Pre-Final Design Concept Report

INTERSTATE 10 NEAR TERM IMPROVEMENTS
(SR 143 – SR 202L, Santan/South Mountain)

VOLUME 1 OF 3

ADOT CONTRACT NO. 2005-026
PROJECT NO. 010 MA 153 H8768 01L
FEDERAL NO. 010-C(213)S

Prepared For:

Arizona Department of Transportation

Prepared By:

AECOM

7720 North 16th Street, Suite 100
Phoenix, Arizona 85020

AUGUST 2016

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ON THE MOVE
PARTNERS IN PROGRESS

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EXECUTIVE SUMMARY

Introduction

The Arizona Department of Transportation (ADOT) in cooperation with the Federal Highway Administration (FHWA) is preparing a Design Concept Report (DCR) and environmental study to evaluate near-term freeway capacity improvements for the segment of Interstate 10 (I-10) between State Route (SR) 143 and the SR 202L Santan/South Mountain Freeway. The purpose of this study is to evaluate existing roadway conditions and determine improvements to I-10 that will improve the traffic operational characteristics of the existing freeways within the study area, which will benefit the mobility of regional and local travelers.

This Design Concept Report (DCR) describes the development, evaluation, and screening of near-term capacity improvement alternatives on I-10 from SR 143 (Milepost 153.5) to the Santan/South Mountain Freeway (Milepost 160.9). This project is located in the Arizona Department of Transportation's (ADOT's) Phoenix District within Maricopa County in south-central Arizona. The study area also includes the segment of US 60 from the I-10/US60 Traffic Interchange (TI) (Milepost 172.0) east to Hardy Drive (Milepost 173.0).

Traffic demand is causing the I-10 corridor and adjacent local arterial street system to become increasingly congested during the morning and evening peak travel periods. Future traffic volume projections indicate the congestion will continue to worsen causing further travel delays and increased travel times for those using the I-10 corridor. Increased congestion on I-10 will cause travelers to divert their trips to other freeway corridors and the local arterial street system, causing these transportation facilities to become increasingly congested as well. Improvements to the I-10 corridor are necessary to increase the freeway capacity and help alleviate increased levels of traffic congestion on all components of the overall transportation system in the study area.

The goal of this study is to develop and objectively evaluate all reasonable alternatives in order to develop near-term capacity improvements and select a Preferred Alternative that meets the goals of the Regional Transportation Plan Freeway Program (RTPFP), satisfies the requirements of the National Environmental Policy Act (NEPA), and obtains public support. This study will seek to optimize the traffic operations within the corridor for the projected Design Year 2035 traffic demand, to retain local access at existing traffic interchanges, and to minimize or mitigate impacts the improvements may have on the surrounding community. In conjunction with the DCR a Categorical Exclusion will be developed in support of this study.

Regional Planning

The Maricopa Association of Governments (MAG), Regional Public Transportation Authority (Valley Metro) and ADOT have worked together for many years to develop a comprehensive plan for the Regional Freeway System that is included in the Regional Transportation Plan (RTP) that was adopted by the MAG Regional Council in November 2003.

The voters of Maricopa County passed Proposition 400 in November 2004, which authorized the continuation of the existing half-cent sales tax for the next 20 years to be used for implementing the RTP. A portion of the revenues collected from the half-cent sales tax extension will be deposited into the Regional Area Road Fund (RARF) to fund the RTP Freeway Program (RTPFP) projects. This project is included in the RTPFP.

Current Planning Studies

MAG, in partnership with the FHWA and ADOT, launched a planning study to develop a Corridor Master Plan for the I-10 and Interstate 17 (I-17) corridors. This corridor is referred to as the "Spine" because it serves as the backbone for transportation mobility in the metropolitan Phoenix area. The 35 mile "Spine" corridor begins on I-17 at the I-17/SR101L (Pima) TI and continues south and east to the I-10/I-17 TI. The corridor then continues east and south along I-10 to the I-10/SR202L (Santan/South Mountain) TI.

The I-10/I-17 Corridor Master Plan will analyze various long-term strategies to improve mobility in the study area. The study will evaluate the full range of transportation modes and concepts to identify the best multimodal solution. These long-term improvements are envisioned as a combination of traditional methods of improving traffic flow, new tools and technology to actively manage traffic, and increase the use of transit or other modes to provide alternatives to single-occupant vehicles. The key outcome of the "Spine" Study will be an improvement and implementation strategy to manage traffic in the I-10 and I-17 corridors through Year 2040. Study recommendations will be programmed in the MAG Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP). The Corridor Master Plan study is anticipated to be completed in mid 2017.

Programming

The Arizona Transportation Board has approved funding in the current ADOT *Five-Year Transportation Facilities Construction Program (2017-2021)* to begin construction of this project. The following projects are listed for I-10 within the study area:

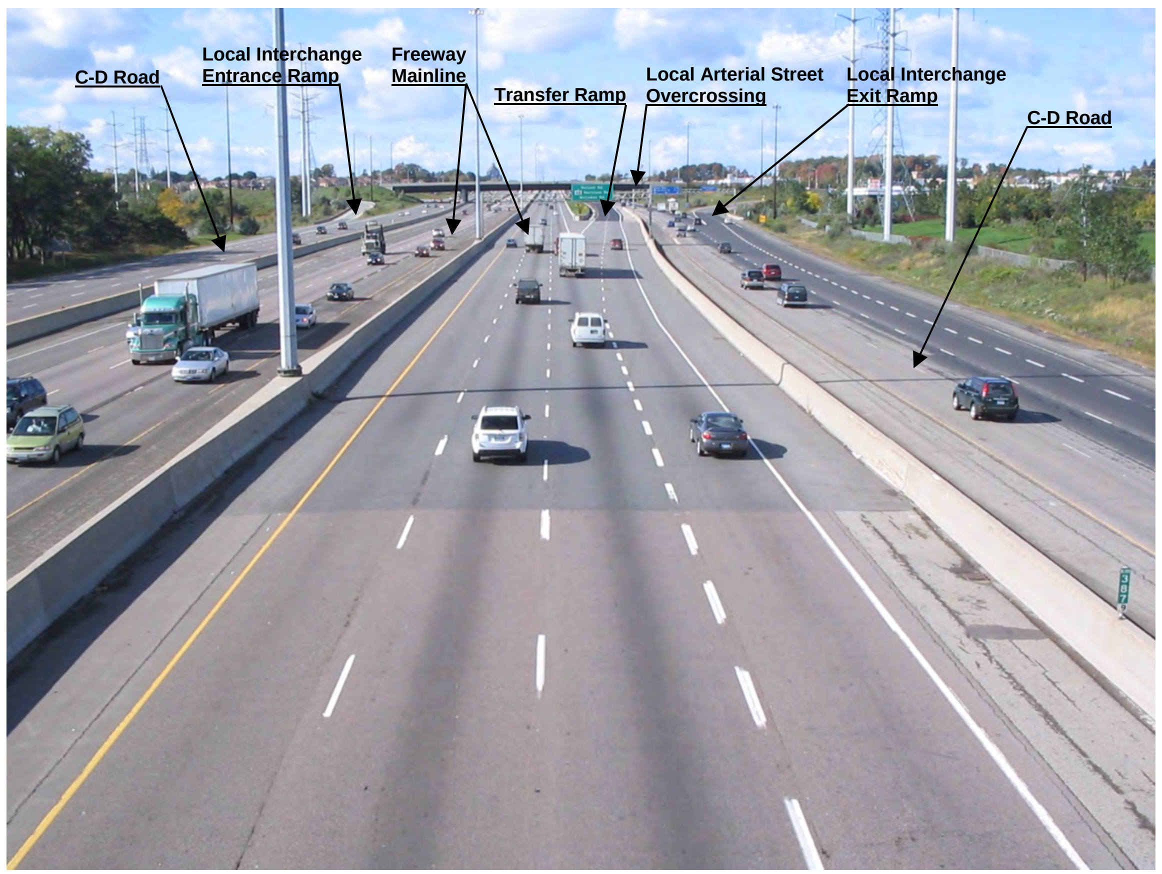
Current Projects in ADOT's 5-Year Construction Program (2017-2021)

Route	Begin MP	Location	Type of Work	Funding Source	Funding Amount ($000)	Fiscal Year
I-10	153.0	Broadway Rd – Baseline Rd, EB	Design	NHPP	2,650	2016
I-10	153.0	Broadway Rd – Baseline Rd, EB	Right-of-Way	RARF	15,220	2016
I-10	153.0	Broadway Rd – Baseline Rd, WB	Design	NHPP	2,830	2016
I-10	153.0	Broadway Rd – Baseline Rd, WB	Right-of-Way	RARF	1,960	2016
I-10	155.0	Baseline Rd – Ray Rd, EB	Design	NHPP	2,170	2016
I-10	155.0	Baseline Rd – Ray Rd, WB	Design	NHPP	1,390	2016
I-10	152.0	Alameda Dr and Guadalupe Rd	Design/Const.	RARF	9,100	2019
I-10	152.0	32nd St. – SR202L, Santan Ph 1	Construction	NHPP	130,000	2019
I-10	152.0	32nd St. – SR202L, Santan Ph 1	Construction	RARF	13,970	2019
I-10	152.0	32nd St .– SR202L, Santan Ph 3	Design	RARF	9,400	2019
I-10	152.0	32nd St .– SR202L, Santan Ph 2	Construction	NHPP	114,000	2020
I-10	152.0	32nd St. – SR202L, Santan Ph 3	Right-of-Way	RARF	47,200	2021
I-10	152.0	32nd St. – SR202L, Santan Ph 3	Construction	NHPP	134,600	2024

Alternatives Development and Screening

This report describes the development and evaluation of the two I-10 Near-Term Improvement Alternatives and design options that were considered with this study.

Each alternative would include the use of Collector-Distributor (C-D) Roads to reconfigure the interchange ramps between SR 143 and Baseline Road to separate the ramp traffic from the I-10 mainline traffic, thereby eliminating the current weaving maneuvers that contribute to severe congestion on the Broadway Curve during the peak travel periods. The C-D Road concept is shown on the following picture of the existing Highway 401 in Toronto, Canada.



Highway 401 Collector-Distributor Roads

Additional general-purpose lanes would be provided on eastbound and westbound I-10 between Baseline Road and Ray Road. Auxiliary lanes would be provided in each direction between successive service interchange entrance and exit ramps.

A screening process was conducted by the Project Team that has led to the initial identification of the Preferred Alternative. The Preferred Alternative is identified based on an evaluation of design criteria, traffic operational characteristics, environmental impacts, right-of-way and utility impacts, and agency/public input. Public agencies that have been involved with this project include ADOT; FHWA; MAG; the Town of Guadalupe; and the cities of Phoenix, Tempe and Chandler.

A two-tiered multi-discipline screening process was used to determine which I-10 Widening Alternative should be identified as the Preferred Alternative. Section 3.0, Design Concept Alternatives and Evaluation, summarizes the process and issues considered in making this recommendation.

Recommendation

The Project Team has identified Alternative 2 (with Westbound C-D Road Option 2) to be the Preferred Alternative for implementation. The Project Team also recommends the following design features to be included with the Preferred Alternative: 1.) the I-10/US60 TI Ramp 'N-E' Option 3; 2.) Warner Road eastbound single-lane exit ramp, and 3.) Ray Road eastbound single-lane exit ramp. The I-10/US60 TI Ramp 'W-S' exit would remain in its current configuration as a mandatory exit from the inside general-purpose lane. The Westbound C-D Road entrance ramp (near 48th Street) would be designed with a parallel entrance configuration that continues to the west on the I-10 mainline.

Additional Information

A new pedestrian/bicycle underpass will be provided across I-10 just north of Alameda Drive. A new multi-use pathway will also be provided along the south side of Guadalupe Road that includes a new bridge structure over I-10.

Americans with Disabilities Act (ADA) improvements will be included with this project where warranted. The locations and details of the ADA improvements is included in Appendix F.

New Right-of-Way and Temporary Construction Easements (TCE's) will be required for the Recommended Alternative. The new right-of-way and easement locations will be finalized during final design.

Coordination with concurrent construction projects will be required for this project. Coordination will also be required with several utility companies; the cities of Phoenix, Tempe, and Chandler; the Town of Guadalupe; the FCDMC; Valley Metro; Phoenix Transit Department; MAG; and the FHWA.

Mitigation measures required for the project are identified in Chapter 8.0. The final environmental document will include all final mitigation and coordination requirements.

Additional reports prepared as part of this study include a Categorical Exclusion (CE) and supporting technical documents, Drainage Concept Report and Traffic Report.

Coordination will be required with the Town of Guadalupe for new drainage improvements planned along Guadalupe Road, east of I-10.

Implementation Plan

The Initial Implementation Plan was developed to identify a menu of construction projects that could be used to implement the Preferred Alternative over time as funding becomes available. The individual projects would continue to allow the traveling public to use the facility yet minimize "throw-away" costs.

The funding identified in ADOT's *Five-Year Transportation Facilities Construction Program (2017 - 2021)* includes a total project budget of $179,290,000. Funding for final design and right-of-way acquisition is budgeted in Fiscal Year (FY) 2016, and construction funding is currently included in FY 2019.

The total estimated design, construction and right-of-way costs for each of the individual projects are summarized below. The individual project estimates are included in Chapter 6.

Estimated Design, Construction and Right-of-Way Costs by Location (Preferred Alternative)

Project	Estimated Design Cost	Estimated Construction Cost	Estimated Right-of-Way Cost	Estimated Total Project Cost
Broadway Road to Baseline Road (EB)	$2,370,300	$34,790,500	$5,665,600	$42,826,400
Broadway Road to Baseline Road (WB)	$3,268,600	$49,425,200	$4,349,300	$57,043,100
Baseline Road to Ray Road (EB)	$1,746,800	$25,251,700	N/A	$26,998,500
Baseline Road to Ray Road (WB)	$950,100	$13,840,600	N/A	$14,790,700
Alameda Drive and Guadalupe Road Crossings	$572,700	$8,146,900	165,500	$8,885,100
TOTAL	**$8,908,500**	**$131,454,900**	**$10,180,400**	**$150,543,800**

Note: Differences between the Total Project Estimate and the sum of the Implementation Plan estimates is due to rounding.

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1.0 INTRODUCTION

1.1 FOREWARD

This Design Concept Report (DCR) describes the development, evaluation, and screening of near-term capacity improvement alternatives on I-10 from SR 143 (Milepost 153.5) to the Santan/South Mountain Freeway (Milepost 160.9). This project is located in the Arizona Department of Transportation's (ADOT's) Phoenix District within Maricopa County in south-central Arizona. The study area also includes the segment of US 60 from the I-10/US60 Traffic Interchange (TI) (Milepost 172.0) east to Hardy Drive (Milepost 173.0). Project location and vicinity maps are provided with Figures 1 and 2, respectively.

The Arizona Transportation Board has approved funding in the current ADOT *Five-Year Transportation Facilities Construction Program (2017-2021)* to begin construction of this project.

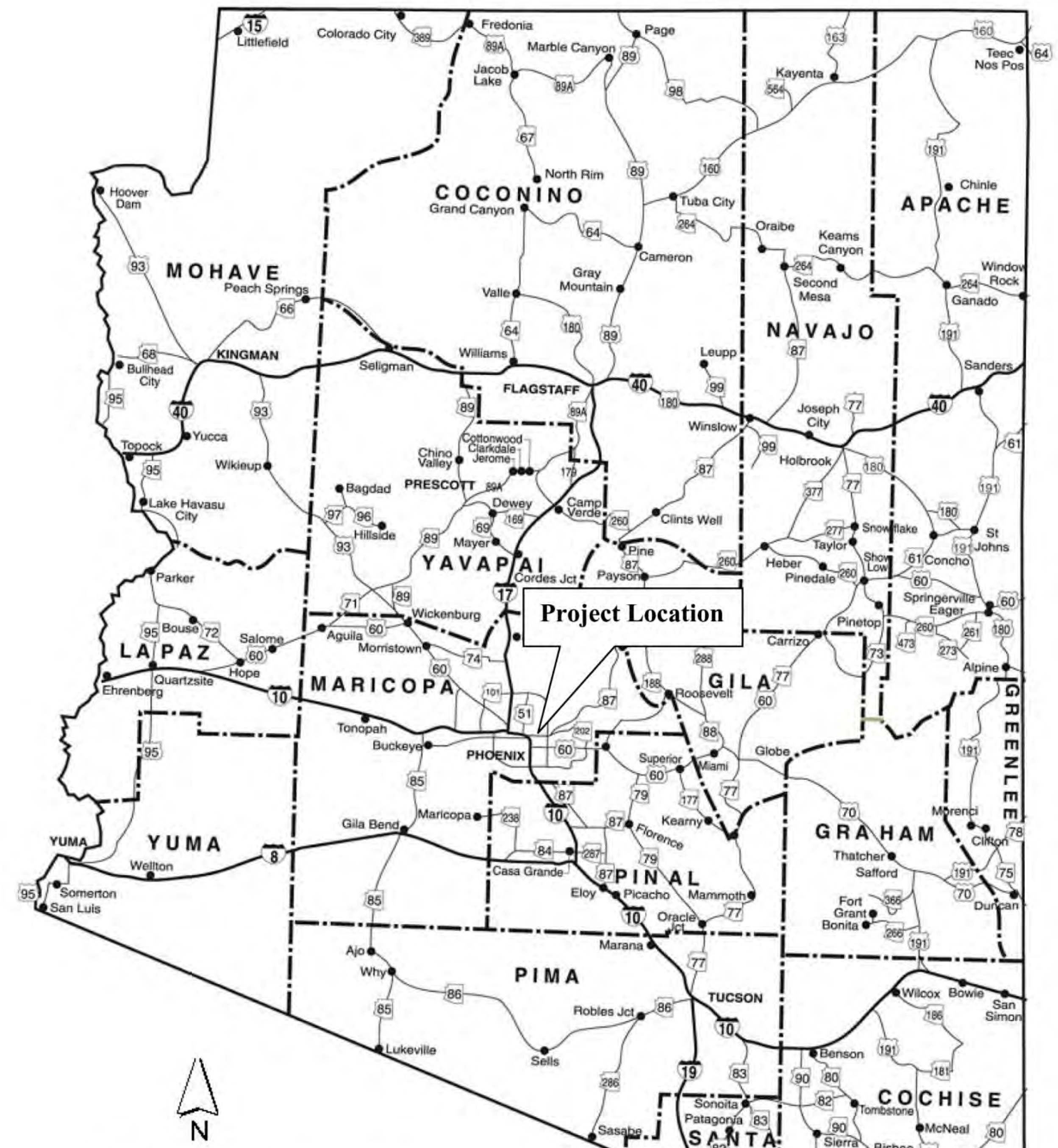
The goal of this study is to develop and objectively evaluate all reasonable alternatives in order to develop near-term capacity improvements and select a Preferred Alternative that meets the goals of the Regional Transportation Plan Freeway Program (RTPFP), satisfies the requirements of the National Environmental Policy Act (NEPA), and obtains public support. This study will seek to optimize the traffic operations within the corridor for the projected Design Year 2035 traffic demand, to retain local access at existing traffic interchanges, and to minimize or mitigate impacts the improvements may have on the surrounding community. In conjunction with the DCR a Categorical Exclusion will be developed in support of this study.

1.2 NEED FOR THE PROJECT

Interstate 10 (I-10) is a major component of the Federal Interstate Highway System and a major element of the Maricopa Association of Governments (MAG) adopted Regional Transportation Plan Freeway Program (RTPFP).

This segment of I-10 accommodates local, regional and interstate traffic originating from I-10 to the west and south, I-17, the Hohokam Expressway (SR 143), the Superstition Freeway (US 60), the Santan Freeway (SR 202L), and the future South Mountain Freeway (SR 202L), This segment of I-10 serves the growing number of people who reside in the south and east Valley that work at the major employment centers within the Phoenix Central Business District; Phoenix Sky Harbor International Airport (PHX); City of Tempe; Arizona State University (ASU); and other significant commercial, industrial and warehouse/distribution employers throughout the area.

I-10 also serves as one of the primary transportation corridors for the movement of freight within Maricopa County, and between Maricopa County and other metropolitan areas within and outside of the State of Arizona.



Source: Arizona Department of Transportation

Figure 1 – Project Location Map

Maricopa County has been one of the fastest growing regions in the United States. Subsequently, traffic demand is causing the I-10 corridor and adjacent local arterial street system to become increasingly congested during the morning and evening peak travel periods. Future traffic volume projections indicate the congestion will continue to worsen, causing further travel delays and increased travel times for those using the I-10 corridor. Increased congestion on I-10 will cause travelers to divert their trips to other freeway corridors and the local arterial street system, causing these transportation facilities to continue to become increasingly congested as well. Improvements to the I-10 corridor are necessary to increase the freeway capacity and help alleviate increased levels of traffic congestion on all components of the overall transportation system in the study area.

MAG, RPTA and ADOT have worked together for many years to develop a comprehensive plan for the Regional Freeway System which is included in the RTP that was adopted by the MAG Regional Council in November 2003.

The voters of Maricopa County passed Proposition 400 in November 2004, which authorized the continuation of the existing half-cent sales tax for the next 20 years to be used for implementing the RTP. A portion of the revenues collected from the half-cent sales tax extension will be deposited into the Regional Area Road Fund (RARF) to fund the RTPFP. This project is included in the RTPFP.

Subsequently, the purpose of this study is to: 1.) evaluate the existing and future levels-of-service along the I-10 corridor; 2.) develop a near-term capacity improvement plan for this segment of the I-10 corridor that will reduce congestion and increase mobility for travelers on the I-10 mainline with the projected 2035 travel demand; and, 3.) develop a phased implementation plan for programming staged construction projects with the funding identified in the RTPFP.

1.3 CHARACTERISTICS OF THE CORRIDOR

This segment of I-10 provides a vital transportation artery in central Maricopa County that links I-10, I-17, SR 51, SR 143, US 60, and SR 202L and provides direct access between the communities in the south and east valley to the Phoenix Central Business District; PHX; City of Tempe, ASU; and the residential, commercial, industrial and warehouse/distribution center developments in the study area.

1.3.1 Roadway Characteristics

Interstate 10

I-10 is classified as a controlled access Urban Principal Arterial – Interstate with a posted speed limit of 65 mph. The existing number of lanes are depicted on Figure 4 on page 26.

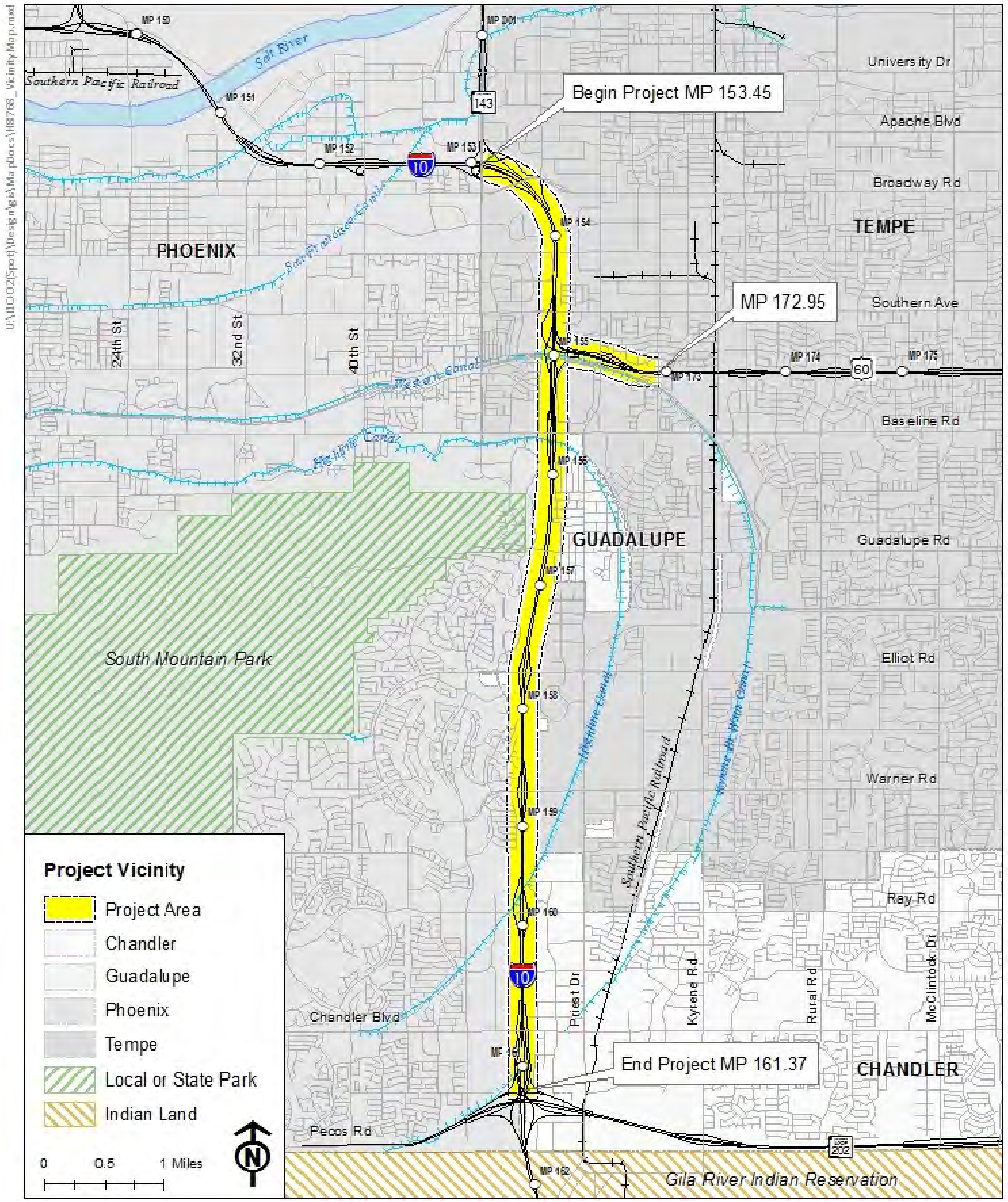


Figure 2 – Vicinity Map

The eastbound and westbound median shoulder is typically 10'-13' wide and the outside shoulder is consistently 12' wide throughout the study area. A 32" median concrete barrier separates the eastbound and westbound roadways. High-Occupancy Vehicle (HOV) lanes are provided in each direction of travel throughout the corridor.

I-10 is an at-grade freeway near 40th Street that continues to US 60. I-10 then passes over Baseline Road and transitions back to an at-grade facility that continues to the south to the Santan Freeway (SR 202L). I-10 is generally bordered with noise walls, earth berms, or a combination of berms and walls along residential developments.

I-10 intersects I-17, SR 143, US 60, and SR 202L with freeway-to-freeway traffic interchanges. With the exception of SR 143, the interchanges include fully directional ramp connections for all traffic movements between each freeway. Additional freeway lanes are provided on the I-10 mainline, and the intersecting freeways, to improve maneuverability for traffic approaching and departing the interchanges.

The I-10/US60 TI includes an HOV lane directional ramp that provides direct HOV access between I-10 (to/from the west) and US 60 (to/from the east). An HOV ramp is also provided at the I-10/SR202L (Santan/South Mountain) TI to provide a direct HOV ramp connection between I-10 (to/from the north) and SR 202L (to/from the east).

The SR 143 interchange is a partial cloverleaf configuration that includes directional ramp connections between westbound I-10 and northbound SR 143, and southbound SR 143 to westbound I-10. A loop ramp provides a free-flow freeway-to-freeway connection between southbound SR 143 and eastbound I-10. A service interchange ramp connection with 48th Street (at a signalized intersection) provides for the freeway-to-freeway traffic movement between eastbound I-10 and northbound SR143, and the local access connections to 48th Street and Broadway Road.

Local arterial street interchanges along I-10 provide full freeway access at 40th Street, Broadway Road, Baseline Road, Elliot Road, Warner Road, Ray Road and Chandler Boulevard. Grade separations and freeway overpasses provide local street connectivity at Southern Avenue and Guadalupe Road. The Western and Highline Canals also pass beneath I-10 south of US 60 and Baseline Road, respectively.

ADOT previously conducted a feasibility study of a possible future pedestrian/bicycle overpass at Alameda Drive, and a multi-use crossing of I-10 at Guadalupe Road. These facilities are currently planned to be included with the I-10 near-term improvements.

48th Street is a six lane arterial street south of Broadway Road that continues to the north to the signalized intersection with the I-10 eastbound exit ramp. North of the ramp intersection, 48th Street transitions into the SR 143 mainline in the northbound and southbound directions of travel.

Broadway Road is a six lane arterial street. At the Broadway Road TI, the street section consists of three lanes in the westbound direction of travel, three lanes in the eastbound direction of travel, and one left-turn lane for the westbound to southbound traffic movement. A right-turn lane is provided for the eastbound to southbound traffic movement. Two right-turn lanes (one lane mandatory and one lane optional) are provided for the westbound to northbound (to westbound I-10) traffic movement.

Baseline Road is a six lane arterial street. At the Baseline Road TI, the street section consists of three lanes in the eastbound direction of travel, three lanes in the westbound direction of travel, two left-turn lanes for the westbound to southbound traffic movement, and two left-turn lanes for eastbound to northbound traffic movement. Right-turn lanes are provided for the westbound to northbound and eastbound to southbound traffic movements.

Elliot Road is a six lane arterial street. At the Elliot Road TI, the street section consists of three lanes in the eastbound direction of travel, three lanes in the westbound direction of travel, two left-turn lanes for the westbound to southbound traffic movement, and two left-turn lanes for the eastbound to northbound traffic movement. Two right-turn lanes are provided for the westbound to northbound traffic movement.

Warner Road is a four lane arterial street. At the Warner Road TI, the street section consists of two lanes in the eastbound direction of travel, two lanes in the westbound direction of travel, two left-turn lanes for the eastbound to northbound traffic movement, and one left-turn lane for the westbound to southbound traffic movement. A right-turn lane is provided for the westbound to northbound movement.

Ray Road is a six lane arterial street. At the Ray Road TI, the street section consists of three lanes in the eastbound direction of travel, three lanes in the westbound direction of travel, two left-turn lanes for the eastbound to northbound traffic movement, and two left-turn lanes for the westbound to southbound traffic movement. Right-turn lanes are provided for the westbound to northbound and eastbound to southbound traffic movements.

Chandler Boulevard is a six lane arterial street. At the Chandler Boulevard TI, the street section consists of three lanes in the eastbound direction of travel, three lanes in the westbound direction of travel, two left-turn lanes for the eastbound to northbound traffic movement, and one left-turn lane for the westbound to southbound traffic movement. Right-turn lanes are provided for the westbound to northbound and eastbound to southbound traffic movements.

Guadalupe Road is a two lane collector street, with one lane in each direction of travel at the I-10 crossing. Southern Avenue is a four lane collector street with two lanes in each direction of travel.

State Route 143

SR 143 is classified as a controlled access Urban Principal Arterial – Other Freeway with three general-purpose lanes in each direction of travel and a posted speed limit of 65 mph. SR 143 is the primary route between the south and southeast Valley communities and Phoenix Sky Harbor International Airport.

SR 143 is generally at-grade but passes over University Drive, the Salt River and Sky Harbor Boulevard.

The northbound and southbound median and outside shoulders are typically 10' and 12' wide, respectively. However, the northbound and southbound median shoulder widths are 4' between the I-10 overpass and the north University Drive entrance and exit ramps. The outside shoulder width on the northbound roadway has been reduced to 4' to develop an additional general-purpose lane over the University Drive overpass. A 32" median concrete barrier separates the northbound and southbound roadways.

US 60

US 60 is classified as a controlled access Urban Principal Arterial – Other Freeway with a posted speed limit of 65 mph east of Hardy Drive. US 60 consists of four general-purpose lanes, one HOV lane, and one auxiliary lane (between the Priest Drive and Mill Avenue ramps) in each direction of travel that are separated by a concrete median barrier. The median and outside shoulders are 10' and 12' wide, respectively.

The freeway is elevated between I-10 and Priest Drive, transitioning to a depressed freeway east of Hardy Drive. US 60 is generally bordered with noise walls, earthen berms, or a combination of berms and walls along developed areas.

A half-diamond interchange is provided at Priest Drive (ramps to/from the east). Priest Drive is a six lane arterial street. At the Priest Drive TI, the street section consists of three lanes in the northbound direction of travel, three lanes in the southbound direction of travel, and two left-turn lanes for the southbound to eastbound traffic movement. A right-turn lane is provided for the northbound to eastbound traffic movement.

A grade separation provides local street connectivity at Hardy Drive. Hardy Drive is a collector street, with one lane in each direction of travel at the US 60 crossing.

Local Roads

Diablo Way is located immediately west of I-10 between Alameda and Fairmont Drives, and provides street circulation and emergency services access to the adjacent commercial and recreational land uses. Diablo Way will be relocated further to the west with this project.

1.3.2 Transit Facilities and Routes

The MAG Regional Council adopted the recommendations of the *High Capacity Transit Plan (HCTP)* in June 2003. This study was conducted to develop a network of transit services to meet the growing travel demand of the MAG region. This long range study considered projected travel demand in the MAG region with a forecast horizon year of 2040 and a projected population of over 7 million residents and is intended to provide the policy framework for transit technology investments in the future.

The recommendations of the HCTP included Express Bus and Bus Rapid Transit (BRT) that would use the existing and planned HOV lanes throughout the Regional Freeway System. The recommendations of this study were included in the transit component of the RTP. These recommendations were confirmed with the completion of the *MAG Regional Transit Framework Study* that was approved by the MAG Regional Council in March 2010, and the *MAG Southeast Corridor Major Investment Study*.

The HCTP also recommended a future LRT corridor that would use the existing north-south UPRR spur east of I-10. This spur would provide rail access between the City of Tempe and southwest Chandler, and would connect to the METRO line at Apache Boulevard.

