	#	%	#	%
Census Tract 6124	6,840	521	7.6	320	5.3	705	27.2
Census Tract 6133	7,102	996	14.0	134	2.0	404	16.4
Census Tract 6150	6,630	957	14.4	238	4.4	669	26.3
Census Tract 6170	5,891	1,341	22.8	622	11.3	983	38.4
Census Tract 6171	2,222	356	16.0	49	2.3	239	26.8
All Census Tracts	28,685	4,171	14.8	1363.0	5.3	3,000	27.2
City of Phoenix	1,445,632	184,319	12.8	273,925	19.1	164,628	32.0
Maricopa County	3,817,117	652,489	17.1	515,030	13.9	420,772	29.8

Source: US Census Bureau (2010 Decennial Census, 2010 American Community Survey)

TABLE 9. DISABLED POPULATION.

Area	Total Population	Disabled	
		#	%
Census Tract 303.55	5,413	1052	19.4
Census Tract 303.56	7,462	847	11.4
Census Tract 303.58	3,581	399	11.1
Census Tract 303.63	5,109	569	11.1
Census Tract 303.67	3,999	539	13.5
All Census Tracts	25,564	3,406	13.3
City of Phoenix	1,320,994	294,582	22.3
Maricopa County	3,072,149	639,007	20.8

Source: US Census Bureau (2000 Decennial Census

Female Head-of-Household Populations

According to the US Census Bureau, female heads-of-household consist of households (both family and non-family) that are headed by a female with no husband present and with her own children under the age of 18. The percentage represents the number of persons within a female-only-headed household compared to the total population. The percentage of households identified as "female head of household" for the five tracts at 27.2 percent is less than the percentages found in the surrounding communities (refer to Table 8).

Environmental Consequences

Build Alternative

Based on the US census data, there may be individuals or small groups of protected populations within the study area; however, there are no distinct concentrations of protected populations. Therefore, there would be no disproportionate impact to protected populations. The proposed improvements are anticipated to improve the transportation system in the study area and surrounding project vicinity. All populations would benefit from the improvements because mobility would be improved, congestion would be reduced, and accessibility to regional public and private facilities and services would be improved.

Residential neighborhoods that have developed along the BMB alignment would not be fractured by the Build Alternative as these developments incorporated the Phoenix *General Plan* alignment of BMB and constructed portions of the BMB roadway into their planning.

The Build Alternative would not require the acquisition of any residential properties, nor would it require full acquisition of any properties. Any acquisition of property would occur in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act 18 of 1970, as amended, and its implementing regulations (49 CFR Part 24).

No-Build Alternative

This alternative would not include a connection to SR 51, but would otherwise be similar to the Build Alternative. There would be no disproportionate impact to protected populations as no distinct concentration of protected populations are located in the study area.

Residential neighborhoods that have developed along the BMB alignment would not be fractured by the No-Build Alternative as these developments incorporated the Phoenix *General Plan* alignment of BMB and constructed portions of the BMB roadway into their planning.

Less new ROW (8.5 acres less) would be required than the Build Alternative, and similarly the No-Build Alternative would not require the acquisition of any residential properties, nor would it require full acquisition of any properties. Any acquisition of property would occur in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act 18 of 1970, as amended, and its implementing regulations (49 CFR Part 24).

Mitigation Measures

- The acquisition of right-of-way would be performed in accordance with 42 U.S.C. Chapter 61 and the Real Property Acquisition Polices Act of 1970 and A.R.S. 12-1111 et seq. (Special Actions and Proceedings Relating to Property).

Conclusion

Selection of the Build Alternative would require the acquisition of property from several non-residential properties. No “full-take” acquisitions would be required. There are no distinct, disproportionately high concentrations of protected populations within the study area; therefore, there would be no disproportionate impact to these populations. No neighborhoods would be bisected by the Build Alternative, and access to local services and facilities would be enhanced due to reduced traffic congestion of surface streets.

Selection of the No-Build Alternative would result in increased traffic congestion on surface streets, which could make travel between residences and employment areas, local services, and other amenities more difficult for populations in the study area. However, there are no protected populations within the study area; therefore, there would be no disproportionate impact to these populations for either alternative.

C. Economic Conditions

Existing Conditions

Business Types and Distribution

The US Census Bureau County Business Patterns database was reviewed for the year 2000 and 2010 (US Census Bureau 2010) for the zip codes that intersect the study area (85050 and 85331). The results show there was a 112 percent increase in the number of businesses in this area during that time (Table 10). It is important to note that this review area covers a much larger area than the study area, and there may be variations in the composition of employment strictly within the study area. While certain sectors of employment had changes in the number of businesses, the overall composition of businesses changed very little over this period with the percentage of businesses in each sector remaining relatively constant. Businesses in these areas are predominately (65%) small businesses with less than 5 employees.

Travel and Commute Data

Based on U.S. Census Bureau, 2005–2009 American Community Survey data, most of the residents in the census tracts around the study area commute to work. Nearly all employees (81–96%) traveled by automobiles between work and home, with most driving alone.

TABLE 10. 2000 AND 2010 EMPLOYMENT BY SECTOR IN THE STUDY AREA AND VICINITY.

Employment Sector	2000	2010	Change in Number of Jobs	Change as Part of all Employment
Total	**612**	**1297**	**112%**	
Forestry, fishing, hunting, and agriculture	6	10	67%	-0.21%
Mining	0	1	0%	0.08%
Utilities	2	3	50%	-0.10%
Construction	125	157	26%	-8.32%
Manufacturing	16	24	50%	-0.76%
Wholesale trade	35	69	97%	-0.40%
Retail trade	58	173	198%	3.86%
Transportation & warehousing	13	12	-8%	-1.20%
Information	17	17	0%	-1.47%
Finance & insurance	22	76	245%	2.26%
Real estate & rental & leasing	27	82	204%	1.91%
Professional, scientific & technical services	86	204	137%	1.68%
Management of companies and enterprises	2	4	100%	-0.02
Administration, support, waste mgt., remediation services	68	116	71%	-2.17%
Educational Services	5	21	320%	0.80%
Health care and social assistance	32	134	319%	5.10%
Arts, entertainment & recreation	16	24	50%	-0.76%
Accommodation & food services	42	92	119%	0.23%
Other services (except public administration)	34	71	109%	-0.08%
Unclassified establishments	11	7	-36%	-1.26%

Source: US Census Bureau County Business Patterns 2000 and 2010

Environmental Consequences

Build Alternative

Based on the projections presented in Table 1, the population for the study area and vicinity are expected to increase. Likewise employment is expected to continue with a 104 percent increase by 2035 (refer to

Table 2). However, a large percentage of the current and future residents of the study area would commute by automobile to work outside of the study area. The Build Alternative would support the expansion of both employment within the study area and facilitate travel to and from employment centers elsewhere.

No-Build Alternative

Development in the area would continue under the No-Build Alternative. Under the No-Build Alternative, BMB would provide local access but without connection to the SR 51, the economic potential within the study area could be reduced. Traffic congestion on existing and future surface streets surrounding the study area would increase, which could impede accessibility to local services for residents and employees, and development could grow at a slower rate.

Mitigation Measures

- The acquisition of right-of-way would be performed in accordance with 42 U.S.C. Chapter 61 and the Real Property Acquisition Policies Act of 1970 and A.R.S. 12-1111 et seq. (Special Actions and Proceedings Relating to Property).
- Access to businesses in the project vicinity would be maintained during construction.

Conclusion

Selection of the Build Alternative would not result in any business displacements. The Build Alternative would have a beneficial effect on the local economy both through short-term increases during construction and long-term through the promotion of development at planned locations along BMB. Selection of the No-Build Alternative may negatively impact the local economy due to lower attractiveness of the study area for planned commercial development. In addition, future traffic congestion of surface streets could further detract from development of the area.

D. Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) and NEPA require federal agencies to take into account the effects of their undertakings on historic properties and afford the State Historic Preservation Office (SHPO) and other interested parties opportunity to comment on such undertakings. To comply with these laws, an assessment of cultural resources was completed for this EA. Regulations for Protection of Historic Properties (36 CFR Part 800) implement Section 106 of the NHPA. These regulations define a process for federal agencies to follow as federal projects are planned and implemented.

Historic properties include prehistoric and historic districts, sites, buildings, structures, or objects included in or eligible for inclusion in the National Register of Historic Places (NRHP). Historic properties may be eligible for nomination to the NRHP if they possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet at least one of the following criteria:

- Criterion A – be associated with events that have made a significant contribution to the broad patterns of our history
- Criterion B – be associated with the lives of persons significant in our past
- Criterion C – embody the distinctive characteristics of a type, period, or method of construction; or represent the work of a master; or possess high artistic values; or represent a significant and distinguishable entity whose components may lack individual distinction
- Criterion D – have yielded, or may be likely to yield, information important in prehistory or history

To allow for flexibility in the design process, the cultural resources study area encompassed all possible alternative alignments and encompassed approximately 491 acres. The area of potential effects (APE) for the Build Alternative consists of the proposed ROW for BMB between the SR 51 and Cave Creek Road including the SR 51/SR 101L TI.

Existing Conditions

A cultural resources assessment was based on records searches and field investigations. Database searches were conducted in AZSITE, the NRHP, and ADOT's Historic Preservation Team portal on-line records. In addition, files at the Pueblo Grande Museum and the SHPO were inspected.

The entire APE has been surveyed. The following reports document the findings of surveys conducted within the APE:

- *Cultural Resources Report for the Proposed Black Mountain Boulevard, Phoenix, Maricopa County, Arizona* (Langan 2012)
- *Cultural Resources Survey of Six Parcels Near Loop 101 and SR 51, Phoenix, Maricopa County, Arizona* (Aguila 1999)
- "Archaeological Survey: Arizona State Trust Land in Sections 13 & 14 (T4N R 3E), Maricopa County, Arizona" (ASLD Application No. 53-107189) (Boloyan 2002)
- "Cultural Resource Pedestrian Visual Reconnaissance Survey and Records Review" (BRW 1988)
- *Cultural Resources Survey of a Ten Mile Long Segment of the Proposed Outer Loop Freeway Between 15th Avenue and Scottsdale Road, North-Central Maricopa County, Arizona* (Curtis and Stone 1988)
- *Cultural Resources of Various Easements for the Tatum Ridge Development near Jomax Road and Tatum Boulevard in Northeastern Phoenix, Maricopa County, Arizona* (Gunn 1993)
- "Phase I Archaeological/Geomorphological Testing of Additional 160 Acres of Desert Ridge Development" (Hudak 1989)
- *Cultural Resource Survey of the Arizona State Land Department Tatum East-West Planning Area, Phoenix, Arizona* (Kirvan et al. 2006)
- *Addendum Survey for New Right-of-Way and Easements along Sonoran Boulevard, Phoenix, Maricopa County, Arizona* (Langan and Rehar 2010)

- *A Cultural Resource Survey for the North Valley Transmission Line Project, Maricopa County, Arizona* (Luhnow et al. 2002)
- *Archaeological Survey for the Proposed Paradise Valley Desert Ridge High School, Phoenix, Maricopa County, Arizona* (Mitchell 1997)
- *Cultural Resources Survey Report for the Black Mountain Parkway—Rough Rider Road to Pinnacle peak Road, Phoenix, Maricopa County, Arizona* (Muñoz and Sorrell 2006)
- *A Cultural Resources Survey of the Desert Ridge Development, North Scottsdale, Maricopa County, Arizona* (Ruble 1998)
- *Cultural Resources Survey of a 50-Acre Parcel of Private Land Southwest of the Intersection of 40th Street and Rose Garden Lane in North Phoenix, Maricopa County, Arizona* (Shepard 1998)
- *Cultural Resources Survey for Nextel Communication Tower Project: Pasadena AZ 0300, Phoenix, Maricopa County, Arizona* (White and Rogge 2001)
- "A Cultural Resources Survey of Ca. 400 Acres of Private Land near Tatum Blvd. and Jomax Road in Northeastern Phoenix, Maricopa County, Arizona" (Wright 1992)

The abovementioned projects have identified two prehistoric and one historic archaeological site partially within the BMB APE (Table 11). Site eligibility is summarized below.

TABLE 11. CULTURAL RESOURCES IN THE APE.

Site Number	Position with Respect to the APE	Site Type	National Register Eligibility
AZ T:8:218(ASM)	Abuts	Possible prehistoric rock pile with prehistoric artifacts	Not eligible
AZ U:5:298(ASM)	Partially in	Historic artifact scatter	Not eligible
AZ T:8:53(ASU)	Partially in	Prehistoric artifact scatter	Requires further research

Site AZ T:8:53(ASU) consists of two discrete artifact scatters. One of these was destroyed during previous development; the other may retain intact subsurface archaeological deposits.

Environmental Consequences

Build Alternative

The Build Alternative would have no direct effect on known cultural resources that are eligible or potentially eligible for listing, or are already listed on the NRHP. The build alternative would involve construction within a portion of AZ T:8:53(ASU) that has already been destroyed by previous development. The remaining portion of the site would be avoided by approximately 250 feet. The recommended finding of "no adverse effect" was concurred with by ASLD on January 22, 2013, Phoenix on February 6, 2013, FCDMC on January 16, 2013, the Fort McDowell Yavapai Nation on January 22, 2013, the Hopi Tribe on January 22, 2013, Reclamation on January 22, 2013, the State Historic Preservation Office on January 16, 2013, the Veterans Administration on January 31, 2013, the White Mountain Apache Tribe on January 23, 2013, and the Yavapai-Prescott Indian Tribe on January 17, 2013 (Appendix D). Based on refinements that have been made to the preliminary design of the Build Alternative, a second round of consultation with interested parties was distributed on March 11, 2013, recommending the same finding of "no adverse effect." Concurrences received to-date include ASLD on April 2, 2013, FCDMC on April 1, 2013, the Fort McDowell Yavapai Nation on March 18, 2013, the Hopi Tribe on March 15, 2013, Reclamation on March 25, 2013, the State Historic Preservation Office on March 20, 2013, the Tonto Apache Tribe on March 14, 2013, the Veterans Administration on March 22, 2013, and the Yavapai-Prescott Indian Tribe on March 14, 2013 (Appendix D). More than 30 days has elapsed and no other concurrences have been received from the second round of Section 106 consultation. FHWA has determined that the Build Alternative, should it be carried forward, would proceed with a finding of "no adverse effect."

In order to comply with the Implementation Handbook for the future development in the Tatum Highlands East-West (Azara) planning area, all activity for the construction of BMB would require archaeological monitoring.

No-Build Alternative

As with the Build Alternative, the No-Build Alternative would have no direct effect on known cultural resources that are eligible or potentially eligible for listing, or are already listed on the NRHP. In order to comply with the Implementation Handbook for the future development in the Tatum Highlands East-West (Azara) planning area, all activity for the construction of BMB would require archaeological monitoring.

Mitigation Measures

- If archaeological, historical, human remains or paleontological features are encountered or discovered during any activity related to the construction of the project, the contractor would stop work immediately at that location and would take all reasonable steps to secure the preservation of those features and notify the City of Phoenix Archaeology Office (602.495.0901).
- Construction of Black Mountain Boulevard within the Tatum Highlands East-West (Azara) planning area would be monitored for archaeological resources during construction. Archaeologist(s) performing this work would be required to hold an Arizona State Museum blanket permit, or be under the supervision or employment of an institution, organization, or business holding a blanket permit.

Conclusion

The entire APE has been surveyed for cultural resources. The Build Alternative or No-Build Alternative would not adversely impact known historic properties.

E. Section 4(f) Resources

Section 4(f) of the US Department of Transportation Act of 1966 (as amended) states that the Secretary of Transportation "may approve a transportation program or project … requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local

significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if 1) there is no prudent and feasible alternative to using that land; and 2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use" (49 U.S.C. Section 303).

A "use" of a Section 4(f) resource, as defined in Title 23 CFR §774.17, occurs when:

- Land is permanently incorporated into a transportation facility.
- There is a temporary occupancy of land that is adverse in terms of the statute's preservation purpose.
- There is a constructive use of a Section 4(f) property.

A constructive use of a Section 4(f) resource occurs when the transportation project does not incorporate land from the Section 4(f) resource, but the project's proximity impacts "are so severe that the protected activities, features, or attributes that qualify a resource for protection under section 4(f) are substantially impaired" [23 CFR §774.15(a)]. For example, a constructive use can occur when:

- The projected noise level attributable to a project substantially interferes with the use and enjoyment of a noise-sensitive facility of a resource protected by Section 4(f). FHWA has defined this noise level as 67 decibels or above.
- The proximity of a proposed project substantially impairs aesthetic features or attributes of a resource protected by Section 4(f), where such features or attributes are considered important contributing elements to the value of the resource. Examples of such an adverse effect would be a transportation facility that obstructs or eliminates the primary views of an architecturally significant historical building, or a transportation facility that substantially detracts from the setting of a park or historic site that derives its value, in substantial part, from its setting.
- A proposed project results in a restriction on access that substantially diminishes the utility of a significant publicly owned park, recreation area, or historic site.

Furthermore, an impact to a Section 4(f) area may be determined to be *de minimis* if the transportation use of the Section 4(f) area, including incorporation of any measure(s) to minimize harm (such as any avoidance, minimization, mitigation, or enhancement measures), does not adversely affect the activities, features, or attributes that qualify the resource for protection under Section 4(f).

The Section 4(f) Resources were analyzed in detail in a Section 4(f) Resources Technical Memorandum. This document is available in Appendix E and the study website at www.blackmountainblvd.com.

Existing Conditions

The following Section 4(f)-protected resources were identified in the study area: the Reach 11 Recreation Area that includes existing trails, the Cave Buttes Recreation Area, and portions of the planned trail system located outside of the recreation areas but identified in the *General Plan* (refer to Figure 19).

In 1986, Phoenix and Reclamation entered into a Recreation Land Use Agreement (RLUA) for approximately 1,500 acres of land now known as the Reach 11 Recreation Area. The RLUA provided the parameters to allow the Phoenix Parks and Recreation Department to construct, operate, and maintain recreational facilities within Reach 11. Reclamation still retains the underlying ownership and rights to Reach 11. Although its primary purposes are flood detention and protection, FHWA, ADOT, Phoenix, and Reclamation have previously determined that Reach 11 is a significant resource for recreation.

In January 2003, a Record of Decision was signed by Reclamation approving the EIS completed for the Reach 11 Recreation Area Master Plan (Reclamation 2002). The EIS and master plan provided analysis of the various recreational needs and an assessment of how these needs would coincide with the underlying purpose of Reach 11 to capture floodwaters. The EIS described the various planned uses within Reach 11 Recreation Area by splitting it into zones—Zones 1–6 (Figure 21). Each zone has

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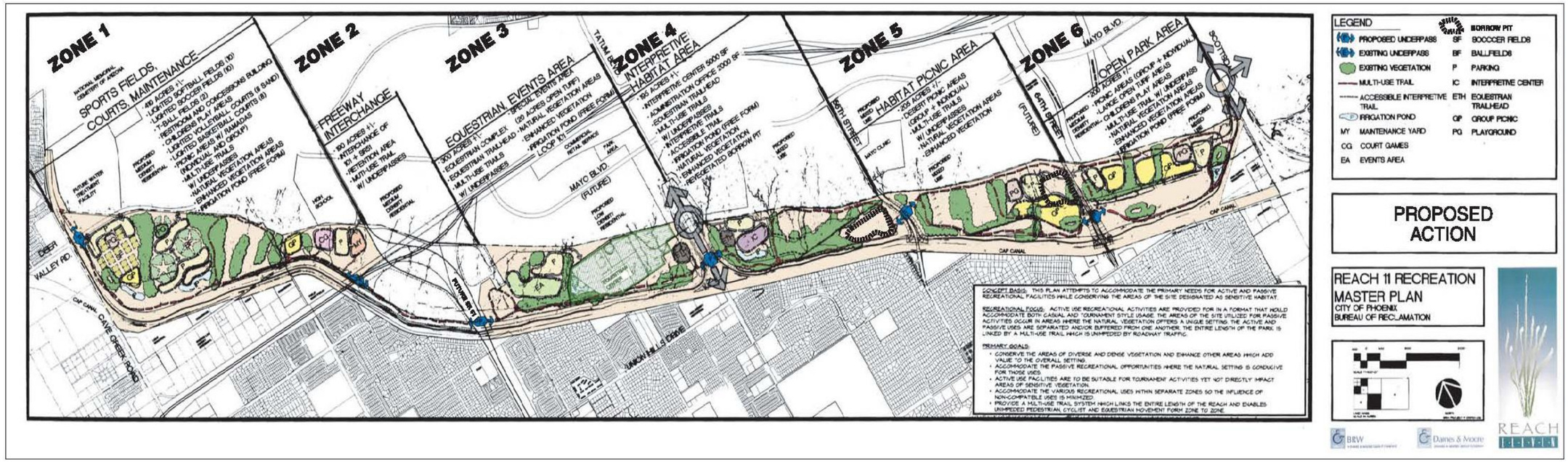

FIGURE 21. REACH 11 RECREATION AREA DEVELOPMENT ZONES.

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specific uses identified, for example, recreational uses, sports facilities, maintenance yards, and equestrian activities. Zone 2 is reserved for transportation needs, which includes the existing SR 51/SR 101L TI. This zone also incorporates plans for the ramp connections from the SR 51 to BMB. Many elements of the Recreation Area Master Plan outside of the current study area have been constructed including softball/baseball fields, soccer fields, and an equestrian center. There are two formally designated east-west trails within Reach 11 (refer to Figure 19). Continuity of the northern of these two trails (W211N) has already been impacted by the original construction of the SR 51-SR 101L TI and it no longer connects Zones 1 and 3. The southern of these two trails (W211S) maintains a connection between Zones 1 and 3 as originally intended. Although they are not identified in the General Plan or the Recreation Area Master Plan, other trails have been established in Reach 11 (Figure 22).