In concert with the HCTP, RPTA conducted their *Regional Transit System Study* (RTSS) that was adopted in the summer of 2003. The RTSS recommended improvements to the local bus network, regional connections, freeway BRT routes, bus service on arterial routes, and demand response service (dial-a-ride, rural service). The recommendations of this study were included in the bus transit component of the RTP.

The *MAG High Occupancy Lanes and Value Lanes Study* was adopted in March 2002. This study recommended the construction of HOV lanes for all freeways within the Maricopa County area, and included recommendations for HOV directional ramp connections at specific freeway-to-freeway traffic interchanges.

Within this segment of the I-10 corridor, HOV directional ramps have been constructed at the I-10/SR51/SR202L TI to provide a direct HOV connection between I-10 (to/from the south) and SR51 (to/from the north), and between I-10 (to/from the west) and SR 202L (to/from the east); at the I-10/US60 TI to provide a direct HOV connection between I-10 (to/from the west) to US 60 (to/from the east); and at the I-10/SR202L (Santan/South Mountain) TI to provide a direct HOV ramp connection from I-10 (to/from the north) to SR 202L (to/from the east).

The *MAG High Occupancy Lanes and Value Lanes Study* has also identified an HOV ramp at the I-10/I-17 (Maricopa) TI to provide a direct HOV ramp connection between I-10 (to/from the east) and I-17 (to/from the west) that would connect to the planned HOV lanes on I-17.

MAG also completed their *Park and Ride Lots Location Study*, in January 2001. This study recommended two park and ride lot locations within this segment of the I-10 corridor, including the 40^{th} Street and Pecos Road Park and Ride that has been in operation since December 2002.

A second park and ride lot was recommended near I-10 and Warner Road. However, existing and planned development has precluded the acquisition of the property necessary for a park and ride lot at this location.

Valley Metro currently operates their I-10 East RAPID route that originates at the Pecos Road Park and Ride and provides service to the Phoenix central business district. This bus route utilizes the I-10 HOV lanes between the Washington/Jefferson Street TI and Pecos Road. Fifteen inbound (A.M.) and fourteen outbound (P.M.) routes are provided during the morning and evening peak periods.

The Tempe Express (520) originates at Broadway and Price Road and provides service to the Phoenix central business district. Two inbound (A.M.) and two outbound (P.M.) routes are provided during the morning and evening peak periods.

The Tempe Express (521) originates at Baseline Road and Price Road and provides service to the Phoenix central business district. Four inbound (A.M.) and four outbound (P.M.) routes are provided during the morning and evening peak periods.

The Tempe Express (522) originates at Elliot Road and Country Club Way or Elliot Road and 48th Street provides service to the Phoenix central business district. Two inbound (A.M.) and two outbound (P.M.) routes are provided for each service during the morning and evening peak periods.

The Mesa/Gilbert Express (531) originates at the Gilbert Road Park-and-Ride and provides service to the Phoenix central business district. Six inbound (A.M.) and six outbound (P.M.) routes are provided during the morning and evening peak periods.

The Mesa Express (533) originates at the Superstition Springs Park-and-Ride and provides service to the Phoenix central business district. Six inbound (A.M.) and six outbound (P.M.) routes are provided during the morning and evening peak periods.

The Chandler Express (541) originates at Arizona Avenue and Ray Road (via the West Mesa Park-and-Ride) provides service to the Phoenix central business district. Four inbound (A.M.) and four outbound (P.M.) routes are provided during the morning and evening peak periods.

The Chandler Express (542) originates at the Chandler Park-and-Ride and provides service to the Phoenix central business district. Six inbound (A.M.) and six outbound (P.M.) routes are provided during the morning and evening peak periods.

1.3.3 Land Use

The project area is located within portions of the Cities of Phoenix, Tempe, Chandler, and the Town of Guadalupe. No tribal or federal lands exist within the project limits. The land adjacent to the ADOT right-of-way is primarily privately owned or within municipal ownership. Phoenix South Mountain Park is also located on state owned land at the southwest corner of 48th Street and Guadalupe Road.

West of 48th Street, the land use within the City of Phoenix is dominated by PSHIA, industrial/commercial, and warehouse/distribution land uses with interspersed single-family and multi-family residences. Residential land uses occur south of I-10 just west of 48th Street.

A highly industrial area is present to the north of I-10 between 32nd Street and 48th Street that includes office buildings, warehouse/distribution centers and other commercial land uses. The University of Phoenix and Pepsi Cola Bottling Company are located north of I-10 between 40th Street and SR 143. The Cotton Center and other commercial, industrial, and warehouse/distribution centers are located south of Broadway Road.

The existing land use west of SR 143 that is within Phoenix includes a mix of office buildings, commercial development and hotel facilities. The existing land use east of SR 143 that is within Tempe includes Maricopa Community College, commercial/industrial businesses, and warehouse/distribution facilities.

The segment of I-10 within the City of Tempe includes residential, industrial, commercial retail, office/service, golf courses, cemeteries, and recreational land uses. Major developments include Tempe Diablo Stadium, Arizona Mills Mall, Wyndham Buttes Resort, Fountainhead Business Park, Motorola, Fairmont Commerce Center, Tempe Auto Mall, Coca Cola bottling facility, and IKEA retail center.

Residential develop includes the Meadows Mobile Home Park, Peterson Park neighborhood, Tempe Villages, Galleria Palms apartment complex, and Greenwood Village apartments. Several residential neighborhoods and subdivisions are located adjacent to US 60 including Roosen Place, Southern Palms Units II and III, Knoell Gardens, Rancho Tempe Mobile Home Park, and the Tierra Verde Apartments.

The Town of Guadalupe's northern boundary is located directly south of Baseline Road, on the east side of I-10. Commercial land uses are predominant along Baseline Road between I-10 and Priest Drive. A few small, family owned businesses are interspersed with single-family housing east of I-10, between the Highline Canal and Guadalupe Road.

South of Baseline Road, the I-10 corridor becomes the jurisdictional boundary between the cities of Phoenix, Tempe and Chandler. Newer office parks, retail development and the large residential community of Ahwatukee are located west of I-10 within the City of Phoenix. The Point South Mountain Resort and Golf Course is located between I-10 and the foothills of South Mountain Park.

Commercial and retail land uses dominate the area east of I-10 within the cities of Tempe and Chandler. The Chandler Pavilions Commercial Retail Center, Chandler Auto Mall, IKEA, and several industrial business parks are located east of I-10 between Elliot Road and Chandler Boulevard. No residential communities occur within Chandler adjacent to I-10.

1.3.4 Existing and Planned Recreational Facilities

Two existing parks are located adjacent to the freeway right-of-way within the study area. Tempe Diablo Stadium is located west of I-10 and north of Alameda Drive. The stadium parking lot is immediately adjacent to the I-10 right-of-way. Discussions with representatives of the Tempe Parks and Recreation Department have indicated no new facilities are planned for the parking lot area.

Mountain Vista Park is located west of I-10 and north of Ray Road and is operated by the City of Phoenix.

The City of Tempe Double Butte Cemetery is located west of I-10 and south of Broadway Road. This facility is managed by the Tempe Parks and Recreation Department, and is the only public cemetery located within the City of Tempe. Approximately 12,000 burial sites have been documented at this cemetery, including former Senator Carl Hayden and two previous state governors. The cemetery was opened in the 1880's, with the original site located near the center of the north property line. The City plans to submit the cemetery for inclusion in the National Register of Historic Places.

Maricopa County Facilities Management operates the Belle Butte Cemetery located east of I-10 and south of Broadway Road. This cemetery has been used for the indigent population from within Maricopa County. The cemetery is at capacity, and records indicate grave sites are located near the I-10 right-of-way.

ADOT previously conducted a feasibility study of a possible future pedestrian/bicycle overpass at Alameda Drive, and a multi-use crossing of I-10 at Guadalupe Road. These facilities are currently planned to be included with the I-10 near-term improvements.

1.3.5 Utilities and Railroad

Cities and utilities agencies that own and operate utilities inside existing ADOT right-of-way were notified at the start of this project in December 2014. A listing of the utility companies and agency representatives that were contacted is shown in Table 1. Agencies that responded to the notification letters and provided updated utility information included Air Products and Chemicals, Salt River Project Water Engineering, and Southwest Gas.

Table 1 – Utility and Agency Contacts

Organization	Name	Phone	Address
City of Chandler	Steve DiDomenico	(480) 312-5636	215 E. Buffalo Street Mail Drop 402 Chandler, AZ 85244-4008 Steve.DiDomenico@chandleraz.us
City of Phoenix	Jami Erickson	(602) 261-8229	200 W. Washington, 8th Floor Phoenix, AZ 85003 Jami.erickson@phoenix.gov
City of Tempe	Catherine Hollow	(480) 350-8445	31 E. 5th Street Tempe, AZ 85281 catherine_hollow@tempe.gov
City of Tempe	Tom Wilhite	(480) 350-2921	31 E. Fifth Street Tempe, AZ 85281 Tom_wilhite@tempe.gov

Table 1 – Utility and Agency Contacts (continued)

Organization	Name	Phone	Address
AT&T	Joseph Forkert	(714) 963-7964	22311 Brookhurst Street, Suite 203 Huntington Beach, CA 92646 joef@forkertengineering.com
CenturyLink	Karen Brown	(480) 768-4398	135 Orion Tempe, AZ 85283 Karen.Brown1@CenturyLink.com
Cox Communications	Terran Gutierrez	(623) 328-3514	1550 W. Deer Valley Road Phoenix, AZ 85027 Terran.gutierrez@cox.com
Kinder Morgan	Garry Zieske	(602) 438-4237	7776 S. Pointe Parkway Suite 185 Phoenix, AZ 85044 Garry.zieske@kindermorgan.com
Kinder Morgan	James Pigg	(480) 262-9337	7776 S. Pointe Parkway Suite 185 Phoenix, AZ 85044 James_pigg@kindermorgan.com
Salt River Project – Power Distribution	Ryan Earwood	(602) 236-4128	Mail Station XCT 341 P.O. Box 52025 Phoenix, AZ 85072-2025 Ryan,earwood@srpnet.com
Salt River Project – Power Distribution	Kyle Reid	(602) 236-4842	Mail Station XCT 341 P.O. Box 52025 Phoenix, AZ 85072-2025 Kyle.reid@srpnet.com
Salt River Project – Line Asset Management	Floyd Hardin	(602) 236-8327	SRP Line Asset Management 110 E. Elliot Road, Bldg. 4 Tempe, AZ 85284 Floyd.Hardin@srpnet.com
Salt River Project – Line Asset Management	Keith Pellien	(602) 236-4962	SRP Line Asset Management 110 E. Elliot Road, Bldg. 4 Tempe, AZ 85284 Keith.Pellien@srpnet.com
Salt River Project – Water Engineering	Harold Biever	(602) 236-5227	Mail Station PAB106 P.O. Box 52025 Phoenix, AZ 85072-2025
Southwest Gas Corporation	Scott Suaso	(480) 730-3843	5705 South Kyrene Rd, Tempe, AZ 85283-1729 Scott.suaso@swgas.com
Zayo Group LLC	Matt Burke	(480) 980-2342	2600 N Central Avenue Suite 600 Phoenix, AZ 85004 Matt.burke@zayo.com
Zayo Group LLC	Frank Platchek	(480) 980-2342	2600 N Central Avenue Suite 600 Phoenix, AZ 85004 Frank.platchek@zayo.com

Existing Utilities

The major existing public utilities that are located within the study limits are presented in Table 2. The utility inventory was compiled from quarter-section maps, existing facility plans and record drawings that were provided by the local agencies and utility companies. The inventory contains existing utilities that cross the freeway corridor, as well as those located along the freeway corridors within and adjacent to the ADOT right-of-way.

A utility inventory that was previously prepared for the I-10 Corridor Improvement Study (State Route 51 to Santan Freeway) in March 2010, was supplemented by utility designation that was performed by Cardno/TBE in August 2008. The designation was conducted in accordance with the CI/ASCE Standard 38-02 Publication "*Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data"* Quality Level B, C and D Guidelines. A utility base file was developed by Cardno/TBE based on those combined efforts.

At the time of this utility designation, much of the recent consolidation of the telecommunication companies had not taken place, (e.g. the mergers/acquisitions of AGL Network, Metro Media FiberNetwork, etc). The identification of the Zayo Group, which is the current owner of several of these telecommunication companies, is not reflected in the existing utility base file used in the preparation of this report.

Significant existing utility corridors are located parallel with the I-10 west right-of-way between Diablo Way and the Western Canal, and between Guadalupe Road and Ray Road.

The Western and Highline Canals are owned and operated by Salt River Project (SRP). The Western Canal passes under I-10 within the I-10/US 60 TI. The Highline Canal crosses under I-10 just south of Baseline Road.

Railroad Crossings

There are no railroad crossings within the project limits.

Table 2 – Existing Utility Facilities

Freeway Corridor/ Approximate Station	Facility Owner	Description
I-10; Station 8096+00	ADOT	24" storm drain
I-10; Station 8100+60	City of Tempe	12" waterline
I-10; Station 8118+83 - 8131+00 Lt	Level 3, XO Communications, CityNet, MetroMedia, AGLN, AT&T, PFNet	Underground fiber optic lines and manholes
I-10; Station 8123+40	SRP Power; ELI	Underground power and fiber optics in 24" RCP
I-10; Station 8123+17 - 8131+00 Rt	City of Tempe, SRP Power	Underground power service lines, stadium lights, electric meters and switching cabinets
I-10; Station 8130+42	CenturyLink	Telephone
I-10; Station 8130+51	Zayo (AGL Network)	4 1-1/2" HDPE conduits in 7" STL casing
I-10; Station 8130+58	City of Tempe	27" VCP sanitary sewer

Table 2 – Existing Utility Facilities (continued)

Freeway Corridor/ Approximate Station	Facility Owner	Description
I-10; Station 8130+62	CenturyLink	Fiber optic telephone
I-10; Station 8130+71	City of Tempe	18" DIP water line
I-10; Station 8130+79	Level 3	Fiber optic line
I-10; Station 8130+95	AT&T	6 1-1/2" HDPE conduits in 14" STL casing
I-10; Station 8131+00 - 8144+00 Lt	Cox Communications	CATV fiber optic lines
I-10; Station 8131+00 - 8144+00 Rt	City of Tempe, SRP Power, CenturyLink, Southwest gas, Cox, Zayo	12" CIP water line, 27" RGRCP storm drain, 8" VCP sanitary sewer, underground power service lines and cabinets, underground fiber optic telephone lines, 2" abandoned natural gas line, fiber optic CATV line, telecommunication fiber optic conduits
I-10; Station 8143+95	City of Tempe	18" VCP sanitary sewer
I-10; Station 8144+00 - 8456+00 Lt	Cox, CenturyLink, SRP Power, Southwest Gas	Underground CATV, underground telephone line, power service lines and meters, 2" PE gas line
I-10; Station 8144+00 - 8156+00 Rt	Cox, SRP Water, CenturyLink, SRP Power, City of Tempe	Fiber optic CATV lines, underground telephone line, 24" RGRCP irrigation lateral, 12" DIP water line
I-10; Station 8144+10	Cox Communications	CATV fiber optic line
I-10; Station 8144+14	SRP Power	12kV overhead power
I-10; Station 8156+05	City of Tempe	12" waterline
I-10; Station 8157+00	Cox	CATV fiber optic
I-10; Station 8157+20	City of Tempe	48" sanitary sewer
I-10; Station 8158+35	Southwest Gas	4" PE gas
I-10; Station 8158+42	CenturyLink	Fiber optic telephone
I-10; Station 8158+20	City of Tempe	6" waterline
I-10; Station 8158+50 - 8176+82 Rt	SRP Water	24" RGRCP irrigation lateral
I-10; Station 8159+00 - 8170+00 Lt	City of Tempe, SRP Power, CenturyLink, Southwest Gas	Abandoned water and sewer lines and misc. dry utilities power services, telephone, gas lines
I-10; Station 8177+00	SRP Power	Underground power line
I-10; Station 8177+28	SRP Water	Western Canal
I-10; Station 8182+40	SRP Power	69kV overhead power
I-10; Station 8210+00	Southwest Gas	4" PE Gas and 4" STL Gas
I-10; Station 8210+10	SRP Power	Underground power line
I-10; Station 8210+25	City of Tempe	16" DIP waterline
I-10; Station 8210+56	Cox Communications	CATV (FO)
I-10; Station 8214+75	SRP Water	Highline Canal – 72"x48" RCBC irrigation lateral
I-10; Station 8214+75	SRP Power	Double circuit 230kV overhead power
I-10; Station 8222+90	El Paso Natural Gas	4" STL gas
I-10; Station 8223+13	SRP Power	69kV/12kV overhead power
I-10; Station 8263+37	El Paso Natural Gas	6" STL gas
I-10; Station 8288+35	El Paso Natural Gas	16" STL gas
I-10; Station 8288+60	El Paso Natural Gas	2-10" HP gas (abandoned)
I-10; Station 8290+75	CenturyLink	Fiber optic telephone
I-10; Station 8290+90	SRP Power	69kV/12kV overhead power
I-10; Station 8291+26 - 8303+75 Rt	City of Phoenix	2-24" DIP sewer force mains
I-10; Station 8303+75 - 8309+15 Rt	City of Phoenix	3-24" DIP sewer force mains
I-10; Station 8309+15 - 8326+22 Rt	City of Phoenix, Southwest Gas	3-24" DIP sewer force mains; 4" STL gas line
I-10; Station 8309+15	Southwest Gas	4" STL gas line
I-10; Station 8326+22 - 8335+47 Rt	City of Phoenix	3-24" DIP sewer force mains

Table 2 – Existing Utility Facilities (continued)

Freeway Corridor/ Approximate Station	Facility Owner	Description
I-10; Station 8335+47 - 8338+85 Rt	City of Phoenix	3-24" DIP sewer force mains, 8" DIP sanitary sewer
I-10; Station 8338+85 - 8347+65 Rt	City of Phoenix	3-24" DIP sewer force mains
I-10; Station 8347+65 - 8419+18 Rt	City of Phoenix	3-24" DIP sewer force mains, 8" VCP/24" VCP sanitary sewer
I-10; Station 8419+18 - 8421+30 Rt	City of Phoenix	Sewer lift station
I-10; Station 8362+60	SRP Power	Underground power line
I-10; Station 8419+62	SRP Water	Highline Canal – 60" RGRCP irrigation lateral
I-10; Station 8423+00	CenturyLink	Fiber optic telephone line
I-10; Station 8424+80	SRP Water	21" RGRCP irrigation lateral
I-10; Station 8425+00	SRP Water	27" RGRCP irrigation lateral
I-10; Station 8425+00 - 8430+90 Rt	City of Phoenix, SRP Power	16" / 12" / 14" DIP sewer force mains; underground power line
I-10; Station 8426+05 Lt - End of Project	SRP Water	24" RGRCP irrigation lateral
I-10; Station 8430+90	SRP Power	69kV overhead power
I-10; Station 8430+90 Rt - End of Project	City of Phoenix	16" / 12" / 14" DIP sewer force mains
US60; Station 117+65 - 120+80 Rt	SRP Power	12kV underground power line and switching cabinets
US60; Station 120+62	SRP Power	12kV underground power line
US60; Station 120+72	Cox Communications	Fiber optic CATV line
US60; Station 120+93	City of Tempe	21" VCP sanitary sewer
US60; Station 121+24	City of Tempe	21" VCP sanitary sewer
US60; Station 121+35	City of Tempe	42" VCP sanitary sewer
US60; Station 121+35 - 137+00 Rt	City of Tempe	42" RGRCP sanitary sewer
US60; Station 121+63	City of Tempe	21" VCP sanitary sewer
US60; Station 121+71	CenturyLink	Fiber optic telephone
US60; Station 121+79	SRP Power	Underground 12kV power
US60; Station 121+92	SRP Water	Underground irrigation lateral
US60; Station 122+95	SRP Power	69kV overhead power
US60; Station 140+90 - 145+25 Rt	SRP Water	Irrigation lateral

1.3.6 Drainage

This section provides a brief summary of the existing onsite and offsite drainage systems within the project area. Due to modifications to the proposed roadway improvements, the drainage facilities have been modified from those described in the I-10 Corridor Improvement Study *Pre-Initial Drainage Concept Report for I-10, (October 2013)*.

The project corridor extends along I-10 from SR 143 to the Santan/South Mountain Freeway and along the US 60 from I-10/US 60 TI to Hardy Drive. The existing major offsite and onsite drainage systems are depicted in Figure 3 on page 14.

1.3.6.1 Offsite Drainage Systems

The offsite drainage systems may be divided into the following segments: 1) tributary to the Tempe Drain/Salt River (north of Guadalupe Road), and 2) tributary to the Warner Basin Road (south of Guadalupe Road).

Tributary to the Tempe Drain

Segment 1 is the project area along I-10 between SR 143 and Guadalupe Road. It also includes a portion of US 60 between the I-10/US60 TI and Hardy Drive.

The offsite watershed contributing to this segment has a western boundary east of 40th Street. The southern boundary is generally along the peaks of South Mountain Park, Guadalupe Road, and US 60 to approximately Mill Avenue. The eastern watershed boundary is the Price Freeway, and the northern boundary is located along a ridgeline that is approximately one-half mile south of and parallel to the Salt River. Offsite runoff within this segment is captured by the Tempe Drain, 48th Street storm drain, Broadway Road storm drain, the Guadalupe Flood Retarding Structure, and swales, catch basins, and linear retention basins adjacent to I-10.

The majority of the offsite and onsite runoff from I-10, and the watersheds surrounding this segment of I-10, is conveyed by the Tempe Drain for discharge into the Salt River. The Tempe Drain is a trapezoidal channel (concrete and rip rap lined) that originates near 52nd Street and extends west to the Salt River. Bridges span the Tempe Drain at SR 143, 44th Street, 40th Street, 36th Street, and several maintenance access structures. The Tempe Drain passes under 32nd Street through a multi-barrel culvert that discharges into a large riprap lined open channel between 32nd Street and the Salt River. In addition, the City of Phoenix recently constructed the Rio Salado trail/box culvert across the Tempe Drain at the Salt River. A preliminary hydraulic analysis performed in the above referenced October 2013 report of the existing concrete lined portion of the channel indicates the Tempe Drain does not have sufficient capacity to convey the existing 50- or 100-year peak discharges at the SR 143 or 32nd Street crossings.

The Tempe Drain outfall channel has capacity to convey the 50-year runoff and the 100-year runoff without the required freeboard between 32nd Street and the Salt River. The hydraulic capacity of the Tempe Drain is being evaluated as part of the *Tempe Area Drainage Master Study* which should be completed by the end of 2015. Proposed improvements for the I-10 project end east of 48th Street (east of the Tempe Drain limits) so improvements and/or solutions to the reported capacity limitations of Tempe Drain are not addressed in this study.

The 48th Street storm drain extends to the north on 48th Street between Baseline Road and the Tempe Drain. The 48th Street storm drain collects offsite runoff from the drainage area between I-10 on the east and 48th Street on the west, and between Baseline Road on the south and Broadway Road on the north. In addition, it also collects runoff generated in the area between the South Mountain crest on the south, I-10 on the east, Baseline Road on the north, and 40th Street on the west. The 48th Street storm drain outfalls to the Tempe Drain on the east side of SR 143.

Offsite runoff intersecting I-10 from the west between Guadalupe Road and Baseline Road is intercepted by the Guadalupe Floodwater Retarding Structure which is designed to retain the 100-

year storm event. Between Baseline Road and the Salt River, catch basins and swales adjacent to I-10 capture any offsite flow that intersects I-10.

Tributary to the Warner Road Basin

Segment 2 is the project area along I-10 between Guadalupe Road and SR 202. Offsite runoff intersects I-10 from the west between Guadalupe Road and Ray Road. South of Ray Road, offsite flows are southerly, parallel to I-10. The offsite area has been divided into the northern and southern regions.

The northern region is bounded by Guadalupe Road on the north, City of Tempe Improvement District No. 140 (56th Street) on the east, the ADOT Retention Pit and Knox Road on the south, and South Mountain Park on the west. Offsite runoff generated within the northern region enters the ADOT right-of-way from the west and is ultimately discharged into the ADOT Retention Pit (located east of I-10 and south of Warner Road).

Between Guadalupe and Ray Roads, offsite runoff enters the I-10 right-of-way from the west through open channels, openings in sound walls, or overflow from private retention basins. This runoff either crosses I-10 directly through existing cross culverts, or passes through a series of linear detention basins before being conveyed across I-10 through existing cross culverts. Approximately twenty three (23) cross culverts convey runoff across I-10.

North of Elliot Road, the runoff discharged by the cross culverts is either collected in ADOT linear retention basins or the existing Tempe Improvement District No. 140 detention basins. Runoff discharging from cross culverts between Elliot and Warner Roads is collected in the Tempe Storm Water Diversion System, which is an underground box culvert on the east side of I-10 that begins south of Elliot Road and discharges into the ADOT Retention Pit Diversion Channel. Runoff discharged from the culverts located between Warner Road and the ADOT Retention Pit (Warner Road Basin) is conveyed by either the ADOT Retention Pit Diversion Channel or a 12’ concrete trapezoidal channel that drains into the ADOT Retention Pit.

The southern region is bounded by Knox Road on the north, I-10 on the east, the Santan Freeway on the south, and the peaks of South Mountain on the west. Offsite runoff generated in the southern region ultimately outfalls into the 48th Street Detention Basin that is located west of 48th Street and south of the Santan Freeway.

South of Ray Road, the natural drainage path changes from southeasterly to southerly. Consequently, the only offsite flows that enter the right-of-way south of Ray Road is emergency overflow from private retention basins adjacent to I-10. This offsite flow is conveyed to the south in an open channel that outfalls to the 48th Street Detention Basin near the I-10/SR202L TI.

1.3.6.2 Onsite Drainage Systems

Segment 1

The onsite drainage systems in this segment are divided into two pieces: I-10 between Guadalupe Road and the SR 143 and US 60 between I-10 and Hardy Road.

The existing onsite drainage systems on I-10 between SR 143 and Guadalupe Road is comprised of storm drains, detention basins, and open channels that collect and route storm water runoff to the Tempe Drain. The storm drains were designed for a 10-year return period, while the detention basins were designed to accommodate the 50-year, 6-hour storm event.

The eastbound and westbound I-10 mainline is drained by catch basins, laterals, and trunk lines. Where the existing roadways do not include curb and gutter, onsite runoff drains directly into roadside swales or onsite storage basins. The existing trunk lines within I-10 and their capacities are in the following table. The existing storm drain system was modeled with ADOT approval using U.S. Environmental Protection Agency (EPA) Storm Water Management Model (SWMM). EPA SWMM has the capability of dynamic modeling and can use the effects of basin attenuation and the different timing of peak flows within the systems to provide realistic results.

Table 3 – Existing Storm Drain Pipe Capacity (Segment 1)

Storm Drain Segment	SWMM Pipe	Flow Capacity (cfs)	Slope (ft./ft.)	Diameter (ft)
Broadway Road to Tempe Drain	PTDB1	87	0.0026	4.5
Southern Avenue to Basin ‘E’	P153	68	0.0010	5
Baseline Road to Basin ‘1’	PA20	133	0.0013	5.5

An Intergovernmental Agreement (IGA) between ADOT, the City of Tempe, the City of Phoenix, the Salt River Valley Water Users Association (SRVWUA), the Salt River Project Agricultural Improvement and Power District (SRP), and the Flood Control District of Maricopa County (FCDMC) was developed in 1989 to designate discharges to the Tempe Drain from each participant. ADOT is limited to a discharge of 93 cfs into the Tempe Drain at the SR 143 crossing.

Due to this restriction, ADOT detention basins have been constructed throughout the project to attenuate the peak discharge. There are five detention basins within the I-10/SR143 TI, and five detention basins within the I-10/US60 TI that attenuate the peak discharge to the Tempe Drain. On the west side of I-10 and north of Guadalupe Road, a series of four linear detention basins (called the Guadalupe Detention Basins) also reduce the onsite peak discharge.

Between the I-10/US60 TI and Mill Avenue, the US 60 onsite drainage is collected and conveyed in two trunk lines that are located along the north and south sides of the freeway that vary in size from 24” to 36” in diameter. Near Station 139+00, the northern trunk line crosses to the south across US 60 and combines with the south trunk line that continues to the east and discharges into the Kyrene Road pump station and detention basin.

Segment 2

The onsite drainage system of Segment 2 is composed of catch basins, storm drains, roadside swales, open channels, and onsite storage basins that are summarized as follows:

- Catch basins located in the median collect runoff from the median shoulders and HOV lanes between Guadalupe Road and the Ray Road TI. A 24" median storm drain trunk line extends the entire length of I-10 from Guadalupe Road to Elliot Road, where it connects to a box culvert. This box culvert discharges to the City of Tempe Storm Water Diversion System (TSDS). South of Elliot Road, smaller lateral systems connect catch basins to cross culverts. South of the Ray Road TI, catch basins are located along the outside shoulders.
- Onsite storage basins collect runoff from the general-purpose lanes between Guadalupe Road and the Ray Road TI where there is no existing curb and gutter. The basins also collect runoff from roadside swales and offsite cross culverts. There are approximately 49 basins located adjacent to I-10 and within the Elliot, Warner and Ray Road TI infield areas. Basins in the western right-of-way overflow to the eastern basins through cross culverts. Basins in the eastern right-of-way overflow into the City of Tempe Improvement District No. 140 detention basins, the Tempe Storm Water Diversion System, the ADOT Retention Diversion Channel or the Warner Road Pit.
- Roadside swales collect onsite runoff from the general-purpose lanes where there is no curb and gutter and no adjacent onsite storage basin. The swales outlet into nearby cross culverts and onsite storage basins.

An open channel is located within the western I-10 right-of-way between Ray Road and the 48th Street Detention Basin (at 48th Street and the Santan Freeway). It accepts runoff from two cross culverts near Ray Road, and emergency overflows from private detention basins adjacent to the western right-of-way between Ray Road and Chandler Boulevard.

1.3.7 Right-Of-Way

The existing ADOT right-of-way width varies along the I-10 corridor throughout the study area. The total I-10 right-of-way width varies from approximately 300' to 800'. The existing right-of-way width varies along SR 143 from 170' to 400', and along US 60 from 300' to 600'.

The City of Chandler has reserved approximately 50' of open space adjacent to the I-10 corridor for future I-10 freeway expansion. This open space is limited to the I-10 frontage between Ray Road and the Chandler city limits.

The Maricopa Community College is located north of I-10 and east of SR 143. Their existing surface parking is located within the ADOT right-of-way by a lease agreement with ADOT.

The ADOT Phoenix Maintenance District currently operates a maintenance yard south of I-10, east of 48th Street, and north of Broadway Road.

[Text resumes on page 16]

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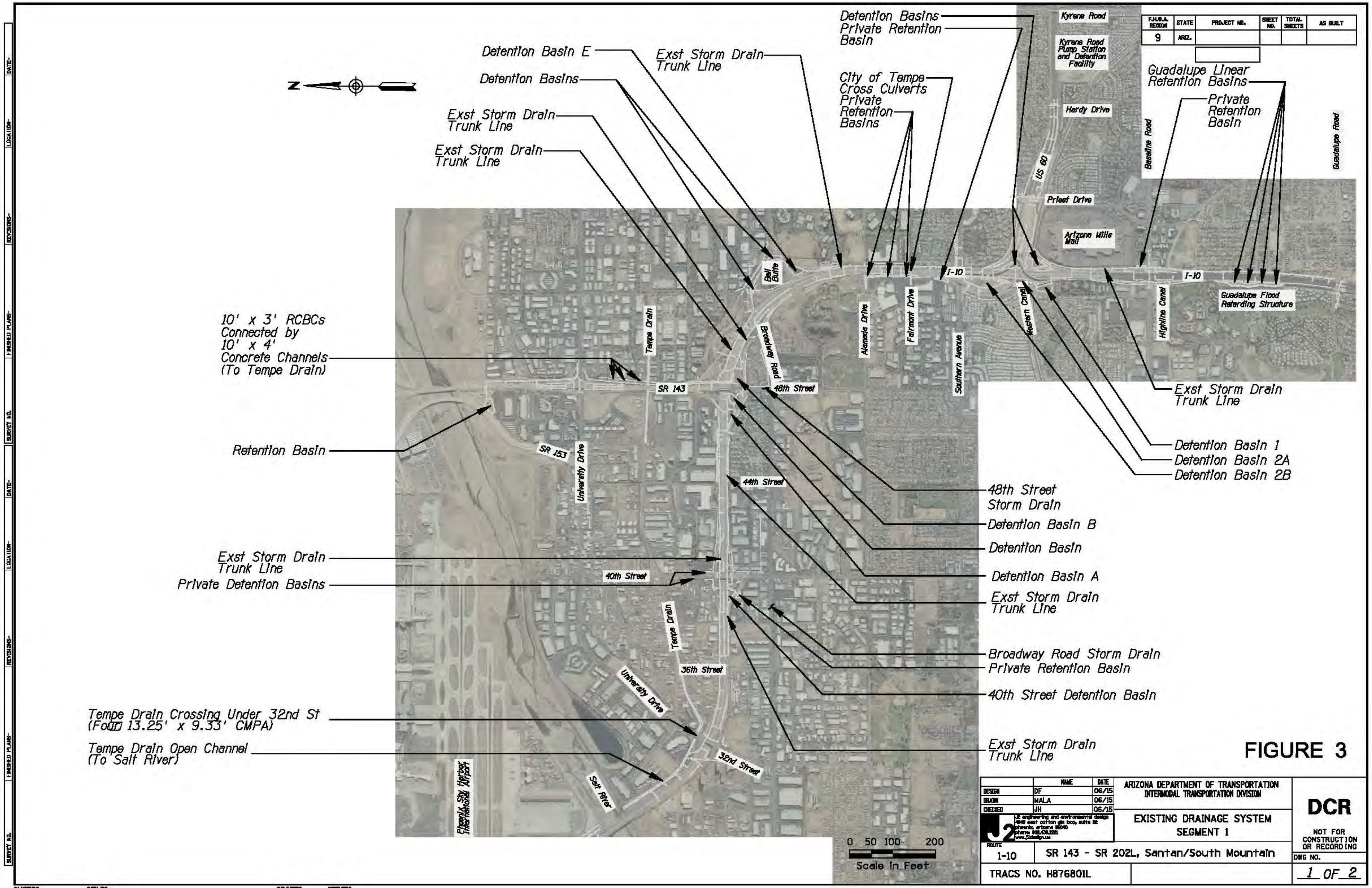
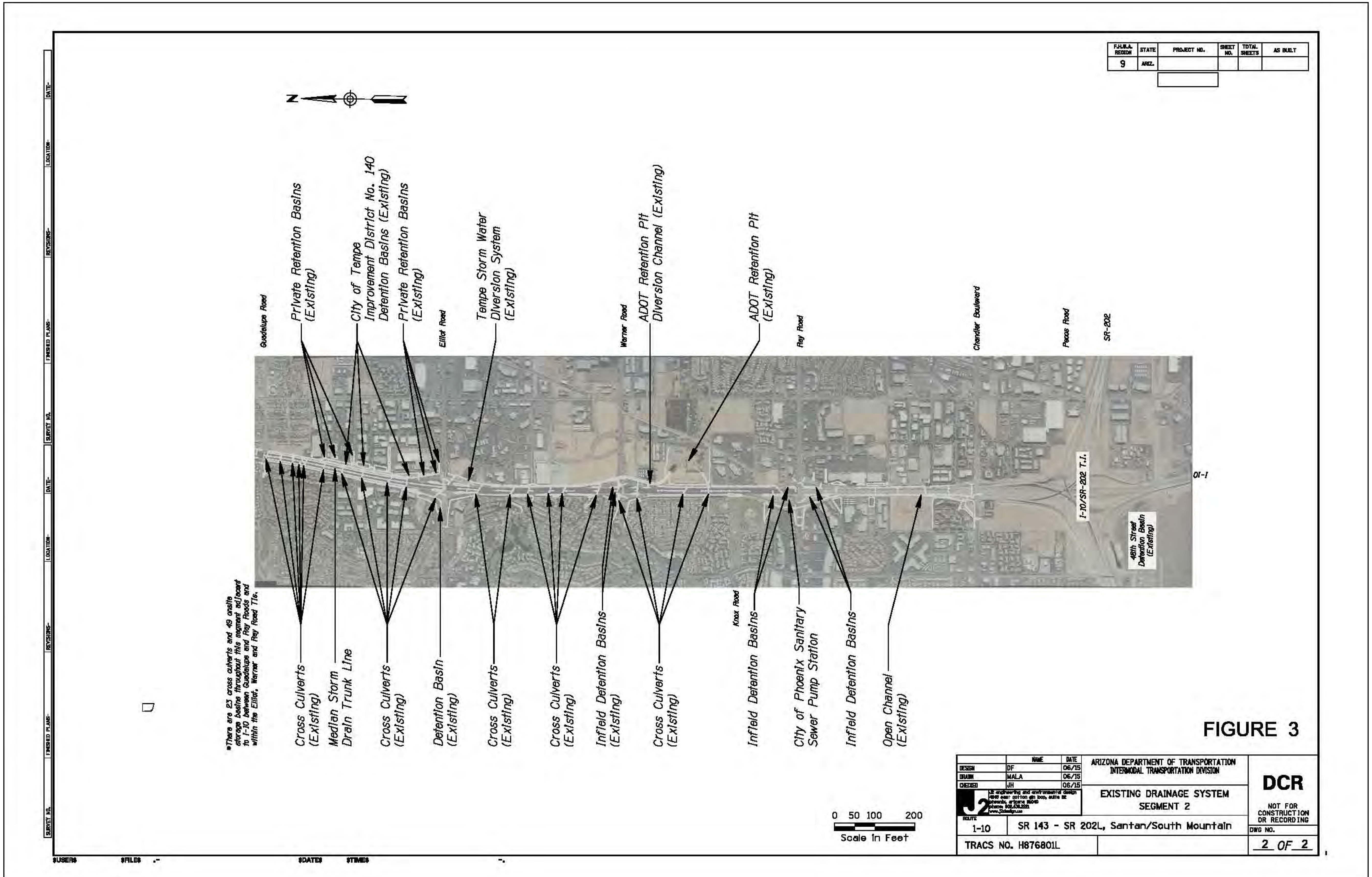

Detention Basin E
Detention Basins
Exst Storm Drain Trunk Line
Exst Storm Drain Trunk Line
Exst Storm Drain Trunk Line
Detention Basins
Private Retention Basin
City of Tempe Cross Culverts
Private Retention Basins
Guadalupe Linear Retention Basins
Private Retention Basin
10' x 3' RCBCs Connected by 10' x 4' Concrete Channels (To Tempe Drain)
Retention Basin
Exst Storm Drain Trunk Line
Private Detention Basins
Tempe Drain Crossing Under 32nd St (Four 13.25' x 9.33' CMPA)
Tempe Drain Open Channel (To Salt River)
Exst Storm Drain Trunk Line
Detention Basin 1
Detention Basin 2A
Detention Basin 2B
48th Street Storm Drain
Detention Basin B
Detention Basin
Detention Basin A
Exst Storm Drain Trunk Line
Broadway Road Storm Drain
Private Retention Basin
40th Street Detention Basin
Exst Storm Drain Trunk Line
Kyrene Road
Kyrene Road Pump Station and Detention Facility
Hardy Drive
US 60
Priest Drive
Arizona Mills Mall
Baseline Road
Guadalupe Road
I-10
Guadalupe Flood Retarding Structure
Highline Canal
Western Canal
Southern Avenue
Fairmont Drive
Alameda Drive
Bell Butte
Broadway Road
48th Street
Tempe Drain
SR 143
SR 153
University Drive
44th Street
40th Street
36th Street
32nd Street
Salt River
Phoenix Sky Harbor International Airport
0 50 100 200
Scale in Feet
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
EXISTING DRAINAGE SYSTEM
SEGMENT 1
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H876801L
1 OF 2

FIGURE 3


Guadalupe Road
Private Retention Basins (Existing)
City of Tempe Improvement District No. 140 Detention Basins (Existing)
Private Retention Basins (Existing)
Elliot Road
Tempe Storm Water Diversion System (Existing)
Warner Road
ADOT Retention Pit Diversion Channel (Existing)
ADOT Retention Pit (Existing)
Ray Road
Chandler Boulevard
Pecos Road
SR-202
I-10/SR-202 T.I.
48th Street Detention Basin (Existing)
Knox Road
*There are 23 cross culverts and 49 onsite storage basins throughout this segment adjacent to I-10 between Guadalupe and Ray Roads and within the Elliot, Warner and Ray Road TIs.
Cross Culverts (Existing)
Median Storm Drain Trunk Line
Cross Culverts (Existing)
Detention Basin (Existing)
Cross Culverts (Existing)
Cross Culverts (Existing)
Infield Detention Basins (Existing)
Cross Culverts (Existing)
Infield Detention Basins
City of Phoenix Sanitary Sewer Pump Station
Infield Detention Basins
Open Channel (Existing)
0 50 100 200
Scale in Feet
FIGURE 3
ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION
EXISTING DRAINAGE SYSTEM SEGMENT 2
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H876801L
2 OF 2

1.3.8 Structures

1.3.8.1 Bridge Structures

The existing bridge structures within the project limits were built between the years of 1965 and 2007. The sufficiency of bridge vertical clearances is summarized in the AASHTO Criteria Report. A summary of the existing bridges within the study area is provided by freeway corridor in Table 4.

Table 4 – Existing Bridge Summary

Structure Number	Route/ Milepost	Structure Name	Superstructure and Foundation Type(s)	Minimum Vertical Clearance (ft)
1211	I-10, 153.47	Broadway Road TI Underpass	Steel girder bridge; Stub abutments on single row of alternating battered and straight steel piles; Piers on spread footings	16.97'
1144	I-10, 154.62	Southern Avenue Overpass (EB)	Cast-in-place reinforced concrete box girders with hinges in the second span; Integral abutments on a single row of straight steel piles; Piers on spread footings; Most recent widening consists of a reinforced concrete box with a drop-in precast prestressed concrete box beam section over Southern Avenue; Stub abutments and piers on drilled shaft foundations	16.56'
2305	I-10, 154.62	Ramp 'S-E' Over Southern Avenue	Precast prestressed concrete AASHTO Type VI Modified girders; Partial-height abutments on dual row of drilled shaft foundations located behind planter wall	15.75'[(1)]
2777	I-10, 154.62	Southern Avenue Overpass (WB)	Cast-in-place reinforced concrete box girders with hinges in second span; Integral abutments on a single row of straight steel piles; Piers on spread footings; Widening consists of an identical superstructure and substructure.	15.34'[(2)]
2702	I-10, 154.62	HOV Southern Avenue Overpass	Precast prestressed concrete box beams; Stub abutments and piers on drilled shaft foundations. Note: The bridge was built between the removed portions of the original Southern Avenue HOV overpass	25.55'
2347	I-10, 154.93	Ramp 'S-E' Over I-10	Cast-in-place post-tensioned concrete box; Stub abutments and piers on drilled shaft foundations	17.24'
2368	I-10, 155.00	WB60-EB10 Ramp	Cast-in-place post-tensioned concrete box girders; Partial height abutments and piers on drilled shaft foundations	18.59'[(3)]
2367	I-10, 155.01	Ramp 'NE' Over Western Canal	Precast prestressed concrete AASHTO Type IV girders; Stub abutments on drilled shaft foundations	N/A (As-builts note a 3'-4" minimum vertical clearance to top of canal bank)
5411	I-10, 155.01	Western Canal RCB	2 cell 14' x 5' x 383' reinforced concrete box culvert with approximately 7' of fill	N/A

Table 4 – Existing Bridge Summary (continued)

Structure Number	Route/ Milepost	Structure Name	Superstructure And Foundation Type(s)	Minimum Vertical Clearance (ft)
2700	I-10, 155.14	I-10 to US 60 HOV Ramp	Precast prestressed concrete AASHTO Type VI Super girders; Stub abutments on drilled shaft foundations behind MSE walls; Piers on drilled shafts foundations (two piers are post-tensioned straddle bents)	16.93'[(4)]
2348	I-10, 155.64	Baseline Road TI Overpass Westbound CD	Cast-in-place post-tensioned concrete box girders; Full-height abutments on spread footings	17.61'[(5)]
2349	I-10, 155.64	Baseline Road TI Overpass	Cast-in-place post-tensioned concrete box girders; Full-height abutments on spread footings	17.11'
2725	I-10, 155.65	Guadalupe Road Underpass	Precast prestressed concrete AASHTO Type VI girders; Stub abutments on drilled shaft foundations; Pier on spread footing. Note: Record drawings indicate an additional, stand alone spread footing and column to accommodate a future multi-use crossing over I-10 south of Guadalupe Road.	16.33'[(6)]
5414	I-10, 157.68	RCB	2 cell 10' x 4' x 933' reinforced concrete box culvert with approximately 10' of fill	N/A
2306	I-10, 157.69	Elliot Road TI Underpass	Precast prestressed concrete AASHTO Type VI Modified girders; Partial-height abutments and pier on drilled shaft foundations	16.67'[(7)] (posted clearance; measured minimum vertical clearances not available at this time)
5416	I-10, 158.06	RCB	2 cell 10' x 3' x 260' reinforced concrete box culvert with approximately 5' of fill	N/A
5418	I-10, 158.35	RCB	2 cell 10' x 4' x 268' reinforced concrete box culvert with approximately 3' of fill	N/A
5420	I-10, 158.65	RCB	2 cell 10' x 5' x 631' reinforced concrete box culvert with approximately 2' of fill	N/A
6792	I-10, 158.65	RCB	4 cell 10' x 8' x 274' reinforced concrete box culvert with approximately 30' of fill	N/A
2016	I-10, 158.69	Warner Road TI Underpass	Precast prestressed concrete AASHTO Type VI Modified girders; Partial-height abutments on dual row of drilled shaft foundations; Pier on spread footings	16.58'[(8)] (posted clearance; measured minimum vertical clearance not available at this time)
2017	I-10, 159.70	Ray Road TI Underpass	Precast prestressed concrete AASHTO Type VI Modified girders; Partial-height abutments on dual row of drilled shafts foundations; Pier on spread footings	16.59'

Table 4 – Existing Bridge Summary (continued)

Structure Number	Route/ Milepost	Structure Name	Superstructure And Foundation Type(s)	Minimum Vertical Clearance (ft)
2721	I-10, 160.87	Chandler Boulevard TI Underpass	Precast prestressed concrete AASHTO Type III girders; Partial-height abutments on dual row of drilled shaft foundations; Piers on drilled shaft foundations	17.13'
2350	US 60, 172.37	Priest Drive Eastbound Overpass	Precast prestressed concrete AASHTO Type VI Modified girders; Full-height abutments on dual row of drilled shaft foundations; Bridge widening matched existing structural features	17.39'(9)
2351	US 60, 172.37	Priest Drive Westbound Overpass	Precast prestressed concrete AASHTO Type VI Modified girders; Full-height abutments on dual row of drilled shaft foundations	17.38'(10)
1376	US 60, 172.90	Hardy Drive Underpass	Cast-in-place conventionally reinforced concrete box girders; Partial height abutments and pier on spread footings	15.56'

(1) ADOT Bridge Evaluation Request indicated a clearance of 15.84'; however, supplemental survey indicates that the clearance is 15.75'.
(2) ADOT Bridge Evaluation Request indicated a clearance of 25.55'; however this clearance applies to the adjacent HOV structure.
(3) ADOT Bridge Evaluation Request noted the clearance at 21.18' over Ramp S-E. However, review of inspection report clearance diagrams reveal a vertical clearance of 18.59' over this ramp at the barrier face; 21.18' is the clearance noted over the inside shoulder line.
(4) ADOT Bridge Evaluation Request noted the clearance at 16.93'. However, review of inspection clearance diagrams note the clearance as 17.16' over I-10 WB lanes.
(5) ADOT Bridge Evaluation Request noted the clearance as 17.71'. However, review of inspection clearance diagrams note the clearance as 17.61'.
(6) ADOT Bridge Evaluation Request noted the clearance as 16.37'. However, review of inspection clearance diagrams note the clearance as16.33'.
(7) ADOT Bridge Evaluation Request noted the clearance as 17.95'. However, review of inspection clearance diagrams note that the bridge posted as 16'-8". This is not a measured clearance.
(8) ADOT Bridge Evaluation Request noted the clearance as 17.02'. However, review of inspection clearance diagrams note that the bridge ADOT Bridge Evaluation Request noted the posted clearance as 16.58'. This is not a measured clearance.
(9) (ADOT Bridge Evaluation Request noted the clearance as 17.50'. However, supplemental survey indicates the clearance is 17.39'
(10) ADOT Bridge Evaluation Request noted the clearance as 17.45'. However, review of inspection clearance diagrams note the clearance as 17.38''.

1.3.8.2 Retaining Walls

A review of the as-built plans indicate the majority of the existing retaining walls were built with spread footing foundations. Numerous Mechanically Stabilized Earth (MSE) walls were used at the I-10/US60 TI. Existing wall types and locations are listed in Table 5. As-built stationing data is shown in the tables unless noted otherwise.

Table 5 – Existing Retaining Walls

Route/General Location	Retaining Wall Description (Approximate Freeway Centerline Stationing Unless Noted Otherwise)	Retaining Wall Type
I-10, Broadway Road TI Underpass	Walls located in front of and adjacent to both abutments, approximately parallel to I-10 on both sides of the bridge; West abutment walls from Station 8091+69 to Station 8095+78; East abutment walls from Station 8093+79 to Station 8096+52; Stationing was approximated using aerial survey	Walls immediately in front of bridge are tie-back walls; Remaining portions of walls are on drilled shaft foundations
I-10, 52nd Street/ Broadway Road Intersection	Located on both sides and parallel to 52nd Street, north of Broadway Road intersection; Eastern wall extends beyond ramp return and follows Broadway Road; West side from 52nd Street Station 21+48 to Station 23+60; East side from Broadway Road Station 33+95 to 52nd Street Station 23+60	Cantilevered wall on spread footing; East wall has an interrupted spread footing; Two drilled shafts were placed around an existing 102" diameter storm drain
I-10, North Side of HOV-Southern Avenue Overpass	Two median barrier walls located at edge of I-10/US60 TI HOV ramp; Both walls located from Station 7153+15 to Station 7156+38	Combination cantilevered retaining and barrier wall on spread footing
I-10, Southern Avenue Overpass	Located on north and south slopes of Southern Avenue Overpasses, parallel to Southern Avenue (all stations are Southern Avenue): • Station 11+89 to Station 13+99 • Station 14+87 to Station 15+17 • Station 15+89 to Station 16+09 South slope only wall: • Station 17+10 to Station 18+90 North slope only wall: • Station 16+61 to Station 18+41	Planter walls on spread footings
I-10, Ramp 'S-E' just south of Southern Avenue Overpass	Located at toe of embankment, parallel to Ramp 'S-E' construction centerline Station 84+51 to Station 93+77; Note: No record drawings were available for this wall; Stationing based on aerial surveys	Cantilevered retaining wall on spread footing; This ADOT standard wall was added as a construction change order
I-10, Eastbound Transfer Ramp 4 (I-10/US 60 TI)	Wall located along western edge of the EB Transfer Ramp 4 between Ramp 4 Station 16+00 to Station 29+89	Combination cantilevered retaining wall and noise wall on spread footing (between Stations 16+00 and 19+00); MSE wall from Station 19+00 to Station 29+89)
I-10, WB60-EB10 Ramp (east side I-10/US60 TI)	Two walls located at the end of the bridge along the roadway edge where the bridge ties into US60: • NE wall from Ramp' W-S' Station 15+77 to Station 18+47 • SE wall from Ramp 'W-S' Station 17+27 to Station 18+47	MSE wall
I-10, WB60-EB10 Ramp (I-10 side of I-10/US60 TI)	One wall located between ramp and I-10 mainline where bridge ties into I-10; Wall located from Ramp 'W-S' Station 39+53 to Station 41+03	MSE wall
I-10, Eastbound Transfer Ramp 4 (southwestern quadrant of I-10/US60 TI)	Wall located along eastern edge of the EB Transfer Ramp 4; Wall located between EB T-4 Station 23+49 to Station 25+80	MSE wall

Table 5 – Existing Retaining Walls (continued)

Route/General Location	Retaining Wall Description (Approximate Freeway Centerline Stationing Unless Noted Otherwise)	Retaining Wall Type
I-10, I-10/US60 HOV Connector (I-10 side of the I-10/US60 TI)	Walls located along HOV ramp connecting I-10 to US 60; MSE wall is also located in front of Abutment 1 of HOV connector bridge; North end of walls connect to the HOV Ramp over Southern Avenue wingwalls; Walls located on both sides of ramp from Station 7158+08 to Station 7163+45; The walls are tied together in front of the bridge abutment at Station 7163+45	MSE wall
I-10, I-10/US60 HOV Connector (US60 side of the I-10/US60 TI)	Wall located in front of HOV Connector Abutment 2 and parallel to the HOV ramp; The north wall is located from HOV Ramp Station 7175+45 to Station 7176+36; The south wall is located from Station 7175+45 to Station 7176+50; The north and south walls are tied together in front of the abutment at Station 7175+45; The wall stationing was determined from aerial surveys since the as-built plans do not provide wall stationing relative to ramp	MSE wall
I-10, Ramp 'N-E' over the Western Canal	Wall located at all four corners of bridge structure: • SE wall from Ramp 'N-E' Station 10+64 to Station 11+13 • SW wall from Ramp 'N-E' Station 10+96 to Station 11+82 • NW wall from Station Ramp 'N-E' 9+79 to Station 9+95 • NE wall from Ramp 'N-E' Station 9+29 to Station 9+50	Cantilevered wall on drilled shaft foundations
I-10, Eastbound I-10 between the I-10/US60 TI and the Baseline Road TI Overpass	Wall located along the outside edge of eastbound I-10 from Station 8185+12 to Station 8207+66 Wall located along western edge of eastbound I-10; Wall located from Ramp 'W-S' Station 46+50 to Baseline Road Ramp 'C' Station 15+84	Combination cantilevered retaining and barrier wall on spread footing MSE wall
I-10, I-10 Westbound C-D Road and north of the Baseline Road TI Overpass	Wall located between the westbound C-D Road and I-10 mainline from Station 8194+50 to Station 8207+63	Combination cantilevered retaining and barrier wall on spread footing
I-10, Baseline Road Ramp 'D'	Wall located at edge of Baseline Road Ramp 'D' from Station 3+09 to Station 8+19	MSE wall
I-10, I-10 Westbound C-D Road along Baseline Road Ramp 'D'	Wall located at edge of WB I-10 CD Road, providing grade separation from the Baseline Road Ramp 'D' north of Baseline Road TI Overpass; Wall from I-10 Station 8204+96 to Station 8210+36	MSE wall
I-10, North of the Baseline Road TI overpass	Wall located between Ramp 'W-S' and eastbound I-10; Wall located from Ramp 'W-S' Station 57+20 to I-10 Station 8209+51	MSE wall
I-10, I-10 Westbound C-D (Baseline Road Ramp 'A')	Wall located at edge of westbound I-10 CD Road, providing grade separation from the Baseline Road Ramp 'A' from Station 8212+01 to Station 8220+86	MSE wall

Table 5 – Existing Retaining Walls (continued)

Route/General Location	Retaining Wall Description (Approximate Freeway Centerline Stationing Unless Noted Otherwise)	Retaining Wall Type
I-10, South of Baseline TI overpass	Wall located along western edge of eastbound I-10 from Station 8211+16 to Station 8215+66	MSE wall
I-10, Baseline Road Ramp 'B'	Wall located at toe of Baseline Ramp 'B' embankment from Baseline Road Ramp 'B' Station 4+58 to Station 17+80; A noise wall is located on a portion of this wall	Cantilevered retaining wall on spread footing from Station 4+58 to Station 12+07; Combination cantilevered retaining and noise wall on spread footing from Station 12+07 to Station 17+80
I-10, Baseline Road Ramp 'A'	Wall located at toe of Ramp' A' embankment from I-10 Station 8215+63 to Station 8229+38	Cantilevered wall on spread footing between Stations 8215+63 to 8221+30; Combination cantilevered retaining wall and noise wall on spread footing between Stations 8221+30 to 8229+38
I-10, Guadalupe Road	No as-built data is available for the wall located between Guadalupe Road Station 10+91 to Station 13+20; The wall limits were estimated by using aerial survey	Note: Wall type is unknown (likely cantilevered wall on spread footing)
I-10, Elliot Road TI Underpass	Two walls located at toe of the embankment along the westbound side of Elliot Road: • NW wall located from Elliot Road Station 12+35 to Station 16+27 • NE wall located from Elliot Road Station 23+82 to Station 31+00	Cantilevered wall on spread footing
I-10, North of Warner Road TI Underpass	Wall located at the toe of the embankment along Warner Road Ramp 'D' from Ramp 'D' Station 11+50 to Station 13+43	MSE wall
I-10, Ray Road TI Underpass	Walls located parallel to Ray Road: • South side: Station 11+19 to Station 15+56 • North side: Station 23+66 to Station 27+40 Walls located at all 4 corners of bridge structure: • NW wall: Station 16+89 to Station 18+52 • SW wall: Station 17+19 to Station 18+51 • NE wall: Station 24+49 to Station 22+18 • SE wall – Station 21+49 to Station 22+34 Wall located along Ray Road Ramp 'B' from Station 3+00 wrapping around to Ray Road Station 27+98 Wall located along Ray Road Ramp 'C' embankment toe from Ramp 'C' Station 14+68 to Station 17+88; Additional wall located from approximate Ray Road Ramp 'C' Station 18+37 to Station 20+29 (record drawings were not available so the wall limits were estimated using aerial survey)	Cantilevered wall on spread footing except for grouted segmental block gravity wall located along Ramp C from Station 14+68 to Station 17+88. Note: Wall type is unknown for wall located along Ramp 'C' from Station 18+37 to Station 20+29 (probable cantilevered wall on spread footing). Cantilevered wall on spread footing except for grouted segmental block gravity wall located along Ramp 'C' from Station 14+68 to Station 17+88. Note: Wall type is unknown for wall located along Ramp 'C' from Station 18+37 to Station 20+29 (probable cantilevered wall on spread footing).

Table 5 – Existing Retaining Walls (continued)

Route/General Location	Retaining Wall Description (Approximate Freeway Centerline Stationing Unless Noted Otherwise)	Retaining Wall Type
I-10; Chandler Boulevard TI UP	Walls located along Chandler Blvd and ramp edges outside of the interchange: • NW walls: Chandler Blvd Stations 23+65 to 29+14, and Stations 29+88 to 30+10 • NE wall: Chandler Blvd Station 10+14 to Ramp 'A' Station 36+00 • SW wall: Ramp 'D' Station 16+00 to Chandler Blvd Station 27+30 • SE wall: Ramp 'C' Station 10+83 to Station 16+42, and Station 23+30 to Station 27+00 Also, walls also located at all 4 corners of the Chandler Blvd Underpass: • NW wall: Station 21+82 to Station 22+16 • NE wall: Station 17+91 to Station 18+32 • SW wall: Station 21+82 to Station 22+28 • SE wall: Station 17+88 to Station 18+32	Cantilevered wall on spread footing except for SW wall along Chandler Blvd and Ramp D where the wall is a combination cantilevered retaining wall and noise wall on a spread footing
US 60, Ramp 'S-E' to US 60 (I-10/US60 TI)	Wall located along edge of Ramp S-E/US60 eastbound along US60 to Kyrene Road from Station 144+33 to Station 148+78	MSE wall from Stations 144+33 to Station 148+13(1); Tieback wall from Station 148+13 to Station 148+78
US 60, WB US 60 from I-10/US60 TI to Hardy Drive	Wall located along edge of US 60 westbound	MSE wall from Stations 141+03 to 148+06(1); Tieback wall from Station 148+06 to Station 148+86
US 60, Priest Drive Westbound Overpass	Walls located at edge of US60 mainline adjacent to bridge structure: • NW wall: Station 119+22 to Station 120+12 • NE wall: Station 121+56 to Station 122+36 Additional walls are on alignments skewed approximately 45 degrees to Priest Drive: • SW wall: Station 117+82 to Station 120+71 • SE wall: Station 122+20 to Station 122+86	NW and NE walls: Cantilevered wall on drilled shaft foundations SW and SE walls: MSE wall
US 60, Hardy Drive Underpass	Walls located at all four corners of Hardy Drive bridge structure: • NW and NE walls: Hardy Drive Station 8+62 to Station 9+04 • SW and SE walls: Hardy Drive Station 10+96 to Station 11+38	Cantilevered wall on spread footing

Note: (1) Record drawings indicate that this wall was a cantilevered wall on spread footings; however, a field visit revealed that this wall was constructed as an MSE wall.

1.3.8.3 Noise Walls

Existing noise wall locations are presented in Table 6. Masonry walls are predominant along US 60 while cast-in-place concrete walls are more prevalent along I-10. As-built stationing data is shown in the tables unless noted otherwise.

Table 6 – Existing Noise Walls

Corridor and General Location	Noise Wall Description (Approximate Freeway Construction Centerline Stationing)	Noise Wall Type
I-10, North of Southern Avenue along I-10 Westbound (fronting Edwards Drive)	Wall located along I-10 Westbound from Station 8144+39 to Station 8156+09; wall at Station 8156+09 continues parallel to Southern Avenue Station 11+71	Masonry wall on spread footing
I-10, Eastbound Transfer Ramp 'T-4' at the I-10/US60 TI	Wall located along the western edge of Ramp 'T-4' from Station 13+20 to Station 19+00	Cast-in-place concrete noise wall on spread footing from Station 13+20 to Station 16+00; Cast-in-place concrete combination cantilevered retaining and noise wall on spread footing from Station 16+00 to Station 19+00
I-10; Baseline Road Ramp 'A'	Wall located at toe of Ramp 'A' embankment from Station 8221+30 to Station 8229+38	Cast-in-place concrete combination cantilevered retaining and noise wall on spread footing
I-10; Baseline Road Ramp 'B'	Wall located along edge of Ramp' B' from Ramp 'B' Station 12+07 to I-10 Station 8228+71	Cast-in-place concrete combination cantilevered retaining and noise wall on spread footing from Ramp 'B' Station 12+07 to Station 17+80; The remainder of the wall is a cast-in-place concrete noise wall on a spread footing
I-10; Baseline Road to Guadalupe Road	Walls located along both sides of I-10. In the eastbound direction of travel the walls are located at the following: • Station 8228+71 to Station 8232+35 • Station 8247+67 to Station 8262+34 In the westbound direction of travel the walls are located at the following: • Station 8221+30 to Station 8251+00	Cast-in-place concrete noise wall on spread footing
I-10; Guadalupe Road to Elliot Road	Wall located along apartment complex on west side of I-10: • Station 8263+35 to Station 8291+00	Masonry privacy wall owned by Pinnacle Apartments
I-10; Elliot Road to Warner Road	Wall located along eastbound I-10 from Elliot Road Ramp 'D' Station 3+75 to I-10 Station 8370+60. Note: The record drawings were unavailable for the end portion of this wall at Elliot Road so the end of wall stationing was determined by aerial mapping	Cast-in-place concrete noise wall on spread footing
I-10, Between Warner Road and Ray Road	Wall located along eastbound I-10: • Segment 1: Station 8376+08.00 to Station 8395+25.33, • Segment 2: Station 8395+25.33 to Station 8397+16.50 • Segment 3: Station 8397+16.50 to Station 8401+16.50	• Segment 1: Masonry wall on drilled shaft foundations • Segment 2: Combination concrete and masonry wall on drilled shafts • Segment 3: Combination concrete and masonry wall on spread footing
I-10; Chandler Boulevard TI Underpass	Walls are located along Chandler Boulevard Ramp 'D' and wrap around to Chandler Boulevard between Ramp 'D' Station 13+30 and Chandler Boulevard Station 27+30	Cast-in-place concrete combination cantilevered retaining and noise wall on spread footing
US 60; Priest Drive to Hardy Drive	Walls area located along both sides of US60; The south wall extends from Ramp 'S-E' Station 134+67 to US60 Station 47+99; The north wall extends from Ramp 'S-E' Station 121+34 to US60 Station 48+02	Masonry wall on spread footing

1.3.9 Signing, Lighting

1.3.9.1 Guide Signs

The existing freeway guide signs are supported with cantilever sign supports, tubular sign bridges, and truss sign bridges. The existing guide signs vary in size, age and legend design since they were designed and installed with numerous projects. The majority of the existing sign bridges were not designed to accommodate future pavement widening based on a review of the record drawings.

Table 7 summarizes the existing sign bridges that would be required to be modified to support the additional general-purpose and auxiliary lanes associated with this project.

Table 7 – Existing Sign Structures

Freeway Corridor	Direction of Travel	Station	Sign Structure Type	Span Length
I-10	Westbound	8084+00	Cantilever	32’
I-10	Westbound	8103+00	Sign Bridge	141’-10”
I-10	Westbound	8116+00	Sign Bridge	141’-10”
I-10	Westbound	8128+00	Sign Bridge	121’-10”
I-10	Westbound	8136+50	Sign Bridge	129’-10”
I-10	Westbound	8144+50	Sign Bridge	129’-10”
I-10	Westbound	8206+50	Sign Bridge	129’-10”
I-10	Westbound	8332+50	Cantilever	32’
I-10	Westbound	8344+70	Cantilever	32’
I-10	Westbound	8385+70	Cantilever	32’
I-10	Westbound	8439+00	Cantilever	32’
I-10	Eastbound	8100+00	Sign Bridge	125’-10”
I-10	Eastbound	8114+80	Sign Bridge	129’-10”
I-10	Eastbound	8136+00	Sign Bridge	105’-6”
I-10	Eastbound	8146+09	Sign Bridge	118’
I-10	Eastbound	8188+00	Cantilever	16’
I-10	Eastbound	8197+50	Sign Bridge	62’
I-10	Eastbound	8303+00	Cantilever	32’
I-10	Eastbound	8344+90	Cantilever	32’
I-10	Eastbound	8357+40	Cantilever	32’
I-10	Eastbound	8404+00	Cantilever	32’
US 60	Eastbound	131+40	Sign Bridge	86’
US 60	Westbound	125+00	Sign Bridge	86’
US 60	Westbound	133+60	Sign Bridge	86’
US 60	Westbound	142+73	Cantilever	32’

1.3.9.2 Freeway Lighting

The existing I-10 freeway lighting consists of high mast lighting at the system interchanges, and a mixture of median mounted high mast poles and offset mounted poles. The pole heights vary in the vicinity of the service interchange ramps.

The I-10 mainline and ramp lighting systems are energized with 240/480 volt Type IV load centers. Table 8 presents the locations of the existing load centers and the limits of the lighting fixtures associated with each load center.

Table 8 – Existing Load Center Locations

Freeway Corridor	Direction	Location (Station)	Load Center Type	Begin Lighting System Limit	End Lighting System Limit
I-10	Westbound	Station 8067+00	IV	Station 8068+00	Station 8103+50
I-10	Westbound	Station 8117+00	IV	Station 8107+00	Station 8140+00
I-10	Westbound	Station 8208+00	IV	Station 8193+00	Station 8230+00
I-10	Eastbound	Station 8159+00	IV	Station 8145+00	Station 8188+00
US 60	Westbound	Station 113+75	IV	Station 103+00	Station 135+00
US 60	Eastbound	Station 48+00	IV	Station 138+00 (1)	Station 86+00 (1)
US 60	Eastbound	Station 120+45	IV	Station 89+00	Station 126+00

(1) Station Equation: Station 147+00 Bk = Station 49+00 Ahd

1.3.10 Freeway Management System (FMS)

The existing Freeway Management System (FMS) consists of node buildings, communications trunk lines, ramp meters at various entrance ramps, Dynamic Message Signs (DMS), Closed Circuit Television (CCTV) cameras, detector loops and other features. These FMS features interact through the node buildings to communicate with the Traffic Operations Center (TOC) to mitigate congestion problems, minimize the effects of non-recurring congestion such as vehicular crashes, and improve operational safety for the general public.