The Cave Buttes Recreation Area is identified in the recreation element of the Phoenix *General Plan* as a future district park. The Flood Control District of Maricopa owns and retains the underlying rights for this property. Although the City of Phoenix has rights to develop recreation facilities on the property in the future, its primary function is to control stormwater and prevent flooding of downstream properties. The majority of this property lies outside of the study area to the west of Cave Creek Road (refer to Figure 19). The only portion of this property that is currently used for recreation is in the aforementioned portions west of Cave Creek Road and outside of the study limits; an area is used for the operation of remote-control model airplanes. During a field inspection of the Cave Buttes Recreation Area within the BMB study area, which coincides with the Cave Buttes Dike #2 between Cave Creek Road and 40th Street, it was noted that the area is fenced and signed “No Trespassing/ Property of Flood Control District of Maricopa County.” Therefore, because the portion of the Cave Buttes Recreation Area within the study area is not currently accessible to the public for recreation purposes, it is not afforded protection under Section 4(f).

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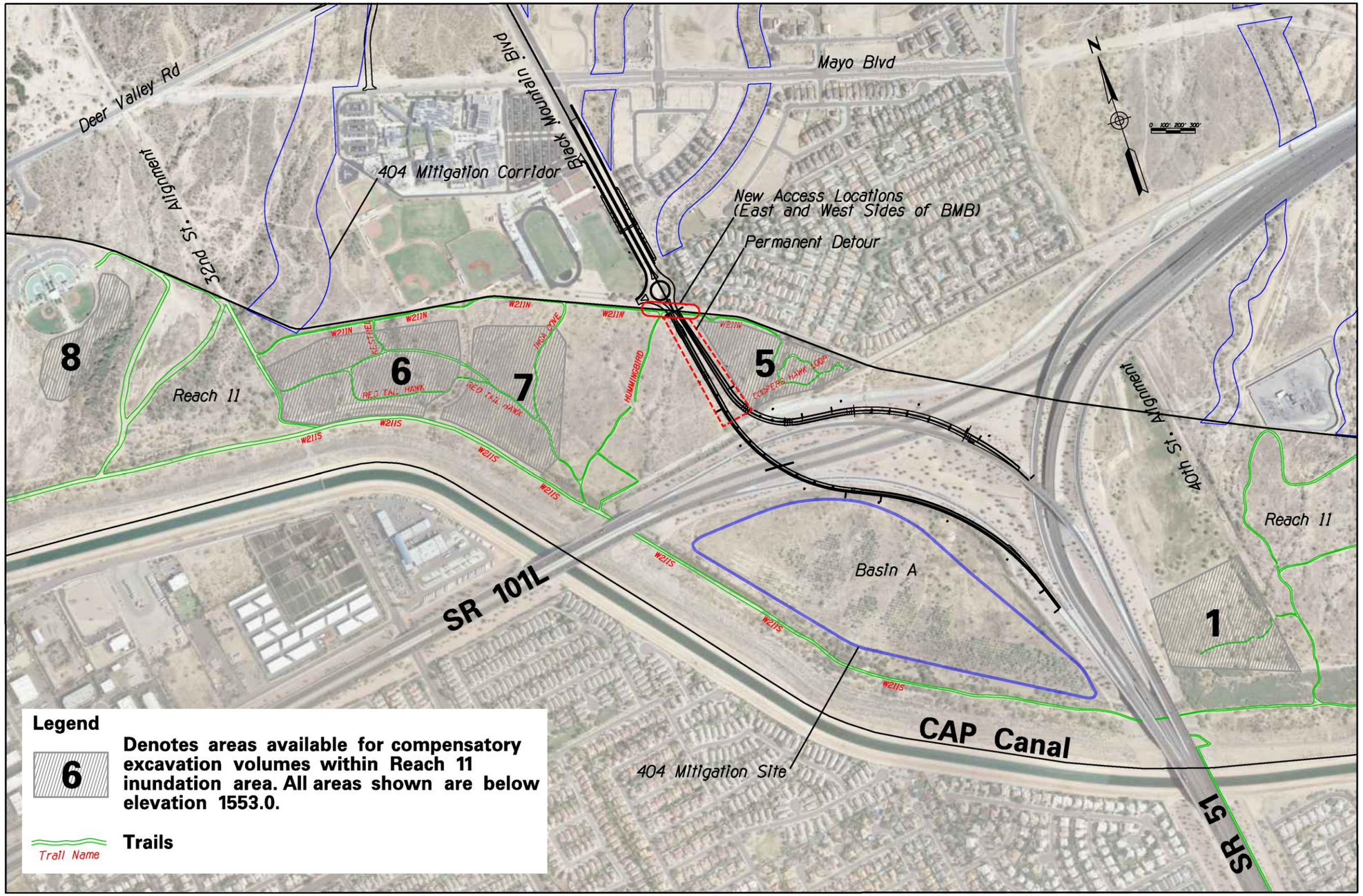

FIGURE 22. DETAILED MAPPING OF TRAILS WITHIN THE REACH 11 RECREATION AREA.

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Three planned trails within the BMB study area are identified in the *General Plan* (refer to Figure 19). Two east-west trails are planned; one along the future alignment of Happy Valley Road; the other would cross the 40th Street alignment to access the Cave Buttes Dike #2 from the southwest corner of the Tatum Highlands neighborhood. The planned trail along the dike would connect to the Cave Buttes Recreation Area; however, as stated earlier, the dike is restricted from public access and, therefore, not protected by Section 4(f) at this time. A new trail is also planned along a north-south axis and would intersect the east portion of the study area in the vicinity of Deer Valley Road.

The athletic fields at PHS are not open to the public after normal school hours, on weekends, or during the summer and exist for the sole purpose of formal physical education for the students and organized extracurricular sport activities. PHS has a trespass policy in accordance with these restrictions on their athletic fields. Therefore, no portion of PHS is protected under Section 4(f). There are no existing public parks or wildlife, waterfowl refuges, or significant historic sites within the study area.

Environmental Consequences

Build Alternative

The portions of the Reach 11 Recreation Area that would be impacted by the Build Alternative ramps are within Zone 2, the area that was set aside for transportation use as specified in the *Reach 11 Recreation Area Master Plan* and EIS. Therefore, the construction of ramps for this alternative would not result in a direct use of the portions of Reach 11 that are currently occupied with recreational facilities or that are for planned recreational facilities. Based on the original design concepts for this alternative, the Section 4(f) Resources Technical Memorandum (Appendix E) identified impacts outside of Zone 2 for the construction of ramps. However, the most recent design for the Build Alternative would confine ramps entirely to Zone 2 and the updated analysis in this EA supersedes that of the Section 4(f) Resources Technical Memorandum.

Although the construction of ramps would introduce more traffic into Zone 2 of the Reach 11 Recreation Area, constructive uses would not occur. The traffic noise from existing SR 101L travel lanes and ramps of the SR 51-SR 101L TI is already present, and according to traffic noise modeling, noise levels from new BMB ramps would not worsen impacts. Furthermore, the changes would be consistent with the existing aesthetic qualities of the TI and access to Reach 11 would be improved under the Build Alternative.

During construction, Trail W211N would be rerouted and spanned by new ramp connections between SR 51 and BMB and would be closed for limited periods of time due to safety reasons. Because this trail terminates in a dead-end (Coopers Hawk Loop; refer to Figure 22) a short distance from the construction limits, this temporary closure would effectively reduce the trail length but would not result in substantial loss of its use outside of the construction limits. Once construction is complete, the rerouting of this segment of W211N would represent a permanent change to its alignment but it would still provide a connection between the same locations within the Reach 11 Recreation Area as it does in the existing conditions. New points of ingress/egress to the Recreation Area are also proposed at the detour location and would connect the Recreation Area's trail system to non-motorized improvements associated with BMB that would connect to the larger City-wide trail system. Therefore, the rerouting and spanning of this trail would not adversely affect the activities, features, or attributes that qualify the resource for protection under Section 4(f) as the connectivity would be reestablished following construction. FHWA determined changes to Trail W211N would constitute a *de minimis* impact. The City of Phoenix Parks and Recreation Department concurred with this finding in writing on April 15, 2013 (Appendix H).

The excavation of shallow basins within the Reach 11 Recreation Area for the purposes of maintaining stormwater capacities would also cause temporary closures of trails coinciding with basin locations should the Build Alternative be selected (refer to Figure 22). There is a network of other trails including W211N (outside of the portions being rerouted), W211S, Hummingbird, and the 32nd Street alignment

that would be available for recreation users to detour around work sites. Once basins are complete, the trails would be reestablished in consultation with the City of Phoenix Parks staff and their function restored. The temporary closures of these trails and their subsequent reestablishment once excavations are complete would not involve a change in land ownership, and their original connectivity and recreation value would be reestablished following construction. FHWA made a determination that the temporary occupancy of trails that would be closed during the excavation of basins qualifies for the exception under Section 4(f). The City of Phoenix Parks and Recreation Department concurred with this finding in writing on April 15, 2013 (Appendix H). The primary means for recreation users to transit between the developed park facilities located east and west of the project area is Trail W211S, which would not be temporarily or permanently impacted by construction.

The implementation of the Build Alternative also would not directly or indirectly affect the portions of the Cave Buttes Recreation that are within the study area. BMB would be constructed on the 40th Street alignment and would be located east of the Cave Buttes Recreation Area property and Cave Buttes Dike #2 that are currently illegal for the public to access. The portion of the Cave Buttes Recreation Area that is used by remote-controlled model airplane enthusiasts is outside the study area and would not be affected by the Build Alternative.

The Build Alternative would be compatible with planned trails as the future road network was jointly planned and identified within the recreation element of the *General Plan*. Therefore, no direct uses of these trails would occur. Because these trails were conceived as urban trails, traffic noise, aesthetic changes to the adjacent landscapes due to future development, or changes in access to the trails that would result from the construction of an arterial street would not result in constructive uses.

No-Build Alternative

Under the No-Build Alternative, nothing would be constructed in Reach 11 and no direct or indirect impacts would occur to this property. The north-south arterial street that would be developed by the City of Phoenix in lieu of BMB between Deer Valley and Cave Creek Roads would be built on the 40th Street alignment and would avoid the Cave Buttes Recreation Area. The construction trails that are part of the *General Plan* would not be affected by the north-south arterial street because they have been jointly planned and would be developed together.

Mitigation Measures

- During final design, the City of Phoenix would design Black Mountain Boulevard to accommodate the future planned trails in the Phoenix *General Plan* and *Reach 11 Recreation Master Plan*.
- During final design, project designers would coordinate the design of any new points of access to the Reach 11 Recreation Area, rerouting of existing trails, and any potential construction-related temporary trail closures with the City of Phoenix Parks and Recreation Department.
- Trails in place at the time of construction would be kept open through the duration of construction except in instances where public safety could not be reasonably maintained.

Conclusion

The Build Alternative would not affect any recreation value or require changes to the implementation of the *Reach 11 Recreation Master Plan*. The rerouting of and spanning of Trail W211N would constitute *de minimis* impacts and the temporary closure and reestablishment of trails for basin excavations would represent temporary occupancy. The No-Build Alternative would avoid Reach 11 entirely. Similarly, both the Build and No-Build alternatives would avoid the Cave Buttes Recreation Area. The trails planned as part of the *General Plan* are jointly planned with the arterial streets and future development of the study area, and neither alternative would affect their construction or use. Only a *de minimis* level

impact, or use of a Section 4(f)-protected resource, would occur as the result of the Build Alternative. No use of a Section 4(f)-protected resource would occur with the implementation of the No-Build Alternative.

F. Air Quality

Background

The Federal Clean Air Act (CAA) of 1970 was the first comprehensive legislation aimed at reducing levels of air pollution throughout the country. The 1970 law required the US Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS), which set maximum allowable concentrations for seven criteria pollutants: carbon monoxide, nitrogen dioxide, ozone, particulate matter and fine particulate matter, sulfur dioxide, and lead (Table 12).

EPA is required to periodically review the NAAQS and modify them, as necessary. EPA recently modified the NAAQS for ozone (O_3) based on new studies that showed a lower level was needed to protect public health. EPA also regulates air toxics. Most air toxics originate from human-made sources, including vehicles, airplanes, dry-cleaning equipment, factories, and refineries.

Mobile Source Air Toxics

Mobile source air toxics (MSAT) are a subset of the 188 air toxics defined by the CAA. MSAT consist of 21 compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline. Of the 21 MSAT, a subset of seven compounds has been designated by the EPA as the priority MSAT. These are

TABLE 12. NATIONAL AMBIENT AIR QUALITY STANDARDS.

Pollutant	Averaging Time	Primary Standard	Secondary Standard
Carbon monoxide (CO)	1-hour	35 ppm[a]	NS[b]
	8-hour	9 ppm	NS
Nitrogen dioxide (NO_2)	1-hour	0.1 ppm	NS
	Annual	0.053 ppm	0.053 ppm
Ozone (O_3)	8-hour (1997 standard)	0.08 ppm[c]	0.08 ppm
	8-hour (2008 standard)	0.075 ppm[c]	0.075 ppm
Particulate matter (PM_{10})	24-hour	150 $\mu g/m^3$ [d]	150 $\mu g/m^3$
Fine particulate matter ($PM_{2.5}$)	24-hour	35 $\mu g/m^3$	35 $\mu g/m^3$
	Annual	15 $\mu g/m^3$	15 $\mu g/m^3$
Sulfur dioxide (SO_2)	3-hour	NS	0.5 ppm
	24-hour	0.14 ppm	NS
	Annual	0.03 ppm	NS
Lead	Rolling 3-month average (2008 standard)	0.15 $\mu g/m^3$	0.15 $\mu g/m^3$
	Quarterly	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$

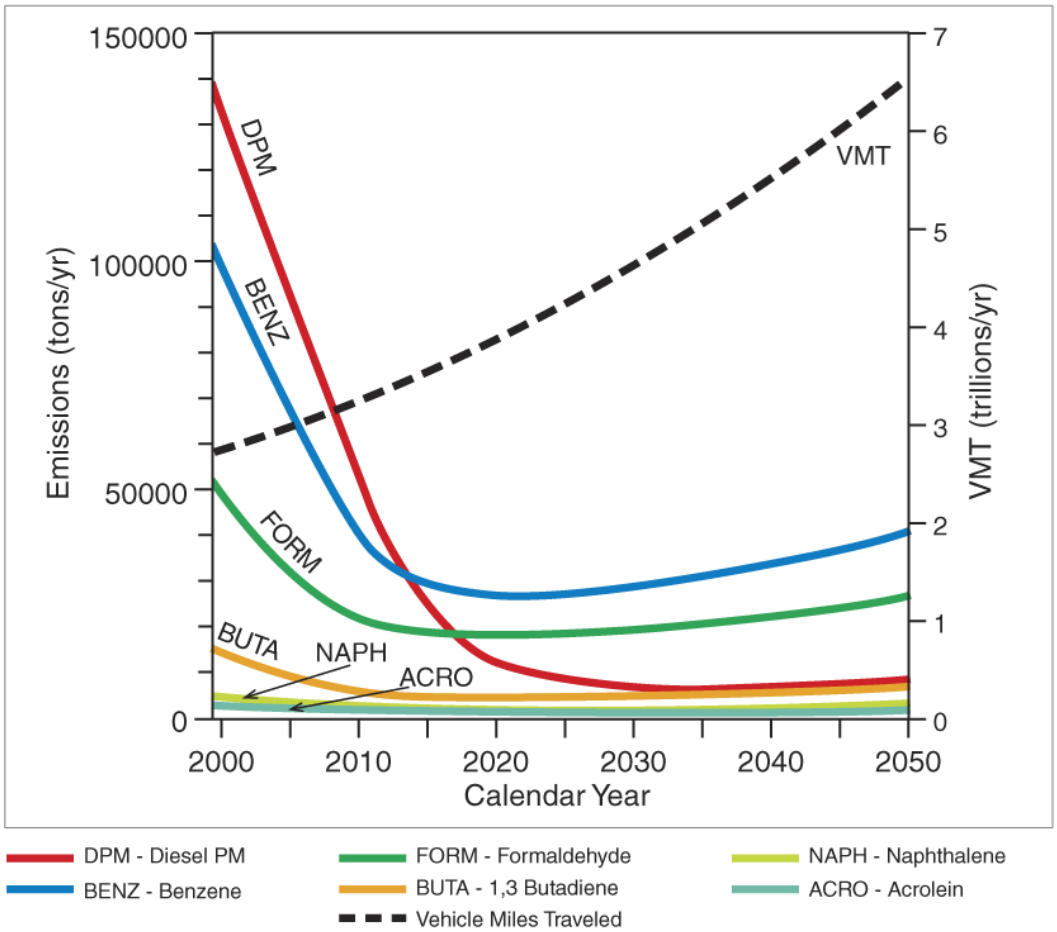
[a] parts per million
[b] no standard
[c] Based on a 3-year average of the 4th highest concentration
[d] micrograms per cubic meter
Source: 40 CFR Part 50

acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel particulate emissions), formaldehyde, naphthalene, and polycyclic organic matter (POM).

The EPA is the federal agency that administers the CAA and has certain responsibilities regarding the health effects of MSAT. EPA has examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline program, its national low emission vehicle standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control

requirements. According to an FHWA analysis using EPA's MOBILE 6.2 model, even if vehicle activity (vehicle miles traveled, [VMT]) increases by 145 percentage as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050 (Figure 23).

NATIONAL MSAT EMISSION TRENDS 1999 - 2050 FOR VEHICLES OPERATING ON ROADWAYS USING EPA's MOBILE6.2 MODEL



Note:
(1) Annual emissions of polycyclic organic matter are projected to be 561 tons/yr for 1999, decreasing to 373 tons/yr for 2050.
(2) Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors

Source: FHWA, 2010.

FIGURE 23. NATIONAL MSAT EMISSION TRENDS 1999 – 2050 FOR VEHICLES OPERATING ON ROADWAYS USING EPA'S MOBILE 6.2 MODEL.

In 2007, EPA issued a final rule to reduce hazardous air pollutants from mobile sources. The final standards will lower emissions of benzene and other air toxics in three ways: 1) by lowering the benzene

content in gasoline, 2) by reducing exhaust emissions from passenger vehicles operated at cold temperatures, and 3) by reducing emissions that evaporate from, and permeate through, portable fuel containers. As a result of this rule, new passenger vehicles would emit 45 percent less benzene, gas cans would emit 78 percent less benzene, and gasoline would have 38 percent less benzene overall. In addition, the hydrocarbon reductions from the vehicle and gas can standards would reduce volatile organic compound emissions (which are precursors to ozone and can be precursors to $PM_{2.5}$) by over 1 million tons in 2030.

Particulate Matter

Particulate matter refers to solid or liquid particles suspended in the air that may be composed of acids, organic chemicals, metals, or soil and dust particles. Particle sizes range from those large enough to be seen as smoke or haze to those so small that they act as a gas and are visible only through an electron microscope. Those particles with diameters less than 2.5 microns are denoted as $PM_{2.5}$, and sources include fuel combustion, power plants, and diesel vehicles. Those particles with diameters of 10 microns or less are denoted as PM_{10}, and sources include fugitive dust from unstable or disturbed dirt surfaces, vehicle travel on unpaved roads, crushing and grinding operations, and open burning. Fugitive dust sources in Maricopa County are the largest contributors to nonattainment of the PM_{10} standard. Maricopa County is in attainment for $PM_{2.5}$.

Statutory Requirements for PM_{10} Hot-Spot Analyses

An air quality hot-spot analysis is an estimation of the likely future localized pollutant concentrations and a comparison of those concentrations to the relevant air quality standards. The focus is usually the immediate area around a proposed project, as opposed to the regional focus of an emissions inventory for an entire nonattainment area. Hot-spot analyses may be either quantitative, in which future concentrations are calculated for specific locations within the study area, or qualitative, in which the

proposed project and study area are compared with similar existing facilities, existing monitoring data, and other readily available information.

EPA has not yet released modeling guidance for performing quantitative $PM_{2.5}$ and PM_{10} hot-spot analyses at the project level for transportation projects, and such analyses are not currently required under 40 CFR §93.123(b)(4). Transportation projects within nonattainment or maintenance areas for particulate matter that are not exempt require a qualitative analysis that "must document that no new local PM_{10} violations will be created and the severity or number of existing violations will not be increased as a result of the project" (US Department of Transportation [USDOT] 2006b).

In 2006, EPA and FHWA issued a joint, updated guidance document on performing qualitative hot-spot analyses in $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas. Projects of "air quality concern," as defined by 40 CFR §93.123(b)(1), require a hot-spot analysis. The methodology may involve a comparison of the study area with an area possessing similar characteristics, a review of findings from air quality studies that may have been performed, or other qualitative approaches.

Existing Conditions

The CAA amendments of 1990 authorized the EPA to designate those areas that have not met the NAAQS as nonattainment and to classify them according to their degree of severity. States that fail to attain the NAAQS for any of the criteria pollutants are required to submit state implementation plans (SIP) that outline those actions that would be taken to attain compliance.

The study area lies within nonattainment areas for O_3 and PM_{10} and a maintenance area for CO. A maintenance area is a previous nonattainment area that has met the NAAQS and continues to show attainment. The nonattainment area for eight-hour O_3 is a large area of Maricopa County and a small portion of Pinal County. The nonattainment area for PM_{10} is an approximate 48-by-60-mile rectangular section of eastern Maricopa County plus a 6-by-6-mile section including the City of Apache Junction in

Pinal County. The maintenance area for CO includes approximately 2,000 square miles within central Maricopa County and most of the municipalities adjacent to and including Phoenix.

The Arizona Department of Environmental Quality (ADEQ) and Maricopa County Air Quality Department (MCAQD) maintain a network of air quality monitoring sites throughout the state of Arizona and Maricopa County respectively. Monitoring sites are not necessarily identical because pollutants monitored and sampling duration at the sites may vary depending on the site objectives. Some sites are seasonal and operate only during those months of the year when a given pollutant is prevalent.

Concentrations of those pollutants monitored at the three selected locations during 2011 are summarized in (Table 13). During 2011, maximum concentrations obtained at the two locations that monitor O_3 often exceeded the new, lower 8-hour standard. Maximum concentrations of PM_{10} and $PM_{2.5}$ were above the NAAQS at one monitoring site. The location that exceeded the 24-hour standard for PM_{10} and $PM_{2.5}$ is situated in an old established neighborhood of North Phoenix. The maximum 8-hour CO and 24-hour lead concentrations were within the NAAQS. The remaining criteria pollutants NO_2 and SO_2 were not monitored in the area.