A number of Intelligent Transportation System (ITS) devices are used with the FMS in order to achieve these goals. Dynamic Message Signs (DMS) are used to disseminate information to the traveling public and Closed Circuit Television (CCTV) cameras are used to view freeway conditions at the TOC. In-pavement loop detectors and non-intrusive detection (such as acoustic detectors) are used to perform traffic monitoring by gathering traffic data, and ramp meters are used to limit the demand on the freeway mainline in order to preserve freeway operations.

Each of the ITS components are linked to the TOC through a communications system. Information from individual devices is collected and converted on a fiber optic transceiver or a copper twisted wire pair modem in cabinets with traffic controllers. A series of Node buildings act as network hubs for the fiber optic and copper wire communications system that brings all of the data provided by the individual components to the TOC. The TOC serves as the base of operations for all of the ITS components for the FMS. Operators can control each component remotely from their workstations at the TOC, and the FMS software can ensure that all of the devices are working in concert with each other.

The entire I-10 and US 60 corridors within the study limits include a fully operational FMS system including all of the DMS, CCTV, detector stations, ramp meters and communications systems.

1.3.10.1 FMS Communications and Trunk Line

Node buildings serve as the communications hubs with the Traffic Operations Center (TOC) for the existing fiber optic and copper wire communication system. Within the nodes, the information from the field components is digitized and transmitted to the TOC. The existing Node buildings that are located within the study limits are shown in Table 9.

Table 9 – Existing FMS Node Buildings

Node Building No.	Location
Node No. 12	West of the Broadway Road TI eastbound entrance ramp

The trunk line of the FMS is the primary conduit that carries the information collected by devices between nodes to the TOC. Along the I-10 corridor, the trunk line generally also carries the power for the operation of the FMS components.

The FMS communication system includes three 3” conduits with fiber optic cables that are typically located along the shoulders of the existing roadways, and generally 30” below the ground surface. The conduit system is concrete encased, and is typically attached to the bridge structures at the overpasses. Most of the freeway corridors are designed with a trunk line located on each side of the roadway that occasionally connect to each other to provide system redundancy. The node buildings are connected to each other with these redundant fiber optic cables, termed a ring. In order to maintain communications during relocation, the cable on one side of the freeway (one side of the ring) must remain connected at all times.

In addition to the interconnectivity between the node buildings, the communication system is connected from the node to each ITS component. There are currently two typical applications for this communication system that include:

- An eight strand Multi-Mode Fiber Optic Cable (MMFO) to communicate video from the CCTV to the node building, while a connection to the other ITS devices is completed with a 25 Twisted Wire Pair (TWP) cable.
- The current approach is to communicate all ITS components to the node building with a Single-Mode Fiber Optic Cable (SMFO). This SMFO cable contains fiber optic strands used for the backbone communication system.
- The newer FMS systems utilize SMFO while the older phases of the overall freeway system FMS implementation were installed with MMFO for video and 25 TWP for the remaining devices.

Each node ultimately communicates information back to the TOC. The interconnectivity between the node buildings within the project limits is shown in Table 10.

Table 10 – Node-to-Node Communications

Node (From)	Node (To)	Fiber Optic Backbone
Node 12	Node 8	SMFO (46)

Note: SMFO(XX): Single Mode Fiber Optic Cable, type of fiber optic cable with specified number of individual fibers

The 10 Gigabit Ethernet Backbone Switch (10 GBS) is used as a collection and distribution point for the DMS, ramp meter, traffic signal, traffic count stations (TCS), telephone, and node monitoring/control circuits via terminal servers and/or Ethernet capable equipment located in the noted buildings and the TOC. The 10GBS also serves as a concentration point for IP video and PTZ control for the CCTV cameras via the encoder units and channel terminal servers located in the node buildings and used as a distribution point for the decoder units located in the TOC. The 10GBS equipment will interconnect with each other via a 10 Gigabit Optical Ethernet backbone using two strands of existing single mode fiber optic cable. All node buildings within the project limits are assumed to have been upgraded to 10 GigE prior to initiating the I-10 near-term improvements.

1.3.10.2 FMS Devices

Dynamic Message Signs (DMS)

DMS are used to communicate important messages from the TOC to motorists on the freeway. All of the signs are manufactured by Fiber Optic Display Systems (FDS) and are a fiber optic hybrid type. The sign hardware may vary for signs installed in different projects at different periods of time. However, each sign is compatible with the ADOT FMS system.

All of the DMS are connected to the ADOT FMS communication system through the trunk lines and node buildings via the SMFO or TWP. No signs are connected to the TOC through a cellular or land-line telephone connection. Six (6) DMS signs are located within the project limits as shown in Table 11.

Closed Circuit Television (CCTV)

CCTV cameras are used to remotely view traffic conditions and incidents from the TOC. The CCTV cameras are typically installed on 55’ high modified “T” poles that are located within the freeway right-of-way. The CCTV hardware can either be mounted on the camera pole inside of a Type 343 cabinet or mounted in a 341A cabinet near the bottom of the pole.

Table 11 – Existing DMS Locations

Freeway Corridor	Direction/ Milepost	Cabinet ID	DMS No.	Structure Type	Location Description
I-10	Westbound, MP 154.26	1015426	10	Box truss	Just north of Southern Avenue
I-10	Westbound, MP 156.82	1015682	9	Box truss	Near Guadalupe Road underpass
I-10	Westbound, MP 159.71	1015971	8	Crossroad overpass	Mounted on Ray Road underpass
I-10	Eastbound, MP 153.56	1115356	7	Box Truss	Broadway Road eastbound entrance ramp
I-10	Eastbound, MP 157.14	1115714	82	Monotube bridge	Approaching Guadalupe Road
I-10	Eastbound, MP 158.68	1115868	83	Crossroad overpass	Mounted on Warner Road overpass
US60	Eastbound, MP 172.59	3117259	16	Box truss	Near Priest Drive eastbound entrance ramp

The CCTV cameras used within the I-10 corridor are the barrel type manufactured by either COHU or Javelin. The later FMS projects used the COHU cameras, while the early projects used the Javelin cameras. All of the cameras are located adjacent to the freeway within the ADOT right-of-way within the locations provided in Table 12.

Table 12 – Existing CCTV Locations

Freeway Corridor	Direction/ Milepost	Cabinet ID	Cabinet Type	CCTV No.	Location Description
I-10	Westbound, MP 152.61	1015261	341A	29	Between 40th Street and SR143
I-10	Westbound, MP 153.11	1015311	343	30	East of I-10/SR143 TI
I-10	Westbound, MP 154.25	1015425	341A	31	Between Broadway Road and Southern Avenue
I-10	Westbound, MP 156.05	1015605	343	33	Between Baseline and Guadalupe Roads
I-10	Eastbound, MP 155.21	1115521	343	32	South of I-10/US60 TI
I-10	Eastbound, MP 157.12	1115712	341A	34	Between Guadalupe and Elliot Roads
I-10	Eastbound, MP 158.22	1115822	341A	35	Between Elliot and Warner Roads
I-10	Eastbound, MP 159.24	1115924	341A	36	Between Warner and Ray Roads
I-10	Eastbound, MP 160.25	1116025	341A	37	South of Ray Road
US60	Westbound, MP 172.38	3017238	343	169	West of Priest Drive underpass

Detector Stations and Ramp Meters

As part of the FMS system, ADOT has installed a series of count or detector stations to monitor freeway traffic and congestion. The detector stations have been installed at a spacing of 1/3 mile along each freeway and each direction of travel. ADOT is currently utilizing the detector stations at the mile stations and have disconnected the intermittent stations. The mainline detector stations generally consist of a pair of loop detectors placed within each lane. An alternative to detector loops is the Passive Acoustic Detectors (PADs) that are typically installed on poles above the roadway, and are mounted near the roadway (median or shoulder) and rely on the sound waves created by passing vehicles to detect the traffic. The majority of the I-10 corridor uses loop detector stations, while PADs have been installed on I-10 at the Broadway Curve and along US 60.

Loops have also been installed beneath the exit and entrance ramps to provide traffic count data and to serve as detection for ramp metering. Currently only the on-ramp detection is utilized and exit ramp detectors have been decommissioned. Ramp metering is designed to limit the traffic demand on the mainline by metering the volume of entrance ramp traffic based on freeway volumes. There are three configurations that a ramp can be categorized with respect to ramp metering including: 1.) not metered; 2.) single lane – metered; and, 3.) dual lane – metered.

The ramp meter status for the traffic interchanges located within the study limits is included in Table 13.

Ramp metering and detection stations are installed in either a Type 341A controller cabinet or a Type 341D controller cabinet. The two cabinet types are physically similar with the distinction being that the Type 341D cabinet houses two 2070 controllers and the 341A controller cabinet houses only one. The 341D typically is used to monitor both sides of the freeway from a single cabinet.

The ramp metering sites will typically have an adjacent traffic counting station whose detectors (loops or PADs) will also be included in the Type 341 controller cabinet along with the ramp metering functions and hardware

Table 13 – Ramp Meter Locations and Configurations

Freeway Corridor	Entrance Ramp Location	Ramp Meter Configuration
I-10	Broadway Road – westbound	Not metered
I-10	Broadway Road – eastbound	Dual lane – metered
I-10	Baseline Road – westbound	Not metered
I-10	Baseline Road – eastbound	Dual lane – metered
I-10	Elliot Road – westbound	Dual lane – metered
I-10	Elliot Road – eastbound	Dual lane – metered
I-10	Warner Road – westbound	Dual lane – metered
I-10	Warner Road – eastbound	Single lane – metered
I-10	Ray Road – westbound	Dual lane – metered
I-10	Ray Road – eastbound	Not metered
US60	Priest Drive – eastbound	Dual lane – metered

Power Distribution System

The FMS components utilize a 120/240V power system. The power distribution is typically 480V, with a step-down transformer at each FMS component. Depending on location, the service providers for these load centers are either Arizona Public Service (APS) or Salt River Project (SRP). Each device is connected via a wire directly back to the load center through the conduit system.

Crossroad Traffic Signals

The crossroad traffic signal cabinet represents a device that is not originally installed as part of the overall FMS. However, they have been integrated into the FMS system and connect to TOC. Many of the crossroad traffic signals are owned by ADOT but are operated by the local jurisdiction.

Other Features

The existing pump station located at Southern Avenue is not integrated with the FMS in the project area, although some of the necessary infrastructure (cabinet and hardwiring) is in place. This pump station is currently controlled by the Phoenix Maintenance District through radio telemetry.

1.3.11 Geotechnical Conditions

Existing Subsurface Conditions

The generalized subsurface conditions were determined based on review of published geologic maps and test boring logs from the as-built plans of the existing bridges, and relevant experience with previous geotechnical investigations performed within the study area.

The project site is situated within the southern Basin and Range physiographic province which is characterized by broad intermountain alluvial valleys and intervening fault-bounded and uplifted mountain ranges, often with well-developed pediments and alluvial fans. Generally, the mountain ranges and valleys trend in a north-south to northwest-southeast direction. The typical modern Basin and Range landscape was formed by late Tertiary (Miocene-Pliocene) extensional tectonics and high-angle normal faulting, followed by subsequent erosion of the uplifted mountains and deposition of the sediments in the newly-formed basins.

The generalized site geology consists of relatively flat-lying surficial Holocene alluvial plain sediments in the Phoenix basin of central Arizona between the Phoenix Mountains to the north, Papago Buttes to the northeast, and the South Mountains to the south and west of the study area. The geology within the project limits consists of alluvial soils which vary from fine to coarse depending mainly upon the proximity to the sand, gravel and cobble laden Salt River sediments within the approximate upper 100’ to 150’ within the central majority of the study area.

The bedrock in the vicinity of the Phoenix Mountains consists predominately of late-Proterozoic metasedimentary and metavolcanic rocks. The bedrock in the vicinity of the Papago Buttes is primarily Proterozoic granitic overlain by tilted Tertiary age sedimentary conglomerate, then sandstones and mudstones that are locally known as the Tempe Beds which form the resistant buttes. In the vicinity of the Broadway Curve, Tertiary volcanic rock forms large outcrops comprised of andesite known as Twin Butte and Belle Butte on the west and east side of I-10, respectively. In the southern portion of the study area, the bedrock of the South Mountains is Tertiary age granitic and gneissic rock and can be seen in the freeway cuts along the east side of I-10 to the south of Baseline Road.

Relatively shallow to exposed bedrock and associated cemented colluvial soil is present along I-10 between Broadway Road and Southern Avenue. This is the only area where shallow bedrock should impact construction within the study area limits.

The upper layer of the Salt River sediments that primarily consists of sand, gravel and cobble (locally referred to as SGC) were formed by the broad ancestral meandering, incising and infilling of paleochannels originating in the mountains upstream of the study area. The SGC deposit is known to extend to depths of 150’ or more near the Salt River. Most of the SGC is non-plastic and uncemented, though it does contain isolated lenses or layers (generally at depth) with higher percentages of low to medium plastic fines. The upper 5’ to 10’ of this stratum is also locally weakly to moderately cemented with calcium carbonate (lime). Though much of the SGC layer is exposed within the active Salt River channel, a large portion of this deposit at and beyond the stream banks is overlain by a more recent (Quaternary Age) deposit of silt, sand, and clay with minor gravels.

From an engineering standpoint, the general subgrade conditions can be grouped into the soils that are located near the relatively shallow Salt River channel SGC soils (on I-10 and SR 143); soils transitioning to shallow bedrock near the I-10/SR143 TI and the Broadway Curve; firm to hard finer grained soils and relatively shallow SGC in the vicinity of the I-10/US60 TI; and a transition to variably firm, finer grained soils to significant depths along the I-10 corridor to the south that extends past Chandler Boulevard. SGC is located at a depth of approximately 5’ to 10’ at the I-10/SR143 TI, and at a depth of approximately 13’ at the I-10/Broadway Road TI.

The Tempe Formation sedimentary bedrock is located immediately south of Broadway Road. This bedrock (mainly conglomerate) is exposed for several hundred feet near the Tempe Buttes Resort and then dives to the south. SGC is again anticipated to a depth of 20’ to 25’ at Southern Avenue near the existing overpasses. The SGC underlies moderately soft to firm, medium to high plasticity clay.

At the I-10/US60 TI and extending to the east on US 60 to Hardy Drive, and extending to south on I-10 to Baseline Road, generally firm to hard, weakly to moderately cemented clayey soils are present to depths of approximately 50’ to 65’. These relatively hard soils generally overlie SGC, though granitic bedrock (likely gneiss) was encountered at the Baseline Road TI OP. This rock is an extension of the bedrock exposed on the east flank of South Mountain. The soils present to the south of Baseline Road TI consist mainly of finer grained, typically medium plasticity silty and clayey soils to the full depths of investigation. These soils vary from soft to hard being mainly dependent on the amount of moisture and cementation with calcium carbonate. Though some of the project area is likely dropping due to general groundwater withdrawals, there are no known earth fissures within or near the project study area.

Pavement Structural Sections

The existing pavement structural sections were obtained from the as-built plans and available geotechnical investigation reports. The existing pavement structural sections that were constructed with the previous freeway projects are provided in Table 14.

Table 14 – Existing Pavement Structural Sections

Freeway Corridor	Location	AR-ACFC (in)	PCCP (in)	CTB (in)	LCB (in)	ACB (in)	AB-2 (in)	Select (in)
I-10	40th Street to Southern Avenue	1	14.5			3		
I-10	Southern Avenue to Baseline Road	1	12			4		
I-10	Baseline Road to Chandler Boulevard	1	13			4		
SR 143	Broadway Road to University Drive	1	12.5				4	
US 60	I-10 to Mill Avenue (original pavement)	1	9	4			4	
US 60	I-10 to Mill Avenue (mainline widening)		12			4		

Dowel baskets were utilized in the mainline and high-occupancy vehicle (HOV) lanes with the previous mainline and HOV construction between SR 143 and Baseline Road. The recent auxiliary lane construction project along I-10 westbound from US 60 to SR 143 did not utilize dowel baskets for the pavement widening.

1.3.12 Previous Projects

The ADOT Milepost Strip Map shows the project listed in Table 15 below:

Table 15 – Previous Projects

Freeway Corridor	Project Number and/or TRACS Number	Milepost	As-Built Date	Description
I-10	010 MA 147 H6956 01C	147.9 - 155.7	2007	Quiet Pavement Phase 8, Van Buren St. to Baseline Rd.
I-10	I-10-3-937 NO TRACS	149.6 - 153.5	1980	24th St. - Broadway Rd. - Slurry Seal
I-10	I-10-3(50) NO TRACS	149.9 - 152.1	1964	24th St. - 40th St. - GD
I-10	ACIR-10-3(243) H0108 04C	150.0	1988	Buckeye Rd. - 32nd St. - Erosion Control

Table 15 – Previous Projects (continued)

Freeway Corridor	Project Number and/or TRACS Number	Milepost	As-Built Date	Description
I-10	I-10-3-507 H2839 01C	150.0	1990	Bridge Repair - Structure #2003
I-10	H0192 07C	150 - 154	1994	24th St. - Southern Ave. (FMS)
I-10	IR-10-3(312) H0143 04C	151.6 - 154.3	1989	Ramps and Signs, New BR, Reconstruct T.I., 40th St. T.I.
I-10	I-10-3(33) NO TRACS	152.0 - 153.9	1966	40th St. - Broadway Rd.
I-10	I-10-3(54)NO TRACS	152.0 - 155.5	1967	40th St. - Baseline Rd. - BC PCC
I-10	IR-10-3(326) H2798 01C	152.0	1989	VMS - Various Locations
I-10	STP-10-3(337) H3144 01C	152.0 - 152.2	1992	40th St. Landscaping, Erosion Control, Bank Proctection
I-10	I-10-3(107) NO TRACS	152.1 - 155.7	1976	40th St. - Baseline - Landscaping
I-10	STP-10-3(331) H2875 01C	152.1 - 154.2	1992	44th St. - Southern Ave. - Landscaping/ Irrigation
I-10	ACIR-10-3(315) I-10-3(309) H203601C	152.2 - 154.5	1990	40th St. - Southern Ave. 44th St. - Superstition - GC, PV
I-10	ACIR-10-3(198) H2650 01C	152.9 - 153.9	1988	48th St. & Broadway Rd. T.I. - EB Widening
I-10	I-10-3(521) H3862 01C	153.1 - 154.2	1995	I-10 Frontage - Broadway Rd. - Pavement Preservation
I-10	I-10-3(51) NO TRACS	153.9 - 155.1	1966	Broadway Rd. - Baseline - GD
I-10	010-C-NFA 010 MA 154 H7278 01C	153.9 - 154.8	2008	Southern Ave. – SR 413 Auxiliary Lane
I-10	ACIR-10-3(260) H2080 01C	154.0 - 155.1	1989	Southern Ave. Structure O P, Widening
I-10	NH-10-3(310) H0142 04C	154.0 - 157.9	1992	Superstition T.I. - Baseline Unit I: Vol. I - IV
I-10	NH-10-3(317) H2035 01C	154.3 - 156.0	1994	Superstition T.I. - Baseline Unit II: Vol. I - IV
I-10	NH-10-3(339) H3227 01C	154.6 - 155.9	1992	Superstition T.I. - Baseline Unit I: Sewer Pipe
I-10	I-10-3(60) NO TRACS	155.1 - 155.2	1964	Western Canal Bridge
I-10	I-10-3(34) NO TRACS	155.2 - 158.8	1964	Baseline Rd. - Warner Rd. - GD
I-10	I-10-3(56) NO TRACS	155.2 - 160.1	1966	Baseline Rd. - Williams Field Rd. - BC, AC
I-10	I-10-C-503 H5540 01C	155.6	2000	Phx-Casa Grande Hwy I-10 - Baseline Rd. T.I. - OP #1097 - B Deck Joint Repair
I-10	I-10-3(133) NO TRACS	155.6 - 157.9	1984	Baseline Rd. - Elliot Rd. - Landscape & Irrigation
I-10	I-10-3(533) H5050 01C	155.6 - 157.7	1999	Phx-Casa Grande Hwy I-10 -Baseline Rd. - Elliot Rd. - Landscape & Irrigation
I-10	NH-900-A(072) 999 MA 000 H6371 03C	155.7 - 159.7	2004	Quiet Pavement Phase 3, Baseline Rd. to Ray Rd.
I-10	AC-10-3(322) H2382 01C	156.0 - 160.2	1995	Baseline Rd. -Chandler Blvd. - Close/Add Median Lane

Table 15 – Previous Projects (continued)

Freeway Corridor	Project Number and/or TRACS Number	Milepost	As-Built Date	Description
I-10	IM-10-3(353)P H3880 01C	156.4 - 156.8	2000	Phx - Tucson Hwy I-10 - Guadalupe Rd. Underpass #1098 - Remove/Replace Bridges
I-10	M-514-8(1) H2383 03C	157.5 - 157.9	1991	Elliot Rd. T.I. Reconstruction
I-10	I-10-C-202 H5756 01C	158.0 - 159.6	2002	Elliot Rd. - Ray Rd. - Auxiliary Lane
I-10	I-10-3(241) NO TRACS	158.1 - 160.9	1987	Warner Rd. T.I. Landscaping and Signing
I-10	I-10-3(53) NO TRACS	158.7 - 161.7	1965	Warner Rd. - Reservation Ln. - GD
I-10	I-10-C-501 H5482 01C	158.8 - 159.3	Not Available	Phx - Casa Grande Hwy I-10 & Warner Rd. - Constr Wall
I-10	I-10-3(236) H0121 05C	159.0	1985	Western Canal - Ray Rd. T.I. (SRP Project)
I-10	888 MA 000 H7082 01C	159.7 - 162.5	2008	Quiet Pavement Phase 10, Ray Rd. to Wild Horse Pass
I-10	IR-10-3(194) NO TRACS	160.0 - 160.7	1985	Ray Rd. T.I.
I-10	AC-STP-600-6(1)B H508701C	160	2000	I-10/SR 202L T.I. Phase I
I-10	AC-STP-600-7(1)B H508801C	160	2001	I-10/SR 202L T.I. Phase II
SR 143	RAM-600-3-503	0.0 - 0.5	1977	I-10 - University Dr.
SR 143	RAM-600-3(5)P	0.0 - 0.5	1998	I-10 - University Dr.
SR 143	RAM-600-3-511 H204501C	0.0 - 0.6	1995	University Dr. - Sky Harbor Blvd.
SR 143	RAM-600-3-501	0.0 - 1.2	1980	Hohokam Tempe Drain - Sky Harbor Blvd
SR 143	RAM-600-3-514 H2045 02C	3.0 - 4.1	1990	Sky Harbor Blvd. - Washington St.
SR 143	ST-833103		Not Available	48th St. Storm Drain - Baseline Rd. to Broadway Rd. (City of Tempe Project)
SR 143	900-0(96) H3826 01C		1996	SR51 from I-10 to Glendale Ave. (FMS) SR143 from I-10 to 202L (FMS) 202L from I-10 to SR143 (FMS)
US 60	F-028-1(1) NO TRACS	0.4 - 2.2	1969	Jct. I-10 - Rural Rd.
US 60	AC-NH-060-C(001)B H5370 01C	173.0 - 184.0	2003	I-10 - Val Vista Dr. Segments 1 & 2 (HOV Lanes)
US 60	060-B-NFA 060 MA 172 H6898 01C	172.6 - 175.5	Underway	I-10 to 101L (Price) Roadway Widening

[Text resumes on page 34]

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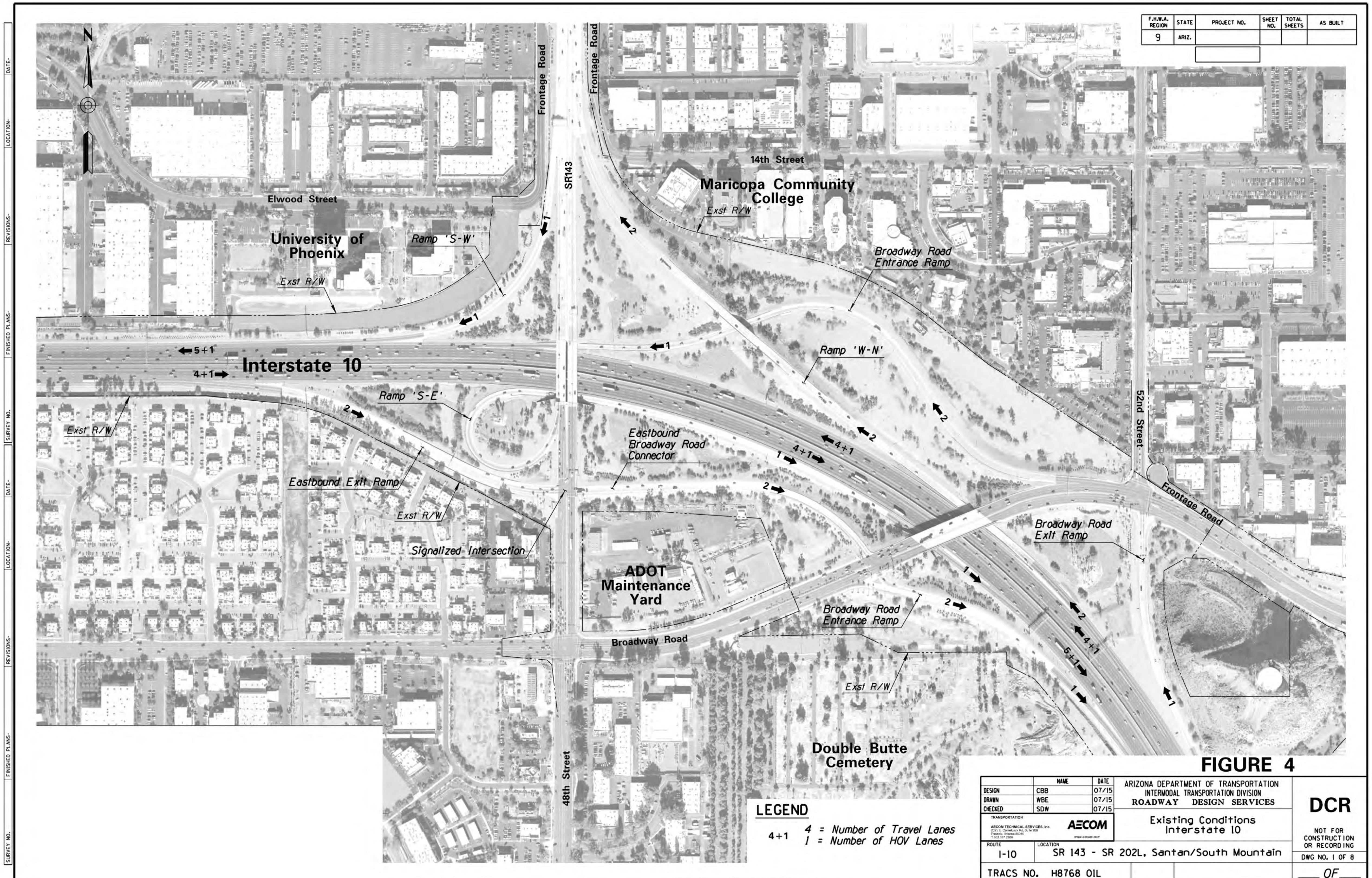
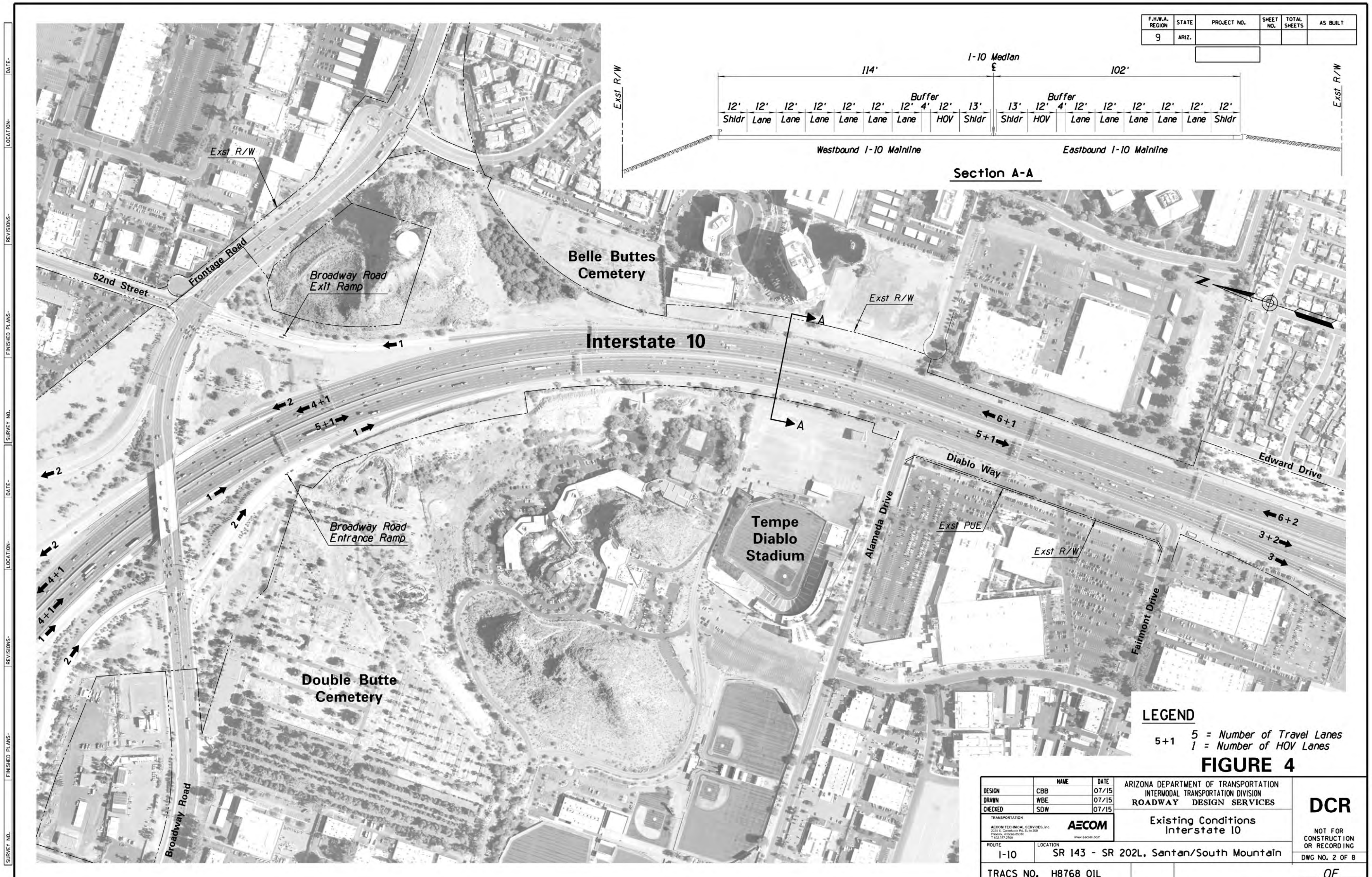
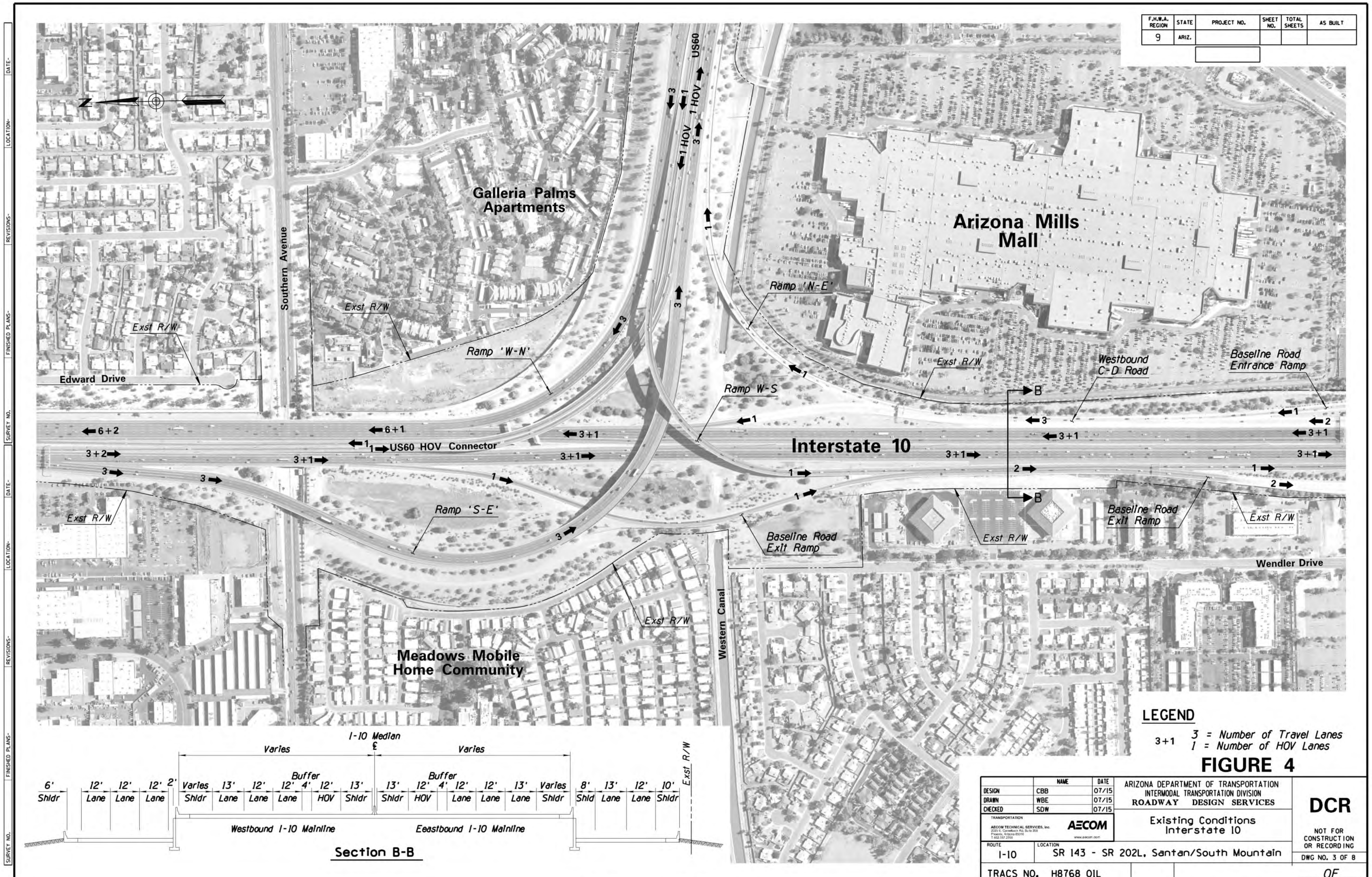
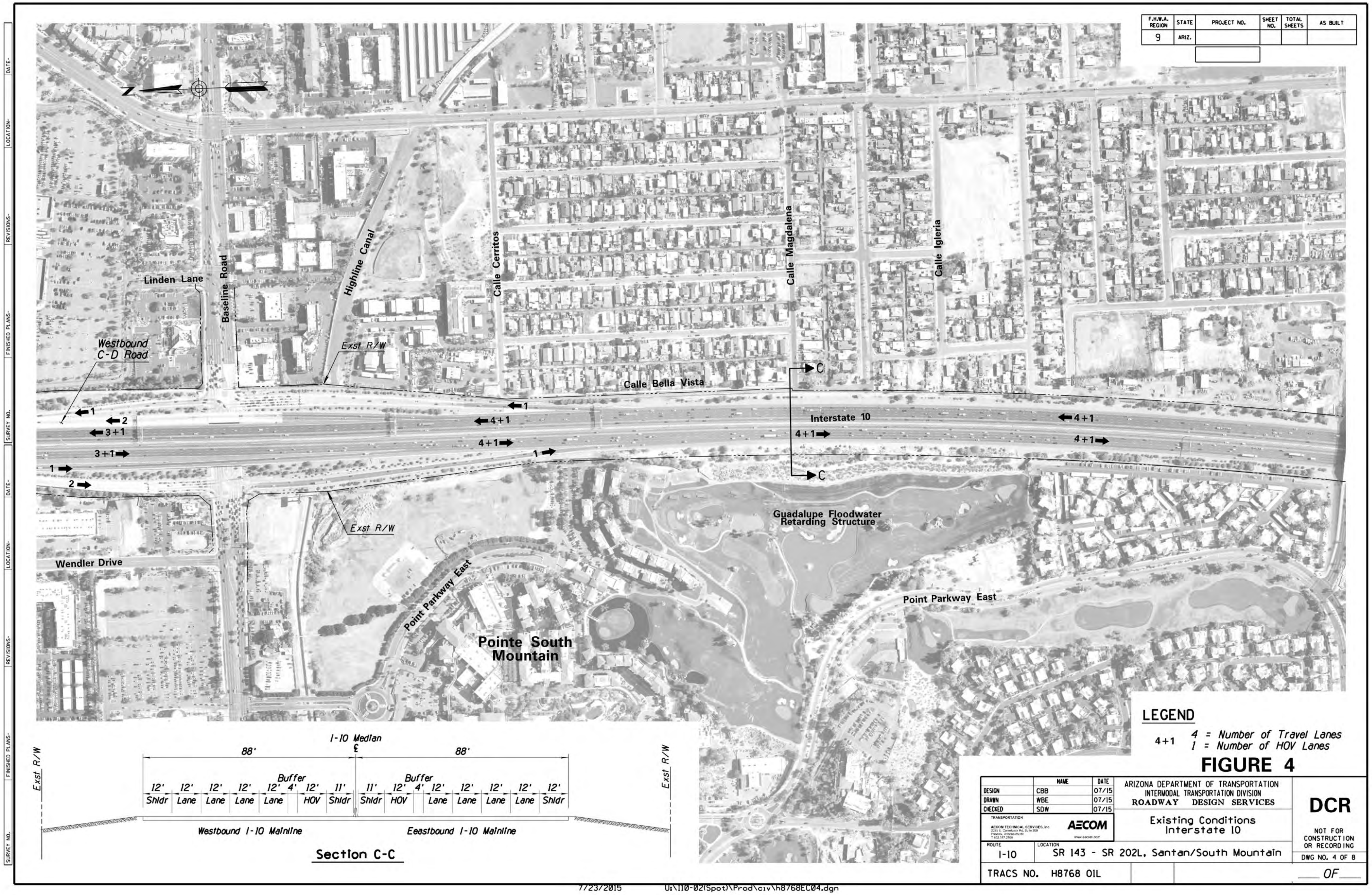
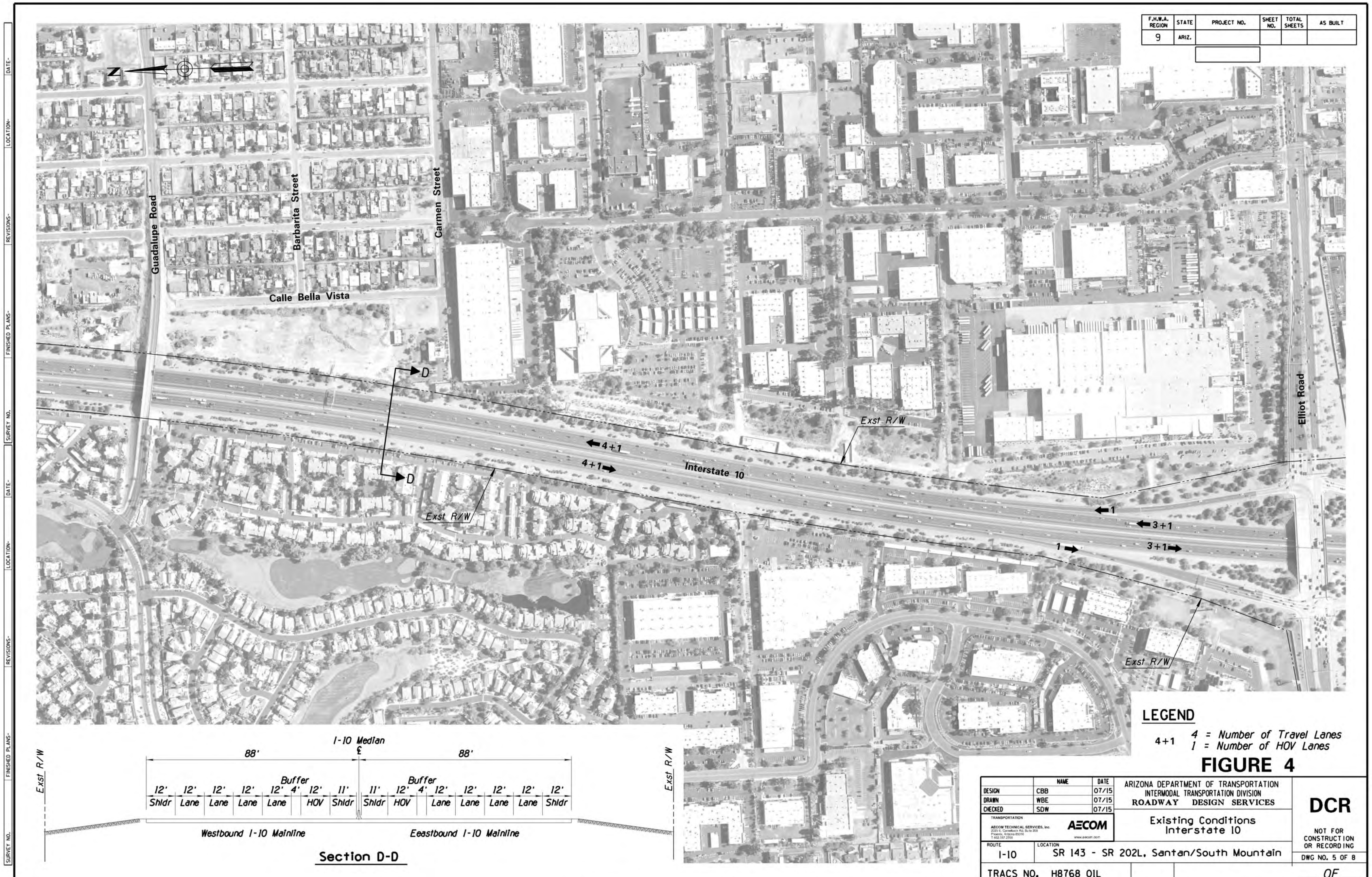
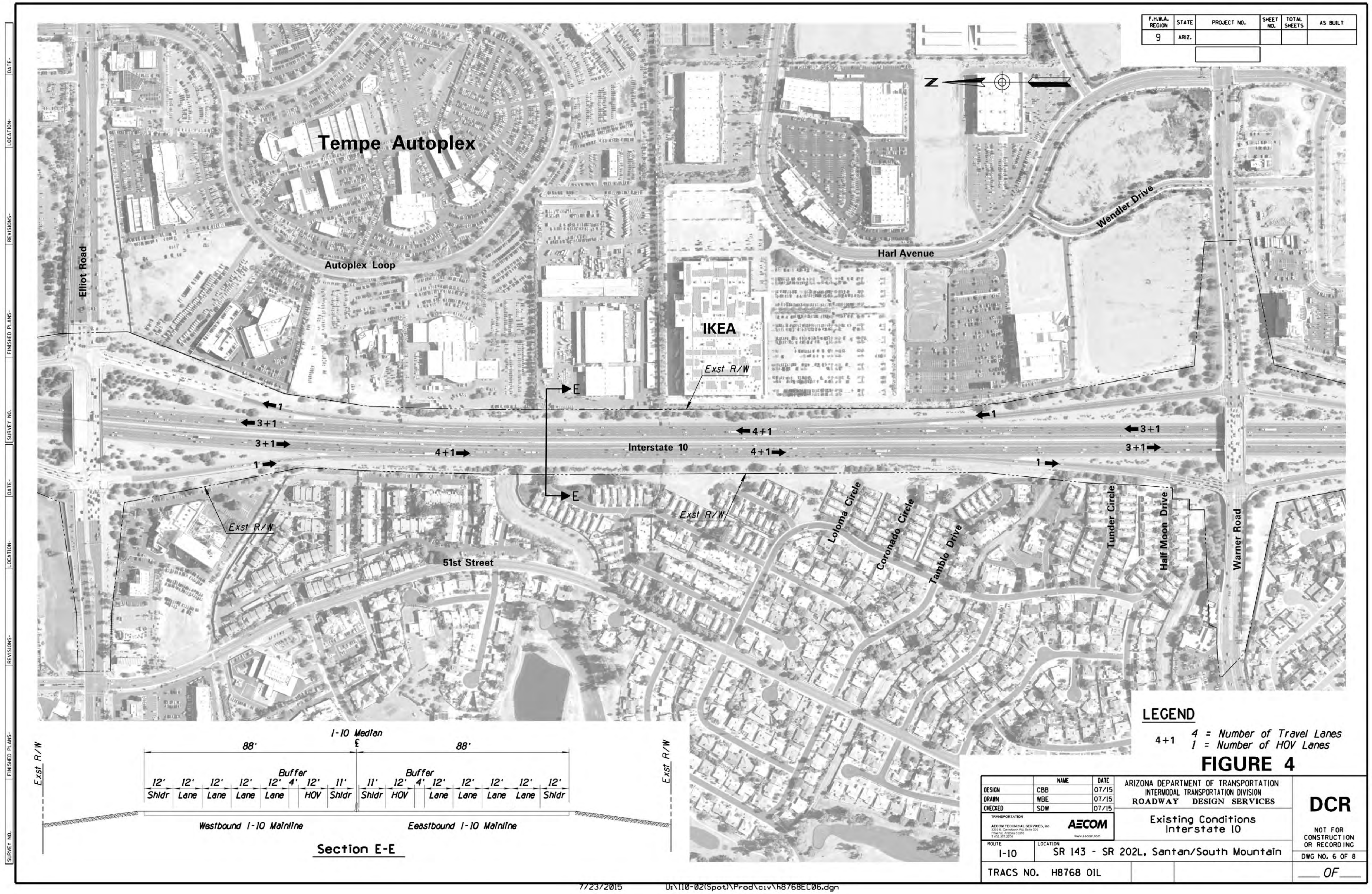

Frontage Road
SR143
14th Street
Maricopa Community College
Elwood Street
University of Phoenix
Ramp 'S-W'
Exst R/W
Broadway Road Entrance Ramp
Ramp 'W-N'
Interstate 10
5+1
4+1
Ramp 'S-E'
Eastbound Broadway Road Connector
52nd Street
Eastbound Exit Ramp
Signalized Intersection
ADOT Maintenance Yard
Broadway Road Exit Ramp
Broadway Road
48th Street
Double Butte Cemetery
LEGEND
4+1
4 = Number of Travel Lanes
1 = Number of HOV Lanes
FIGURE 4
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Existing Conditions
Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
DWG NO. 1 OF 8
7/23/2015

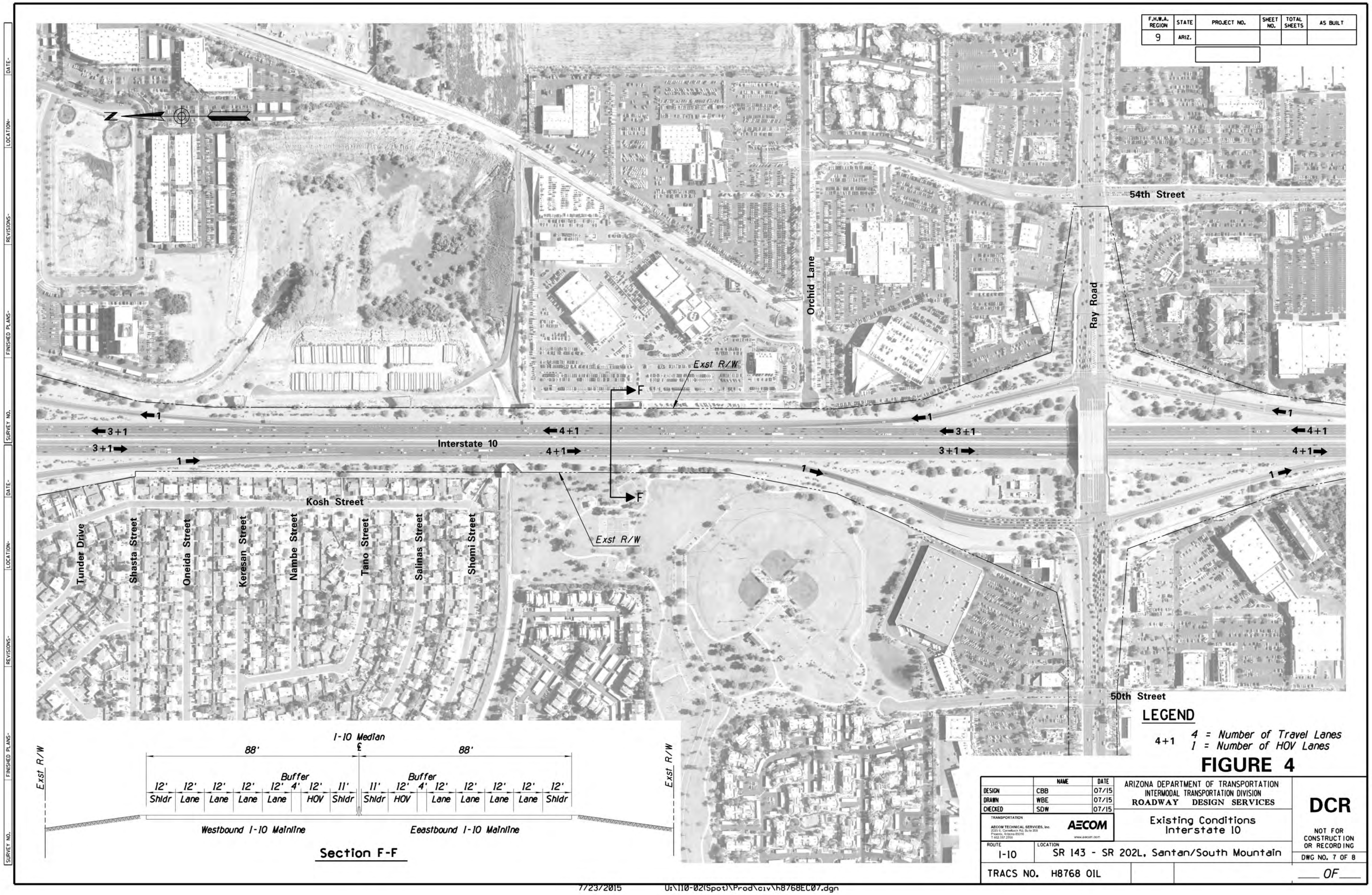

I-10 Median
114'
102'
Exst R/W
Westbound I-10 Mainline
Eastbound I-10 Mainline
Section A-A
Interstate 10
Belle Buttes Cemetery
Broadway Road Exit Ramp
Broadway Road Entrance Ramp
Frontage Road
52nd Street
Double Butte Cemetery
Tempe Diablo Stadium
Alameda Drive
Diablo Way
Edward Drive
Fairmont Drive
Broadway Road
Exst PUE
LEGEND
5+1
5 = Number of Travel Lanes
1 = Number of HOV Lanes
FIGURE 4
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Existing Conditions
Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
DWG NO. 2 OF 8


Galleria Palms Apartments
Arizona Mills Mall
Southern Avenue
Edward Drive
Exst R/W
Ramp 'W-N'
Ramp 'N-E'
Ramp W-S
Ramp 'S-E'
US60
US60 HOV Connector
Interstate 10
Westbound C-D Road
Baseline Road Entrance Ramp
Baseline Road Exit Ramp
Wendler Drive
Western Canal
Meadows Mobile Home Community
LEGEND
3+1
3 = Number of Travel Lanes
1 = Number of HOV Lanes
FIGURE 4
I-10 Median
Varies
Buffer
Westbound I-10 Mainline
Eastbound I-10 Mainline
Section B-B
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Existing Conditions Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
DWG NO. 3 OF 8


Linden Lane
Baseline Road
Highline Canal
Calle Cerritos
Calle Magdalena
Calle Igleria
Westbound C-D Road
Exst R/W
Calle Bella Vista
Interstate 10
4+1
3+1
Guadalupe Floodwater Retarding Structure
Wendler Drive
Point Parkway East
Pointe South Mountain
LEGEND
4 = Number of Travel Lanes
1 = Number of HOV Lanes
FIGURE 4
I-10 Median
88'
Shldr
Lane
HOV
Buffer
Westbound I-10 Mainline
Eastbound I-10 Mainline
Section C-C
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DCR
Existing Conditions Interstate 10
I-10
SR 143 - SR 202L, Santan/South Mountain
NOT FOR CONSTRUCTION OR RECORDING
DWG NO. 4 OF 8
TRACS NO. H8768 01L


Guadalupe Road
Barbarita Street
Carmen Street
Calle Bella Vista
Elliot Road
Interstate 10
Exst R/W
4+1
3+1
1
D
I-10 Median
88'
Shldr Lane Lane Lane Lane HOV Shldr Shldr HOV Lane Lane Lane Lane Shldr
Buffer
Westbound I-10 Mainline
Eastbound I-10 Mainline
Section D-D
LEGEND
4+1 4 = Number of Travel Lanes
1 = Number of HOV Lanes
FIGURE 4
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Existing Conditions
Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
DWG NO. 5 OF 8
AECOM


Tempe Autoplex
Autoplex Loop
Elliot Road
IKEA
Exst R/W
Harl Avenue
Wendler Drive
Interstate 10
3+1
4+1
1
51st Street
Loloma Circle
Coronado Circle
Tamblo Drive
Tunder Circle
Half Moon Drive
Warner Road
LEGEND
4+1
4 = Number of Travel Lanes
1 = Number of HOV Lanes
I-10 Median
88'
Buffer
12' Shldr
12' Lane
4'
12' HOV
11' Shldr
Westbound I-10 Mainline
Eeastbound I-10 Mainline
Section E-E
FIGURE 4
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DESIGN CBB 07/15
DRAWN WBE 07/15
CHECKED SDW 07/15
AECOM
Existing Conditions
Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
ROUTE I-10
LOCATION SR 143 - SR 202L, Santan/South Mountain
DWG NO. 6 OF 8
TRACS NO. H8768 01L
OF


54th Street
Orchid Lane
Ray Road
Interstate 10
Exst R/W
Kosh Street
Tunder Drive
Shasta Street
Oneida Street
Keresan Street
Nambe Street
Tano Street
Salinas Street
Shomi Street
50th Street
3+1
4+1
1
LEGEND
4+1
4 = Number of Travel Lanes
1 = Number of HOV Lanes
FIGURE 4
I-10 Median
88'
Buffer
12' Shldr
12' Lane
4'
12' HOV
11' Shldr
Westbound I-10 Mainline
Eastbound I-10 Mainline
Section F-F
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Existing Conditions
Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
DWG NO. 7 OF 8
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
DESIGN CBB 07/15
DRAWN WBE 07/15
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AECOM
7/23/2015
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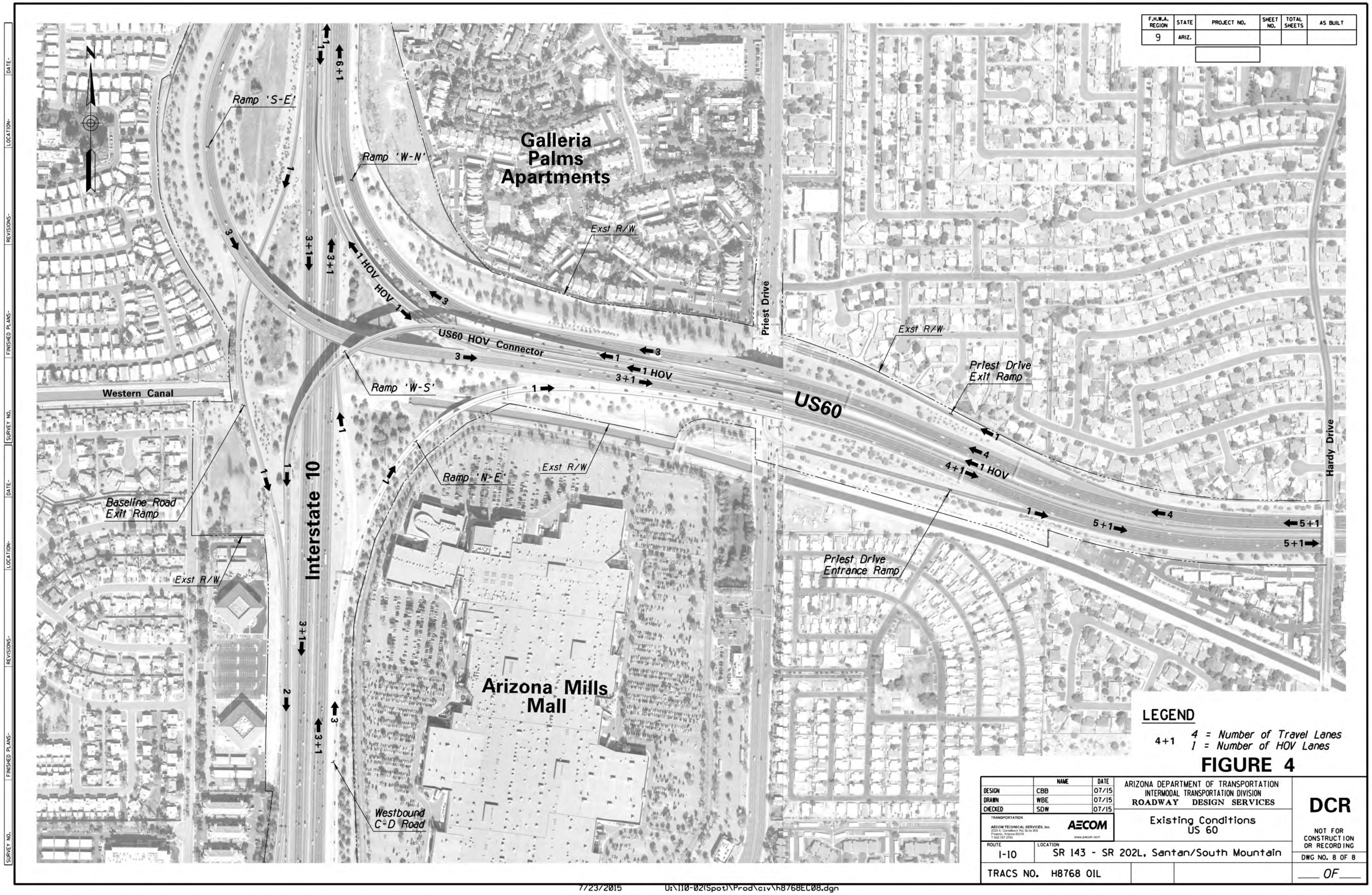

Ramp 'S-E'
Ramp 'W-N'
Galleria Palms Apartments
Exst R/W
US60 HOV Connector
Priest Drive
Western Canal
Ramp 'W-S'
US60
Priest Drive Exit Ramp
Ramp 'N-E'
Interstate 10
Baseline Road Exit Ramp
Hardy Drive
Priest Drive Entrance Ramp
Arizona Mills Mall
Westbound C-D Road
LEGEND
4+1 4 = Number of Travel Lanes
1 = Number of HOV Lanes
FIGURE 4
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Existing Conditions
US 60
DCR
NOT FOR CONSTRUCTION OR RECORDING
DWG NO. 8 OF 8
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
7/23/2015

2.0 TRAFFIC AND CRASH DATA

2.1 CRASH ANALYSIS

The ADOT Traffic Studies Section provided crash data for the segment of I-10 between the I-10/SR143 TI and the I-10/SR202L TI. There were a total of 3,383 reported crashes within the study area between January 1, 2009 and December 31, 2013. Figure 5 (on pages 35-38) and Table 16 illustrate the crash summary by freeway segment during this time period. The following is a summary of some key characteristics of the crash data:

- Of the 3,383 crashes reported, 2,417 resulted in property damage only (71.4%), 953 resulted in injuries (28.2%), and 13 resulted in a fatality (<1%).
- 83% of the crashes involved another motor vehicle in transport, 6% involved a concrete traffic barrier, and 4% involved another non-fixed object. These three types of crashes accounted for 93% of the crashes.
- Of the 2,800 crashes with another motor vehicle, 73% (2031 crashes) were rear-end crashes, and 23% (639 crashes) were sideswipe crashes.
- 75% of the crashes occurred during the daylight hours, 4% occurred at dusk or dawn, and the remaining 21% occurred during hours of darkness.

Table 16 – Mainline Crash Summary

Freeway Segment	No. of Crashes (January 2009 – December 2013)	Crash Rate (2009 – 2013) (Crash/Million Vehicle Miles)
Eastbound I-10		
40th Street to SR 143	298	1.63
SR 143 to US 60	360	1.10
US 60 to Baseline Road	166	1.18
Baseline Road to Elliot Road	271	0.80
Elliot Road to Warner Road	134	0.87
Warner Road to Ray Road	93	0.70
Ray Road to SR 202L	62	1.16
Westbound I-10		
SR 202L to Ray Road	165	1.36
Ray Road to Warner Road	203	1.38
Warner Road to Elliot Road	192	1.23
Elliot Road to Baseline Road	517	1.54
Baseline Road to US 60	404	2.49
US 60 to SR 143	292	0.83
SR 143 to 40th Street	159	0.68

According to the *Regional Freeway Bottleneck Study* (MAG, 2006), the average crash rate on the Regional Freeway System was 0.78 accidents per million vehicle miles in 2000. This study also documented the 75th percentile as 1.41 crashes per million vehicle miles. In the eastbound direction, 6 of the 7 segment rates are more than the average crash rate, with 1 segment above the 75th percentile. In the westbound direction of travel, 6 of the 7 segment rates exceed the average, and 2 of segments are above the 75th percentile.

This evaluation indicates that 96% of the crashes with another motor vehicle on this segment of the I-10 corridor are either rear-end or sideswipe crashes. These types of crash are commonly associated with congested traffic conditions. Providing additional freeway capacity and reducing the significant weaving conditions at the Broadway Curve may reduce the level of congestion and provide a more balanced level-of-service throughout the corridor, which may reduce these crash rates.

2.2 EXISTING TRAFFIC CONDITIONS

Historical traffic count data was obtained from ADOT's Multimodal Planning Division (MPD) for years 2011 through 2013. Mainline traffic counts were conducted at several locations within the study area I-10, US 60, and SR 143 in November and December 2014. The existing average daily traffic (ADT) and peak hour volumes are shown on Figure 6 (on pages 39-42).

Since vehicles can enter and exit the HOV lanes at any given point throughout the corridor, the mainline volumes include an estimate of the ingress and egress of vehicles from the HOV lanes. HOV lanes are represented by a dashed line on all of the lane diagram figures, and the ramp traffic volume includes vehicles that enter and exit both the general-purpose lanes and the HOV lane.

The existing I-10 mainline daily traffic volumes vary within the study area from approximately 252,700 vehicles per day (vpd) at the north end (between US60 and Broadway Road) to approximately 158,300 vpd at the south end (between Ray Road and SR 202L). Aside from the I-10/SR143 TI, I-10/US60 TI, and I-10/SR202L TI directional ramps, the Elliot Road and Baseline Road ramps have the highest traffic volumes (8,400 – 22,200 vpd).

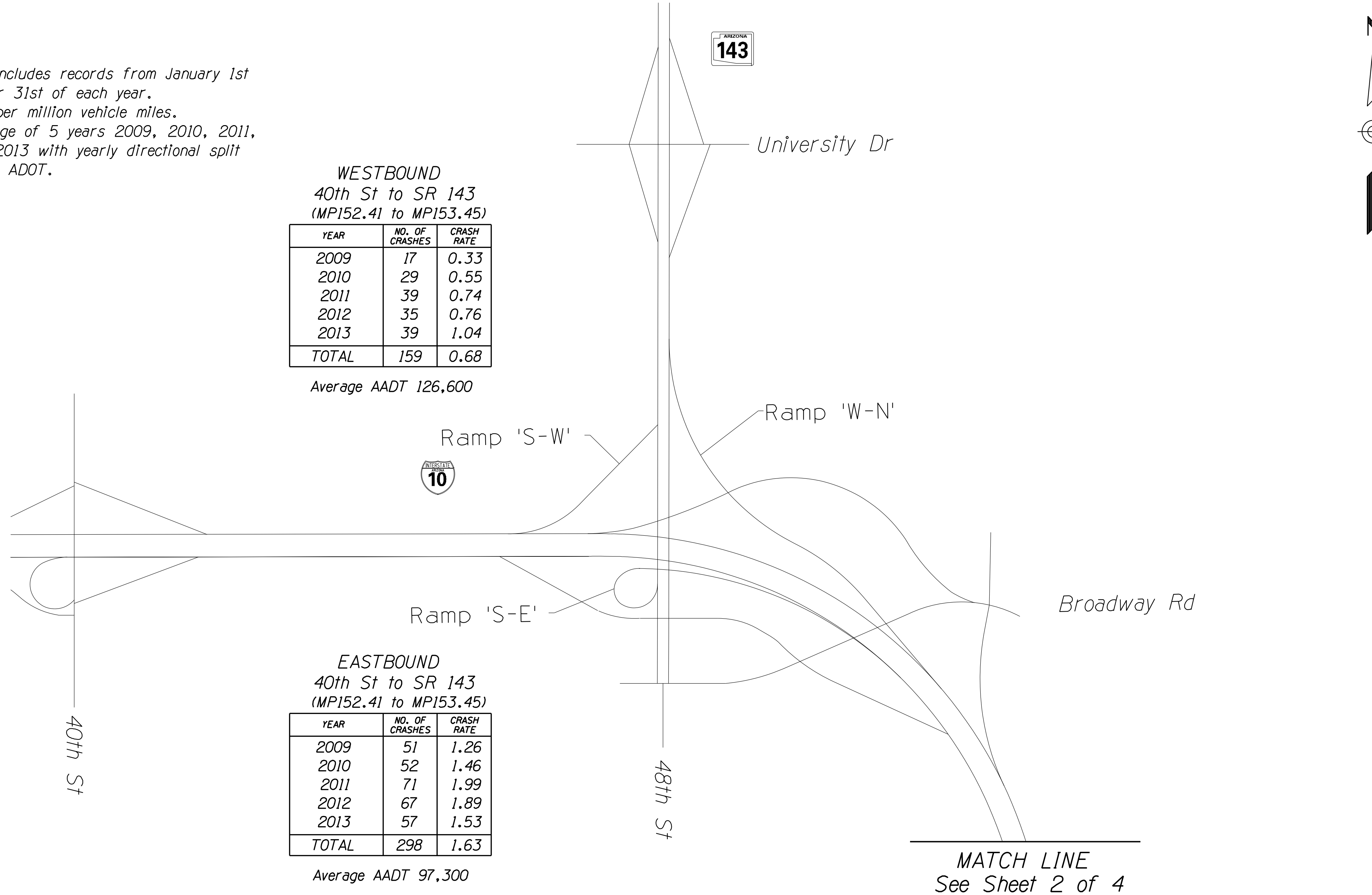
The traffic factors shown in Table 17 are based on traffic counts that were obtained in November and December 2014. The portion of the ADT occurring within the peak hour is approximately 6% to 7%. The directional distribution is approximately 60% in the peak direction of travel during the A.M. peak hour and approximately 50% during the P.M. peak hour. The portion of traffic classified as commercial vehicles (trucks) is approximately 13% along this segment of the I-10 corridor.