TABLE 13. AMBIENT CONCENTRATION SUMMARY.

Monitoring Site	Pollutant	Averaging Time	Maximum Concentration	Number of Exceedances
Deer Valley (approx. 6 miles to study area)	Lead	24-hour	0.07 $\mu g/m^3$	0
Pinnacle Peak (approx. 8 miles to study area)	O_3	8-hour	0.088 ppm	4
North Phoenix (approx. 8 miles to study area)	CO	8-hour	1.6 ppm	0
	O_3	8-hour	0.090 ppm	8
	PM_{10}	24-hour	186 $\mu g/m^3$	2[a]
	$PM_{2.5}$	24-hour	46.9 $\mu g/m^3$	1

[a] Exceptional event

Source: MCAQD 2011

Environmental Consequences

Analysis of potential air quality impacts resulting from the proposed roadway involved an evaluation of CO, MSAT, and particulate matter. CO was analyzed because it is required due to the maintenance status of the area. An analysis of MSAT and particulate matter was conducted as required by FHWA.

Carbon Monoxide

A micro-scale analysis of the roadways was performed using the model CAL3QHC Version 2. Ambient concentrations of CO were estimated for the existing traffic conditions and roadway configurations during 2012 (existing), for the estimated traffic conditions and roadway configurations during 2015 and 2035 for both the No Build and Build alternatives.

The components of the micro-scale analysis included the calculation of vehicle emissions for various vehicle speeds and years, identification of the roadway alignments, determination of vehicle speeds and volumes, establishment of roadway segments (links) with common characteristics (e.g., width, vehicle speed and volume, configuration, etc.), determination of receptor locations, determination of meteorological conditions, calculations, and review of the modeling results. To provide a conservative estimate of resulting concentrations, the worst-case inputs were used for the model.

The highest CO concentration occurs at the BMB/Deer Valley Road intersection. The maximum 1-hour and 8-hour CO concentrations for these five scenarios were projected and are listed in Table 14. These projected concentrations of CO for the Build Alternative are not expected to cause or contribute to an exceedance of the NAAQS. As previously discussed, the NAAQS are established to protect the public health and welfare from adverse effects of air pollution.

TABLE 14. PROJECTED MAXIMUM CARBON MONOXIDE CONCENTRATIONS.

Scenarios	1-Hour Concentration	8-Hour Concentration	Primary Standard
Existing Roadway Network (2012)	3.0 ppm to 3.7 ppm	2.1 ppm to 2.6 ppm	35 ppm (1-hour) 9 ppm (8-hour)
Future No-Build Alternative (2015)	3.0 ppm to 3.6 ppm	2.1 ppm to 2.5 ppm	35 ppm (1-hour) 9 ppm (8-hour)
Future Build Alternative (2015)	3.0 ppm to 3.7 ppm	2.1 ppm to 2.6 ppm	35 ppm (1-hour) 9 ppm (8-hour)
Future No-Build Alternative (2035)	3.4 ppm to 4.5 ppm	2.4 ppm to 3.2 ppm	35 ppm (1-hour) 9 ppm (8-hour)
Future Build Alternative (2035)	3.4 ppm to 4.8 ppm	2.4 ppm to 3.4 ppm	35 ppm (1-hour) 9 ppm (8-hour)

Mobile Source Air Toxics

FHWA guidance requires a quantitative analysis (Level 3) for MSAT on large projects with expected traffic volumes greater than 140,000 to 150,000 ADT. Although the ADT on BMB is not expected to reach these levels, the SR 101L segment within close proximity to the study area has greater than 140,000 vehicles per day and requires a Level 3 analysis to be preformed.

Results

The total estimated MSAT emissions are provided for each of the five scenarios. Results of the analysis are present in Table 15.

Existing vs. Build Alternative

The daily VMT would increase 11 percent in the 2015 Build Alternative compared to the Existing Condition. The total MSAT emissions are 12.745 tons per year in the 2012 Existing Condition and are estimated to be 11.574 tons per year in the 2015 Build Alternative. This represents a predicted drop in MSAT emissions of 9.19 percent between 2012 and 2015. In the 2035 Build Alternative, the daily VMT would increase 54 percent compared to the Existing Condition. Emissions of two major MSAT

compounds, benzene and diesel particulates, are expected to decrease. The total MSAT emissions are 12.745 tons per year in the 2012 Existing Condition and are estimated to be 9.961 tons per year in the 2035 Build Alternative. Over this period, the total MSAT emissions are predicted to drop 21.84 percent.

TABLE 15. MSAT EMISSION INVENTORY IN TONS PER YEAR.

MSAT Compound	2012 Existing	No-Build	Difference from Existing	Build	Difference from Existing	Difference from No-Build
		Year 2015 (Year 2035)				
Acrolein	0.116	0.118 (0.134)	1.52% (15.65%)	0.117 (0.132)	1.01% (14.29%)	-0.50% (-1.18%)
Benzene	3.837	3.691 (3.754)	-3.83% (-2.18%)	3.666 (3.681)	-4.48% (-4.07%)	-0.67% (-1.93%)
1,3-butadiene	0.506	0.501 (0.537)	-0.94% (6.10%)	0.499 (0.527)	-1.49% (4.21%)	-0.55% (-1.79%)
Diesel Particulates	4.967	3.899 (1.709)	-21.51% (-65.59%)	3.883 (1.685)	-21.83% (-66.08%)	-0.40% (-1.42%)
Formaldehyde	2.627	2.681 (3.075)	2.05% (17.03%)	2.668 (3.036)	1.54% (15.55%)	-0.50% (-1.27%)
Naphthalene	0.338	0.365 (0.447)	7.84% (32.23%)	0.363 (0.441)	7.41% (30.41%)	-0.40% (-1.37%)
POM	0.353	0.380 (0.465)	7.84% (31.81%)	0.379 (0.458)	7.41% (30.00%)	-0.40% (-1.37%)
Total MSAT Emissions	**12.745**	**11.634 (10.121)**	**-8.72% (-20.59%)**	**11.574 (9.961)**	**-9.19% (-21.84%)**	**-0.52% (-1.58%)**
Total Daily VMT	**2,180,968**	**2,429,769 (3,422,627)**	**11.41% (56.93%)**	**2,427,751 (3,362,223)**	**11.32% (54.16%)**	**-0.08% (-1.76%)**

No-Build vs. Build Alternatives

The daily VMT would be similar in the 2015 Build Alternative compared to the 2015 No Build Alternative. As a result, the estimated emissions of MSAT compounds are expected to be similar for the 2015 Build Alternative as those estimated for the 2015 No Build Alternative. The total MSAT emissions are 11.634 tons per year in the 2015 No Build Alternative and are estimated to be 11.574 tons per year in

the 2015 Build Alternative. The total MSAT emissions are predicted to drop 0.52 percent. In the 2035 Build Alternative, the daily VMT would decrease 1.76 percent compared to the 2035 No Build Alternative because the Build Alternative would allow motorists to select shorter routes via the BMB ramps. Consequently, MSAT compound emissions would be expected to decrease by 1 to 2 percent. The total MSAT emissions are 10.121 tons per year in the 2035 No Build Alternative and are estimated to be 9.961 tons per year in the 2035 Build Alternative. The total MSAT emissions are predicted to be 1.58 percent less when comparing the 2035 Build to the No Build Alternatives.

Particulate Matter

PM_{10} Hot-Spot Analysis

EPA's latest guidance on PM_{10} hot-spot analyses requires localized assessment for studies such as BMB. The qualitative analysis of the potential impacts for the Build Alternative began with a review of future traffic conditions on the affected roadways (Table 16).

TABLE 16. WORST-CASE TRAFFIC SCENARIOS UNDER THE EXISTING AND FUTURE BUILD ALTERNATIVES.

Year/Configuration	Interchange or Roadway Segment	% Diesel	Average Daily Traffic
2012 Existing Condition	Black Mountain Blvd	1-2%	1,600 – 2,300
2015 Build Alternative	Black Mountain Blvd with ramp connections from SR 51	1-2%	3,100 – 20,000
2035 Build Alternative	Black Mountain Blvd with ramp connections from SR 51	1-3%	35,200 – 49,200

The transportation conformity rule requires that the analysis considers the year of expected peak emissions. Using the EPA-approved emission model MOBILE 6.2, emission factors for PM_{10} in grams per VMT were calculated for 2012, 2015, and 2035. The emission factor decreased by approximately 7

percent between 2012 and 2015 and by approximately 17 percent between 2012 and 2035; the reduction between 2015 and 2035 was approximately 11 percent.

The total emissions in each year would be dependent upon both the emission factor and the VMT. The emission factor may decrease in future years, but the total emissions during 2035 may increase over those of 2015 due to the increase in the average daily traffic (ADT) and corresponding VMT.

The PM_{10} conformity analysis that is prepared by MAG may also provide an indication of future emissions. The federal transportation conformity rule, 40 CFR Parts 51 and 93, specifies criteria and procedures for conformity determinations for transportation plans, programs, and projects. Section 93.122(d)(2) of the federal conformity rule requires that PM_{10} from construction-related fugitive dust be included in the regional PM_{10} emissions analysis, if it is identified as a contributor to the nonattainment problem in a PM_{10} plan. Because the construction-related dust was included in the MAG 2007 Five Percent Plan for PM_{10}, the PM_{10} estimates developed for the current conformity analysis includes regional re-entrained dust (small particles that are thrown from the road surface by contact with vehicle tires or are induced to become airborne by vortexes from passing vehicles) from travel on paved roads, vehicular exhaust, travel on unpaved roads, and road construction.

For the 2010 MAG Conformity Analysis, emissions of PM_{10} were estimated for 2010, 2015, 2025, and 2031. The applicable conformity test for PM_{10} is the emission budget test, using the 2010 emissions budget established in the MAG 2007 Five Percent Plan for PM_{10}. Results of the analysis indicated that the total vehicle-related emissions associated with the implementation of the Transportation Improvement Plan (TIP) and the RTP for the years of analysis are projected to be less than the 2010 emission budget and are therefore in conformity. Emissions of PM_{10} are projected to increase in each of the modeled years.

The RTP, which was adopted in 2003, is updated annually to reflect changing conditions and new information; the current approved RTP covers the period through Fiscal Year 2031. The TIP, which is usually prepared annually, is a 5-year regional guide for transportation projects; the current TIP is for 2011–2015.

Based on the projected ADT volumes and results of the PM_{10} conformity analysis, BMB between Mayo Boulevard and Deer Valley Road in the year 2035 was selected for a qualitative analysis of PM_{10} impacts. The analysis was a comparative approach that reviewed ambient concentrations of PM_{10} at various locations in the greater Phoenix metropolitan area. The analysis included vehicle-related emissions such as tailpipe exhaust, brake wear particles, tire wear particles, and re-entrained road dust, which is released into the air from passing vehicles. Emissions from construction activities were also included in the analysis. Of the 15 MCAQD PM_{10} monitoring sites in Maricopa County, seven were selected for review and discussion. These sites were selected to represent urban areas adjacent to freeways, urban areas removed from freeways, and rural areas. The selected sites, ambient concentrations of PM_{10} obtained during 2011, nearest roadway, traffic volumes and diesel percentages are presented in Table 17.

A review of the monitoring data suggests that those locations that generally have the highest ambient concentrations of PM_{10} are in industrial, mining, or agricultural areas. The Buckeye location, near MC 85 and SR 85, is situated in a rural area adjacent to agricultural operations. This location exceeded the 24-hour PM_{10} standard on nine occasions in 2011. This location experienced exceptional events, which typically consist of weather-related exceedances caused by wind-blown dust.

The Durango Complex location, near 27th Avenue and Durango Street, is situated in a mixture of land uses, including residential, industrial, open desert, dry riverbed, and landfill. The South Phoenix location, near Broadway Road and Central Avenue, also is situated in a mixture of land uses, including

TABLE 17. 2011 PM_{10} CONCENTRATIONS AND ROADWAY CHARACTERISTICS IN URBAN AND RURAL AREAS OF MARICOPA COUNTY.

Location	PM_{10} Concentrations ($\mu g/m^3$)[a]			Number of Exceedances	Nearest Roadway	Distance from Roadway	AADT[c]	Diesel Trucks (%)
	Maximum 24-hour	Second Maximum 24-hour	Annual Average[b]					
Urban Locations Adjacent to Freeways (less than or equal to 0.5 mile)								
Central Phoenix	308[d]	307[d]	39.5	8	I-10	0.25 mile	291,000	7–8
					SR 51	0.75 mile	168,000	7–8
					SR 202L	0.75 mile	116,000	7–8
Greenwood	388[d]	254[d]	42.2	7	I-10	200 feet	230,000	8–9
					I-17[e]	0.5 mile	122,000	7–8
West Chandler	669[d]	387[d]	39.8	11	SR 202L	0.5 mile	97,000	3
					SR 101L	0.5 mile	95,300	3
Urban Locations Removed from Freeways (greater than 0.5 mile)								
Durango Complex	436[d]	277[d]	48.0	8	I-17	0.75 mile	119,000	7–8
South Phoenix	420[d]	338[d]	47.7	9	I-17	1.5 miles	119,000	7–8
West 43rd Avenue	369[d]	292[d]	47.9	7	I-17	2.5 miles	119,000	7–8
Rural Locations								
Buckeye	385[d]	296[d]	43.7	9	n/a[f]	n/a	n/a	n/a

[a] micrograms per cubic meter
[b] Annual average standard was revoked in 2006 and is provided for information only.
[c] annual ADT
[d] exceptional event
[e] Interstate 17
[f] not applicable
Source: MCAQD 2011

residential, industrial, commercial, and vacant land. The West 43rd Avenue location, near 43rd Avenue and Broadway Road, is surrounded by sand-and-gravel operations, automobile and metal recycling operations, landfills, paved and unpaved haul roads, and cement casting facilities. The 24-hour PM_{10}

standard has been exceeded on 24 occasions at these three locations. Twenty-three of the recorded exceedances have been identified as exceptional events.

Locations adjacent to a freeway typically have ambient concentrations within the standards. The Central Phoenix location, near 19th and Roosevelt streets, has been in operation for over 40 years and provides data representative of a high-population, high-density area near three freeways—I-10, SR 51, and SR 202L. This location had eight exceedances for the 24-hours standard in 2011; all were identified as exceptional events.

The Greenwood location, near 27th Avenue and I-10, is situated within 200 feet of I-10 and a half mile from I-17. This location is surrounded by a mix of residential, commercial, and light industrial land uses. This location had seven exceedances of the 24-hour standard in 2011; all were identified as exceptional events.

The West Chandler location, near Ellis Street and Frye Road, is a half mile away from SR 101L and SR 202L. This location is situated primarily in a residential area with some agricultural and industrial land uses nearby. This location had 11 exceedances of the 24-hour standard in 2011; all were identified as exceptional events.

Results

Of the monitoring locations reviewed, the Greenwood site was compared with the BMB project because of their similar land uses and roadway characteristics. The BMB project vicinity is surrounded by land uses consisting of residential and vacant properties. The traffic volume and truck volume for I-10 and I-17 at the Greenwood site are similar to those on what is predicted for SR 101L and SR 51 in 2035 near the BMB study area. Although PM_{10} concentrations at the Greenwood site had seven exceedances of the 24-hour standard in 2011, all were identified as exceptional events. It is unlikely that the proposed BMB

project improvements would cause or contribute to an exceedance of the PM_{10} standards. This conclusion is based on the following reasons:

- Diesel exhaust is not a major contributor to ambient concentrations of PM_{10}.
- ADT volume and truck volume are predicted to be relatively low on the proposed BMB in the design year.
- Fugitive dust sources in Maricopa County are the largest contributors to ambient concentrations of PM_{10}. Fugitive dust emissions may be reduced as the area changes from undeveloped properties to a more urban and suburban area.
- The proposed BMB project would improve the roadway capacity and would reduce travel time and traffic congestion on nearby arterial streets in the area.
- The MOBILE 6.2 calculated emission factors for PM_{10} is 0.0334 gram/mile (g/mi) in 2012 and 0.0279 g/mi in 2035. The 2035 PM_{10} emission factor is projected to be approximately 83 percent of the 2012 value.

This conformity determination meets all of the applicable CAA Section 176(c) requirements for federally funded or approved transportation projects. Specifically, the requirements for PM hot-spot analysis are codified at 40 CFR §93.116 and §93.123. This conformity determination demonstrates compliance with the requirements of CAA Section 176(a)(1).

Impacts

Criteria Pollutants

The long-term impacts associated with the proposed improvements are not expected to cause or contribute to an exceedance of air quality standards. Results of the micro-scale modeling performed indicate that impacts to ambient 1-hour average concentrations of CO are predicted to generally be less than 1 ppm. Impacts to the remaining Criteria Pollutants are also expected to be low. Short-term impacts to ambient levels of CO may occur during construction due to the interruption of normal traffic flow. Efforts should be made to reduce queuing, especially during the peak hours of travel.

Short-term impacts to $PM_{2.5}/PM_{10}$ may also occur during the construction phase, but these may be reduced by watering or other dust-control measures to ensure compliance with MCAQD Rule 310 and other appropriate federal, state, and local rules or ordinances, including MAG Uniform Standard Specifications and Details. A qualitative analysis of the potential impacts to ambient levels of PM_{10} indicated that the net effect of the proposed actions would reduce impacts to the area.

The federal conformity rule (40 CFR §93.113) requires that the TIP and RTP must provide for the implementation of transportation control measures that reduce emissions or concentrations of air pollutants from transportation sources. Such measures include an assortment of actions such as improved public transit, vehicle inspection programs, and flexible work schedules. MAG has a list of 55 suggested measures to reduce PM. Measures such as retrofitting on-road diesel engines with particulate filters, limiting speeds to 15 mph on high traffic dirt roads, and preventing the construction of new dirt roads are included.

Mobile Source Air Toxics

Future MSAT emissions would be lower than current emissions due to stricter controls on vehicle emissions. Future reductions of MSAT emissions would rely on the performance of both conventional and reformulated gasoline and on stricter hydrocarbon and particulate matter tailpipe standards. Controls of fuel and tailpipe standards have improved during the last several decades and further controls and reductions are anticipated. For example, federal hydrocarbon tailpipe standards for light-duty vehicles were 3.0 g/mi in 1972 and by 2004 the standard was reduced to 0.125g/mi. (FHWA 2005b). Likewise, benzene, which contributes the most to the MSAT total emissions, is expected to decrease by more than 40 percent by 2030, diesel particulate matter ($PM_{2.5}$) by nearly 90 percent and the total reduction of MSAT emissions by 2030 is anticipated to be about 56 percent (FHWA 2005c).

Construction Impacts

Construction activity may generate a temporary increase in MSAT emissions. Project-level assessments that render a decision to pursue construction emission mitigation would benefit from a number of technologies and operational practices that should help lower short-term MSAT. In addition, *SAFETEA-LU* has emphasized a host of diesel retrofit technologies in the law's Congestion Mitigation and Air Quality provisions—technologies that are designed to lessen a number of MSAT (*SAFETEA-LU*, Public Law 109-59, August 10, 2005).

Construction mitigation includes strategies that reduce engine activity or reduce emissions per unit of operating time. Operational agreements that reduce or redirect work or shift times to avoid community exposures can have positive benefits when sites are near vulnerable populations. For example, agreements that stress work activity outside normal hours of an adjacent school campus would be operations-oriented mitigation. Also on the construction emissions front, technological adjustments to equipment, such as off-road dump trucks and bulldozers, could be appropriate strategies. These technological fixes could include particulate matter traps, oxidation catalysts, and other devices that provide an after-treatment of exhaust emissions. The use of clean fuels, such as ultra-low sulfur diesel, also can be a very cost-beneficial strategy.

The EPA has listed a number of approved diesel retrofit technologies; many of these can be deployed as emissions mitigation measures for equipment used in construction. This listing can be found at www.epa.gov/otaq/retrofit/index.htm.

Greenhouse Gases

To date, no national standards have been established regarding greenhouse gases (GHG), nor has EPA established criteria or thresholds for greenhouse gas emissions. On April 2, 2007, the Supreme Court issued a decision in *Massachusetts et al. v. Environmental Protection Agency et al.* that the EPA does

have authority under the CAA to establish motor vehicle emissions standards for carbon dioxide (CO_2) emissions. The EPA is currently determining the implications to national policies and programs because of the Supreme Court decision. However, the Court's decision did not have any direct implications on requirements for developing transportation projects.

FHWA does not believe it is informative at this point to consider greenhouse gas emissions in an EA. The climate impacts of CO_2 emissions are global in nature. Analyzing how alternatives evaluated in an EA might vary in their relatively small contribution to a global problem would not better inform decisions. Further, due to the interactions between elements of the transportation system as a whole, emissions analyses would be less informative than ones conducted at regional, state, or national levels. Because of these concerns, FHWA concludes that we cannot usefully evaluate CO_2 emissions in the same way that we address other vehicle emissions.

FHWA is actively engaged in many other activities with the USDOT Center for Climate Change to develop strategies to reduce transportation's contribution to GHGs—particularly CO_2 emissions—and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue. FHWA will review and update its approach to climate change at both the project and policy level as more information emerges and as policies and legal requirements evolve (FHWA 2002).

Mitigation Measures

- During final design, the City of Phoenix would evaluate strategies that reduce engine activity or reduce emissions per unit of operating time to reduce construction impacts on air quality.
- Fugitive dust generated from construction activities would be controlled in accordance with Maricopa County Rule 310, special provisions, as well as other local rules and ordinances.