Table 17 – Mainline Traffic Factors

	A.M. Peak Hour			P.M. Peak Hour		
	K value	Directional Split		K value	Directional Split	
		WB/NB	EB/SB		WB/NB	EB/SB
I-10, West of SR 143	7%	58%	42%	7%	51%	49%
I-10, SR 143 to Broadway Road	7%	67%	33%	7%	54%	46%
I-10, Broadway Road to US 60	7%	60%	40%	7%	48%	52%
I-10, US 60 to Baseline Road	6%	59%	41%	7%	49%	51%
I-10, Baseline Road to Elliot Road	6%	52%	48%	7%	48%	52%
I-10, Warner Road to Ray Road	5%	58%	42%	7%	48%	52%
I-10, Ray Road to SR 202L	6%	59%	41%	7%	45%	55%
US 60, Priest Drive to Mill Avenue	6%	63%	37%	7%	49%	51%
SR 143, University Drive to I-10	8%	58%	42%	7%	50%	50%

[Text resumes on page 43]

NOTE:
1. Crash Data Includes records from January 1st to December 31st of each year.
2. Crash Rate per million vehicle miles.
3. AADT -average of 5 years 2009, 2010, 2011, 2012 and 2013 with yearly directional split reported by ADOT.



WESTBOUND
40th St to SR 143
(MP152.41 to MP153.45)

YEAR	NO. OF CRASHES	CRASH RATE
2009	17	0.33
2010	29	0.55
2011	39	0.74
2012	35	0.76
2013	39	1.04
TOTAL	159	0.68

Average AADT 126,600

EASTBOUND
40th St to SR 143
(MP152.41 to MP153.45)

YEAR	NO. OF CRASHES	CRASH RATE
2009	51	1.26
2010	52	1.46
2011	71	1.99
2012	67	1.89
2013	57	1.53
TOTAL	298	1.63

Average AADT 97,300

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7/24/2015

I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 5
YEARLY CRASH SUMMARY
SHEET 1 OF 4

MATCH LINE
See Sheet 1 of 4

NOTE:
1. Crash Data Includes records from January 1st to December 31st of each year.
2. Crash Rate per million vehicle miles.
3. AADT -average of 5 years 2009, 2010, 2011, 2012 and 2013 with yearly directional split reported by ADOT.

EASTBOUND
SR 143 to US 60
(MP153.45 to MP154.94)

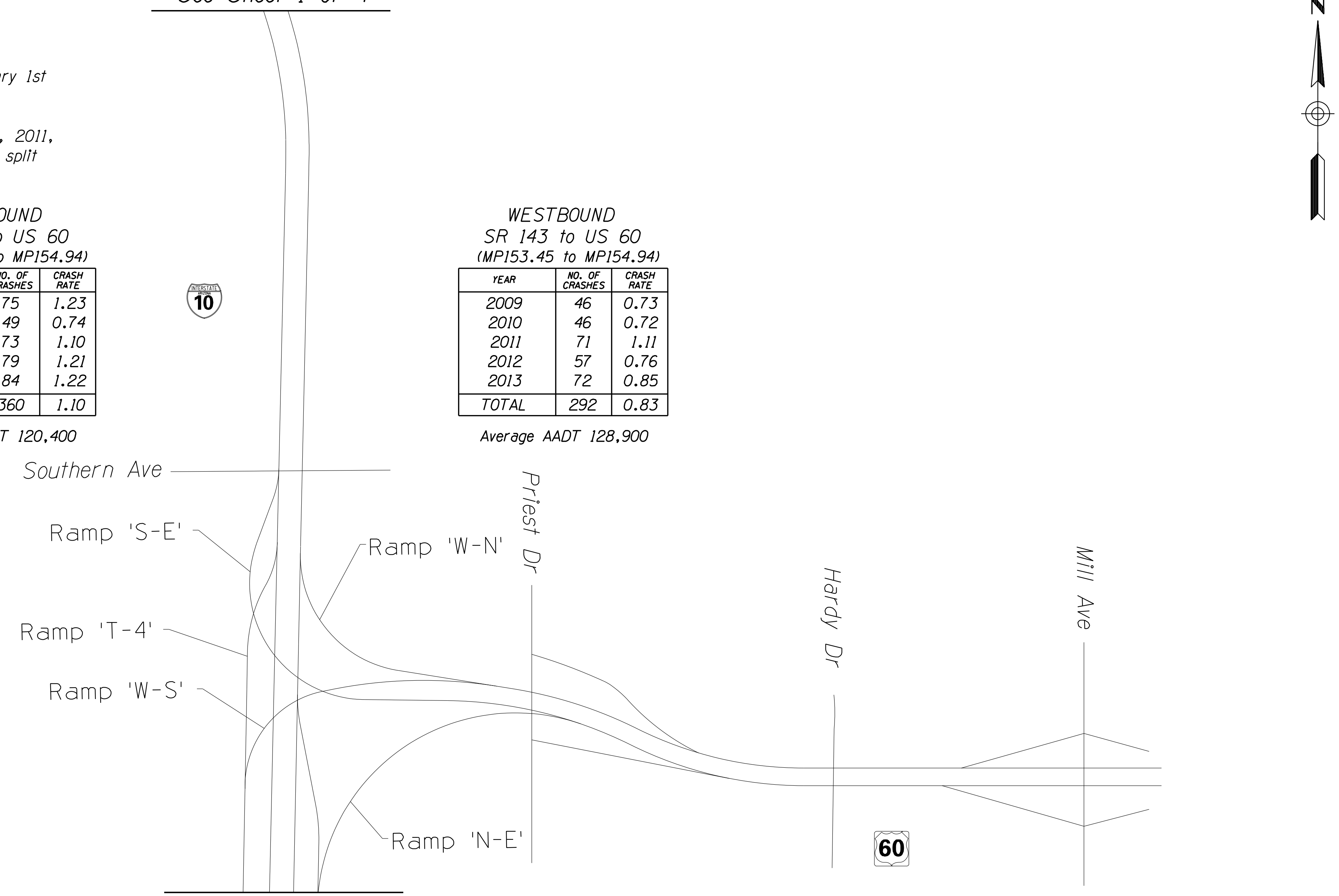
YEAR	NO. OF CRASHES	CRASH RATE
2009	75	1.23
2010	49	0.74
2011	73	1.10
2012	79	1.21
2013	84	1.22
TOTAL	360	1.10

Average AADT 120,400

WESTBOUND
SR 143 to US 60
(MP153.45 to MP154.94)

YEAR	NO. OF CRASHES	CRASH RATE
2009	46	0.73
2010	46	0.72
2011	71	1.11
2012	57	0.76
2013	72	0.85
TOTAL	292	0.83

Average AADT 128,900



MATCH LINE
See Sheet 3 of 4

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I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

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FIGURE 5
YEARLY CRASH SUMMARY
SHEET 2 OF 4

NOTE:
1. Crash Data Includes records from January 1st to December 31st of each year.
2. Crash Rate per million vehicle miles.
3. AADT -average of 5 years 2009, 2010, 2011, 2012 and 2013 with yearly directional split reported by ADOT.

WESTBOUND
US 60 to Baseline Rd
(MP154.94 to MP156.03)

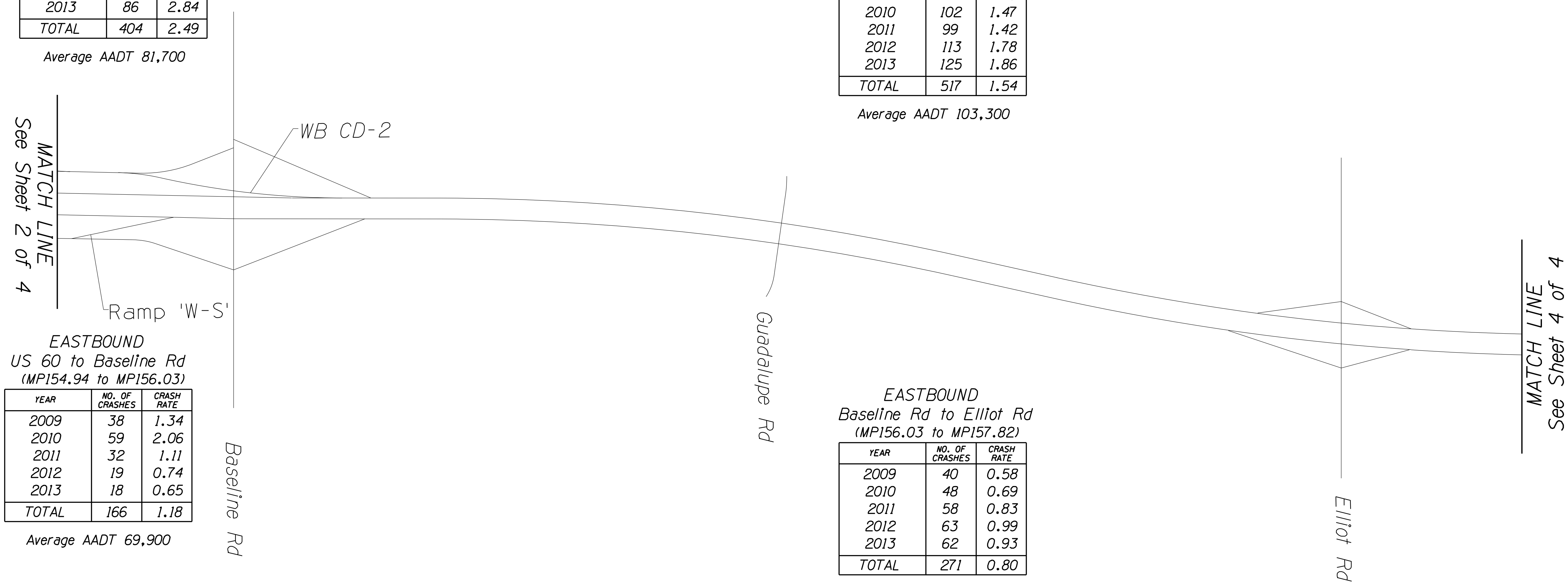
YEAR	NO. OF CRASHES	CRASH RATE
2009	81	2.35
2010	95	2.74
2011	77	2.22
2012	65	2.28
2013	86	2.84
TOTAL	404	2.49

Average AADT 81,700

WESTBOUND
SR 143 to US 60
(MP156.03 to MP157.82)

YEAR	NO. OF CRASHES	CRASH RATE
2009	78	1.15
2010	102	1.47
2011	99	1.42
2012	113	1.78
2013	125	1.86
TOTAL	517	1.54

Average AADT 103,300



EASTBOUND
US 60 to Baseline Rd
(MP154.94 to MP156.03)

YEAR	NO. OF CRASHES	CRASH RATE
2009	38	1.34
2010	59	2.06
2011	32	1.11
2012	19	0.74
2013	18	0.65
TOTAL	166	1.18

Average AADT 69,900

EASTBOUND
Baseline Rd to Elliot Rd
(MP156.03 to MP157.82)

YEAR	NO. OF CRASHES	CRASH RATE
2009	40	0.58
2010	48	0.69
2011	58	0.83
2012	63	0.99
2013	62	0.93
TOTAL	271	0.80

Average AADT 103,800

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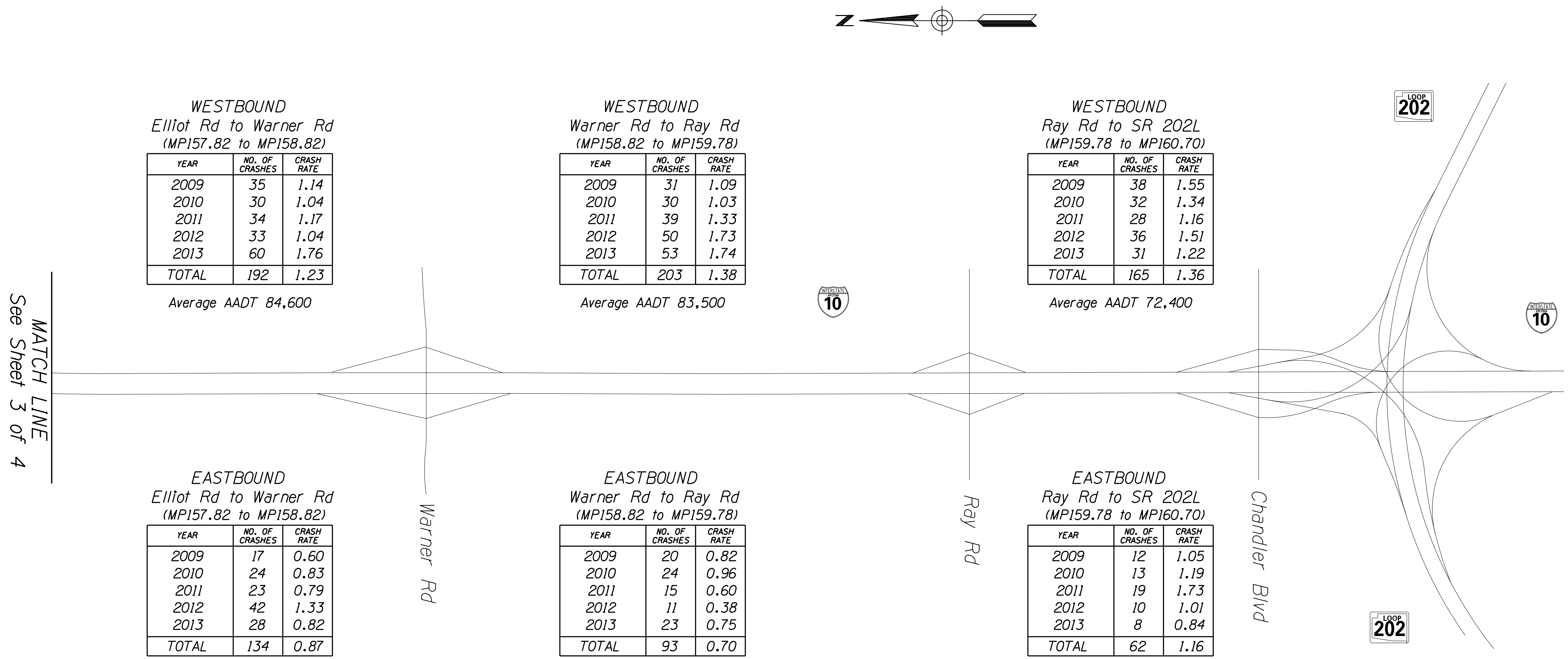
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 5
YEARLY CRASH SUMMARY
SHEET 3 OF 4



WESTBOUND
Elliot Rd to Warner Rd
(MP157.82 to MP158.82)

YEAR	NO. OF CRASHES	CRASH RATE
2009	35	1.14
2010	30	1.04
2011	34	1.17
2012	33	1.04
2013	60	1.76
TOTAL	192	1.23

Average AADT 84,600

WESTBOUND
Warner Rd to Ray Rd
(MP158.82 to MP159.78)

YEAR	NO. OF CRASHES	CRASH RATE
2009	31	1.09
2010	30	1.03
2011	39	1.33
2012	50	1.73
2013	53	1.74
TOTAL	203	1.38

Average AADT 83,500

WESTBOUND
Ray Rd to SR 202L
(MP159.78 to MP160.70)

YEAR	NO. OF CRASHES	CRASH RATE
2009	38	1.55
2010	32	1.34
2011	28	1.16
2012	36	1.51
2013	31	1.22
TOTAL	165	1.36

Average AADT 72,400

EASTBOUND
Elliot Rd to Warner Rd
(MP157.82 to MP158.82)

YEAR	NO. OF CRASHES	CRASH RATE
2009	17	0.60
2010	24	0.83
2011	23	0.79
2012	42	1.33
2013	28	0.82
TOTAL	134	0.87

Average AADT 83,400

EASTBOUND
Warner Rd to Ray Rd
(MP158.82 to MP159.78)

YEAR	NO. OF CRASHES	CRASH RATE
2009	20	0.82
2010	24	0.96
2011	15	0.60
2012	11	0.38
2013	23	0.75
TOTAL	93	0.70

Average AADT 76,300

EASTBOUND
Ray Rd to SR 202L
(MP159.78 to MP160.70)

YEAR	NO. OF CRASHES	CRASH RATE
2009	12	1.05
2010	13	1.19
2011	19	1.73
2012	10	1.01
2013	8	0.84
TOTAL	62	1.16

Average AADT 31,400

NOTE:

1. Crash Data Includes records from January 1st to December 31st of each year.
2. Crash Rate per million vehicle miles.
3. AADT -average of 5 years 2009, 2010, 2011, 2012 and 2013 with yearly directional split reported by ADOT.

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7/24/2015

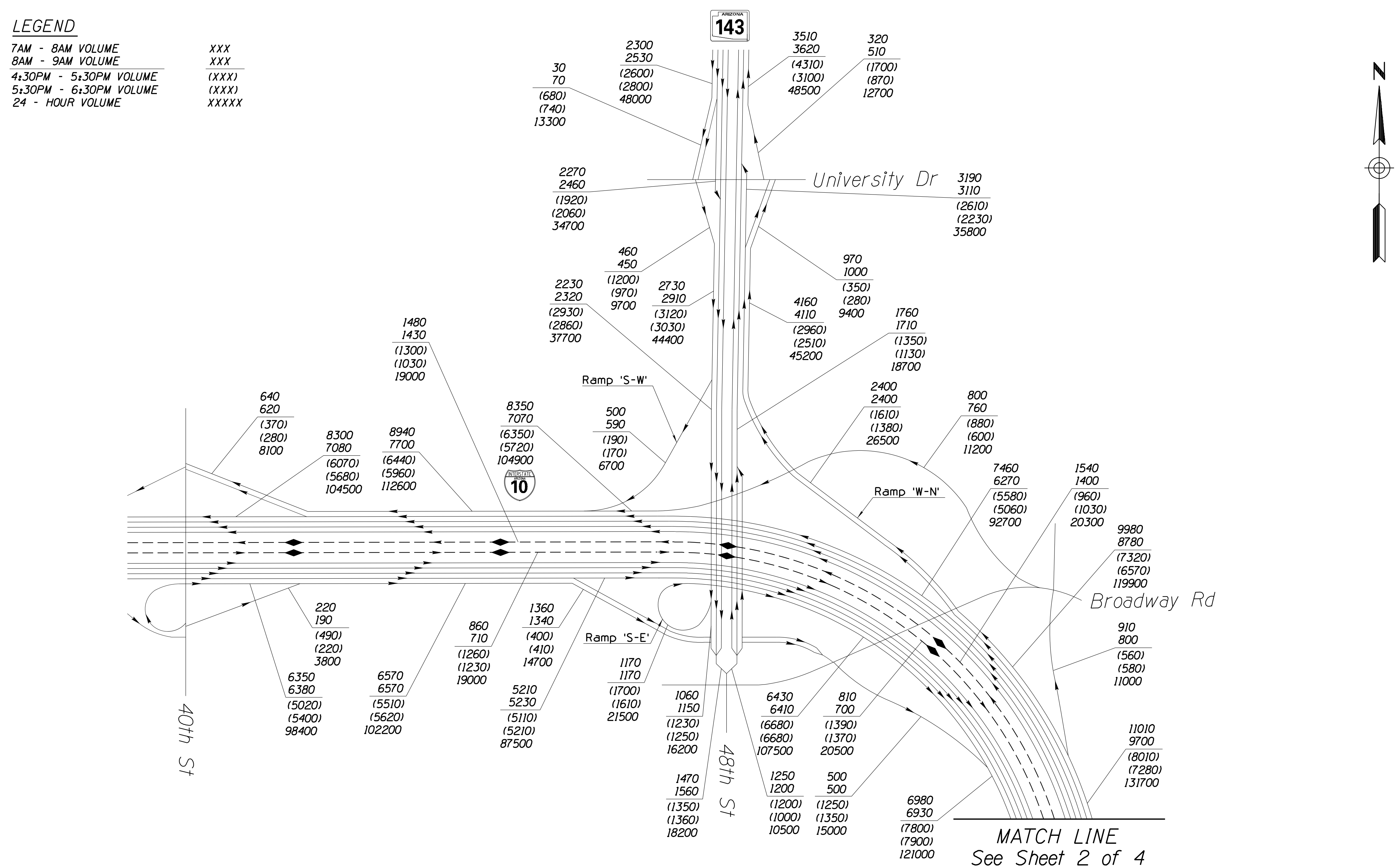
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 5
YEARLY CRASH SUMMARY
SHEET 4 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 6
2014 EXISTING VOLUMES
& LANE CONFIGURATION
SHEET 1 OF 4

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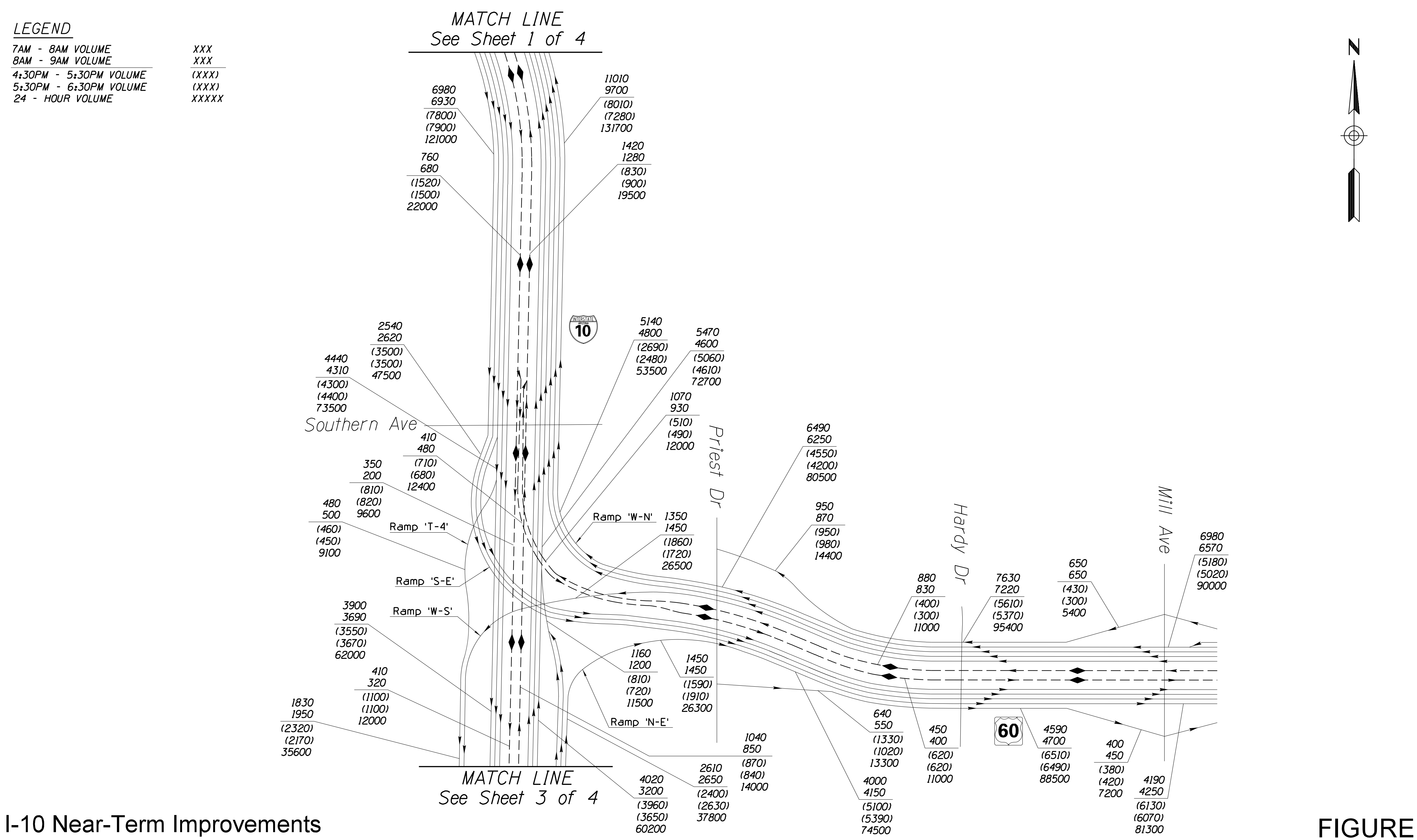

I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 6
2014 EXISTING VOLUMES
& LANE CONFIGURATION
SHEET 2 OF 4

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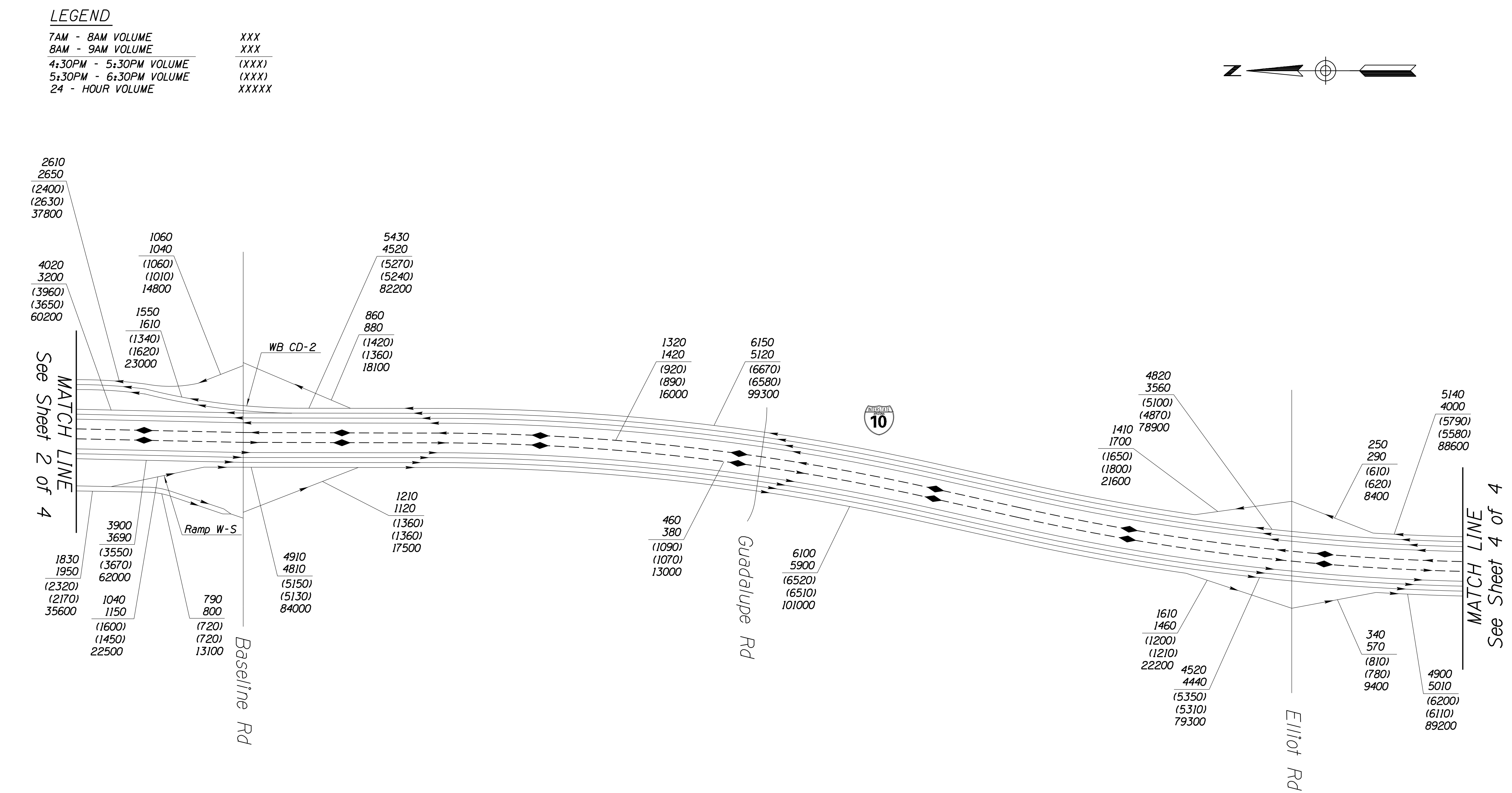


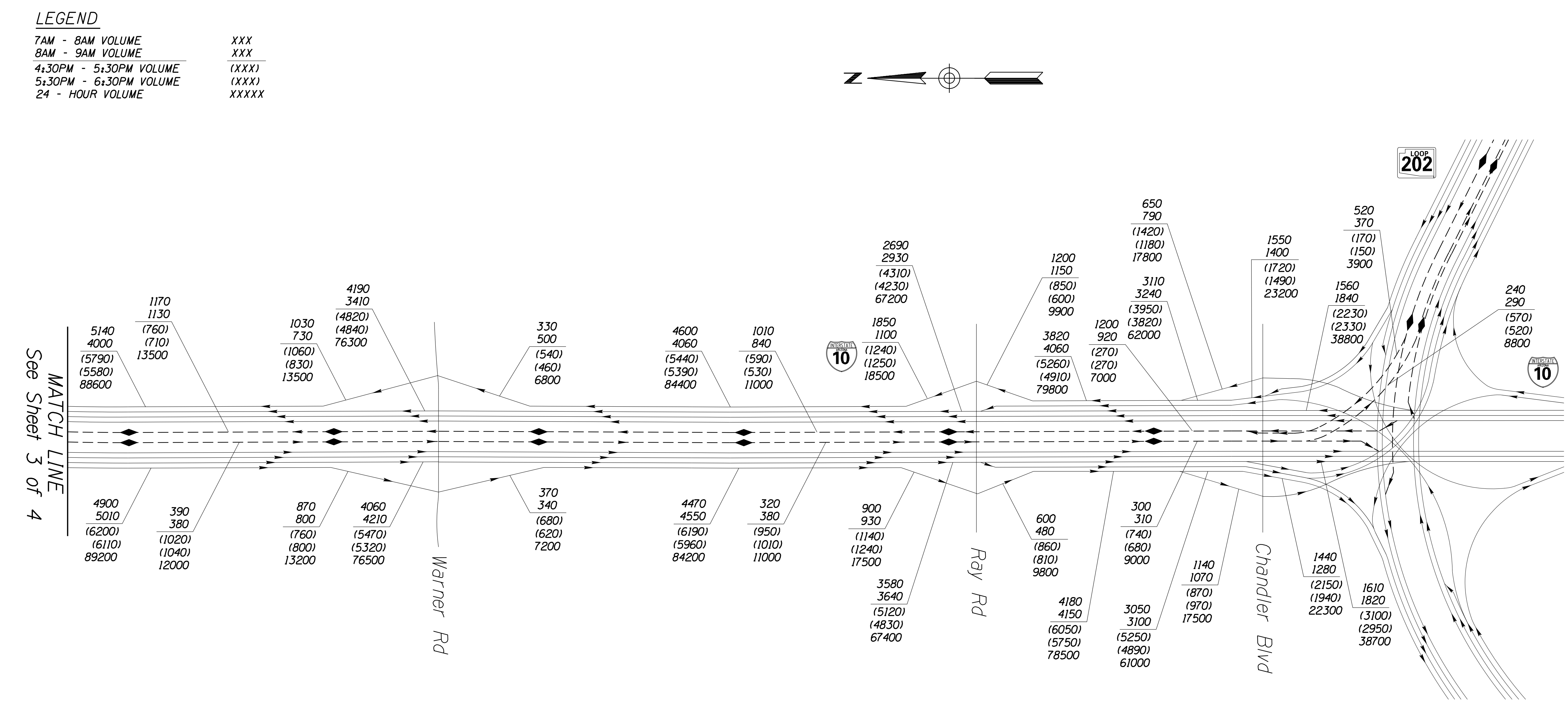
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 6
2014 EXISTING VOLUMES
& LANE CONFIGURATION
SHEET 3 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 6
2014 EXISTING VOLUMES
& LANE CONFIGURATION
SHEET 4 OF 4

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7/24/2015

2.3 OPERATIONAL ANALYSIS METHODOLOGY

An operational analysis was performed for all segments of the mainline including the general-purpose lanes, HOV lanes, ramp junctions, and weave sections for the existing conditions, No-Build alternative, and each of the Build alternatives. The VISSIM computer program was used to provide a simulation of the entire freeway system within the study area. VISSIM is a microscopic traffic simulation program that uses roadway geometry and traffic volume inputs to simulate operations of an entire freeway network. VISSIM has the ability to provide various measures of effectiveness for each link within the system. The vehicle density and speed outputs from VISSIM were used as the measure of effectiveness to relate to a level-of-service as established by the Highway Capacity Manual (HCM).

The concept of level-of-service (LOS) uses qualitative measures that characterize operational conditions within a stream of traffic. The descriptions of individual levels-of-service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience. Six levels of service are defined for each type of facility for which the analytical procedures are available. They are given letter designations from ‘A’ to ‘F’, with LOS ‘A’ representing the best operational conditions and LOS ‘F’ representing an over-capacity condition with a high degree of congestion. Each level of service represents a range of operating conditions. Table 18 below depicts the vehicle densities (vehicles per mile per lane) and corresponding levels-of-service established in the HCM:

Table 18 – Vehicle Densities and Corresponding Levels-of-Service

Level-of-Service	Density Range (pc/mi/ln)
A	0-11
B	>11-18
C	>18-26
D	>26-35
E	>35-45
F	>45

Source: *Highway Capacity Manual* (2010), pg. 23-3

In order to verify the VISSIM output, additional analyses were performed using the Highway Capacity Software (HCS), which uses the procedures from the 2000 Highway Capacity Manual (HCM) to provide the traffic operational characteristics in terms of level-of-service. One of the major disadvantages of using HCS for analyzing a major freeway network is that it does not address the cumulative effects of delay on an entire system. HCS only allows for the evaluation of a single location within an overall system and does not take into account the effects of conditions upstream and downstream. For example, a severe upstream “bottleneck” may limit the amount of traffic reaching a downstream location. Similarly, a severe downstream “bottleneck” may cause queuing to such an extent that it effects an upstream location. Therefore, VISSIM was used to evaluate the entire system and HCS was used to verify the VISSIM results.