Conclusion

Since 1977 federal agencies and metropolitan planning organizations have been required by Section 176c of the CAA to ensure that all transportation projects conform to the approved air quality SIP. The CAA Amendments enacted in 1990 defined conformity to a SIP as meaning "conformity to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS" (*Federal Register*, November 30, 1993). The conformity determinations for Federal actions related to transportation projects must meet the requirements of 40 CFR Parts 51 and 93. The Build Alternative is included within the *Final Transportation Improvement Program Fiscal Years 2011 – 2015* approved on July 28, 2010 by MAG, which conforms to the SIP. In addition, the Build Alternative would not likely cause or contribute to the severity or number of violations of the NAAQS. Therefore, the Build Alternative would be in conformity.

G. Noise

Title 23 C.F.R. § 772 requires that a traffic noise analysis be conducted for any proposed federal-aid funded transportation project that would construct a road in a new location or substantially alter an existing road or highway. A traffic noise study was conducted for this project pursuant to the current ADOT Noise Abatement Policy (NAP) and in accordance with the FHWA noise abatement criteria (NAC) outlined in Procedures for Abatement of Highway Traffic Noise and Construction Noise (FHWA 1995).

Sound is a form of energy transmitted by pressure variations. Sound levels are expressed in decibels (dB). A normal human ear is able to hear sound with frequencies from 20 hertz (Hz) to 20,000 Hz. Because the human ear does not equally perceive all sound frequencies, sound levels in some frequency bands are adjusted or weighted to the frequency response of human hearing and the human perception of

loudness. The “A”-weighted sound in decibels, or dBA, most closely represents the range of human hearing.

Noise is often called unwanted sound. Each individual perceives noise-level changes differently. Generally, a 3 dBA noise change is the smallest change that can be detected by the human ear. Most people can readily perceive a noise change of 5 dBA. An increase of 10 dBA is normally perceived as a doubling of noise levels. Typical sound levels experienced by people range from approximately 30 dBA, such as found in a quiet living room at night, to approximately 80 dBA, such as experienced on a sidewalk adjacent to heavy traffic.

Highway traffic noise varies in frequency and its intensity fluctuates over time. Therefore, FHWA and ADOT assess highway traffic noise in terms of an equivalent steady-state noise level (L_{eq}). The hourly “A”-weighted L_{eq}, $L_{Aeq(h)}$, is generally used to analyze traffic noise levels and identify noise impacts because it reflects the way sound is perceived by the human ear.

The FHWA *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (23 C.F.R. § 772) state that a traffic noise impact occurs when the predicted traffic noise levels approach or exceed the FHWA NAC, as shown in Table 18, or when the predicted traffic noise levels substantially exceed the existing noise levels. This analysis predicted traffic noise impacts based on the FHWA NAC, which are referenced in the ADOT NAP, dated July 13, 2011.

ADOT defines “approach” as 3 dBA below the NAC for Categories A–E; there is no noise impact threshold for Categories F and G. In addition, ADOT defines “substantially exceed the existing noise levels” as an increase of 15 dBA or more above the existing noise levels. For noise-sensitive land uses under Category B, such as homes, churches, schools, and parks, the hourly L_{eq} maximum of 64 dBA and 15 dBA increase in the hourly L_{eq} were used to assess the noise impact for the proposed improvements to BMB.

TABLE 18. NOISE ABATEMENT CRITERIA.

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

[a] The hourly equivalent sound level, $L_{Aeq(h)}$, represents the A-weight sound level that contains the same amount of acoustic energy as the actual time-varying, A-weighted sound level over 1 hour.

[b] Includes undeveloped lands permitted for this activity category.

Source: 23 CFR Part 772

The ADOT NAP guidelines for traffic noise mitigation include:

- The mitigation will achieve a predicted noise level of 64 dBA or less.
- The maximum barrier height would be equal to or less than 20 feet.
- The benefited receiver would achieve a noise reduction of 5 dBA or greater.
- The cost of the barrier would be equal to or less than $49,000 per benefited receiver.

Existing Conditions

Landowners within the study area include federal lands managed by Reclamation and VA, State Trust lands managed by ASLD, FCDMC and private entities. Existing land uses within the study area mainly consist of residential and undeveloped. The Category B residential land use is mainly located between SR 101L and Pinnacle Peak Road and between Cave Buttes Dike #2 and Cave Creek Road (Tatum Highlands). Besides the single-family homes and townhouses, two Category C properties exist within the study area—Reach 11 Recreation Area and PHS. This study focuses on the Categories B and C land uses. The sensitive noise areas are shown in Figure 24.

Noise-level measurements were conducted within the study area to describe the existing noise level environment. Noise monitoring followed procedures specified in *Measurement of Highway-Related Noise* (FHWA 1996). Fourteen measurement locations were chosen to represent residential communities (Category B and C land uses) adjacent to the proposed BMB alignment. The purpose of noise level measurements is to describe the existing noise environment in the study area. The averaged measured noise levels ranged from 40 to 59 dBA. The ambient noise levels are relatively low due to low traffic volumes on existing BMB segments.

Environmental Consequences

The FHWA-approved highway noise computer model Traffic Noise Model (TNM) 2.5 was used for the noise level computations and mitigation analysis. Traffic noise levels are affected mainly by roadway geometry, traffic volumes, traffic speeds, traffic mix (percentage of cars, medium trucks, and heavy trucks), and shielding effects between noise sources and receivers. These variables are used in the TNM 2.5 model to predict future peak-hour noise levels at the sensitive receivers. The roadway geometry data used for the noise modeling effort was based on the electronic roadway geometry data and as-built plans. The FHWA criteria specify that the noisiest condition be modeled for the project design year. For

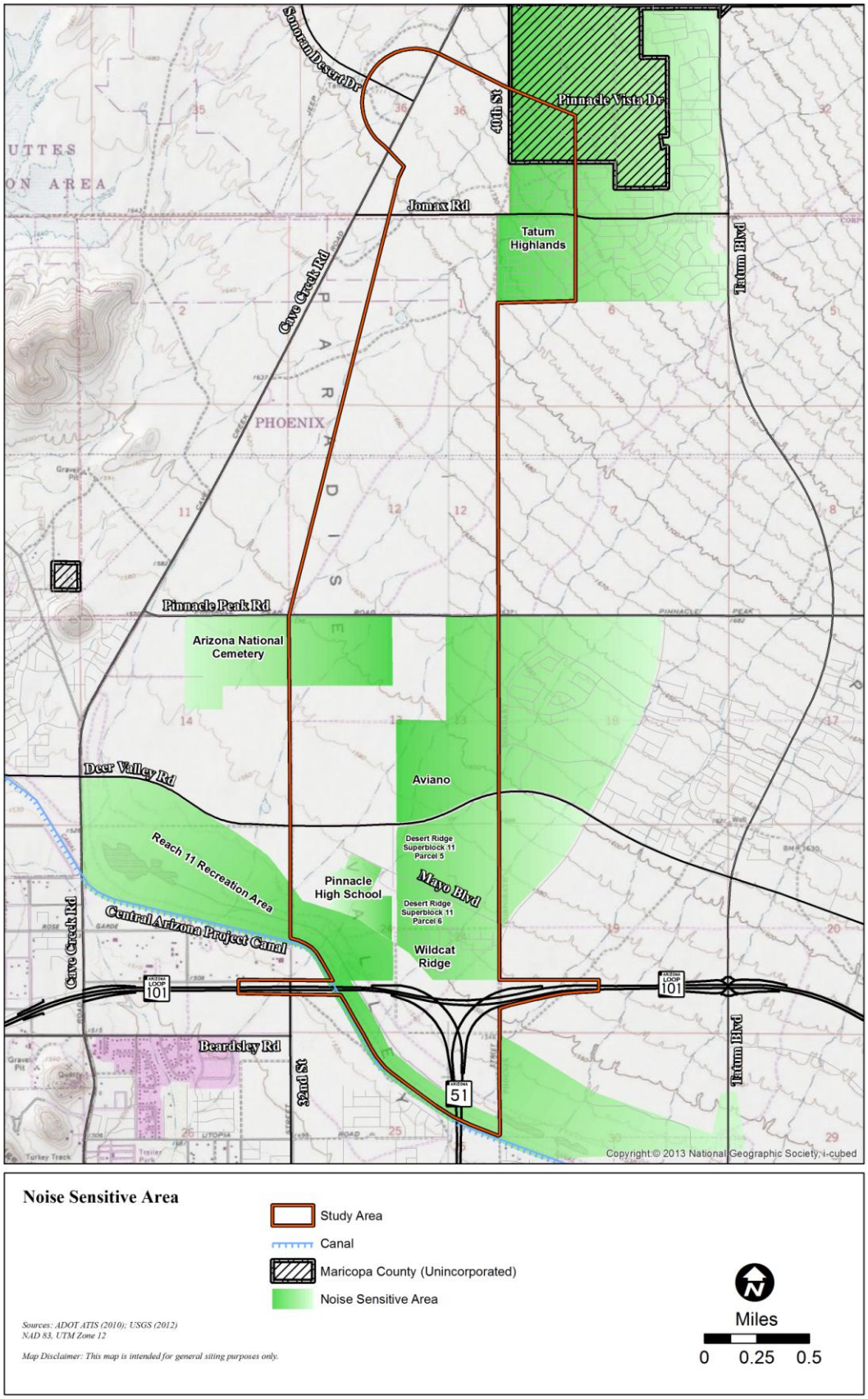


FIGURE 24. SENSITIVE NOISE AREAS.

this project, the noisiest condition is associated with the peak PM hour traffic in 2035. Speeds of 5 mph above the posted speed limit were used in the model.

In total, 157 noise receivers were modeled. Table 19 shows sections with sensitive noise receivers and the summary of the noise level results. Appendix F shows detailed noise receiver locations and site specific noise level results.

TABLE 19. SUMMARY OF NOISE LEVEL RESULTS.

Sections	Description	Range of Noise Levels, dBA (L_{Aeq1h})		
			TNM 2.5 Model Prediction	
		Existing Monitoring	2035 No-Build[a]	2035 Build[a]
1	SR 51/SR 101 TI – Deer Valley Road	44 to 59	43 to **70**	47 to **71**
2	Deer Valley Road – Happy Valley Road alignment	44 to 46	51 to **71**	53 to **73**
3	Happy Valley Road alignment – Cave Creek Road	40 to 42	52 to **72**	54 to **74**

[a]Bolded values indicate an exceedance of the ADOT NAP impact level.

Build Alternative

The noise analysis results are described in three sections below.

Section 1: SR 51/101 TI – Deer Valley Road

Section 1 has 67 modeled receivers representing common use areas in the La Verne condominiums, SFH in the Wildcat Ridge and Fireside neighborhoods, the future court games site in the Reach 11 Recreation Area, and common-use areas at PHS. The noise levels for 23 sensitive receivers are equal to or greater than the ADOT NAP threshold of 64 dBA in the 2035 Build Alternative, representing 30 impacted developed properties and 26 sensitive receptors including the PHS athletic field and tennis courts. As a result, the consideration of noise mitigation is warranted.

A noise barrier was evaluated to shield the Wildcat Ridge subdivision along the existing ADOT ROW boundary for SR 101L. As modeled, this barrier would provide noise attenuation for nine developed properties. Although this barrier would meet the cost-per-benefitted criterion, it is not recommended. The traffic noise source for these receptors is primarily from the SR 101L mainline lanes. Therefore, impacts would not result from the introduction of traffic on BMB ramps. Approximately 93 percent of the modeled noise energy would come from the already existing SR 101L lanes.

Noise barriers were also evaluated for the athletic field and tennis courts at PHS, and the Fireside subdivision. However, these noise barriers do not meet the ADOT NAP criteria and the barrier height would exceed the Phoenix ordinance regarding the wall height limits (Section 703 [Landscaping, Fences, and Walls]); therefore, they are not recommended. Traffic noise impacts at these locations would not be mitigated.

Section 2: Deer Valley Road – Happy Valley Road

Section 2 has 43 modeled receivers representing approximately 57 SFH, and non-sensitive locations including the Pinnacle West Equestrian Center and undeveloped State Trust land. Of the modeled receivers, noise levels for 11 sensitive receivers are equal to or greater than the ADOT NAP threshold of 64 dBA, representing 22 impacted developed properties. As a result, noise mitigation consideration is warranted for sensitive receivers.

The National Memorial Cemetery of Arizona property is located adjacent to the proposed BMB alignment south of Pinnacle Peak Road. The developed portion of this property is a Category C noise sensitive area. No noise mitigation would be considered for the portion of the National Memorial Cemetery of Arizona adjacent to the BMB alignment because it is undeveloped.

The Pinnacle West Equestrian Center is a commercial facility and not considered a noise-sensitive area. As a result, no noise mitigation was considered for this property.

Noise barriers were also evaluated for the Aviano neighborhood. However, the noise barriers evaluated would exceed the Phoenix ordinance regarding wall height limits (Section 703 [Landscaping, Fences, and Walls]); therefore, they are not recommended. Traffic noise impacts at this location would not be mitigated.

Section 3: Happy Valley Road – Cave Creek Road

Concerns for potential noise impacts for this section were identified from comments received at public meetings for the BMB study attended by residents of the Tatum Highlands neighborhood. Section 3 has 47 modeled receivers representing approximately 72 SFH and non-sensitive undeveloped ASLD land. The noise levels for 10 sensitive receivers are equal to or greater than ADOT NAP threshold of 64 dBA, representing 22 impacted developed properties. As a result, noise mitigation was considered.

Noise barriers were evaluated for the Tatum Highlands Subdivision. However, the cost-per-benefitted receiver is above the ADOT NAP criterion of $49,000 and the barrier height would exceed the Phoenix ordinance regarding wall height limits (Section 703 [Landscaping, Fences, and Walls]). As a result, no noise mitigation is recommended for the Tatum Highlands neighborhood and traffic noise impacts at this location would not be mitigated.

Construction Noise

Temporary noise impacts would be experienced during construction of the Build Alternative. Typically, construction noise levels continually change as the construction phases are completed and are usually limited to daylight hours when most human activity occurs. ADOT *Standard Specifications for Highway and Bridge Construction* (ADOT 2008) and/or Phoenix ordinances would be applied for regulating construction-related noise. All exhaust systems on construction equipment would be required to be in good working order and have properly designed engine enclosures and intake silencers. To minimize noise impacts during construction, stationary or idling equipment would be located as far away from

noise-sensitive receivers, such as residences, as possible. During final design, ADOT and Phoenix would review and update the noise analysis as needed.

No-Build Alternative

Future traffic noise from the No-Build Alternative would result in predicted noise levels above 64 dBA for some noise receivers in the study area. However, mitigation for impacted receivers would not be considered because Phoenix currently does not have ordinances requiring traffic noise mitigation to be provided along its arterial streets.

Mitigation Measures

To minimize noise impacts during construction activities, the following mitigation measures would apply to the contractor:

- Equipment would be maintained on a regular basis; new equipment would be subject to new product noise emission standards.
- Stationary equipment would be located as far away from sensitive receivers as possible.
- The public would be adequately notified of construction operations; methods such as construction alert publications would be provided to handle complaints in an expeditious manner.

Conclusion

This analysis evaluated impacts resulting from traffic noise levels during the noisiest conditions that would result from the construction of BMB should the Build Alternative be implemented. The noise analysis provides the existing monitored and future predicted noise levels and considers mitigation measures in accordance with the ADOT NAP. A noise barrier was evaluated to shield the Wildcat Ridge subdivision but is not recommended as part of the proposed undertaking because the traffic noise source for these receptors is primarily the SR 101L. Therefore, mitigation for impacts at the Wildcat Ridge

neighborhood would be evaluated by ADOT and addressed in a separate project.

A portion of this project would be located within Phoenix's jurisdiction outside of ADOT ROW, where Phoenix ordinances regarding wall height limits would apply. Because the Phoenix ordinance would prohibit construction of effective noise-reducing mitigation, none is recommended.

H. Utilities

Existing Conditions

Utilities within the study area are identified in the following Table 20.

TABLE 20. EXISTING UTILITIES AND FACILITY TYPE.

Utility Owner	Facility Type
ADOT	Light poles for SR 51/SR 101L TI Underground electrical lines Freeway Management System Drainage and irrigation facilities
Arizona Public Service Company (APS)	12 kilovolts (kV) and 230 kV/ 69 kV overhead transmission lines 12 kV underground and overhead distribution lines
APS/Salt River Project (SRP)	230 kV/500 kV transmission lines
CAWCD	Electrical and fiber optic lines
Century Link	Telephone and fiber optic lines
Phoenix	Underground water (12", 16", 18", & 42"), reclaimed water (36" & 42"), and sanitary sewer (8", 12", 15", 24", & 42") lines Storm sewer lines
COX Communications	Cable and fiber optic lines
El Paso Natural Gas	Underground natural gas line
Reclamation	CAP Canal
SRP/Western Area Power Administration (Western)	230 kV transmission lines
Southwest Gas	Underground 4" high-pressure natural gas line
VA	Water tank and well

Environmental Consequences

Build Alternative

Construction of the Build Alternative is anticipated to require the relocation of several utilities including underground electric and communication lines; buried telephone cables; and water, sewer, and fiber optic lines. The need to relocate utilities would be further examined during final design. During this investigation it would be determined who would perform the needed relocation and how any affected users would be contacted.

No-Build Alternative

Under the No-Build Alternative any required utility relocations would be completed by Phoenix or land developers.

Mitigation Measures

- During final design, the City of Phoenix would coordinate relocation of utilities with the affected utility companies.
- If service disruption would be required for utility relocation, the City of Phoenix would coordinate with the utility companies to ensure customers are notified 14 days prior to service disruption.

Conclusion

Selection of the Build or No-Build Alternative would require utility relocations. Under the Build Alternative, Phoenix and ADOT would further investigate utility involvement to verify the need for relocation and coordinate the accommodation of utilities with the proposed improvements.

I. Visual Resources

Existing Conditions

Foreground views in the southern portion of the study area are dominated by the built environment that includes the CAP Canal and associated dike, the bridges and ramps of the SR 51/SR 101L TI, and buildings such as those of the PHS campus and houses of the surrounding neighborhoods. Background views include desert expanses where development has not occurred, suburban landscapes of mostly residential buildings where development has occurred, and the surrounding mountains including the McDowell Mountains to the east, the Phoenix Mountains Preserve to the south, the Union Hills to the west, and Black Mountain to the north.

In the north portion of the study area, there is less existing development so foreground views are mostly of native desert landscape with some built features interspersed such as the SRP/Western 230 kV lines, the residential buildings associated with the Tatum Highlands Subdivision, and the Cave Buttes Dike #2. Similar to elsewhere in the study area, background views are of distant suburban development or open desert framed by the aforementioned mountains.

Environmental Consequences

Build Alternative

The entire study area is currently developed or has been committed to suburban development. As the undeveloped portions are converted to their planned uses, the character would transition from natural desert to that of a built environment. Implementation of the Build Alternative would match this transition and represent a compatible change to the future character of the study area.

Public input received from residents of the Tatum Highlands subdivision identified visual resources and preservation of viewsheds to be an important value of their community. However, because the

surrounding undeveloped land has been committed to suburban development through ASLD and the Phoenix planning processes, preserving the natural state of undeveloped land surrounding the Tatum Highlands subdivision would not occur. Current City zoning ordinances address the blocking of views from locations within the Tatum Highlands subdivision and other areas of future development within the study area by limiting residential and commercial structures to two stories (thirty feet). Implementation of the Build Alternative itself would not block views from the Tatum Highlands subdivision because the segments of the roadway near Tatum Highlands would follow the existing terrain and would not involve the construction of structures that would potentially block views.

Implementation of the Build Alternative would involve the construction of new ramps at the SR 51/SR 101L TI. Portions of these ramps would be constructed on earthen or bridge structure above the elevation of the natural ground surface. This would be a noticeable change to casual observers and would partially obscure some views of the surrounding landscape from vantage points in the southern portion of the study area. However, the ramps and their associated structures would be constructed at a similar scale and of similar design and materials to the existing features of the TI. Although noticeable, these changes would be compatible with the existing character of the TI. Furthermore, the height of the new ramps and associated structures would be similar to that of the existing ramps and would match their elevation profiles as much as possible to minimize blocking views.

Shallow basin would be excavated within the Reach 11 Recreation Area to offset the loss of stormwater capacity created by the construction of the BMB ramps. These areas would be temporarily denuded following construction, but seeding would be used to reestablish the native vegetation. The impacts to the aesthetic qualities of the landscape would be temporary as the reestablishment of vegetation would provide an appearance similar to the preconstruction conditions.

The Build Alternative would also include the construction of a pedestrian bridge spanning BMB near the intersection of BMB and Mayo Boulevard. This bridge would be typical for a school setting where pedestrian features are common and would not result in changes to the character of the area. Although it would partially block some views, the overall structure height would be comparable to buildings and rooftops at the adjacent high school.

No-Build Alternative

Implementation of the No-Build Alternative would also be compatible with the planned changes to the landscape and evolving character of the study area as land uses transition from undeveloped to suburban. As stated above, public input received from residents of the Tatum Highlands subdivision identified visual resources and preservation of viewsheds to be an important value of their community. As with the Build Alternative, implementation of the No-Build Alternative would not have any influence over preserving the natural state of undeveloped land, as the transition to suburban uses is a function of existing and approved planning done by ASLD and Phoenix. Current City zoning ordinances address the blocking of views from locations within the Tatum Highlands subdivision and other areas of future development within the study area by limiting residential and commercial structures to two stories (thirty feet). Implementation of the Build Alternative itself would not block views from the Tatum Highlands subdivision because the segments of the roadway near Tatum Highlands would follow the existing terrain and would not involve the construction of structures that would potentially block views.

The No-Build Alternative would not involve the construction of the ramps at the SR 51/ SR 101L TI or the pedestrian bridge at PHS. Therefore, this alternative would not construct built features which would impact views in the southern portions of the study area.

Mitigation Measures

No mitigation measures would be required.

Conclusion

Both Build and No-Build alternatives would be compatible with the planned changes to the landscape and evolving character of the study area as land uses transition from undeveloped to suburban. Although the Build Alternative would include items that would be slightly more intrusive on the landscape, the ramps at the TI and pedestrian bridge at PHS would be built to similar heights as the surrounding structures. The majority of views from the study area would, therefore, be maintained.

J. Drainage and Floodplain Considerations

Included in this analysis are applicable drainage patterns such as surface water and groundwater as well as floodplain issues. Surface water includes water present above the soil surface such as rivers, streams, lakes, pools, and stormwater runoff. Groundwater is water that flows below the soil surface that can be collected by underground wells or other facilities constructed for collecting water or for monitoring.

Executive Order 11988, *Floodplains*, requires impacts to floodplains be evaluated for all federal actions, and directs agencies to reduce impacts to floodplains, minimize flood risks on human safety and well-being, and restore and preserve floodplain values. Floodplains are delineated and managed by the Federal Emergency Management Administration (FEMA). A floodplain is generally level land subject to periodic flooding from an adjacent body of water.

A 100-year flood is a storm having a 1 percent chance of being exceeded in magnitude in any given year. The 100-year floodplain includes areas adjoining a water body that are inundated by water during a 100-year flood. The floodway is the area within the floodplain where the water is likely to be the deepest and fastest; this area should be kept free of obstructions to allow 100-year floodwaters to move downstream without increasing the water surface elevation more than 1 foot. FEMA Flood Insurance Rate Maps (FIRM) depict the delineated 100-year floodplain. The 100-year floodplain is divided into flood zones including:

- Zone A: areas subject to inundation by 100-year flood events that have been identified through qualitative methodologies; no base flood elevations have been determined
- Zone AE: areas subject to inundation by 100-year flood events that have been identified through quantitative methodologies; base flood elevations have been determined
- Zone AH: areas subject to inundation by 100-year shallow flood events where ponding occurs and flood depths are between 1 and 3 feet deep; base flood elevations have been determined
- Zone AO: areas subject to inundation by 100-year shallow flood events typified by sheet flow on sloping terrain with flood depths between 1 and 3 feet; base flood elevations have been determined

Existing Conditions

The study area is located within the East Salt River Valley sub-basin of the Phoenix Active Management Area within the Middle Gila watershed. This watershed receives little rainfall (approximately 13 inches per year) causing the majority (approximately 98 percent) of drainages in the watershed to be intermittent or ephemeral (ADEQ 2012). Within the study area, the drainage pattern is characterized by both poorly and well defined, shallow, ephemeral washes generally flowing from northeast to southwest through a gently sloped alluvial plain. All surface waters in the survey area flow into Reach 11 and the CAP low-flow channel. The CAP low-flow channel parallels the base of the CAP Canal dike and allows stormwater and floodwaters to drain from Reach 11. Groundwater was measured at an approximate depth of 497.9 feet at a well near the center of the study area on December 21, 2011, (Arizona Department of Water Resources [ADWR] 2012). No sole source aquifers are present within the study area.

The current FEMA FIRM panels were used to determine the 100-year floodplain locations. These panels included 04013C1220J (09/30/2005), 04013C1240H (09/30/2005), 04013C1210H (09/30/2005), and 04013C1230H (09/30/2005). The majority of the study area is classified as Zone X, which is defined as

an area of moderate flood hazard between a 100-year and 500-year flood event. However, portions of both the northern and southern limits are located within the 100-year floodplain (Figure 25). These areas include the southern edge of the study area within Reach 11 and a portion of the study area directly south of the Cave Buttes Dike #2 that are classified as Zone A, and from the Cave Buttes Dike #2 to the northern study boundary that is classified as Zone AO.

Environmental Consequences

Build Alternative

Under the Build Alternative, current surface water drainage patterns would be maintained through the construction of culverts along major drainages throughout the alignment. Within the limits of the Build Alternative south of Deer Valley Road, three existing culverts are of adequate length and volume and would not be modified, and two additional culverts would be constructed to maintain drainage under the BMB connection to SR 51. North of Deer Valley Road, the Build Alternative would include extending two existing culverts and constructing seven new culverts to convey drainage under the BMB roadway and maintain drainage patterns.

Ground water depths within the study area are at approximately 498 feet. No construction activities associated with the Build Alternative would require excavation to that depth. Therefore, the Build Alternative would have no direct impacts to groundwater. However, future development within the study area as a result of improved access from the Build Alternative could increase use of ground water in the area.

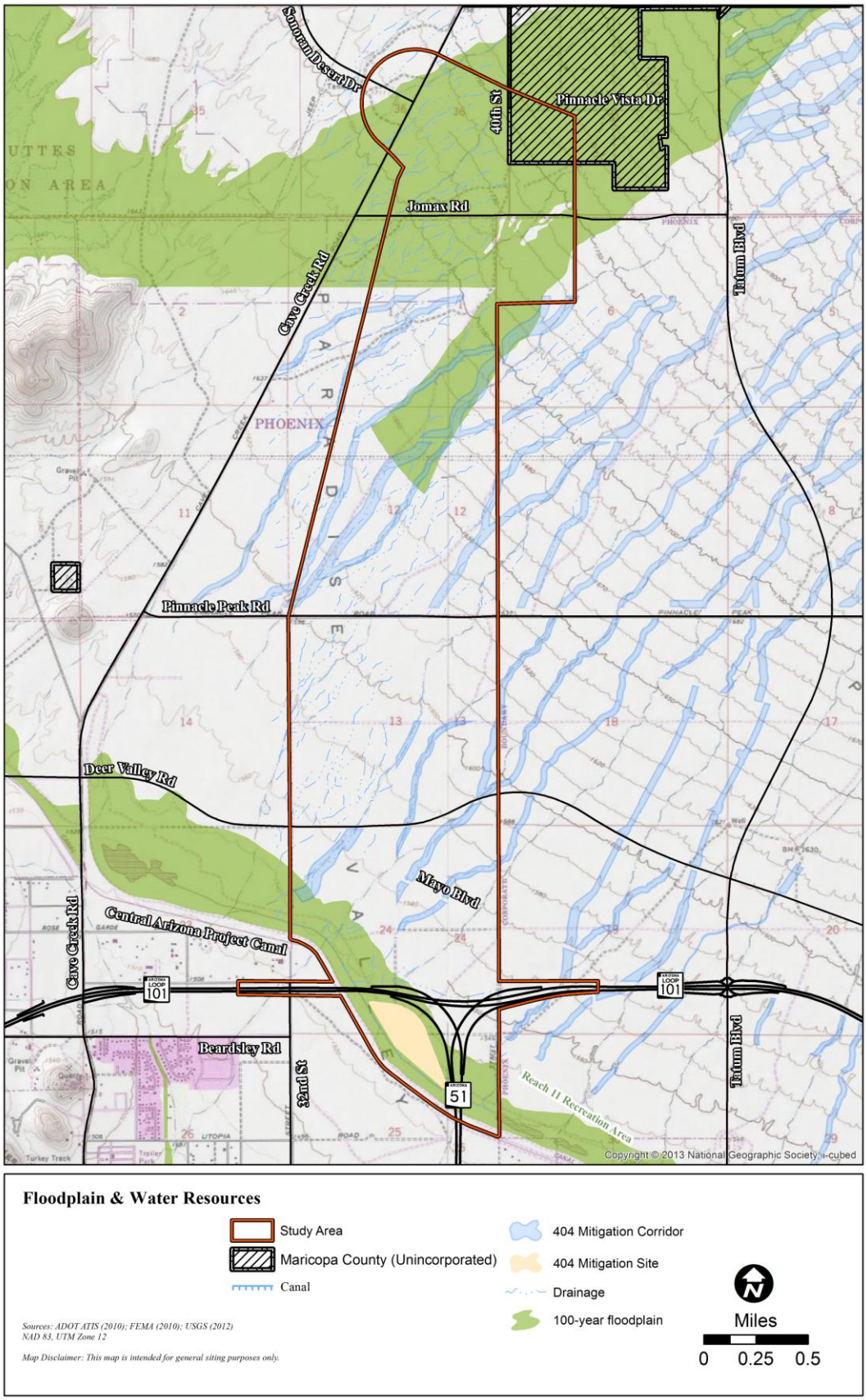


FIGURE 25. FLOODPLAIN AND WATER RESOURCES.

The proposed BMB connection to the existing SR 51 TI ramps would occur within Reach 11, which is in the 100-year floodplain (FEMA 2012). To mitigate flood storage area that is displaced in Reach 11 from construction of the Build Alternative, compensatory flood storage areas would be excavated within Reach 11. This excavation would create replacement storage to maintain the current flood detention volume; excavation would be required to prohibit ponding and allow flows to drain unimpeded into the CAP low-flow channel and outlet drains. In addition, all design elements would be in conformance with the intended flood-control purpose of Reach 11 according to the *Bureau of Reclamation Guidelines for Road Crossings and Development within Dike Drainage Basins, Hayden/Rhodes Aqueduct – Reach 11*. Future construction of the Build Alternative north of Happy Valley Road would also cross a FEMA-designated 100-year floodplain (FEMA 2012). During the final design phase of the Build Alternative, the local floodplain administrator would be provided the opportunity to review the project design and floodplain impacts. Permitting requirements would also be determined during the final design phase.

No-Build Alternative

In order to maintain existing drainage patterns, two culverts would be extended and seven new culverts would be constructed north of Deer Valley Road under the No-Build Alternative. Construction activities associated with the No-Build Alternative would not require excavation to the current ground water depth, and there would be no direct impacts to groundwater under the No-Build Alternative. However, future development of surrounding areas as a result of improved access from the No-Build Alternative could increase use of ground water in the area.

The No-Build Alternative north of Happy Valley Road to Cave Creek Road would cross a 100-year floodplain identified by FEMA (2012). However, the local floodplain administrator would review impacts to floodplains during the building permit review process for future land development.

Mitigation Measures

- During final design of each construction phase, the floodplain managers with local jurisdiction would be provided an opportunity to review and comment on the design plans.
- For project phases occurring within Reach 11, coordination with the Bureau of Reclamation would be done during design to ensure that the flood detention capacity and flood protection purposes of Reach 11 are maintained.

Conclusions

Drainage patterns and groundwater resources would not be directly impacted by either the Build or No-Build Alternatives. Both the Build Alternative and No-Build Alternative are located within a 100-year floodplain. Coordination with the local floodplain managers would occur and potential impacts to the 100-year floodplains would be addressed during the final design or future development review.

K. Section 404/401 of Clean Water Act and Pollutant Discharge Elimination System

The CWA is the primary federal statute governing discharge of pollutants into jurisdictional Waters, which, in Arizona, include perennial and ephemeral watercourses and their tributaries and adjacent wetlands. The principal goal of the CWA is to establish water quality standards to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point (concentrated output) and nonpoint (widely scattered output) pollution sources.

Section 401 of the CWA requires any applicant requesting a federal permit or license for activities that may result in discharge into Waters to first obtain a Section 401 certification from the state in which the discharge originates. The Section 401 certification verifies the prospective permits comply with the state's applicable effluent limitations and water quality standards. Federal permits or licenses are not issued until the Section 401 certification is obtained. The ADEQ is responsible for the Section 401

certification. If a project meets criteria for conditional Section 401 certification, notification to the ADEQ is not required. However, if a project does not meet criteria for conditional certification, such as projects occurring within one-quarter mile of unique or impaired waters, an individual Section 401 certification application to the ADEQ is required.

Section 402 of the CWA formed the National Pollutant Discharge Elimination System (NPDES), which regulates pollutant discharges, including stormwater, into Waters. An NPDES permit sets specific discharge limits for point-source pollutants into Waters and outlines special conditions and requirements for a particular project to reduce impacts to water quality. In 2002, the EPA authorized the ADEQ to administer the NPDES program at the State level, called the Arizona Pollutant Discharge Elimination System (AZPDES). AZPDES permits require that the project be designed to protect Waters, that erosion control best management practices (BMPs) be implemented, and a Stormwater Pollution Prevention Plan (SWPPP) be developed for construction activities exceeding 1 acre of ground disturbance.

Section 404 of the CWA regulates the discharge of earthen fill, concrete, and other construction materials into Waters, and authorizes the Corps to issue permits regulating the discharge of dredge or fill material into Waters. The limits of Waters are defined through a preliminary or approved jurisdictional delineation (JD) accepted by the Corps. A preliminary JD assumes all drainages within a given area are subject to the jurisdiction of the Corps. An approved JD requires all ephemeral drainages display a significant nexus to the nearest downstream “traditional navigable water,” which for this project is the Gila River near the confluence of the Hassayampa River. The most common types of Section 404 permits for transportation projects are the Nationwide Permit 14 (Linear Transportation Projects), which authorizes projects with less than 0.50 acre of permanent loss to Waters with no impacts to special aquatic areas such as wetlands, and the individual permit, which is required for projects that affect more than 0.50 acre of Waters or cause impacts to jurisdictional wetlands. A 404 permit may require

mitigation to minimize or offset the impacts to Waters with “no net loss” of functions and values of the water resource.

Existing Conditions

Within the study area, the predominant sheet flow pattern is from northeast to southwest. There are no perennial sources of water within the study area and all drainage within the study area flows to either Reach 11 or the CAP low-flow channel. Several excavated flood storage basins are located within Reach 11 that have sufficient capacity to retain flood waters from a 100-year storm event. Parallel to SR 101L within the study area, an ADOT-maintained concrete-lined drainage channel intercepts runoff from the north and conveys flow to the CAP low-flow channel. The CAP low-flow channel drains to Indian Bend Wash, a tributary to the Salt River, which ultimately drains to the Gila River, the closest traditional navigable water. The CAP low-flow channel is the dominant drainage feature in the study area providing a downstream connection for area drainages to the Salt River. Besides the constructed drainage facilities, several ephemeral drainages dissect the study area that exhibit the physical characteristics of Waters and pending the approval of a preliminary JD, are understood to be under the Corps’ jurisdiction. Due to the generally flat topography and sandy substrate, several ephemeral drainages exhibiting physical characteristics of Waters end where sheet flows infiltrate the soil and do not have downstream connections to other drainages. Although some drainages do not have an evident downstream connection, the Corps has discretionary authority to assert jurisdiction on these drainages.

Field visits were conducted in July, September, and October 2012 to determine the presence of potential jurisdictional Waters in the project segment south of Pinnacle Peak Road and for areas including the compensatory flood storage areas, PHS access to Deer Valley Road, and the Deer Valley Road improvements west of BMB. A preliminary JD is being prepared for this segment and would be submitted to the Corps for approval once it is complete. Due to the uncertain construction schedule for

the project segment north of Pinnacle Peak Road and dynamic nature of Waters, a formal preliminary JD is not planned at this time. However, approved JDs have been previously completed within portions of the study area and were obtained from the Corps to assist in determining potential Waters. In addition, aerial photographs were reviewed and a reconnaissance field visit was conducted in July 2012 to determine the presence and potential jurisdictional limits of potential Waters in the area north of Pinnacle Peak Road.

In total, 71 potential jurisdictional drainages were identified within the study area. Along the drainages, upland vegetation including shrubs and ground cover, and some xeric riparian species, such as mesquite (*Prosopis* sp.*)* and desert broom (*Baccharis sarothroides*), were present and often denser in these areas. However, no broadleaf riparian or wetland vegetation was observed. Environmental conditions may change in the future. Therefore, the amount, location, and physical characteristics of potentially jurisdictional drainages present within the study area may change.

Along with several previously completed JDs, portions of the study area are located within areas that were previously covered under 404 IPs: Azara (Corps File Number SPL-2005-01170-SDM), Desert Ridge (Corps File Number 984-0030-RWF), and SR 51 Bell Road to Pima Freeway (Corps File Number 2000-01470-LSF). As a result of the Azara and Desert Ridge IPs, several 404 Natural Wash Corridors were identified throughout the permit boundaries as mitigation areas. As a result of the SR 51 Bell Road to Pima Freeway IP, 12.9 acres of mesquite bosque were planted in 2004 as a mitigation site within a retention basin directly west of SR 51 between the CAP canal and SR 101L.

The *Outstanding Arizona Waters* (OAW) (Arizona Administrative Code R18-11-112(G)) and Arizona's 2006/2008 303(d) *List of Impaired and Not Attaining Waters* were reviewed to determine whether any unique or impaired waters are present. No OAW, EPA 303(d) non-attaining impaired waters, or EPA 303(d) impaired waters occur in or within one mile of the study area.

Environmental Consequences

Build Alternative

The Build Alternative would cause greater than 1 acre of ground disturbance. Therefore, selection of the Build Alternative would require an AZPDES permit and the implementation of erosion-control BMPs, a SWPPP, and a water-quality monitoring plan to ensure water quality is protected during construction activities. Although the Build Alternative would add impervious surface area (pavement) through the study area, the increase would be minor relative to the total impermeable area that would occur from surrounding development. Stormwater runoff would not substantially increase as a result of the Build Alternative. However, the Build Alternative would facilitate a greater volume of traffic through the area; thus, the volume of substances such as fuel and oils on the roadway would likely increase, causing a greater volume of these substances to occur in stormwater runoff.

The Build Alternative would involve the discharge of dredge or fill material into potential Waters and would require a Section 404 permit where proposed actions of the Build Alternative cross ephemeral washes. Based on the proposed preliminary JD for the segment south of Pinnacle Peak Road, 45 potentially jurisdictional drainages would be impacted by the Build Alternative. Based on site reconnaissance and review of aerial photographs and existing JDs in the study area, approximately 26 potentially jurisdictional drainages exhibiting characteristics of Waters north of Pinnacle Peak Road would be impacted by the Build Alternative. Therefore, under the Build Alternative approximately 71 potentially jurisdictional drainages would be impacted. Due to the small size of the ephemeral drainages, anticipated impacts to potentially jurisdictional drainages do not exceed 0.10-acre of area of Waters within the study area. Therefore, permanent impacts from the Build Alternative would not exceed 0.50 acre at any drainage allowing the use of a Nationwide Permit 14 and preconstruction notification would not be necessary if the impacts would remain below 0.10 acre as anticipated. Portions of the Build Alternative within the Azara and Desert Ridge permit areas would comply with the terms and conditions

of those permits. Appropriate Section 404 permitting requirements would be determined during the final design phase of each segment of the Build Alternative.

No-Build Alternative

Under the No-Build Alternative, only the improvements north of Deer Valley Road would be constructed. The No-Build Alternative would also cause greater than 1 acre of ground disturbance. Therefore, an AZPDES permit and the implementation of erosion-control BMPs, a SWPPP, and a water-quality monitoring plan would also be required with this alternative to ensure water quality is protected during construction activities. Although the area would be less than with the Build Alternative, the No-Build Alternative would still add impervious surface area (pavement) north of Deer Valley Road. Like the Build Alternative, the increase would be minor relative to the total impermeable area that would be added to surrounding areas through future development. The No-Build Alternative would not substantially increase stormwater runoff in the study area. Also, similar to the Build Alternative, the No-Build Alternative would facilitate increased traffic through the study area; thus, the amount of substances such as fuel and oils on the roadway would likely increase, causing a greater volume of these substances to occur in stormwater runoff.

Discharge of dredge or fill material into potential Waters would occur with the No-Build Alternative and a Section 404 permit would be required. Based on site reconnaissance and review of aerial photographs and existing JDs, approximately 38 potentially jurisdictional drainages exhibiting characteristics of Waters north of Deer Valley Road would be impacted by the No-Build Alternative. The size of ephemeral drainages is relatively small, and anticipated impacts to potentially jurisdictional drainages do not exceed 0.10-acre of area of Waters within the project limits. Therefore, it is anticipated that permanent impacts from the No-Build Alternative would not exceed the 0.10-acre threshold of impact at any drainage and would likely be authorized under a non-notifying Nationwide Permit 14 or would be

authorized under the Section 404 permit issued for the development of the adjacent land. Portions of the No-Build Alternative within the Azara and Desert Ridge permit areas would comply with the terms and conditions of those permits. Appropriate Section 404 permitting requirements would be determined during the final design phase of each segment of the No-Build Alternative.

Mitigation Measures

- During design the City of Phoenix would prepare and submit a jurisdictional delineation and an application to the US Army Corps of Engineers for a Clean Water Act Section 404 permit.
- No work would occur within jurisdictional waters of the US until the appropriate Clean Water Act Section 401 certification and 404 permits are obtained.
- The City of Phoenix and the contractor would adhere to all terms and conditions of the Azara (Corps File Number SPL-2005-01170-SDM) and Desert Ridge (Corps File Number 984-0030-RWF) Section 404 permits, and avoid the mitigation site (mesquite bosque) located in the southwest quadrant of the State Route 51/State Route Loop 101 Traffic Interchange.
- The contractor would obtain the most current copy of the City of Phoenix Best Management Practices for incorporation in the Stormwater Pollution Prevention Plan.
- The contractor would prepare and implement a Stormwater Pollution Prevention Plan with Stormwater Monitoring Plan. The contractor would also prepare a Notice of Intent and a Notice of Termination meeting the terms and conditions of the Arizona Pollutant Discharge Elimination System general permit.
- Upon approval of the Stormwater Pollution Prevention Plan and Stormwater Monitoring Plan by the Arizona Department of Environmental Quality, the contractor would file a Notice of Intent to the Arizona Department of Environmental Quality. Upon final acceptance of the project by the City of Phoenix, the contractor would file a Notice of Termination for the project to the Arizona Department of Environmental Quality. The contractor shall provide copies of the completed final Stormwater Pollution Prevention Plan, Stormwater Monitoring Plan and Notice of Intent and Notice of Termination to the City of Phoenix.

- For project phases occurring within Reach 11, coordination with the Bureau of Reclamation would be done during design to ensure that the flood detention capacity and flood protection purposes of Reach 11 are maintained.

Conclusion

Both alternatives would generate greater than 1 acre of ground disturbance and an AZPDES permit with a SWPPP and Stormwater Monitoring Plan would be required. In addition, both of the alternatives would cause impacts to Waters, and would require compliance with existing or new Section 404 permits. In areas not covered by an existing IP, impacts from both the Build and No-Build Alternatives to Waters are anticipated to be under the 0.10 acre threshold and could be authorized under a non-notifying Nationwide Permit 14. However, the appropriate level of Section 404 permitting would be determined during the final design. The contractor would be required to adhere to the conditions of the Sections 401 and 404 permits as well as implement BMPs and a SWPPP to ensure protection of water quality. Thus, there would be no substantial impacts to water quality as a result of either the Build or No-Build Alternative.