The following VISSIM model input assumptions were used for the operational analysis for the alternatives evaluation:

- Free flow speed of 65 mph for the mainline general-purpose lanes
- Free flow speed of 60 mph for the C-D roads
- Free flow speed of 55 mph for the system interchange ramps
- Free flow speed of 55 mph for the service interchange ramps
- Commercial vehicle percentage on the I-10 mainline was assumed to be 13% during existing peak hours and 9% during future peak hours

The commercial vehicle percentage in the existing conditions is based on recent experience in observing the existing traffic conditions and performing operational analysis for projects on the Regional Freeway System, and not on the existing ADOT count data. All future year analyses of the corridor are assumed to reflect the effects of the South Mountain Freeway that is scheduled to be open to traffic by 2020.

In order to replicate the existing peak hour travel conditions, the A.M. and P.M. peak hour VISSIM models were calibrated based on measured field data. The calibration process followed FHWA guidelines for developing an existing conditions model and included multiple simulation runs (8) using varying random number generator seeds to account for variability in the output. Existing field measured traffic volumes, speeds, travel times, and queue lengths were utilized as calibration data.

Travel time measurements were performed during both A.M. and P.M. peak hours in October 2014. The field travel time measurements were conducted along various routes within the study area including the eastbound and westbound directions of travel from 40th Street to the I-10/SR202L TI. Other travel time data collection routes included both directions of travel between SR 143 at the Salt River and I-10 at Elliot Road; between US 60 at Mill Avenue and I-10 at 40th Street; and several additional routes.

The travel time measurements were recorded and averaged over two days in both directions of travel for each route. These travel times were one of the data sets used to calibrate the existing conditions VISSIM model. The VISSIM output link volume data was compared to the input volumes for each roadway segment. At selected locations the driver behavior parameters were modified to calibrate the volume comparison.

Following the calibration process, the VISSIM model output closely replicated the existing congestion conditions observed in the study area. The lane changing and driver behavior parameters from the calibration process were then used in the future condition VISSIM models for Design Years 2020, 2025, 2030, and 2035. Each of the future conditions models were run at least eight times and the model output was averaged to determine the density.

The VISSIM software contains a feature for restricting access to certain vehicle types, which allows for the inclusion of HOV lanes in the analysis. However, the HOV lanes on the Regional Freeway System allow drivers to enter and exit the HOV lane at any point, thus making it difficult for VISSIM to accurately represent HOV volumes at every point along the corridor. Subsequently, the HOV lanes were included in the VISSIM models only for the purpose of modeling the interactions between HOV vehicles and general-purpose lane vehicles. The HOV lane evaluations were performed independently based on volume-to-capacity (V/C) ratios using the capacity thresholds for HOV lanes that are included in the *MAG High Occupancy Lanes and Value Lanes Study Final Report* (December, 2002). The capacity threshold for a single HOV lane is 1,500 vplph.

The objective of this analysis is to evaluate capacity improvements for the I-10 mainline. Therefore the operational analysis was constrained to the freeway mainlines and ramp junctions.

2.4 I-10 WIDENING ALTERNATIVES

2.4.1 Introduction

Chapter 3 of this report provides a detailed description of the I-10 Widening Alternatives that were evaluated for this study. For the purpose of achieving a longitudinal analysis of freeway operations in this corridor, each widening alternative was evaluated over a series of Design Years. The alternatives and their analysis years include the following:

- No-Build Alternative (Years 2020 and 2035)
- Alternative 1, with Ramp ‘N-E’ Option 1 (Years 2020, 2025, 2030, and 2035)
    - Would provide new eastbound and westbound C-D Roads between the I-10/SR143 TI and Baseline Road
    - Provides one additional general-purpose lane in each direction between Baseline Road and Ray Road
    - Would provide auxiliary lanes between successive service interchange entrance and exit ramps.
- Alternative 1, with Ramp ‘N-E’ Option 2 (Years 2020, 2025, 2030, and 2035)
    - Same as Alternative 1, with Ramp ‘N-E’ Option 1
    - Would modify the configuration of the I-10/US60 TI Ramp ‘N- E’.
- Alternative 1, with Ramp ‘N-E’ Option 3 (Years 2020, 2025, 2030, and 2035)
    - Same as Alternative 1, with Ramp ‘N-E’ Option 1
    - Would reconfigure the I-10/US60 TI Ramp ‘N-E’.
- Alternative 2, with Westbound C-D Road Option 1 (Years 2020 and 2025)
    - Would provide new eastbound and westbound C-D Roads between the I-10/SR143 TI and Baseline Road
    - Provides one additional general-purpose lane in each direction between Baseline Road and Ray Road
    - Would provide auxiliary lanes between successive service interchange entrance and exit ramps.
    - Would relocate the transfer ramp connection between the westbound C-D Road and I-10 mainline from north of Southern Avenue (in Alternative 1) to 48th Street
    - The eastbound exit ramps at Warner Road and Ray Road would be designed as two lane ramps
- Alternative 2, with Westbound C-D Road Option 2 (Years 2030 and 2035)
    - Would increase the number of westbound C-D Road lanes to provide a three lane roadway between the I-10/US60 TI and the Broadway Road exit ramp
- Alternative 2, with Westbound C-D Road Option 3 (Years 2030 and 2035)
    - Would increase the number of westbound C-D Road lanes to provide a three lane roadway between the I-10/US60 TI and the I-10/SR143 TI

MAG provided traffic volume projections for Design Years 2020, 2025, 2030, and 2035. MAG maintains a regional traffic forecasting model to develop future traffic volume projections based on projected socio-economic, population, employment, origin-destination, and other regionally based data. The output from the model includes daily, peak period, and peak hour traffic volumes for general-purpose and HOV lanes for the regional freeway system.

Network simulation output was provided by MAG for the No-Build (2020 & 2035) and Build Alternatives (2020, 2025, 2030, and 2035). The 2020, 2025, 2030 and 2035 models include all transportation system improvements identified in their retrospective years. The South Mountain Freeway Is included in all of the models. The traffic volume projections that were received from MAG for each year were post-processed in accordance with the procedures recommended by MAG. The lane diagrams and latest-year traffic volume projections for each build alternative are provided in the following alternative descriptions.

Traffic operational analyses were conducted for each I-10 Widening Alternative based on the methodology discussed in Section 2.3. The following sections describe the alternatives and the analysis results. The lane diagrams, traffic volume projections and level-of-service analysis results for the No-Build (2035) and Recommended Alternative (2035) are included in the following sections. All other volume projections and level-of-service analysis results for each I-10 Widening Alternatives are included in Appendix G.

In accordance with the traffic operational goals established for this study, I-10 should operate with LOS ‘D’ or better operational characteristics between SR 143 and SR 202L. For alternatives that include C-D Roads, the C-D Roads should operate at LOS ‘D’ or better within the limits of the C-D Roads. The C-D Roads may operate with a lower LOS, but should not queue traffic to the extent that would negatively impact the operations of the I-10 mainline lanes. The termini of the I-10 widening alternatives must connect back into I-10, SR 143 and US 60 in a manner that provides for operational efficiency in accordance with current ADOT design policies and procedures.

2.4.2 Existing Conditions

The existing roadway configurations, existing average daily traffic (ADT), and peak hour volumes were shown previously on Figure 6 (on pages 39-42). The traffic count data represents the existing roadway characteristics in 2014, which precedes the South Mountain Freeway.

2.4.3 No-Build Alternative

The No-Build Alternative includes the existing roadways and planned improvements that are currently identified for construction in the RTP. The Year 2035 traffic volume projections and lane diagrams are shown in Figure 7 (on pages 46-49).

The No-Build alternative includes the potential construction of one additional eastbound HOV lane from the I-10/SR51/SR202L TI to the I-10/US60 TI.

[Text resumes on page 50]

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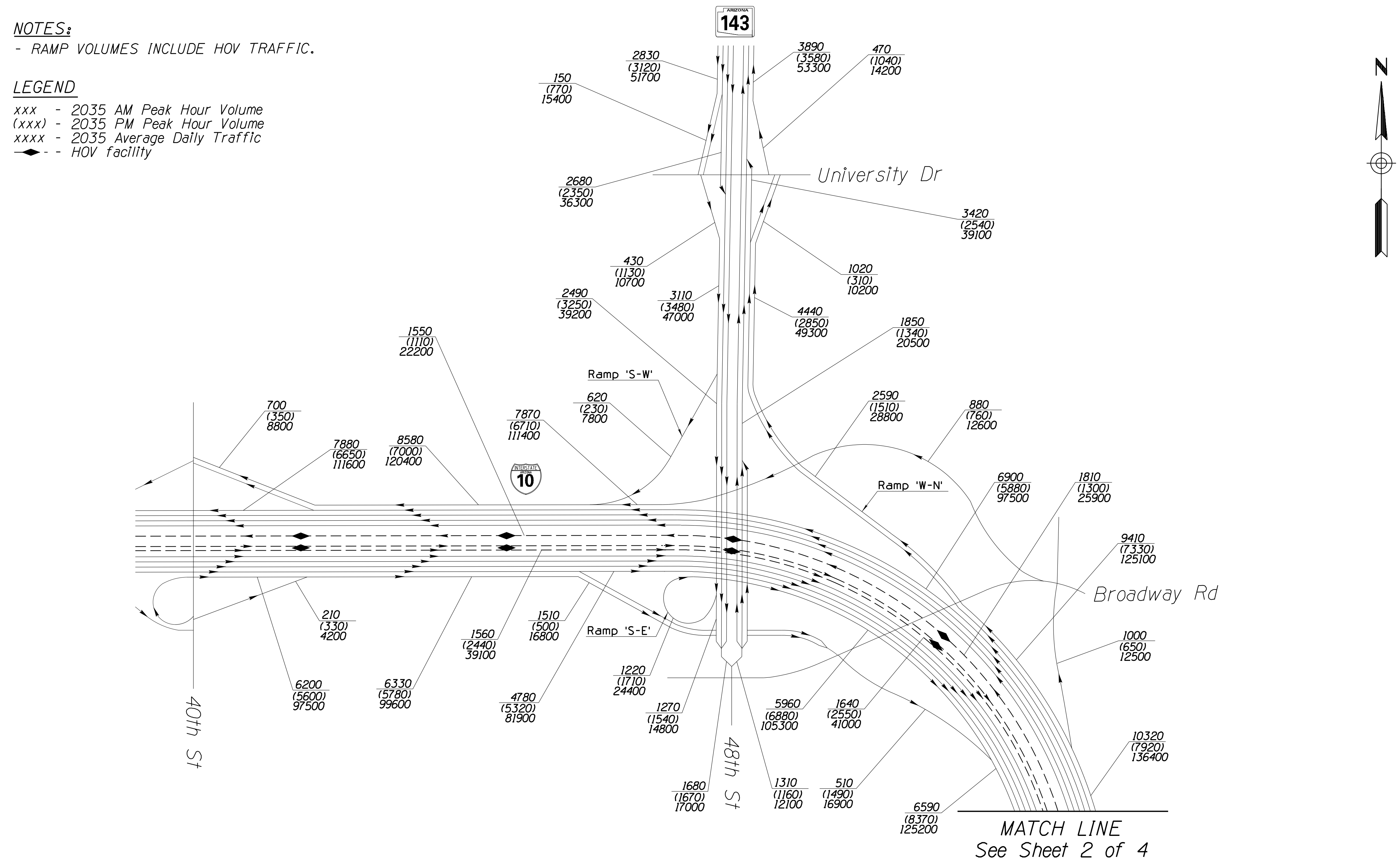

I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 7
2035 NO BUILD VOLUMES
& LANE CONFIGURATION
SHEET 1 OF 4

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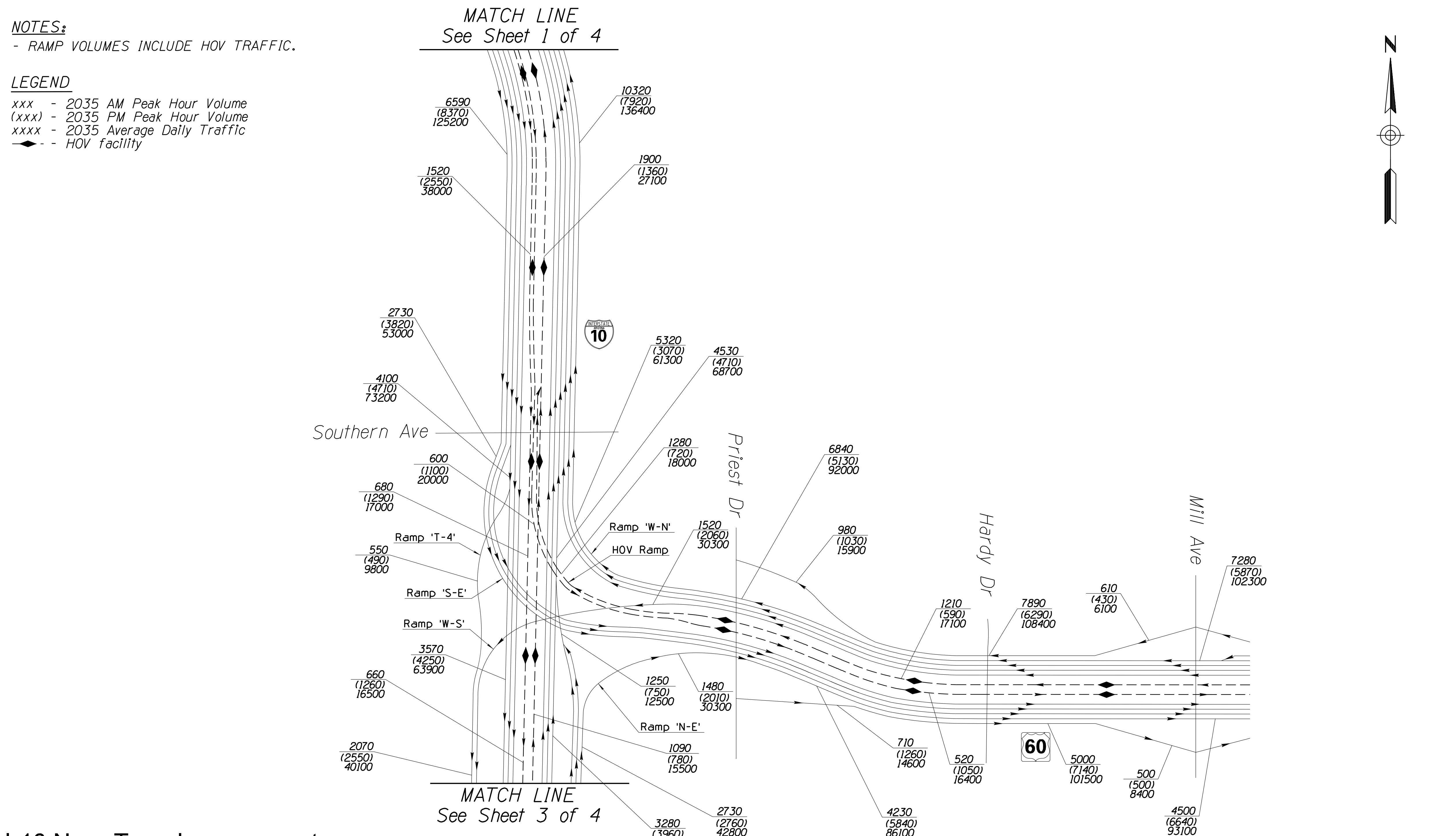
7/24/2015



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 7
2035 NO BUILD VOLUMES
& LANE CONFIGURATION
SHEET 2 OF 4

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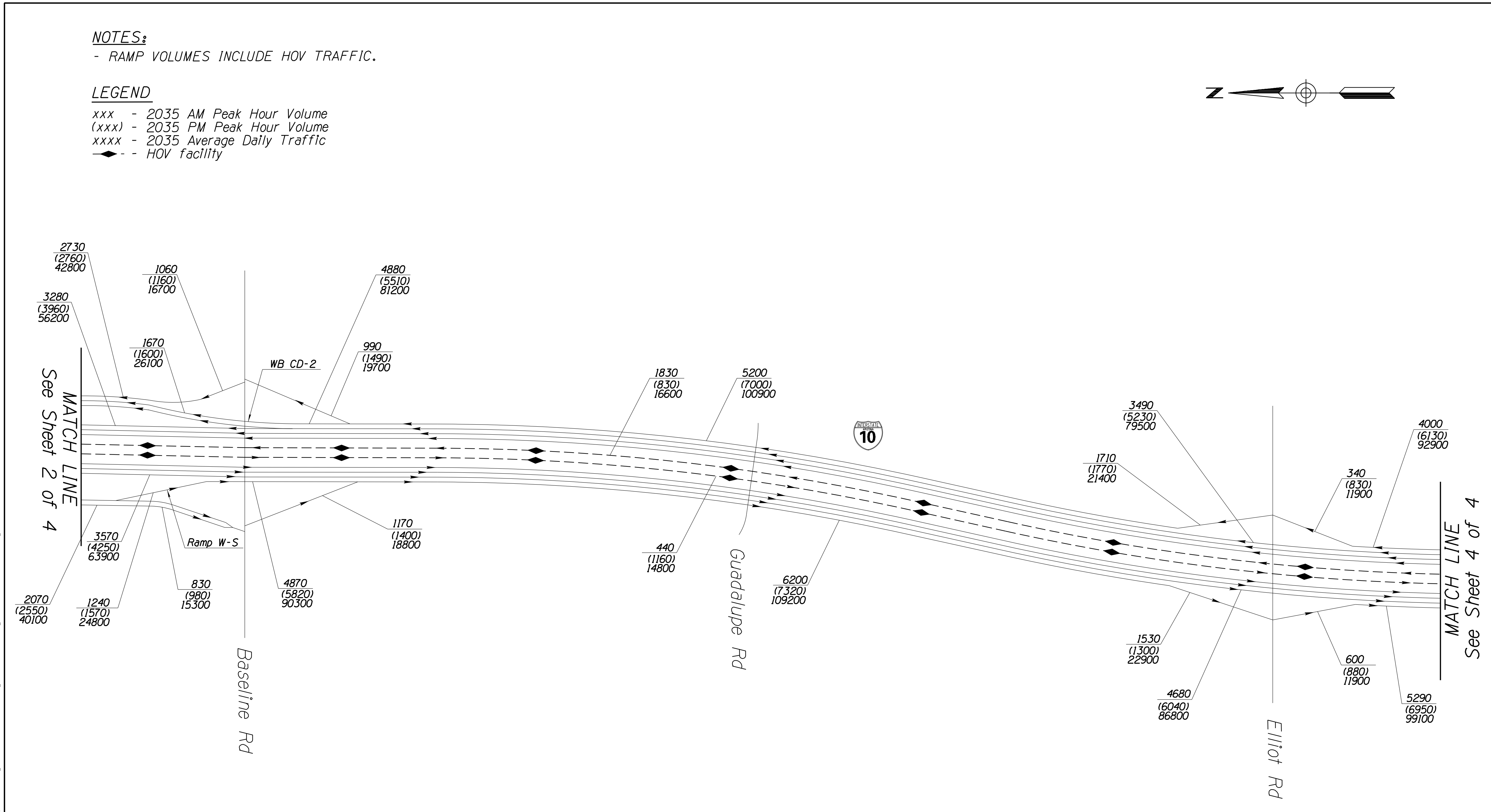


I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

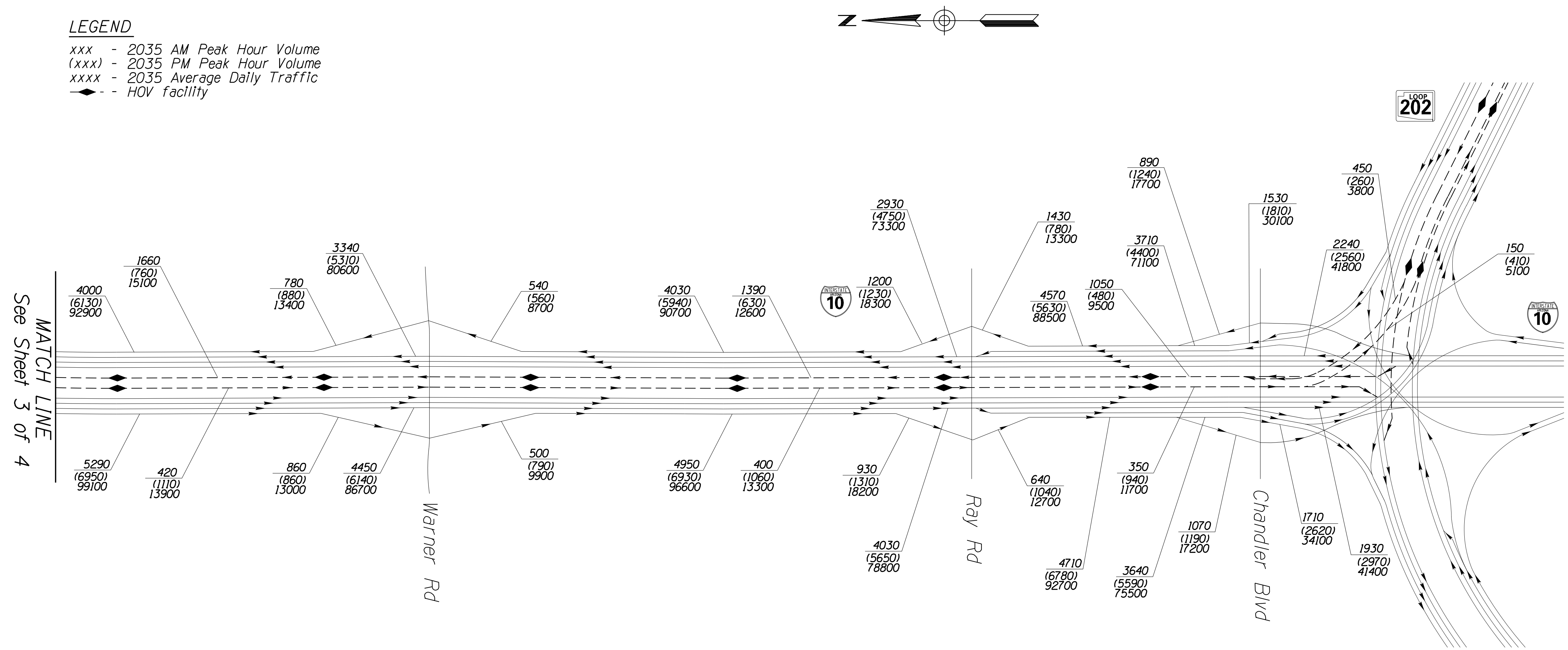
ON THE MOVE PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 7
2035 NO BUILD VOLUMES
& LANE CONFIGURATION
SHEET 3 OF 4

NOTES:
- RAMP VOLUMES INCLUDE HOV TRAFFIC.

LEGEND
xxx - 2035 AM Peak Hour Volume
(xxx) - 2035 PM Peak Hour Volume
xxxx - 2035 Average Daily Traffic
HOV facility



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 7
2035 NO BUILD VOLUMES
& LANE CONFIGURATION
SHEET 4 OF 4

2.4.4 Alternative 1, With Ramp 'N-E' Option 1

Eastbound I-10 Mainline

The Year 2035 traffic volume projections and lane configurations are shown in Figure 8 (on pages 53-56). Four existing general-purpose lanes and one HOV lane are provided on the eastbound I-10 mainline approaching Broadway Road. One additional general-purpose lane would be developed south of Broadway Road to provide five general-purpose lanes and one HOV lane approaching the I-10/US60 TI. Traffic on I-10 that is destined for eastbound US 60 (on Ramp 'S-E') would depart the I-10 mainline lanes with a three lane exit. Ramp 'S-E' would be developed with a mandatory exit from the outside two lanes, and the third lane designed as an optional lane with the I-10 through movement. Three general-purpose lanes and one HOV lane would continue to the south on I-10 through the I-10/US60 TI. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. HOV traffic that is destined for US 60 would exit I-10 at the existing HOV directional ramp.

A transfer ramp (1 lane) would provide a connection between the eastbound C-D Road and Ramp 'S-E' in the vicinity of Fairmont Drive. The transfer ramp lane would merge with Ramp 'S-E' (3 lanes) to develop four lanes that continue to the east on US 60. The existing Ramp 'S-E' bridge over Southern Avenue would be widened to provide the roadway width necessary to accept the additional lane from the transfer ramp.

One lane would continue to the south on the eastbound C-D Road between Fairmont Drive and the I-10 entrance ramp. The C-D Road lane would merge with the eastbound I-10 mainline just south of the I-10/US60 TI to develop four general-purpose lanes and one HOV lane that continue to the south.

The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp 'W-S') (1 lane) would merge with the Baseline Road exit ramps to develop a combined connector road (3 lanes) approaching the Baseline Road TI. The Baseline Road exit ramp (3 lanes) would depart the connector road with two lanes as a mandatory exit from the outside lanes, and the third lane designed as an optional lane with the Ramp 'W-S' through movement to I-10. Ramp 'W-S' would enter the I-10 mainline with a "lane-add" configuration to provide five general-purpose lanes and one HOV lane between Baseline Road and Elliot Road. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that continues to the Elliot Road exit ramp.

The Elliot Road exit ramp (2 lanes) would be realigned with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. An American Association of State Highway Transportation Officials (AASHTO) lane drop would occur prior to the Elliot Road entrance ramp gore to provide four general-purpose lanes and one HOV lane that would continue to the south between Elliot Road and Ray Road. The Elliot Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Warner Road exit ramp.

The Warner Road exit ramp (1 lane) would be realigned with a mandatory exit from the auxiliary lane. The Warner Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Ray Road exit ramp.

The Ray Road exit ramp (1 lane) would be developed as a mandatory exit from the auxiliary lane. Four general-purpose lanes and one HOV lane would continue to the south to match into the existing I-10 mainline approaching the I-10/SR202L (Santan/South Mountain) TI.

South of Baseline Road, the roadway widening on I-10 would be constructed within the existing right-of-way. The Guadalupe Road, Elliot Road, Warner Road and Ray Road underpasses were originally constructed with sufficient span lengths to support the roadway widening recommended with this alternative.

East of I-10, the US 60 eastbound roadway would be widened to match the existing five general-purpose lanes and one HOV lane between Priest Drive and the Mill Avenue exit ramp. The northbound I-10 to eastbound US 60 (Ramp 'N-E') directional ramp (1 lane) would be realigned to develop an additional eastbound general-purpose lane. The Priest Drive entrance ramp would be realigned and merge with eastbound US 60 with parallel entrance configuration.

Eastbound C-D Road

The existing southbound SR 143 to eastbound I-10 loop ramp (1 lane) would initiate the eastbound C-D Road at Broadway Road. The Broadway Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional C-D Road lane (2 lanes total) that continues to the south.

A transfer ramp would be provided between the eastbound C-D Road and the eastbound US 60 ramp (Ramp 'S-E') in the vicinity of Fairmont Drive. The transfer ramp (1 lane) would merge with Ramp 'S-E' (3 lanes) to develop four lanes that continue to the east on US 60. The existing Ramp 'S-E' bridge over I-10 was originally constructed with the roadway width necessary to accept the additional lane from the transfer ramp.

The C-D Road (1 lane) would continue to the south between Fairmont Drive and the I-10 entrance ramp. The C-D Road would merge with the eastbound general-purpose lanes (3 lanes) just south of the I-10/US60 TI to develop four general-purpose lanes and one HOV lane that continue to the south. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. The existing Ramp 'S-E' bridge over Southern Avenue would be widened, and a new bridge would be provided for the eastbound C-D Road over Southern Avenue.

Westbound I-10 Mainline

The original I-10/SR202L (Santan/South Mountain) TI project widened the westbound I-10 mainline to provide four general-purpose lanes and one HOV lane approaching Ray Road from the south. An AASHTO lane-drop was provided to transition to the existing roadway width of three general-purpose lanes and one HOV lane north of Ray Road.

An additional westbound general-purpose lane would be developed on I-10 by removing the AASHTO lane drop and extending the fourth general-purpose lane to the north. The Ray Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Warner Road exit ramp. Westbound I-10 would include four general-purpose lanes and one HOV lane between Ray and Elliot Roads.

The Warner Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane. The entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Elliot Road exit ramp. The Elliot Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane.

Elliot Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional lane between Elliot Road and Baseline Road. Five general-purpose lanes and one HOV lane would be provided on I-10 approaching the initial westbound C-D Road transfer ramp (and eastbound US 60) near Baseline Road. The Baseline Road exit ramp would be developed with a single-lane tapered exit configuration from the outside general-purpose lane. The initial C-D Road transfer ramp would be developed as a two lane mandatory exit from the outside general-purpose lanes.

Three general-purpose lanes and one HOV lane would continue to the north approaching the I-10/US60 TI. A second C-D Road transfer ramp (1 lane) would be developed immediately south of US 60 to provide additional access to the westbound C-D Road. This ramp would be developed with a tapered exit configuration from the outside general-purpose lane. Three general-purpose lanes and one HOV lane would continue to the north through the I-10/US60 TI.

Four general-purpose lanes, an auxiliary lane and one HOV lane are provided on westbound US 60 west of Mill Avenue. The Priest Drive exit ramp (1 lane) would be reconfigured to a single-lane ramp with a mandatory exit from the auxiliary lane. The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp ‘W-S’) (1 lane) would be reconfigured with a parallel “left-exit” configuration.

The westbound US 60 to westbound C-D Road ramp (1 lane) would be developed as a mandatory exit from the outside general-purpose lane. Three lanes would continue to the west on Ramp ‘W-N’ to connect to the westbound I-10 mainline.

Ramp ‘W-N’ (3 lanes) would combine with the westbound I-10 general-purpose lanes (3 lanes) to develop six general-purpose lanes and one HOV lane departing I-10/US60 TI. A new bridge would be constructed for Ramp ‘W-N’ over the westbound C-D Road.

The US 60 HOV lane would enter the westbound I-10 mainline and combine with the I-10 HOV lane (from the south) with a parallel entrance configuration. One westbound HOV lane would continue to the west between US 60 and I-17.

Six general-purpose lanes and HOV lane would depart the I-10/US60 TI. Two lane drops would occur between Southern Avenue and Broadway Road to transition the westbound I-10 mainline to four general-purpose lanes and one HOV lane prior to the Broadway Road underpass.

A C-D Road transfer ramp (1 lane) would be provided north of Southern Avenue. The transfer ramp would merge with the I-10 general-purpose lanes with a parallel “lane-add” configuration.

Westbound C-D Road

Travelers destined for the westbound local lanes, or eastbound US 60 (via Ramp ‘N-E’), would depart I-10 just south of Baseline Road. The westbound transfer ramp exit would be developed as a two lane mandatory exit from the outside general-purpose lanes. The existing westbound C-D Road would remain in its current configuration but widened to provide full lane and shoulder widths.

The westbound C-D Road (2 lanes) would continue to the north immediately east of the I-10 mainline. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Ramp ‘N-E’ exit. The Ramp ‘N-E’ exit (1 lane) would depart the westbound C-D Road as a mandatory exit from the auxiliary lane. Two C-D Road lanes would continue to the north.

A second C-D Road transfer ramp (1 lane) would be provided just south of US 60. The transfer ramp would merge with the C-D Road lanes with a “lane-add” configuration. The outside C-D Road lane would terminate prior to the US 60 entrance ramp to develop three lanes approaching Southern Avenue.

The two lanes from I-10 (from the south) would merge with the westbound US 60 ramp (1 lane) to develop three C-D Road lanes that continue to the Broadway Road TI. The outside C-D Road lane would terminate south of Alameda Drive to develop two C-D Road lanes approaching the I-10/SR143 TI. A new bridge would be provided for the C-D Road crossing over Southern Avenue.

The westbound I-10 to northbound SR 143 (Ramp ‘W-N’) directional ramp (2 lanes) would be retained in its current configuration. A new C-D Road transfer ramp would be provided north of Southern Avenue to allow a connection between the C-D Road and the westbound I-10 mainline.

2.4.5 Alternative 1, With Ramp ‘N-E’ Option 2

Alternative 1, with Ramp ‘N-E’ Option 2 includes the same roadway configuration as Alternative 1, with Ramp ‘N-E’ Option 1. Ramp ‘N-E’ Design Option 2 would reconfigure the I-10/US60 TI Ramp ‘N-E’ exit to depart the westbound C-D Road as a two lane mandatory exit from the outside C-D Road lanes.

Ramp ‘S-E’ would be reconfigured east of the I-10 overpass to develop a lane drop prior to merging with Ramp ‘N-E’. Ramp ‘N-E’ (2 lanes) would be reconfigured to provide a two lane parallel entrance that transitions into additional general-purpose lanes. Five general-purpose lanes and one HOV lane would continue on the eastbound US 60 mainline east of Hardy Drive.

Once Ramp ‘N-E’ diverges from the westbound C-D Road, one C-D Road lane would continue to the north. The transfer ramp from I-10 (1 lane) would merge with the westbound C-D Road to form a two lane roadway. The two lane roadway would continue to the north and be joined by the ramp from westbound US 60, at which point the configuration matches Alternative 1, Ramp ‘N-E’ Option 1. The Year 2035 traffic volume projections and lane configurations are shown in Figure 9 (on page 57).

2.4.6 Alternative 1, With Ramp ‘N-E’ Option 3

Alternative 1, with Ramp ‘N-E’ Option 3 includes the same roadway configuration as Alternative 1, with Ramp ‘N-E’ Option 2. Design Option 3 would reconfigure the I-10/US60 TI Ramp ‘N-E’ exit (2 lanes) to depart the westbound C-D Road with a one lane mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the C-D Road through movement. Two lanes would continue on the westbound C-D Road to the north.

Following the Ramp ‘N-E’ exit from the westbound C-D Road, the configuration along US 60 matches that on Alternative 1, with Ramp ‘N-E’ Option 2 while the configuration on the westbound C-D Road matches that of Alternative 1, with Ramp ‘N-E’ Option 1. The Year 2035 traffic volume projections and lane configurations are shown on Figure 10 (on page 58).