L. Biological Resources

Existing Conditions

This section describes biological resources that may be affected by implementation of the proposed project. It discusses vegetation, wildlife, threatened and endangered species, other special-status species, protected native plants, and invasive species. The project is located in an urban/rural transition area in the Arizona Upland and the Lower Colorado River subdivisions of the Sonoran Desertscrub Biotic Community (Turner and Brown 1994) through relatively flat, southwesterly sloping terrain, at elevations ranging from approximately 1,500 to 1,800 feet above mean sea level. The overall landscape is characterized by sparsely vegetated open desert dominated by shrubs such as creosotebush (*Larrea*

tridentata), triangle-leaf bursage (*Ambrosia deltoidea*), brittlebush (*Encelia farinosa*), desertbroom (*Baccharis sarothroides*), and cat-claw acacia (*Acacia greggii*), interspersed with cacti such as saguaro (*Carnegiea gigantea*), and barrel cactus (*Ferocactus* spp.). The substrate generally consists of bare sand and gravel, with little to no ground cover. Where present, generally along ephemeral drainages and depressed areas where stormwater collects, ground cover consists of weedy annuals, bunch grasses such as Mediterranean grass (*Schismus barbatus*), cheatgrass (*Bromus tectorum*) and red brome (*Bromus rubens*), and small desert senna (*Cassia covesii*) shrubs. Trees such as mesquite (*Prosopis* spp.), paloverde (*Parkinsonia* spp.), and ironwood (*Olneya tesota*) occur primarily along washes.

Threatened and Endangered Species

The US Fish and Wildlife Service (USFWS) list of threatened, endangered, proposed, candidate, and conservation agreement species potentially occurring in Maricopa County was obtained from the Arizona Ecological Services Field Office website (USFWS 2012) and reviewed by a qualified biologist to determine species potentially present in the study area. Of the 17 species on the Maricopa County list, the Sonoran desert tortoise was determined to potentially occur in the study area based on potentially suitable habitat within the current range of the species. Sonoran desert tortoise is a candidate for listing and receives no protection under the federal Endangered Species Act (ESA). There is no designated or proposed critical habitat within 20 miles of the study area.

A biological evaluation (BE) was prepared for the project and was approved by Phoenix and ADOT on December 20, 2012. Species evaluated in detail in the BE are included in Table 21.

TABLE 21. USFWS SPECIES EVALUATED IN DETAIL.

Common Name	Scientific Name	Status[1]
Desert tortoise, Sonoran population	*Gopherus agassizii*	ESA C

[1]Definitions: ESA=Endangered Species Act, C=Candidate.
Source: USFWS, October 3, 2012

The Sonoran desert tortoise typically inhabits paloverde-cacti habitats in Sonoran Desertscrub with boulders, rocky outcrops, natural ground cavities, and incised washes with caliche substrates. These components of high-quality desert tortoise habitat are not present within the study area, and no potential burrows, shelter sites, scat, or other tortoise sign were observed during multiple site visits to the area. The suburbanized character of the landscape and the prevalence of roadways throughout the vicinity further reduce the possibility of a tortoise population persisting. However, desert tortoises traverse less desirable habitats while moving between areas of high-quality habitat. The nearest suitable habitat is in the Union Hills, over three miles northwest of the proposed alignment. The Union Hills are separated from the project limits by Cave Creek Road, a main north–south thoroughfare, which creates a substantial barrier to any tortoise movement from the Union Hills. The Arizona Game and Fish Department (AGFD) did not have records of desert tortoise occurrences within the project vicinity.

Other Special-Status Species

As part of the environmental review process a letter describing the project was sent to the AGFD to inform them of the project and to solicit comments related to the project. The AGFD online environmental review tool was accessed to determine special-status species known to occur in the project vicinity. These special-status species are not protected by the federal ESA, but do receive some limited protection under other wildlife laws and regulations or agency management policies. The AGFD online environmental review tool did not list any special-status species as occurring within three miles of the project vicinity.

Suitable nesting habitat occurs within the study area for several bird species protected by the Migratory Bird Treaty Act, including western burrowing owl (*Athene cunicularia hypugaea*). No burrowing owls or suitable burrows were observed during site visits, although two large raptor nests were observed in saguaros and small passerine nests were observed in trees. The AGFD did not have records of western

burrowing owl occurring within the project vicinity; however, between 2002 and 2004, displaced burrowing owls were relocated into constructed habitats in the Reach 11 Recreation Area between Tatum Boulevard and 56th Street, approximately 1–2 miles east of the study area. Although owl occupancy at these relocation sites has not been documented since 2006, it is possible that the relocated burrowing owls dispersed into suitable habitat within the study area.

Native Plants

Plants protected by the Arizona Native Plant Law include all cacti, yucca, agave, and many leguminous tree species such as paloverde, mesquite, and ironwood that are wild growing (i.e., not planted for landscaping). While no formal inventory of protected native plants within the construction limits of the Build Alternative has been conducted, protected native plant species such as mesquite, paloverde, ironwood, saguaro and barrel cactus were observed within the study area.

Invasive Species

Under *Executive Order 13112*, dated February 3, 1999, projects on federal land or that are federally funded must: "…subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded…"

No invasive species were observed within the study area, although a formal invasive species field survey was not completed. Because nonnative species are known to occur in the Phoenix metropolitan area, and because construction activities have a tendency to introduce invasive species, it is likely that invasive species are present.

Wildlife and Habitat Connectivity

Linear transportation features such as roads and highways can fragment wildlife habitat and act as physical barriers to wildlife movement. Wildlife movement corridors are generally narrow strips of habitat that may be used by wildlife to move from one area to another. Other corridors include those across or near geological features that offer good physical relief and/or vegetative cover. Wildlife movement within these corridors is crucial in maintaining healthy wildlife populations. Fragmentation can prevent wildlife from gaining access to required resources and can isolate populations from each other, resulting in reduced genetic diversity that can undermine a population's long-term viability. In Arizona, wildlife movement corridors are often drainages and associated riparian habitat.

Impacts on wildlife and wildlife movement are related to the type of linear feature and amount of use. The roadway type, width, design, and location are key factors that contribute to this barrier effect and to the impact on wildlife movement. Other features associated with roads, such as ROW fencing and line-of-sight clearing, may also contribute to the impacts on wildlife and wildlife movement. Roads acting as barriers can suppress populations of certain wildlife species occurring near them, primarily by direct mortality (road kill) and reduced genetic viability.

In 2006, the Arizona Wildlife Linkages Workgroup completed Arizona's Wildlife Linkages Assessment, which identifies the locations of known wildlife movement, associated corridors, and wildlife linkage zones in Arizona. The southern portion of the study area is within the CAP Canal Potential Linkage Zone (PLZ) 152 (Figure 26).

Riparian Areas and Wetlands

Riparian and wetland areas are found along perennial, intermittent, or ephemeral water sources and consist of diverse communities of plant and animal species in comparison to adjacent uplands. These areas provide essential habitat to many wildlife species during some portion of their life cycle and

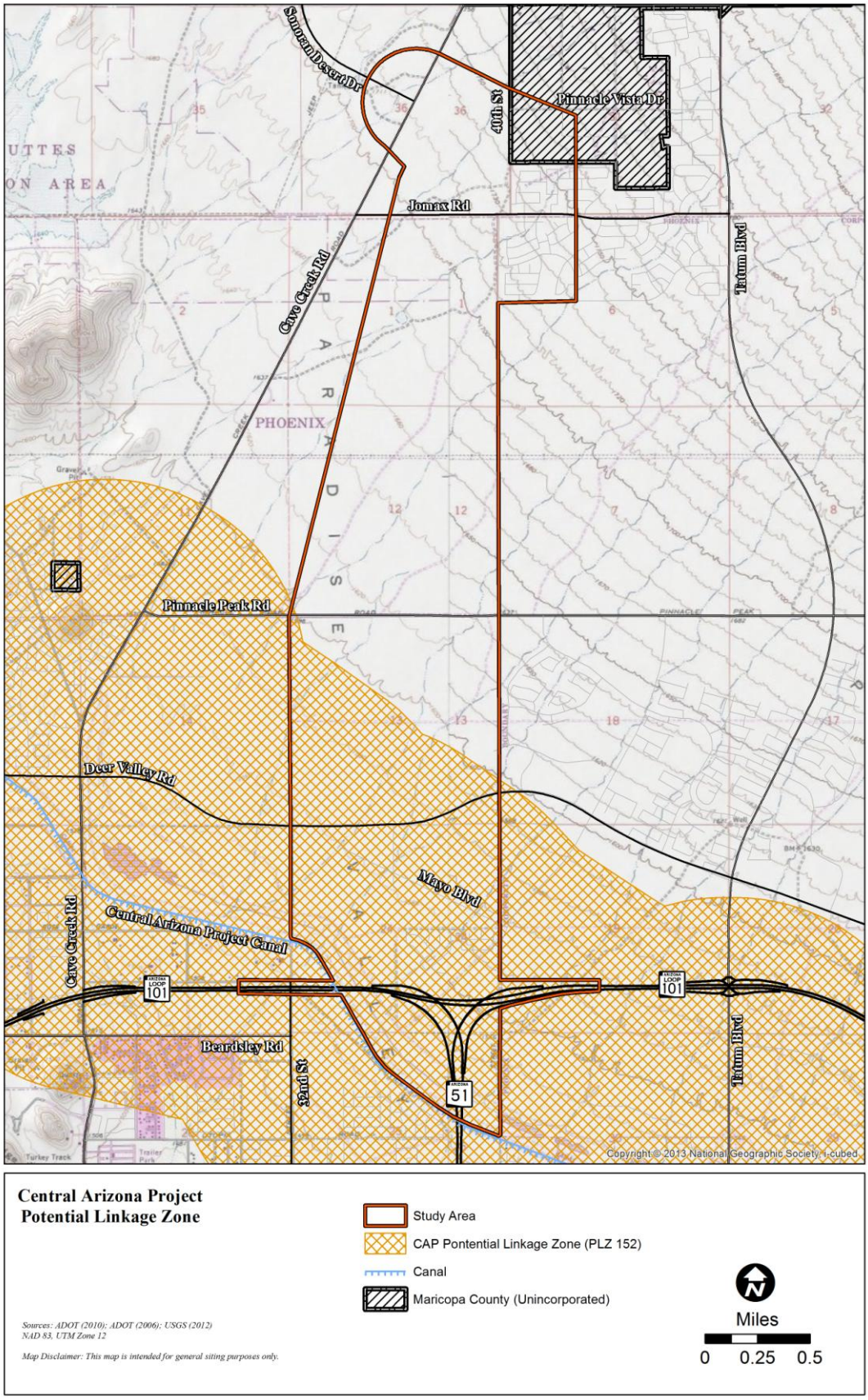


FIGURE 26. WILDLIFE LINKAGES IN THE STUDY AREA.

riparian areas also serve as linear travel corridors. In Arizona, riparian vegetation includes broadleaf species such as Cottonwood (*Populus* spp.), nonnative species such as tamarisk (*Tamarix* spp.), and xeroriparian species such as mesquite. Water sources within the study area are ephemeral and do not support broadleaf riparian or wetland vegetation. Xeroriparian species such as mesquite occur along drainages and are typically denser and taller in these areas, yet only provide narrow stringers of vegetation.

A 12.9-acre mesquite bosque rimmed with paloverde and ironwood trees was planted in 2004 as a mitigation site for impacts to jurisdictional waters resulting from the construction of SR 51 from Bell Road to SR 101L. This mitigation site is located within the southwestern portion of the study area, within a retention basin west of SR 51 between the CAP Canal and SR 101L. The site was established with the intent of producing dense canopy cover to provide wildlife habitat for multiple species.

Environmental Consequences

Threatened and Endangered Species

Build Alternative

Due to the lack of suitable tortoise habitat in the study area, the Build Alternative would not result in a loss of desert tortoise habitat. It is unlikely that a sizeable tortoise population occurs within or near the study area because much of the surrounding landscape has been modified or disturbed, and the existing roadway grid serves as a substantial barrier to tortoise movement into the area. Therefore, the potential for desert tortoises to be directly or indirectly impacted by the Build Alternative is unlikely. However, because the study area contains natural desert in the vicinity of the Union Hills, the potential for Sonoran desert tortoises to wander into the project limits cannot be discounted. A desert tortoise contractor training program will be implemented, and to prevent injury or death to tortoises that may wander into the construction limits, the construction crew would follow the AGFD's *Guidelines for Handling Desert*

Tortoises Encountered on Development Projects (2007) (Appendix A). Therefore, the Build Alternative may impact individual Sonoran desert tortoises, but would not result in a trend towards federal listing or a loss of viability.

No-Build Alternative

The environmental conditions of the No-Build Alternative are similar; therefore, no suitable tortoise habitat is present and it is unlikely that Sonoran desert tortoises would occur in the area. However, because the study area contains natural desert in the vicinity of the Union Hills, the potential for Sonoran desert tortoises to wander into the project limits during construction activities cannot be discounted; therefore, the No-Build Alternative may impact individual Sonoran desert tortoises, but would not result in a trend towards federal listing or a loss of viability.

Other Special-Status Species

Build Alternative

The Build Alternative would result in a permanent loss of suitable nesting habitat for western burrowing owl and other migratory bird species. The proposed project could cause injury or death to migratory bird adults, eggs, or young if active burrows/nests were present in the project limits during construction. Because western burrowing owl and other migratory bird species found in the study area are widespread and relatively common in the Phoenix area, the Build Alternative may impact individual migratory birds, but would not result in a trend toward federal listing or a loss of viability. Due to the potential for impacts to migratory birds, including western burrowing owls, this project would incorporate mitigation measures to prevent the take of migratory birds.

No-Build Alternative

The environmental conditions of the No-Build Alternative are similar; therefore, suitable nesting habitat for western burrowing owl and other migratory bird species is present. The No-Build Alternative could

cause injury or death to migratory bird adults, eggs, or young if active burrows/nests were present in the project limits during construction; however, these species are widespread and relatively common in the Phoenix area. Therefore, the No-Build Alternative has the potential to impact individual migratory birds, including western burrowing owl, but would not result in a trend toward federal listing or a loss of viability.

Native Plants

Build Alternative

Construction of the Build Alternative would result in a loss of approximately 65 acres of natural desert habitat, resulting in the removal of protected native plants such as mesquite, paloverde, ironwood, saguaro, and barrel cactus that are present within the project limits. Additionally, 52 acres of land will be temporarily disturbed for the excavation of basins within Reach 11. Native plants will be avoided to the greatest extent possible and the vegetation of these areas will be reestablished by seeding as specified in the mitigation measures. The excavation of basins would avoid the 12.9-acre mesquite bosque mitigation site.

No-Build Alternative

Upon completion, the No-Build Alternative would result in a loss of approximately 55 acres of natural desert habitat and would require the removal of protected native plants.

Invasive Species

Build Alternative

Construction equipment and vehicles could transport seeds and other invasive plant material between construction sites and within the project limits. Therefore, construction of the Build Alternative has the potential to introduce and/or spread invasive species within the study area. Treatment to prevent the

spread of invasive plant species that would occur during construction are described in the mitigation measures section that follows this environmental consequences section.

No-Build Alternative

Construction activities have the potential to transport invasive plant material and seeds, therefore, the No-Build Alternative may result in the spread and/or introduction of invasive species. Treatment to prevent the spread of invasive plant species that would occur during construction are described in the mitigation measures section that follows this environmental consequences section.

Wildlife and Habitat Connectivity

Build Alternative

The Build Alternative would serve as a physical barrier to wildlife movement and may further fragment habitat. Habitat fragmentation could result in preventing wildlife from accessing vital resources and may isolate certain wildlife populations from each other, thereby reducing the genetic diversity of the population. The Build Alternative would construct a new approximately 140-foot-wide roadway, creating a substantial barrier to wildlife traveling east–west through the study area. Increased mortality rates are often associated with roadways, which may result in the suppression of certain wildlife populations. Several box culverts would be constructed underneath the proposed roadway, which could be utilized as crossing points by various wildlife species and may reduce mortality rates and the effects of fragmentation. The study area and greater vicinity are currently fragmented by roads and development, so while the Build Alternative would create a new barrier to wildlife, impacts to wildlife and habitat connectivity as a result of the project may have a more localized, less substantial impact.

The southern portion of the study area is located within the CAP Canal linkage zone, which provides a generally east–west travel corridor to important wildlife habitat blocks. The CAP Canal borders the southern boundary of the study area, but is not within the limits of construction and would not be

impacted by the Build Alternative. Undeveloped pathways adjacent to the canal would remain undeveloped and would continue to provide an open route of travel for wildlife. Once the excavation of basins in Reach 11 is complete, these areas would continue to function for wildlife passage. Therefore, the Build Alternative may impact wildlife and habitat connectivity, but is not likely to cause a substantial impairment to any wildlife linkage.

No-Build Alternative

The No-Build Alternative would likely be constructed in detached sections as private developments are constructed. The new roadway sections would pose a barrier to wildlife movement and slowly fragment habitat as each section is built. Increased mortality rates associated with road kills are likely to occur, although box culverts would be constructed and could be utilized by wildlife as safe crossing points. The environmental conditions of the No-Build Alternative are similar to those of the Build Alternative; therefore, while the No-Build Alternative would create a new barrier to wildlife, impacts to wildlife and habitat connectivity as a result of the roadway may have a more localized, less substantial impact.

The No-Build Alternative would not occur within any wildlife linkage zones; therefore, this alternative would have no impact to wildlife linkages.

Riparian Areas and Wetlands

Build Alternative

No broadleaf riparian areas or wetlands occur within the study area. Construction of the Build Alternative would result in the removal of xeroriparian vegetation such as mesquite. This vegetation occurs as narrow stringers of taller vegetation, providing somewhat protected nesting and resting sites and travel routes for coyote (*Canis latrans*), javelina (*Pecari tajacu*), other small mammals, and reptiles. Some potential nesting habitat would be lost, although travel routes along larger wash corridors would be maintained through constructed box culverts. Compared to broadleaf riparian and wetland areas,

xeroriparian areas in Arizona are relatively common. Therefore, the Build Alternative would not result in a substantial loss of high-quality riparian habitat.

No-Build Alternative

The environmental conditions of the No-Build Alternative are similar to those of the Build Alternative; xeroriparian vegetation would be removed, but construction would not result in a substantial loss of high-quality riparian habitat.

Mitigation Measures

Threatened and Endangered Species

To minimize potential impacts to the Sonoran desert tortoise, the following measure would be adhered to:

- The contractor would employ a biologist qualified to implement a Sonoran desert tortoise awareness training program. The biologist would present the training to all personnel who would be onsite, including but not limited to contractors, contractors' employees, supervisors, inspectors, and subcontractors. The program would contain information concerning desert tortoise identification; biology and distribution; legal status and occurrence in the project area; measures to avoid impacts to the species; and procedures to be implemented if tortoises are encountered during project activities, including a review of the *Arizona Game and Fish Department's Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects* (Appendix A).
- At least 30 days prior to construction, the contractor would submit resume(s) of all contractor-employed biologist(s) to the City of Phoenix Street Transportation Department Environmental Quality Specialist (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) for approval.

- The City of Phoenix Street Transportation Department Environmental Quality Specialist (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) would review the resumes of the biologist(s) employed by the contractor to verify that the biologist(s) possess the necessary qualifications to implement the biological resources mitigation measures.
- In the event that Sonoran desert tortoises are encountered during construction, the contractor would adhere to the Arizona Game and Fish Department's *Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects* (Appendix A).

Construction for the first phase of the Build Alternative, should it be implemented, would occur between 2014 and 2015, and the ultimate construction date of the entire alignment is currently undetermined. Because of the dynamic nature of the status of Arizona species, habitat quality, and development in the area, conditions may change by the time of construction. Therefore, to ensure project compliance with the ESA, the following measure would be adhered to:

- During final design and prior to construction, the City of Phoenix, in coordination with the Arizona Department of Transportation and Federal Highway Administration, would re-evaluate potential project-related effects to species protected by the federal Endangered Species Act.

Other Special-Status Species

To avoid or minimize potential impacts to other special-status species, the following measures would be adhered to:

- The contractor would plan to complete all tree and columnar cacti removal activities on the site between September 1st and February 28th to avoid harming any active bird nests.

- If tree or columnar cacti removal would occur between March 1st and August 31st, the contractor would employ a biologist(s) qualified to conduct a migratory bird nest search of all trees and columnar cacti that would be removed between March 1st and August 31st. The bird nest search would be conducted within 10 days prior to tree/cacti removal, and would include a search for visible nests, as well as observation of the trees and cacti to determine the potential presence of cavity nests. Upon completion of the nest search, the biologist would contact the City of Phoenix Street Transportation Department Environmental Quality Specialist (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) to provide nest search results.
- The contractor would not remove any trees or columnar cacti between March 1st and August 31st unless a biologist approved by the City of Phoenix has conducted a bird nest search of those trees/cacti and has determined that no active bird nests are present. Trees and cacti may be removed if they have been surveyed within 10 days prior to removal as long as only inactive bird nests, if any, are present, or if relocation of active nests and their inhabitants can be accomplished by an avian wildlife rehabilitator holding the appropriate permits from the US Fish and Wildlife Service and the Arizona Game and Fish Department. Between September 1st and February 28th, tree/columnar cacti removal is not subject to this restriction.
- The contractor would employ a biologist to complete a preconstruction survey for burrowing owls 10 days prior to construction in all suitable habitat that would be disturbed. The biologist would possess a burrowing owl survey protocol training certificate issued by the Arizona Game and Fish Department. Upon completion of the surveys, the contractor would contact the City of Phoenix Street Transportation Department Environmental Quality Specialist at (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) to provide survey results.
- If any burrowing owls or active burrows are located during preconstruction surveys or construction, the contractor would employ a wildlife rehabilitator holding a permit from the US Fish and Wildlife Service and Arizona Game and Fish Department to relocate the birds from the study area, as appropriate.
- If burrowing owls or active burrows are identified during the preconstruction surveys or during construction, no construction activities would take place within 100 feet of any active burrow until the owls are relocated.

- At least 30 days prior to construction, the contractor would submit resume(s) of all contractor-employed biologist(s) to the City of Phoenix Street Transportation Department Environmental Quality Specialist (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) for approval.
- The City of Phoenix Street Transportation Department Environmental Quality Specialist (602.262.6284) and City of Phoenix Office of Environmental Programs 404 Coordinator (602.534.1775) would review the resumes of the biologist(s) employed by the contractor to verify that the biologist(s) possess the necessary qualifications to implement the biological resources mitigation measures.

Native Plants

Protected native plants within the construction limits would be impacted by the project. Therefore, the following measure would be adhered to:

- Protected native plants within the project limits would be impacted by this project; therefore, the City of Phoenix would determine if Arizona Department of Agriculture notification is needed. If notification is needed, the City of Phoenix would send the notification at least 60 calendar days prior to the start of construction.

Invasive Species

Construction activities have the potential to introduce and/or spread invasive species. Therefore, the following measures would be adhered to:

- All disturbed soils that would not be landscaped or otherwise permanently stabilized by construction would be seeded using species native to the project vicinity.
- To prevent the introduction of invasive species seeds, all construction equipment would be washed at the contractor's storage facility prior to entering the construction site.
- To prevent invasive species seeds from leaving the construction site, the contractor would inspect all construction equipment and remove all attached plant/vegetation and soil/mud debris prior to allowing that equipment to leave the construction site.

Wildlife and Habitat Connectivity

Because the project would not result in substantial impacts on wildlife movement or linkages, no mitigation regarding wildlife movement and connectivity would be necessary.

Riparian Areas and Wetlands

Because the project would not result in a loss of wetlands, or a substantial loss of high-quality riparian areas, no mitigation measures would be necessary.

Conclusions

The Build Alternative would impact biological resources, but would not result in substantial impacts to these resources. The Build Alternative may impact individual Sonoran desert tortoises, but would have no effect to any species or critical habitat protected by the ESA. However, due to frequent changes in species' status designations and changes to habitat quality and development, conditions within the study area may change, requiring a re-evaluation of potential project-related effects to federally listed species during final design and prior to construction. The Build Alternative may impact migratory birds, including the western burrowing owl, but would not result in a trend towards federal listing or a loss of viability. The Build Alternative would impact Arizona protected native plants and would have the potential to introduce and/or spread invasive species. No substantial impacts to wildlife and habitat connectivity or riparian and wetland areas would occur as a result of the Build Alternative. Mitigation measures would be implemented to avoid or minimize potential project-related impacts to threatened and endangered species, migratory birds, native plants, and invasive species.

The environmental conditions of the No-Build Alternative are similar to the Build Alternative; therefore, the No-Build Alternative would have a similar level of impact to biological resources.

M. Hazardous Materials

Hazardous materials and hazardous waste sites pose a threat to any infrastructure project, including but not limited to ownership liability concerns and construction safety concerns. EPA's 2002 Brownfields Act identified the steps of "all appropriate inquiry" for investigating hazardous materials sites, and the ASTM International (ASTM) E1527-05 standard was written to provide a set of guidelines for the assessment of properties and the qualifications of environmental professionals engaged to perform the analysis (ASTM International 2006). FHWA has adopted a step-wise approach to hazardous materials site analysis that conforms to the ASTM series of standards governing "Phase I" type site investigations.

ADOT employs a preliminary initial site assessment (PISA) scope of work as an early comparative tool for projects with multiple possible alternatives. The PISA includes a review of regulatory history of sites within the study area and a limited field review by the environmental professional (term defined in ASTM). The PISA is not fully ASTM-compliant, but provides elements of the ASTM scope that give the study team adequate information to compare potential alternatives for "fatal flaws" or hazardous materials issues that may be large enough to provide a basis of preference for one alternative over another.

Existing Conditions

A review of publicly available databases from ADEQ, EPA, and other regulatory agencies was conducted in July 2012. In addition, a site visit and review of current and historical aerial photographs was conducted by a qualified environmental professional. The PISA for the study area was approved by the ADOT Hazardous Materials Coordinator in August 2012. The review of the agency databases and site visit did not reveal the presence of any hazardous materials sites of concern within the study area. Several locations have been used for unauthorized dumping of solid waste (wildcat dumping); however, the materials in these areas are not characterized as hazardous.

Environmental Consequences

Build Alternative

No hazardous material concerns were found during initial investigations. Because the Build Alternative would involve the modification of bridge structures, these structures would require testing for the presence of asbestos-containing materials (ACM). Additionally, the Build Alternative would involve stripe obliteration; therefore, roadway striping would need to be tested for the presence of lead-based paint (LBP). Removal of all solid waste within the study area would occur prior to construction.

No-Build Alternative

The No-Build Alternative would not affect ramp structures. Roadway striping would be obliterated during roadway work and would require testing for LBP. The No-Build alternative could impact areas where previous unauthorized dumping has occurred. Removal of all solid waste within the study area would occur prior to implementation.

Mitigation Measures

- During final design, the Project Manager would contact the City of Phoenix Street Transportation Department at (602.262.6284) to arrange for qualified personnel to review and update the Preliminary Initial Site Assessment.
- During final design, the Project Manager would contact the City of Phoenix Street Transportation Department at (602.262.6284) to determine the need for additional hazardous materials site assessment.

- During final design, the Project Manager would coordinate with the Arizona Department of Transportation Environmental Planning Group Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) to complete testing for asbestos and lead-based paint within the limits of Arizona Department of Transportation right-of-way and, if necessary, recommend remediation measures. For portions of projects not involving Arizona Department of Transportation right-of-way, the Project Manager would contact the City of Phoenix Street Transportation Department at (602.262.6284) to complete testing for asbestos and lead-based paint within the limits of City of Phoenix right-of-way and, if necessary, recommend remediation measures.
- If asbestos-containing materials are found, no activities associated with the demolition or removal of asbestos-containing materials would be allowed to occur until the Asbestos Removal and Disposal Plan is approved.
- The City of Phoenix would coordinate with the Arizona Department of Transportation for any required National Emissions Standards for Hazardous Air Pollutants notifications. This measure would not apply to projects that would not involve modifications to Arizona Department of Transportation ramp structures.
- The contractor would complete a National Emissions Standards for Hazardous Air Pollutants notification for work associated with the modification of Arizona Department of Transportation ramp structures and submit it to the Engineer for review and approval. Upon approval, the contractor would file the notification with the Maricopa County Air Quality Department at least 10 working days prior to the modification of ramp structures. This measure would not apply to projects that would not involve modifications to Arizona Department of Transportation ramp structures.
- If asbestos-containing materials are found, an approved contractor would develop and implement an Asbestos Removal and Disposal Plan for the demolition and removal of asbestos-containing materials. The plan would be submitted to the Engineer for review and approval at least 10 working days prior to implementation. The contractor would follow all applicable local, state, and federal codes and regulations related to the treatment, handling, and disposal of asbestos.

- If regulated amounts of asbestos are found, no demolition or removal of load-bearing concrete would occur until the Asbestos Removal and Disposal Plan is approved and implemented.
- If lead-based paint is found on any surfaces that would be disturbed during construction, an approved contractor would 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 construction limits. The contractor would 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, no disturbance of the lead-based paint would occur until the lead-based paint abatement plan is approved and implemented.
- If suspected hazardous materials are encountered during construction, work would cease at the location and the City of Phoenix Street Transportation Department at (602.262.6284) would be contacted to arrange for proper assessment, treatment, or disposal of the suspect materials.

Conclusions

The Build Alternative would not impact any know hazardous materials site. Testing for the presence of ACM and LBP would be conducted on suspect materials that could be impacted by construction. In addition, ADOT should maintain compliance with ASTM investigation requirements by performing updates to the PISA during design.

The No-Build Alternative would not impact sites of potential concern for hazardous materials or any suspect materials.

N. Secondary Impacts

Actions that may induce secondary (or indirect) impacts are perhaps less obvious than those identified as direct impacts, more difficult to quantify, additive in nature, or long-term in occurrence and effect. This

section identifies the likely, foreseeable secondary impacts that would result from the construction of the proposed roadway; any cumulative impacts are addressed in the following section.

FHWA is required to implement NEPA and the CEQ guidelines under 23 CFR Part 771. FHWA has developed interim guidance on the analysis of indirect and cumulative impacts (FHWA 2003b), which supplements the CEQ guidance. Combined, these documents provide the primary basis for analysis. The classification of secondary and cumulative impacts, in accordance with FHWA guidance, is presented in Table 22.

TABLE 22. SECONDARY AND CUMULATIVE IMPACTS CLASSIFICATION.

Impact Category	Impact Classification	Description
Type	Neutral, positive, or negative	Compares the final condition of a given resource with its existing condition (assumes that the expected impact occurs); impacts on personal property are considered negative
Severity	Minor, moderate, or substantial	Considers the relative contribution of the proposed action to a given impact
Duration	Temporary or permanent	Assumes "permanent" unless otherwise specified

Source: FHWA (1992 and 2003b)

Secondary impacts are reasonably foreseeable consequences of the action, but are later in time or farther removed in distance. Secondary impacts "may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR §1508.8).

The analysis of secondary impacts from the Build Alternative concentrates on reasonably foreseeable future actions that could contribute to impacts on key environmental considerations. Land development plans for the study area will convert the remaining undeveloped land to suburban uses. The Build Alternative is an integral part of the transportation element of these plans. As the land development occurs, the implementation of the Build Alternative would sustain the expansion of this development at

its currently planned density. The documented natural, physical, and cultural resources of the study area would presumably be impacted as these development plans and the Build Alternative are implemented.

The No-Build Alternative is also a part of the development plans for the area, only differing from the published plans and Build Alternative by having no connection to SR 51. This would decrease the efficiency of the transportation network when compared to the Build Alternative and would result in increased traffic congestion and travel times for motorists. This traffic congestion may reach levels that would reduce desirability of the area for prospective residents or as a potential place of employment for people. This may cause less than anticipated demand for growth and development plans would need to be revised with the likely result being plans for less overall development or development at lower densities. Although this may leave more of the study area and vicinity undeveloped and have fewer impacts to the natural and physical environment, it would also impact the population and economic growth of the area as well as intangible aspects such as quality of life.

O. Cumulative Impacts

Cumulative impacts include the direct and indirect impacts of a project together with the impacts of all other anticipated past, present, and reasonably foreseeable future actions in the area including those of others. This analysis of cumulative impacts concentrates on current and future actions that could contribute to cumulative impacts on the key considerations of land use, socioeconomics, noise levels, air quality, prime and unique farmland, water resources, cultural resources, and biological resources. Past, present, and reasonably foreseeable future actions considered in this analysis are the result of planned/proposed projects developed by Reclamation, Phoenix, FCDMC, ADOT, FHWA and MAG, and private developers.

For this cumulative impacts assessment, past, present, and reasonably foreseeable future transportation projects and non-transportation related projects are considered. This EA assumes that Phoenix and

ASLD development plans would be implemented within the study area. The implementation of these land development plans, in part or in whole, would occur regardless of whether the Build or No-Build Alternative is implemented.

Past Actions/Completed Projects

This section describes existing conditions of the applicable environmental resources and considerations that exist from some of the past actions or projects completed since 2000:

- The completion of the SR 51/SR 101L freeways and TI
- Addition of high-occupancy vehicle lanes along SR 101 and SR 51
- Reach 11 recreation facilities
- Area-wide housing subdivisions within the Desert Ridge development
- Construction of Fireside Elementary School

On-Going/Present Actions

Within the study area, on-going or present actions that have a cumulative impact on the Build Alternative include:

- Construction of Sonoran Desert Drive

Reasonably Foreseeable Future Actions

- Expansion of recreation facilities in Reach 11
- Planned residential and commercial developments

When combined with past, present, and future actions, the Build or No-Build alternatives would be part of the transition of the study area vicinity from undeveloped desert to urban and suburban uses. The transition may occur at a faster rate under the Build scenario compared to the No-Build. This transition would impact natural resources such as general wildlife habitat, drainage and water resources, and visual resources. However, the implementation of the Build or No-Build alternatives alone would not have the

magnitude of impacts that the surrounding land development would create. Therefore, the anticipated impacts that would result from either alternative would not be substantial.

P. Summary of Impacts

Table 23 summarizes and compares the environmental impacts of the Build and No-Build alternatives.

TABLE 23. SUMMARY OF ENVIRONMENTAL IMPACTS.

Environmental Consideration	Build Alternative	No-Build Alternative
Land Use	Would conform to planning documents; therefore, would cause minimal change to existing and future land uses	Would partially conform to planning documents: would negatively impact the development of the study area due to increased traffic congestion
Socioeconomic Conditions	Would not disproportionately impact protected populations or involve residential displacement	Would not disproportionately impact protected populations or involve residential displacement
Cultural Resources	Would not adversely affect historic properties	Would not adversely affect historic properties
Section 4(f)	Would not convert any portion of Section 4(f) properties that are for recreation to transportation uses	Would not impact any Section 4(f) property
Air Quality	Would not result in any exceedances of the NAAQS	Would not result in any exceedances of the NAAQS
Traffic Noise Levels	Receivers would be impacted but effective mitigation would not be possible with the Phoenix municipal code that restricts wall heights; mitigation for impacted receptors in the Wildcat Ridge neighborhood would be evaluated by ADOT and addressed in a separate project	Receivers would be impacted but effective mitigation would not be possible with the Phoenix municipal code that restricts wall heights; mitigation for impacted receptors in the Wildcat Ridge neighborhood would be evaluated by ADOT and addressed in a separate project
Utilities	Would require several utility relocations	Would require several utility relocations
Visual Resources	Would be compatible with character of study area	Would be compatible with character of study area
Drainage and Floodplains	Would maintain drainage is accordance with existing plans and permits; potential impacts to floodplains would be monitored during final design or the land development approval process	Would maintain drainage is accordance with existing plans and permits; potential impacts to floodplains would be monitored during final design or the land development approval process
Water Resources (Sections 401, 402, and 404)	Waters of the US would be treated in accordance with existing 404 permits or with 404 permits to be acquired for construction	Waters of the US would be treated in accordance with existing 404 permits or with 404 permits to be acquired for construction
Biological Resources	Would impact general vegetation and wildlife; would not impact currently listed Threatened or Endangered Species; would impact one candidate species and species protected under the Migratory Bird Treaty Act; approximately 65 acres of permanent disturbance would occur as a result of the Build Alternative	Would impact general vegetation and wildlife; would not impact currently listed Threatened or Endangered Species; would impact one candidate species and species protected under the Migratory Bird Treaty Act; approximately 55 acres of permanent disturbance would occur as a result of the No-Build Alternative

Environmental Consideration	Build Alternative	No-Build Alternative
Hazardous Materials	Not anticipated to impact hazardous materials	Not anticipated to impact hazardous materials
Secondary Impacts	Continued urbanization of the study area and vicinity is likely to occur in accordance with adopted development plans and would continue to impact natural resources	Although it may occur at a slower rate than with the Build Alternative, continued urbanization of the study area and vicinity is likely to occur in accordance with adopted development plans and would continue to impact natural resources
Cumulative Impacts	BMB and its ramp connections with SR 51 would be part of a pattern of continued transition from natural desert to suburban uses in the study area and vicinity, but the implementation of this alternative alone would not result in substantial impacts	BMB, even without ramp connections to SR 51, would be part of a pattern of continued transition from natural desert to suburban uses in the study area and vicinity, but the implementation of this alternative alone would not result in substantial impacts

Q. Conclusion

The City of Phoenix, ADOT, and FHWA have determined that the Build Alternative is the alternative that best meets the project's purpose and need and will be carried forward as the preferred alternative.

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V. Public Involvement/Agency Coordination

A. Agency and Public Scoping

To identify government agencies that have an interest in the study area through landownership, jurisdiction, or that may have involvement permitting or authorizing a future action, agencies were contacted by mail and invited to an agency scoping meeting held on January 24, 2012. The following agencies were invited:

- ADEQ
- Arizona Department of Public Safety
- ADOT
- ADWR
- AGFD
- ASLD
- CAWCD
- Corps
- FCDMC
- FHWA
- Maricopa County
- National Memorial Cemetery of Arizona
- Paradise Valley Unified School District/PHS
- Phoenix
- Reclamation
- Valley Metro (concessionaire that provides county wide transit services)
- USFWS
- Western

The detailed list of agency scoping meeting invitees, the invitation, attendees, and their comments are provided in Appendix C. In addition to the verbal comments given by attendees, the invitation to the agency scoping meeting also generated written responses from ADEQ, Arizona Department of Public Safety, ADOT, AGFD, Phoenix, Reclamation, and USFWS (Appendix C).

The Corps, Reclamation, VA, and Western were invited to be cooperating agencies in the preparation of this EA. Agencies with jurisdiction over all or portions of the study area, or that have special expertise that is relevant to environmental analyses and the preparation of NEPA documentation, can become cooperating agencies in accordance with 40 CFR 1501.6 and 1508.5. Cooperating agency invitation letters and responses are also included in Appendix C. The Corps and Reclamation accepted the invitation, VA declined, and Western did not respond.

Coordination meetings with agencies outside of the January 24, 2012, meeting were conducted with the Phoenix Desert View Village Planning Committee, Reclamation and CAWCD, FCDMC, ASLD, and National Memorial Cemetery of Arizona. These meetings are listed in Table 24 and notes are included in Appendix C.

TABLE 24. AGENCY AND PUBLIC OUTREACH MEETINGS.

Meetings	Dates
Fireside HOA	October 24, 2011, and October 24, 2012
Aviano HOA	November 8, 2011 and November 24, 2012
Desert Ridge Community Association	November 15, 2011 and October 9, 2012
Desert View Village Planning Committee	December 6, 2011 and October 2, 2012
Tatum Highlands HOA	January 3, 2012
Reclamation and CAWCD	January 23, 2012
Agency Scoping	January 24, 2012
Public Scoping	January 25, 2012 and January 26, 2012
Stakeholder Group Workshops	January 10, 2012, March 13, 2012 and August 23, 2012
FCDMC	March 1, 2012
Public Workshops	March 27, 2012, March 28, 2012 and April 3, 2012
ASLD	April 24, 2012, and July 10, 2012
National Memorial Cemetery of Arizona	July 25, 2012
Public Open House	August 30, 2012

B. Public Information Meetings

Public scoping meetings were held on January 25 and 26, 2012, to inform residents and local HOA representatives of the study and solicit their input. The public was made aware of these meetings through:

- Approximately 7,000 notices distributed to residences and businesses through door hangers
- 25 notifications posted at highly visible locations throughout the study area and vicinity
- Advertising in the Arizona Republic in the January 11 and 18, 2012, editions
- Provided HOA boards (Aviano, Fireside, Wildcat Ridge, Tatum Highlands, and Desert Ridge Community Association) with meeting notifications to be disseminated to their communities
- Distributed 66 e-mails to recipients in the study's database of interested parties
- A study website (blackmountainblvd.com) was launched to inform the public of upcoming meetings and to solicit comments

As a follow up to the January 2012 public meetings, a series of three public workshops were held on March 27 and 28, and April 3, 2012. The purpose of these workshops was to solicit specific input on the alternatives developed to-date by the study team, and also to gather any information for the development of additional alternatives based upon public input. Similar to the January meetings, the public was made aware through:

- Approximately 6,800 notices distributed to residences and businesses through door hangers
- Approximately 300 notices were mailed to recipients in gated communities where door hangers could not be distributed
- 25 notifications posted at highly visible locations throughout the study area and vicinity
- Advertising in the Arizona Republic in the March 14, 16 and 17, 2012, editions
- Provided HOA boards (Aviano, Fireside, Wildcat Ridge, Tatum Highlands, and Desert Ridge Community Association) with meeting notifications to be disseminated to their communities
- Distributed 212 e-mails to recipients in the study's database of interested parties

- The study website (blackmountainblvd.com)

Appendix G contains the summary for both the January and March/April meetings.

The most recent public meeting for the study prior to the upcoming public hearing was held on August 30, 2012, along with several other presentations shown in Table 24. The purpose of this open-house meeting was to inform the public of the results of the screening analysis for alternatives, and describe the alternative being carried forward for analysis in the EA and those that were eliminated from further consideration. Public notification for this meeting was similar to previously listed methods, but with advertising in the Arizona Republic occurring on August 15, 16 and 18, 2012. A summary of the written comments from this meeting are included in Appendix G.

All public comments gathered from comment cards returned to the study team at the public meetings and workshops, comment cards returned to the study team by mail, and comments registered through the study website have been transcribed into the public meeting and workshop summaries (Appendix G, Public Scoping Meeting Summary for January 25 and 26, 2012, Public Workshop Summary for March 27 and 28, and April 3, 2012, and Public Open House Summary for August 30, 2012) and redacted into a frequently asked questions page on the study website. These comments, grouped by category, and responses from the study team are available at the aforementioned blackmountainblvd.com.

As documented in the public meeting and workshop summaries (Appendix G), many of the public comments voiced at meetings and in written feedback concerned the proximity of a future arterial street to existing residential development and the safety of pedestrians, especially school children. To address these concerns and incorporate public input into decision making, alternatives were developed to consider alignments that would slow traffic, incorporate special pedestrian facilities, or move the alignment away from schools and neighborhoods. This input was used to develop Alternatives 1A-S and 2-S which would incorporate traffic calming adjacent to the school and construct a dedicated pedestrian

bridge. Alternative 3-S, which would be constructed on an alignment to the west of PHS and away from the majority of student-related pedestrian traffic, was also developed in response to public input. For the portion of the study north of Pinnacle Peak Road, residents of the Tatum Highlands subdivision requested that a buffer be preserved between them and alternative alignments for BMB. This resulted in the development and evaluation of Alternatives 2-N and 3-N.

The process for evaluating alternatives and determining which alternatives would be carried forward in this EA included criteria that were identified as being important to the public. These criteria included the broad category of "public input" or how well the alternatives met public expectations and addressed concerns expressed through public involvement and outreach efforts, pedestrian safety, and traffic noise impacts. To ensure the criteria indentified as being important to the public were adequately considered in decision making, these criteria were weighted more heavily than others (Appendix B).

Other comments received from the public centered on issues created by the lack of student parking at PHS. This condition causes students to park on the streets of the adjacent Wildcat Ridge and Desert Ridge subdivisions and walk to the PHS campus. Members of the public expressed concern that if BMB were to be constructed, the flow of pedestrian traffic between PHS and adjacent subdivisions would be dangerous due to excessive motorist speeds and jaywalking. As discussed above, the study team developed alternatives incorporating traffic calming to reduce speeds and a pedestrian bridge to address these public concerns. In addition, the study team proposed constructing additional parking at PHS to reduce pedestrian traffic between the adjacent subdivisions and PHS. Due to the constraints on how MAG regional funding and federal aid funding can be spent, additional parking at PHS cannot be constructed as part of the Build Alternative should that be the alternative implemented. However, the study team has been working with the administration of PHS and ASLD to facilitate a land sale that would allow PHS to expand its campus and construct more parking as part of a separate project from BMB.

Members of the public also expressed the desire for the study to not only consider alternatives that would connect BMB to northbound and southbound SR 51, but that would also construct ramp connections for BMB to access eastbound and westbound SR 101L. As discussed in Chapter III Alternatives, MAG did not identify connections between BMB and SR 101L during their regional transportation planning process. Thus, SR 101L ramps were beyond the scope of this study. However, the construction of BMB to SR 51 ramps, should the Build Alternative be implemented, would not preclude the possibility of SR 101L ramps being constructed at a later date. If members of the public are interested in participating in regional transportation planning with MAG, it is encouraged by MAG for them to do so. Additional information and opportunities to participate are available through their website (www.azmag.gov) or by telephone (602.254.6300).

To further assist the study team with decision making, identifying important issues, and disseminating information to the public, a stakeholder group comprised of HOA representatives and agency representatives from ASLD, PHS, and Reclamation met on January 10, March 13, and August 23, 2012. Summaries of the stakeholder meetings are included in Appendix G.

The study team also attended HOA meetings to keep community representatives informed and gather comments. Meetings with the Fireside, Aviano, and Tatum Highlands HOAs and the Desert Ridge Community Association are listed in Table 24. Notes for these meetings are included in Appendix G, or in cases where a slideshow was presented without a question-and-answer session, the slideshow has been included.

C. Public Hearing

A public hearing for this Draft EA is anticipated to occur in June 2013. A summary of public comments received following distribution of the Draft EA and during the public hearing comment period would be provided in the Final EA. The public testimony gathered during the Draft EA comment period and from

the public hearing will be used, along with the analysis presented in this EA, by the lead federal agency and joint lead agencies in the decision to pursue either a No-Build Alternative or Build Alternative.

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References

Aguila, Lourdes L. 1999. *Cultural Resources Survey of Six Parcels Near Loop 101 and SR 51, Phoenix, Maricopa County, Arizona.* No. 99-38A. Archaeological Consulting Services, Ltd., Tempe.

Arizona Department of Commerce. 2010. Population Estimates. http://www.azcommerce.com/econinfo/demographics/Population+Estimates.html. Accessed March 2010.

Arizona Department of Environmental Quality (ADEQ). 2009. *2008 Air Quality Annual Report*. Phoenix

Arizona Department of Environmental Quality (ADEQ). 2012. Water Quality Assessments by Watershed and Impaired Waters Lists. Available at: http://www.azdeq.gov/environ/water/assessment/assess.html Accessed 10/30/2012

Arizona Department of Transportation (ADOT). 1993. *Arizona Functional Classification Guidelines*. Phoenix.

_____. 2000. *Squaw Peak Freeway (SR 51) Preliminary Bridge Selection Report (30% Design): Bell Road to Pima Freeway (101L)*. Prepared by DMJM, Phoenix.

_____. 2004. *Arizona Long-Range Transportation Plan (MoveAZ)*. Phoenix. Prepared by Cambridge Systematics Inc. Cambridge, Massachusetts.

_____. 2008. Standard Specifications for Road and Bridge Construction. Phoenix.

_____. 2010a. Initial Drainage Report, State Route 802, Williams Gateway Freeway (State Route 202L – Ellsworth Road). Prepared by AECOM and J2 Engineering and Environmental Design. Phoenix.

_____. 2010b. 2011–2015 Tentative Five-Year Transportation Facilities Construction Program. Phoenix.

_____. 2011. *Noise Abatement Policy*, July 13, 2011. Phoenix.

Arizona Department of Water Resources (ADWR). 2012. Groundwater Site Inventory. Available at: https://gisweb.azwater.gov/waterresourcedata/. Accessed 10/30/2012.

Arizona Game and Fish Department (AGFD). 2004. *Glaucidium brasilianum cactorum* occurrences in Arizona. Unpublished map prepared by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix.

Arizona Game and Fish Department (AGFD). 2007. "Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects." Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ.

Arizona Office of Employment and Population Statistics. 2012. Census Data and Population Estimates. http://azstats.gov/population-data-query-tool/. Accessed June 2012.

Arizona State Land Department (ASLD). 1990, as revised through 2010, *Desert Ridge Specific Plan: Master Plan and Development Regulations* and *Desert Ridge.* Prepared by ASLD and Northeast Phoenix Partners, Phoenix.

_____. 2008. *Tatum East-West (Azara) Infrastructure Masterplan*. Prepared by ASLD, Phoenix.

_____. 2012. ASLD website. http://www.land.state.az.us/index.html. Accessed June 2012.

ASTM International. 2006. ASTM Standards on Environmental Site Assessments for Commercial Real Estate. West Conshohocken, Pennsylvania.

Boloyan, David S. 2002. "Archaeological Survey: Arizona State Trust Land in Sections 13 & 14 (T4N R 3E), Maricopa County, Arizona" (ASLD Application No. 53-107189). Ms. on file, David S. Boloyan Archaeological Services, Tempe.

BRW. 1988. "Cultural Resource Pedestrian Visual Reconnaissance Survey and Records Review." Ms. on file, Arizona State Museum, Tucson.

Center for Biological Diversity (CBD). 2004. Petition to List the Tucson Shovel-nosed Snake (*Chionactis occipitalis klauberi*) as an Endangered Species. Ms. on file, CBD, Tucson.

Curtis, Ross, and Lyle M. Stone. 1988. *Cultural Resources Survey of a Ten Mile Long Segment of the Proposed Outer Loop Freeway Between 15th Avenue and Scottsdale Road, North-Central Maricopa County, Arizona*. Report No. 88:31. Archaeological Research Services, Inc., Tempe.

Federal Emergency Management Agency. 2012. Floodplain Mapper. https://hazards.fema.gov. Accessed June 2012.

Federal Highway Administration. 1978. *Highway Traffic Noise Prediction Model*, FHWA-RD-77-108. Washington, D.C.

_____. 1993. *Air Quality Analysis for NEPA Documents – A Discussion Paper*. Washington, D.C.

_____. 1995. *Highway Traffic Noise Analysis and Abatement Policy and Guidance*. Washington, D.C.

_____. 1996. *Measurement of Highway-Related Noise*, FHWA-PD-96-046. Washington, D.C.

_____. 2002. Greenhouse Gas and NEPA. http://knowledge.fhwa.dot.gov/ReNEPA/ReNepa.nsf/All+Documents/0746B5060E7D212385256E5800723B1F/$FILE/NEPA%20global%20warming%20WA%20Project.doc. Accessed July 2010.

_____. 2003. *Interim Guidance on Purpose and Need*. Washington, D.C.

_____. 2005b. *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*. http://www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemission2.htm. Accessed September 2012.

_____. 2005c.*Transportation-Related Air Toxics: Case Study Materials Related to US 95 in Nevada*. http://www.fhwa.dot.gov/environment/airtoxic/casesty6.htm. Accessed May 2010.

_____. 2006a. *Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Environmental Review Process Final Guidance*. Washington, D.C.

_____. 2006b. *Interim Guidance on Air Toxic Analysis in NEPA Documents*. Washington, D.C.

_____. 2006c. *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas*. Washington, D.C.

Gunn, Trevor. 1993. *Cultural Resources of Various Easements for the Tatum Ridge Development near Jomax Road and Tatum Boulevard in Northeastern Phoenix, Maricopa County, Arizona*. Report No. 93:26. Archaeological Research Services, Inc., Tempe.

Hinman, K.E. and T.K. Snow, eds. 2003. *Arizona Bat Conservation Strategic Plan. Nongame and Endangered Wildlife Program.*, Technical Report 213. Arizona Game and Fish Department, Phoenix.

Hudak, G. Joseph. 1989. "Phase I Archaeological/Geomorphological Testing of Additional 160 Acres of Desert Ridge Development." Ms. on file, Arizona State Museum, Tucson.

Kirvan, Chad V., Margaret A Windsor, Eric S. Cox, Kate A. Compton-Gore, and A.E. (Gene) Rogge. 2006. *Cultural Resource Survey of the Arizona State Land Department Tatum East-West Planning Area, Phoenix, Arizona.* URS Cultural Resource Report 2006-4(AZ). URS Corporation, Phoenix.

Langan, John S. 2012. *Cultural Resources Report for the Proposed Black Mountain Boulevard, Phoenix, Maricopa County, Arizona*. Report No. AZE1134. AZTEC Engineering Group, Inc., Phoenix.

Langan, John S., and Courtney C. Rehar. 2010. *Addendum Survey for New Right-of-Way and Easements along Sonoran Boulevard, Phoenix, Maricopa County, Arizona*. Report No. AZG0901-01. AZTEC Engineering, Inc., Phoenix.

Luhnow, Glennda, Kris Dobschuetz, and Kimberley A. Ryan. 2002. *A Cultural Resource Survey for the North Valley Transmission Line Project, Maricopa County, Arizona.* Cultural Resources Technical Paper No. 2002-16. Environmental Planning Group, Inc., Phoenix.

Maricopa Association of Governments (MAG). 2003. List of Original ALCP Projects in the RTP. http://www.azmag.gov/Documents/pdf/cms.resource/List_of_Original_ALCP_Projects_in_RTP11802.pdf. Accessed June 2012.

_____. 2008. Population Growth in Maricopa County 1912-2030. http://www.azmag.gov/Documents/pdf/cms.resource/POPTAC_2008_Population-Growth-in-Maricopa-County_1912-2030.pdf. Accessed June 2012.

_____. 2011. 2011 TAZ Data. Provided by MAG via Stanley Consultants Incorporated 2012.

Maricopa County Air Quality Department. 2012. *2011 Air Monitoring Network Review.* Phoenix.

Maricopa County Trail Commission. 2004. *Maricopa County Regional Trail System Plan*. http://www.maricopa.gov/parks/MaricopaTrail/pdf/TrailPlan.pdf. Accessed May 2010.

Mitchell, Douglas R. 1997. Archaeological Survey for the Proposed Paradise Valley Desert Ridge High School, Phoenix, Maricopa County, Arizona. Archaeological Report Series No. 97-133. SWCA, Inc., Environmental Consultants, Phoenix.

Muñoz, A. René, and Daniel H. Sorrell. 2006. *Cultural Resources Survey Report for the Black Mountain Parkway—Rough Rider Road to Pinnacle Peak Road, Phoenix, Maricopa County, Arizona*. Report No. 03-674:67. EcoPlan Associates, Inc., Mesa.

Phoenix, City of. 1995. *Outer Loop Freeway Specific Plan: Agua Fria and Pima Freeways (Loop 101)*.

_____. 2002. *General Plan*.

_____. 2010. Street Classification Map. http://phoenix.gov/planning/stclass.pdf. Accessed June 2012.

_____. 2012. *Out of the Ashes*. http://phoenix.gov/citygovernment/facts/history/index.html. Accessed June 2012.

Rex, Tom R. 2000. *Development of Metropolitan Phoenix: Historical, Current and Future Trends*. Center for Business Research, L. William Seidman Research Institute, College of Business, Arizona State University, Tempe.

Ruble, Ellen. 1998. *A Cultural Resources Survey of the Desert Ridge Development, North Scottsdale, Maricopa County, Arizona*. Report No. 97-19. Northland Research, Inc., Flagstaff.

Shepard, Kristopher S. 1998. *Cultural Resources Survey of a 50-Acre Parcel of Private Land Southwest of the Intersection of 40th Street and Rose Garden Lane in North Phoenix, Maricopa County, Arizona*. Report No. 98-70. Archaeological Research Services, Inc., Tempe.

Turner, R. M., and D. E. Brown. 1994. "Sonoran Desertscrub" in *Biotic Communities: Southwestern United States and Northwestern Mexico* (edited by D. E. Brown). University of Utah Press, Salt Lake City. Section 154.1, pp. 181–192.

United States Bureau of Reclamation. 2002. *Record of Decision, Central Arizona Project Reach 11 Recreation Area Master Plan Final Environmental Impact Statement*.

United States Census Bureau. 2000. Data Set: Census 2000 Summary File 3 (SF3) Sample Data, 17 http://www.factfinder.census.gov/. Accessed May 2010.

_____. 2009. *Population Estimates*. http://www.census.gov/popest/counties/CO-EST2009-popchg2000_2009.html. Accessed August 2010

_____. 2010. *County Business Patterns*. http://www.census.gov/econ/cbp/index.html. Accessed May 2010.

United States Department of Agriculture (USDA). 2009. Natural Resource Conservation Service Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed April 2009.

United State Department of Transportation. 2007. *An Analysis of Airports and Metropolitan Area Demand and Operational Capacity in the Future*. Prepared by MITRE Corporation, Bedford, Massachusetts.

United States Environmental Protection Agency (Office of Air Quality Planning and Standards). 1992. *Guideline for Modeling Carbon Monoxide from Roadway Intersections*. Publication EPA-454/R-92-005. Washington, D.C.

_____. 1995. User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections. Publication EPA-454/R-92-006 (revised).

_____. 2006. *National Oil and Hazardous Substances; Pollution Contingency Plan; National Priorities List*. http://epa.gov/fedrgstr/EPA-WASTE/2006/August/Day-14/f13298.htm.. Accessed October 2007.

United States Fish and Wildlife Service (USFWS). 2000. Recommended Guidance for Private Landowners Concerning the Cactus Ferruginous Pygmy-owl.

_____.2007. Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*). 5-year Review. August 30, 2007.

_____.2008. Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*). General Species Information. <http://www.fws.gov/southwest/es/arizona/Cactus.htm>. Accessed December 7, 2008.

_____.2010a. "Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Tucson Shovel-Nosed Snake (*Chionactis occipitalis klauberi*) as Threatened or Endangered with Critical Habitat". Federal Register 75(61): 16050–16065.

United States Fish and Wildlife Service (USFWS). 2012. Maricopa County, Arizona Species List. <http://www.fws.gov/southwest/es/arizona/Threatened.htm#CountyList> . List Date: October 3, 2012.

White, Joel, and A. E. (Gene) Rogge. 2001. *Cultural Resources Survey for Nextel Communication Tower Project: Pasadena AZ 0300, Phoenix, Maricopa County, Arizona*. Cultural Resources Report No. 2001-29(AZ), URS Corporation, Phoenix.

Wright, Thomas E. 1992. “A Cultural Resources Survey of Ca. 400 Acres of Private Land near Tatum Blvd. and Jomax Road in Northeastern Phoenix, Maricopa County, Arizona.” Ms. on file, Archaeological Research Services, Inc., Tempe.

Glossary

1,3-butadiene: A colorless gas with a mild, gasoline-like odor. Major sources of airborne 1,3-butadiene include combustion byproducts from motor vehicle engines, manufacturing, and other processes; forest fires; and cigarette smoking. Exposure to 1,3-butadiene causes irritation of the eyes, nasal passages, throat, and lungs in low concentrations. 1,3-butadiene has recently been reclassified from a probable human carcinogen to a known human carcinogen.

100-year floodplain: Areas that are subject to a 1 percent or greater chance of flooding in any given year.

500-year floodplain: Areas that are subject to a 0.2 percent or greater chance of flooding in any given year.

Acrolein: A colorless or yellow liquid with a disagreeable odor. It dissolves in water very easily and quickly changes to a vapor when heated. It also burns easily. Small amounts of acrolein can be formed and can enter the air when trees, tobacco, other plants, gasoline, and oil are burned. Acrolein is used as a pesticide to control algae, weeds, bacteria, and mollusks. It is also used to make other chemicals.

A-weighted decibel (dBA): Sound levels are measured on three weighted scales: A., B, and C. The A scale most closely represents the range of human hearing; therefore, measurements of roadway noise use the A-weighted decibel. The approximate threshold of hearing is 0 dBA, while the approximate threshold of pain is 140 dBA. Most suburban areas have daytime noise levels ranging from 50 to 70 dBA.

Arizona Department of Transportation (ADOT): The state agency responsible for providing and maintaining state roads, highways, and other transportation modes.

arterial street: A street that provides a high degree of mobility through an urban area, as opposed to collector and local streets, which emphasize access to adjacent land uses.

benzene: A volatile, colorless, highly flammable liquid that dissolves easily in water and has a sweet odor. Benzene is found in emissions from motor vehicle engines, in combustion products from burning coal and oil, and in the gases resulting from evaporation of gasoline and industrial solvents. Tobacco smoke contains benzene and accounts for nearly half the national exposure to benzene. Benzene exposure causes drowsiness, dizziness, headaches, unconsciousness, vomiting, convulsions, and irritation to the eyes, skin, and upper respiratory tract. Benzene is a known human carcinogen. Chronic exposure to benzene causes blood disorders and chromosomal aberrations.

carbon monoxide (CO): A colorless, odorless gas resulting from the incomplete combustion of carbon-based fuels, including petroleum products. In most areas, vehicle emissions are the primary source of carbon monoxide.

census tract: A small statistical subdivision of a county that is designed to be relatively permanent. The US Census Bureau goal is for census tracts, when originally designated, to have between 2,500 and 8,000 people and to be relatively homogeneous with respect to population characteristics, economic status, and living conditions. Census tracts never cross county boundaries.

cooperating agency: agencies other than the lead or joint-lead agencies that have jurisdiction over part or all of a project area, or that possess special expertise, that assist with the environmental analyses or preparation of documentation for a NEPA study.

Criterion A: Cultural resources may qualify for listing in the National Register of Historic Places under this criterion if they are associated with events that have made a significant contribution to the broad patterns of our history.

Criterion B: Cultural resources may qualify for listing in the National Register of Historic Places under this criterion if they are associated with the lives of persons significant in our past.

Criterion C: Cultural resources may qualify for listing in the National Register of Historic Places under this criterion if they embody the distinctive characteristics of a type, period, or method of construction; or represent the work of a master; or possess high artistic values; or represent a significant and distinguishable entity whose components may lack individual distinction.

Criterion D: Cultural resources may qualify for listing in the National Register of Historic Places under this criterion if they have yielded, or may be likely to yield, information important in prehistory or history. Unless preservation in place is warranted, Criterion D cultural resources sites generally do not qualify for protection under Section 4(f) of the Federal Department of Transportation Act of 1966, as amended.

cumulative impact: The impact on the environment that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

environmental assessment (EA): A federally mandated report that includes brief discussions of a project need, alternatives, environmental impacts associated with alternatives, and a listing of individuals and agencies consulted. An EA is conducted to decide whether to prepare a finding of no significant impact (FONSI) or to undertake the preparation of an environmental impact statement.

Federal Highway Administration (FHWA): A branch of the US Department of Transportation responsible for administering the Federal-aid Program, among other programs. The program provides financial resources and technical assistance for constructing, preserving, and improving the National Highway System, along with other urban and rural roads.

floodplain: A lowland and relatively flat area that adjoins inland and coastal waters and is covered with water during floods.

formaldehyde: At room temperature, formaldehyde is a colorless, flammable gas that has a distinct, pungent smell. It is also known as methanal, methylene oxide, oxymethyline, methylaldehyde, and oxomethane. Formaldehyde is naturally produced in small amounts in our bodies. Smog is a major source of formaldehyde exposure. It is used in the production of fertilizer, paper, plywood, and urea-formaldehyde resins. It is also used as a preservative in some foods and in many products used around the house, such as antiseptics, medicines, and cosmetics.

maintenance area: Areas that were formerly nonattainment that have improved and are no longer violating or contributing to violations of the air quality standard. Maintenance areas retain their classification for 20 years after they are designated as attainment.

mobile source air toxics (MSAT): Air pollutants emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

naphthalene: A white solid that evaporates easily. Fuels such as petroleum and coal contain naphthalene. It is also called white tar and tar camphor, and has been used in mothballs and moth flakes. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell. The major commercial use of naphthalene is in the manufacture of polyvinyl chloride (PVC) plastics. Its major consumer use is in moth repellents and toilet deodorant blocks.

nonattainment area: Areas where air pollution levels persistently exceed the national ambient air quality standards.

particulate matter ($PM_{2.5}$): This pollutant consists of particles with diameters less than 2.5 microns. Sources include fuel combustion, power plants, and diesel vehicles.

particulate matter (PM_{10}): This pollutant, measuring 10 microns or less in diameter, consists of suspended dust, fibers, combustion ash, and other fine particles. The major source is industrial emissions, but PM_{10} also results from diesel vehicle emissions, travel on unpaved roadways, and agricultural and construction activities.

polycyclic organic matter (POM): A broad class of compounds that includes the polycyclic aromatic hydrocarbon compounds (PAHs), of which benzo[a]pyrene is a member. POM compounds are formed primarily from combustion and are present in the atmosphere in particulate form. Sources of air emissions are diverse and include cigarette smoke, vehicle exhaust, home heating, laying tar, and grilling meat.

Section 4(f): A section of the Department of Transportation Act of 1966, as amended. The section stipulates that the Secretary of Transportation cannot approve the use of land from a significant publicly owned public park, recreation area, wildlife or waterfowl refuge, or significant cultural resource unless there is no prudent and feasible alternative to the use of that land and unless the action includes all possible planning to minimize harm to the property resulting from its use.

secondary impact: A change that is caused by an action and is later in time or farther removed in distance, but is still reasonably foreseeable. Secondary impacts may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air, water, and other natural systems, including ecosystems.