[Text resumes on page 59]

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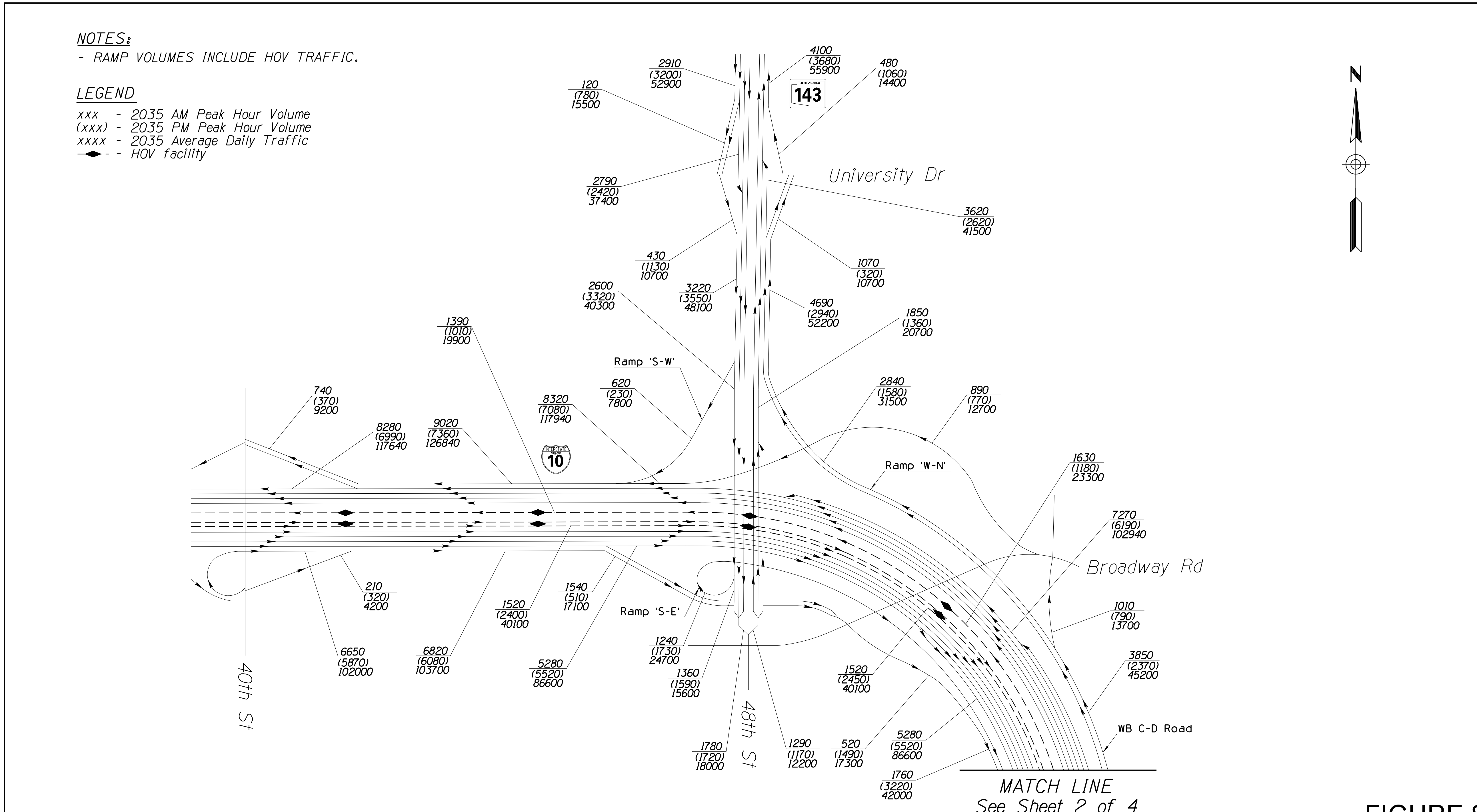


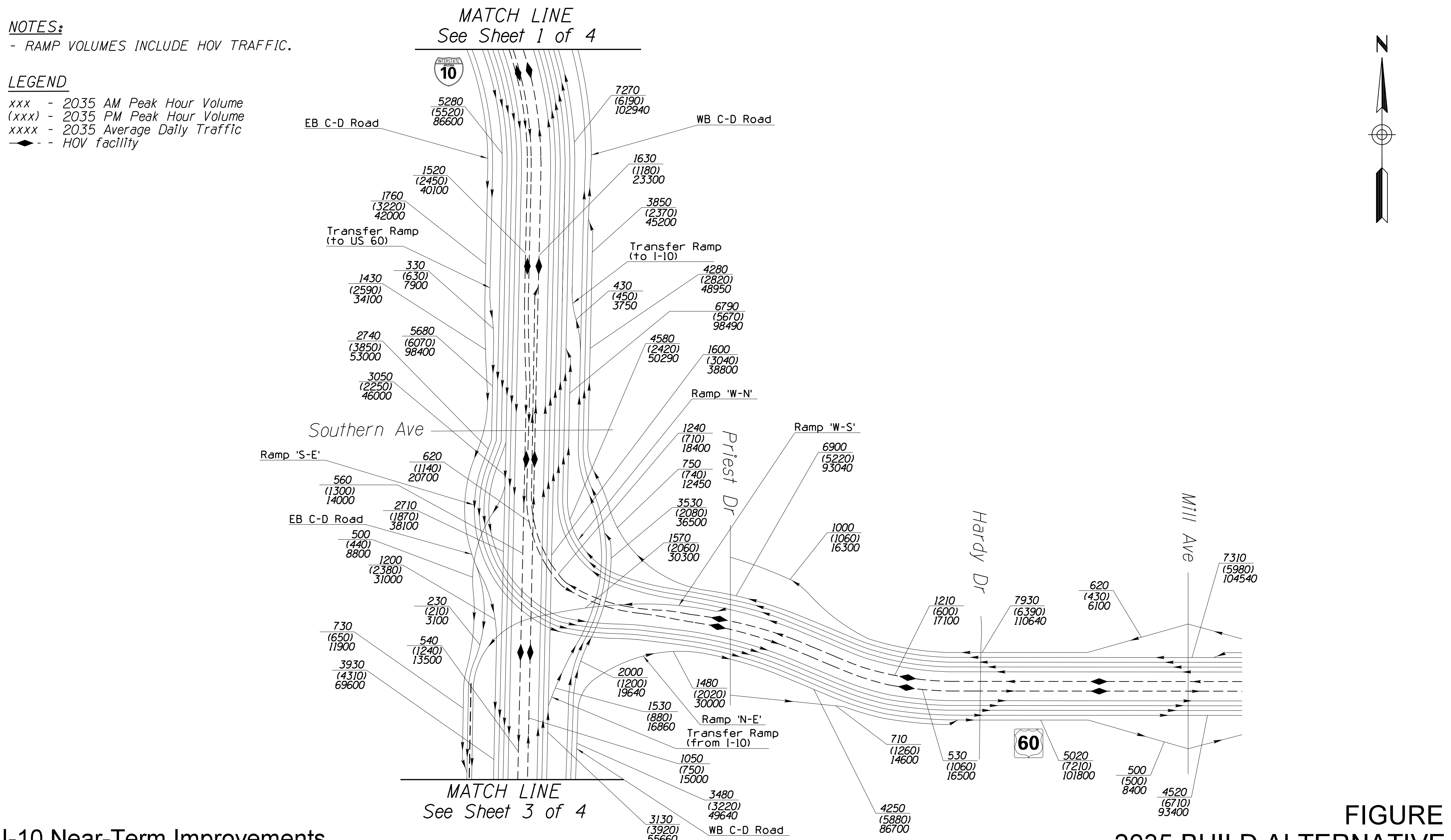
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 8
2035 BUILD ALTERNATIVE 1
RAMP 'N-E' OPTION 1
VOLUMES & LANE CONFIGURATION
SHEET 1 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

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ON THE MOVE
PARTNERS IN PROGRESS

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FIGURE 8
2035 BUILD ALTERNATIVE 1
RAMP 'N-E' OPTION 1
VOLUMES & LANE CONFIGURATION
SHEET 2 OF 4

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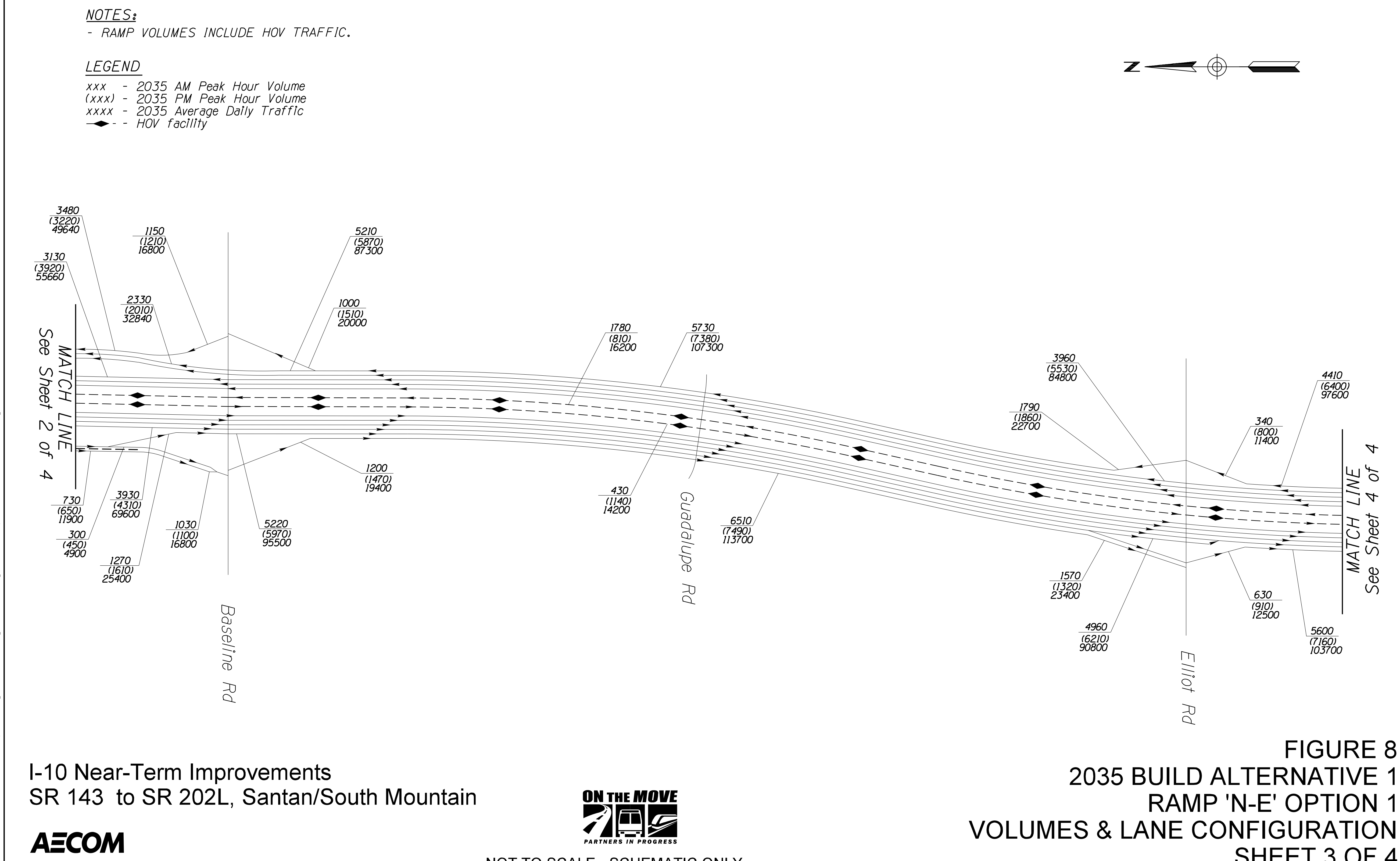
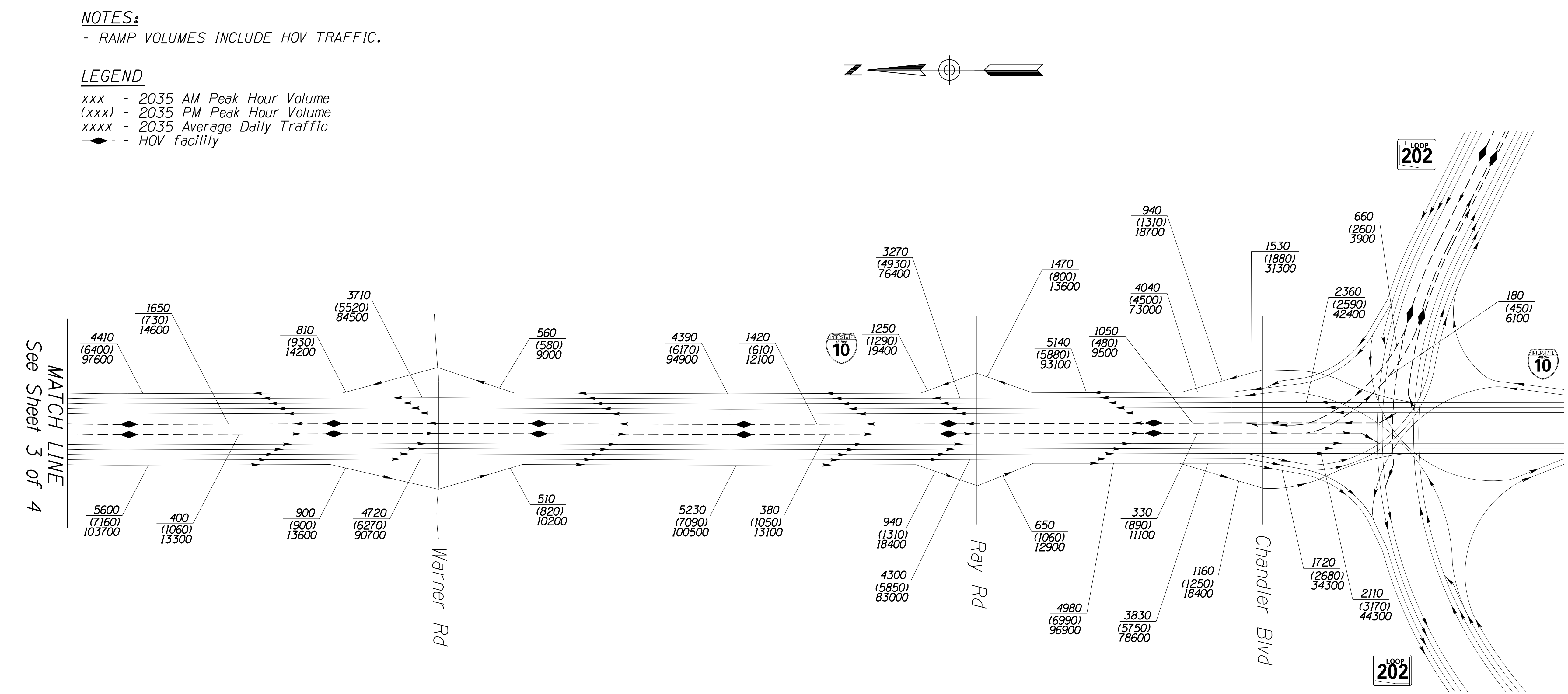


I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

FIGURE 8
2035 BUILD ALTERNATIVE 1
RAMP 'N-E' OPTION 1
VOLUMES & LANE CONFIGURATION
SHEET 3 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 8
2035 BUILD ALTERNATIVE 1
RAMP 'N-E' OPTION 1
VOLUMES & LANE CONFIGURATION
SHEET 4 OF 4

7/24/2015

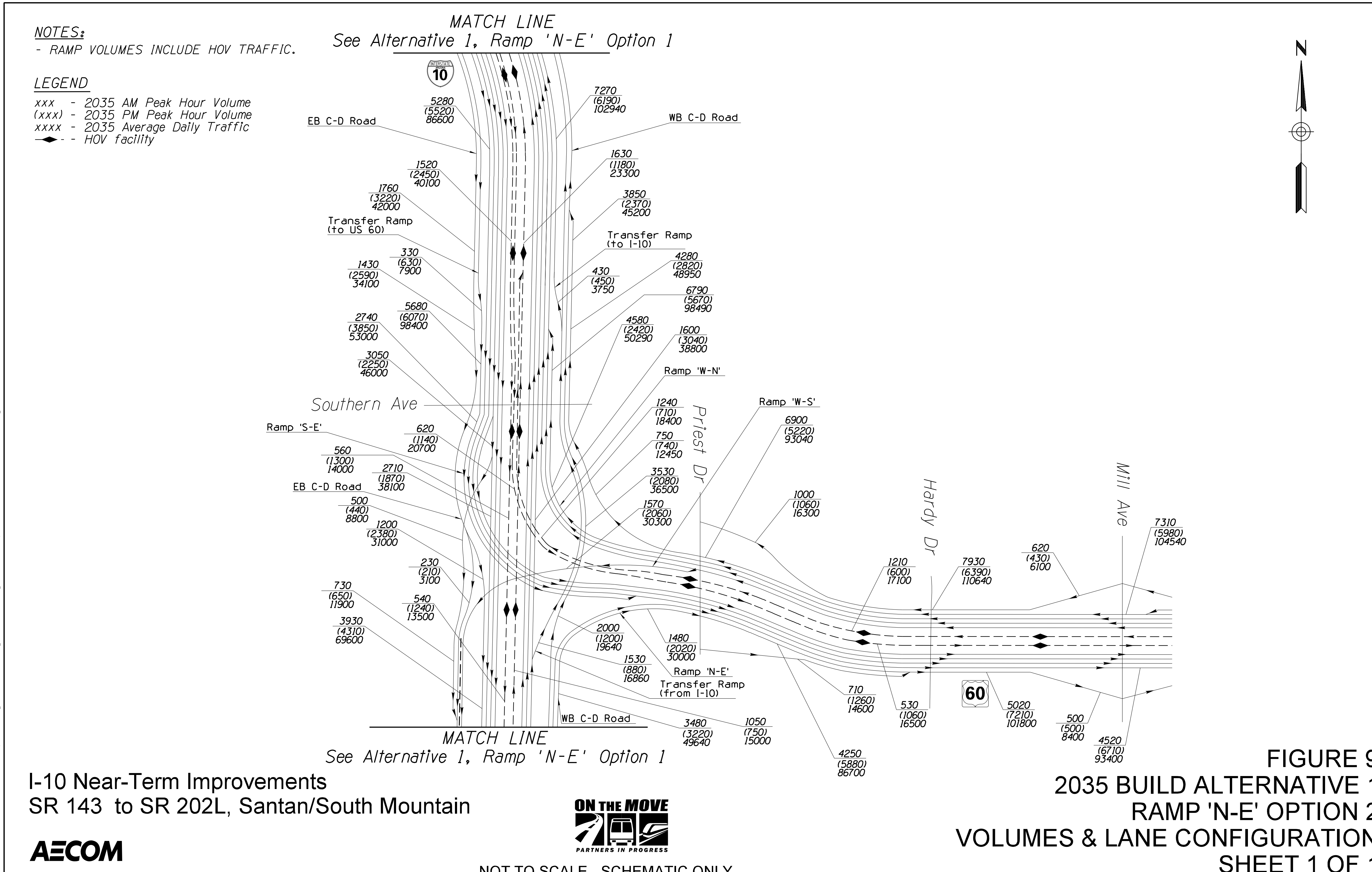
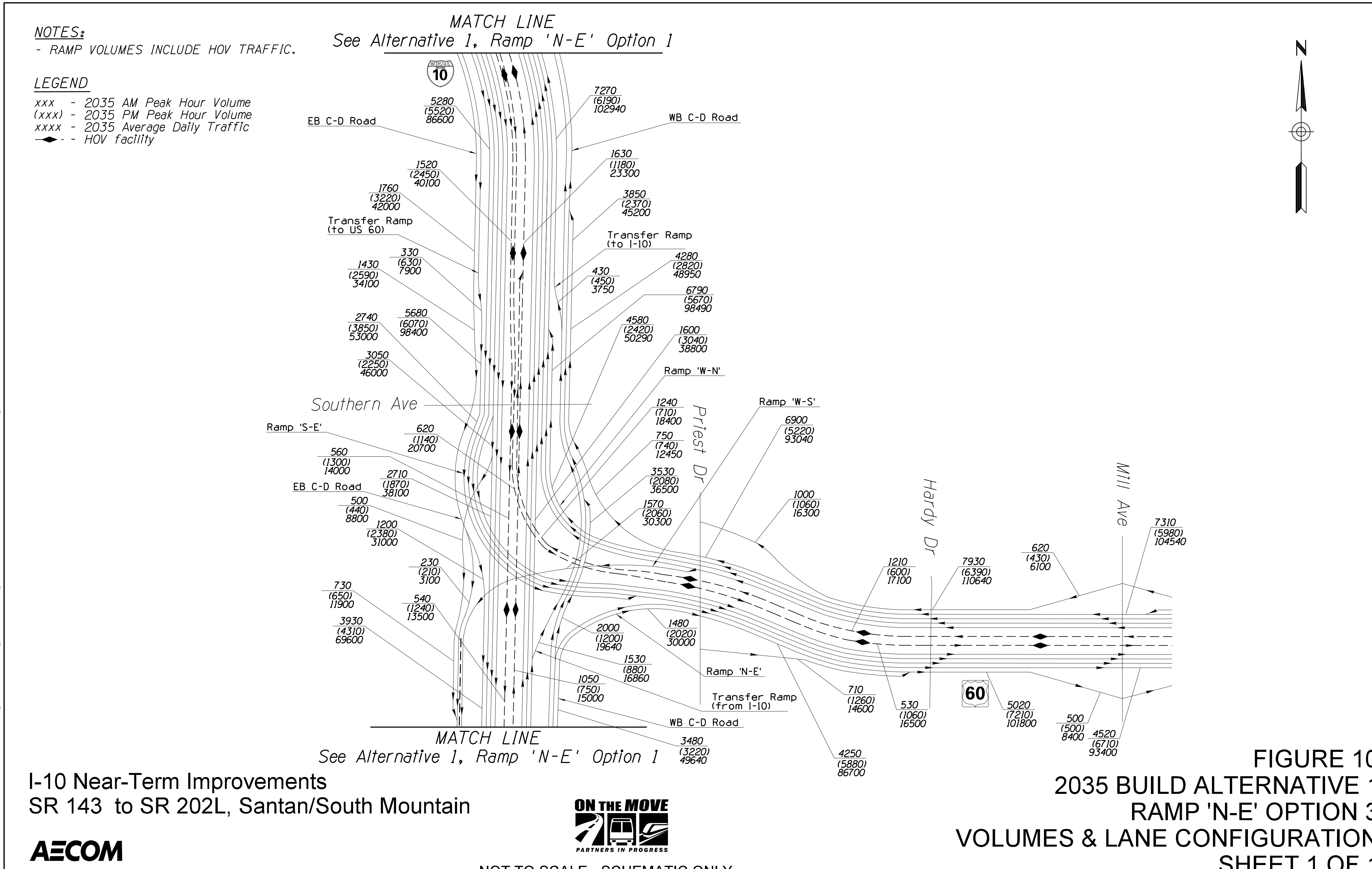


FIGURE 9
2035 BUILD ALTERNATIVE 1
RAMP 'N-E' OPTION 2
VOLUMES & LANE CONFIGURATION
SHEET 1 OF 1



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

FIGURE 10
2035 BUILD ALTERNATIVE 1
RAMP 'N-E' OPTION 3
VOLUMES & LANE CONFIGURATION
SHEET 1 OF 1

2.4.7 Alternative 2, With Westbound C-D Road Option 1

The Year 2025 traffic volume projections and lane configuration for Alternative 2, with Westbound C-D Road Option 1 are shown in Figure 11 (on pages 62-65).

Eastbound I-10 Mainline

Four existing general-purpose lanes and one HOV lane are provided on the eastbound I-10 mainline approaching Broadway Road. One additional general-purpose lane would be developed south of Broadway Road to provide five general-purpose lanes and one HOV lane approaching the I-10/US60 TI. Traffic on I-10 that is destined for eastbound US 60 (on Ramp 'S-E') would depart the I-10 mainline lanes with a three lane exit. Ramp 'S-E' would be developed with a mandatory exit from the outside two lanes, and the third lane designed as an optional lane with the I-10 through movement. Three general-purpose lanes and one HOV lane would continue to the south on I-10 through the I-10/US60 TI. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. HOV traffic that is destined for US 60 would exit I-10 at the existing HOV directional ramp.

A transfer ramp (1 lane) would provide a connection between the eastbound C-D Road and Ramp 'S-E' in the vicinity of Fairmont Drive. The transfer ramp lane would merge with Ramp 'S-E' (3 lanes) to develop four lanes that continue to the east on US 60. The existing Ramp 'S-E' bridge over Southern Avenue would be widened to provide the roadway width necessary to accept the additional lane from the transfer ramp.

One lane would continue to the south on the eastbound C-D Road between Fairmont Drive and the I-10 entrance ramp. The C-D Road lane would merge with the eastbound I-10 mainline just south of the I-10/US60 TI to develop four general-purpose lanes and one HOV lane that continue to the south.

The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp 'W-S') (1 lane) would merge with the Baseline Road exit ramps to develop a combined connector road (3 lanes) approaching the Baseline Road TI. The Baseline Road exit ramp (3 lanes) would depart the connector road with two lanes as a mandatory exit from the outside lanes, and the third lane designed as an optional lane with the Ramp 'W-S' through movement to I-10. Ramp 'W-S' would enter the I-10 mainline with a "lane-add" configuration to provide five general-purpose lanes and one HOV lane between Baseline Road and Elliot Road. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that continues to the Elliot Road exit ramp.

The Elliot Road exit ramp (2 lanes) would be realigned with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. An American Association of State Highway Transportation Officials (AASHTO) lane drop would occur prior to the Elliot Road entrance ramp gore to provide four general-purpose lanes and one HOV lane that would continue to the south between Elliot Road and Ray Road. The Elliot Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Warner Road exit ramp.

The Warner Road exit ramp (2 lanes) would be realigned with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. The Warner Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Ray Road exit ramp.

The Ray Road exit ramp (2 lanes) would be developed as a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. Four general-purpose lanes and one HOV lane would continue to the south to match into the existing I-10 mainline approaching the I-10/SR202L (Santan/South Mountain) TI.

South of Baseline Road, the roadway widening on I-10 would be constructed within the existing right-of-way. The Guadalupe Road, Elliot Road, Warner Road and Ray Road underpasses were originally constructed with sufficient span lengths to support the roadway widening recommended with this alternative.

East of I-10, the US 60 eastbound roadway would be widened to match the existing five general-purpose lanes and one HOV lane between Priest Drive and the Mill Avenue exit ramp. The northbound I-10 to eastbound US 60 (Ramp 'N-E') directional ramp (1 lane) would be realigned to develop an additional eastbound general-purpose lane. The Priest Drive entrance ramp would be realigned and merge with eastbound US 60 with a parallel entrance configuration.

Eastbound C-D Road

The existing southbound SR 143 to eastbound I-10 loop ramp (1 lane) would initiate the eastbound C-D Road at Broadway Road. The Broadway Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional C-D Road lane (2 lanes total) that continues to the south.

A transfer ramp would be provided between the eastbound C-D Road and the eastbound US 60 ramp (Ramp 'S-E') in the vicinity of Fairmont Drive. The transfer ramp (1 lane) would merge with Ramp 'S-E' (3 lanes) to develop four lanes that continue to the east on US 60. The existing Ramp 'S-E' bridge over I-10 was originally constructed with the roadway width necessary to accept the additional lane from the transfer ramp.

The C-D Road (1 lane) would continue to the south between Fairmont Drive and the I-10 entrance ramp. The C-D Road would merge with the eastbound general-purpose lanes (3 lanes) just south of the I-10/US60 TI to develop four general-purpose lanes and one HOV lane that continue to the south. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. The existing Ramp 'S-E' bridge over Southern Avenue would be widened, and a new bridge would be provided for the eastbound C-D Road over Southern Avenue.

Westbound I-10 Mainline

The original I-10/SR202L (Santan/South Mountain) TI project widened the westbound I-10 mainline to provide four general-purpose lanes and one HOV lane approaching Ray Road from the south. An AASHTO lane-drop was provided to transition to the existing roadway width of three general-purpose lanes and one HOV lane north of Ray Road.

An additional westbound general-purpose lane would be developed on I-10 by removing the AASHTO lane drop and extending the fourth general-purpose lane to the north. The Ray Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Warner Road exit ramp. Westbound I-10 would include four general-purpose lanes and one HOV lane between Ray and Elliot Roads.

The Warner Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane. The entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Elliot Road exit ramp. The Elliot Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane.

Elliot Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional lane between Elliot Road and Baseline Road. Five general-purpose lanes and one HOV lane would be provided on I-10 approaching the initial westbound C-D Road transfer ramp (and eastbound US 60) near Baseline Road. The Baseline Road exit ramp would be developed with a single-lane tapered exit configuration from the outside general-purpose lane. The initial C-D Road transfer ramp would be developed as a two lane mandatory exit from the outside general-purpose lanes.

Three general-purpose lanes and one HOV lane would continue to the north approaching the I-10/US60 TI. A second C-D Road transfer ramp (1 lane) would be developed immediately south of US 60 to provide additional access to the westbound C-D Road. This ramp would be developed with a tapered exit configuration from the outside general-purpose lane. Three general-purpose lanes and one HOV lane would continue to the north through the I-10/US60 TI.

Four general-purpose lanes, one auxiliary lane and one HOV lane are provided on westbound US 60 west of Mill Avenue. The Priest Drive exit ramp (1 lane) would be reconfigured to a single-lane ramp with a mandatory exit from the auxiliary lane. The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp 'W-S') (1 lane) would be reconfigured with a parallel "left-exit" configuration.

The westbound US 60 to westbound C-D Road ramp (1 lane) would be developed as a mandatory exit from the outside general-purpose lane. Three lanes would continue to the west on Ramp 'W-N' to connect to the westbound I-10 mainline.

Ramp 'W-N' (3 lanes) would combine with the westbound I-10 general-purpose lanes (3 lanes) to develop six general-purpose lanes and one HOV lane departing I-10/US60 TI. A new bridge would be constructed for Ramp 'W-N' over the westbound C-D Road.

The US 60 HOV lane would enter the westbound I-10 mainline and combine with the I-10 HOV lane (from the south) with a parallel entrance configuration. One westbound HOV lane would continue to the west between US 60 and I-17.

Six general-purpose lanes and HOV lane would depart the I-10/US60 TI. Two lane drops would occur between Southern Avenue and Broadway Road to transition the westbound I-10 mainline to four general-purpose lanes and one HOV lane prior to the Broadway Road underpass.

A C-D Road transfer ramp (1 lane) would be provided north of Southern Avenue. The transfer ramp would merge with the I-10 general-purpose lanes with a parallel "lane-add" configuration.

Westbound C-D Road

Travelers destined for the westbound local lanes, or eastbound US 60 (via Ramp 'N-E'), would depart I-10 just south of Baseline Road. The westbound transfer ramp exit would be developed as a two lane mandatory exit from the outside general-purpose lanes. The existing westbound C-D Road would remain in its current configuration but widened to provide full lane and shoulder widths.

The westbound C-D Road (2 lanes) would continue to the north immediately east of the I-10 mainline. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Ramp 'N-E' exit. The Ramp 'N-E' exit (1 lane) would depart the westbound C-D Road as a mandatory exit from the auxiliary lane. Two C-D Road lanes would continue to the north.

A second C-D Road transfer ramp (1 lane) would be provided just south of US 60. The transfer ramp would merge with the C-D Road lanes with a "lane-add" configuration. The outside local lane would terminate prior to the US 60 entrance ramp to develop three lanes approaching Southern Avenue.

The two C-D Road lanes (from the south) would merge with the westbound US 60 ramp (1 lane) to develop three C-D Road lanes that extend to approximately Alameda Drive. The outside C-D Road lane would then merge with the adjacent lane to develop two C-D Road lanes approaching the I-10/SR143 TI. A new bridge would be provided for the C-D Road crossing over Southern Avenue.

The westbound I-10 to northbound SR 143 (Ramp 'W-N') directional ramp (2 lanes) would be retained in its current configuration. A new C-D Road transfer ramp would be provided north of Broadway Road to allow a connection between the C-D Road and the westbound I-10 mainline near 48th Street.

2.4.8 Alternative 2, With Westbound C-D Road Option 2

Alternative 2, with Westbound C-D Road Option 2 is configured similar to Alternative 2, with Westbound C-D Road Option 1. The outside lane drop on the westbound C-D Road near Alameda Drive would be eliminated to provide a continuous three lane roadway between the I-10/US60 TI and the Broadway Road exit ramp. The Broadway Road exit ramp (1 lane) would be developed as a mandatory exit from the outside C-D Road lane. Two lanes would continue to the north to connect with the I-10/SR143 TI Ramp 'W-N'. The Year 2035 traffic volume projections and lane configuration for Alternative 2, with Westbound C-D Road Option 2 are shown in Figure 12 (on pages 66-69).

2.4.9 Alternative 2, With Westbound C-D Road Option 3

Alternative 2, with Westbound C-D Road Option 3 would be configured similar to Alternative 2, with Westbound C-D Road Option 2. Three lanes would be provided between the I-10/US60 TI and the I-10/SR143 TI. The Broadway Road exit ramp would be reconfigured to a tapered exit from the outside lane. The I-10/SR143 TI Ramp 'W-N' (2 lanes) would be configured as a mandatory exit from the outside C-D Road lanes. The left C-D Road lane would continue as a transfer ramp to provide a connection to westbound I-10 near 48th Street. The Year 2035 traffic volumes and lane configuration for Alternative 2, with Westbound C-D Road Option 3 is shown in Figure 13 (on pages 70-71).

[Text resumes on page 72]

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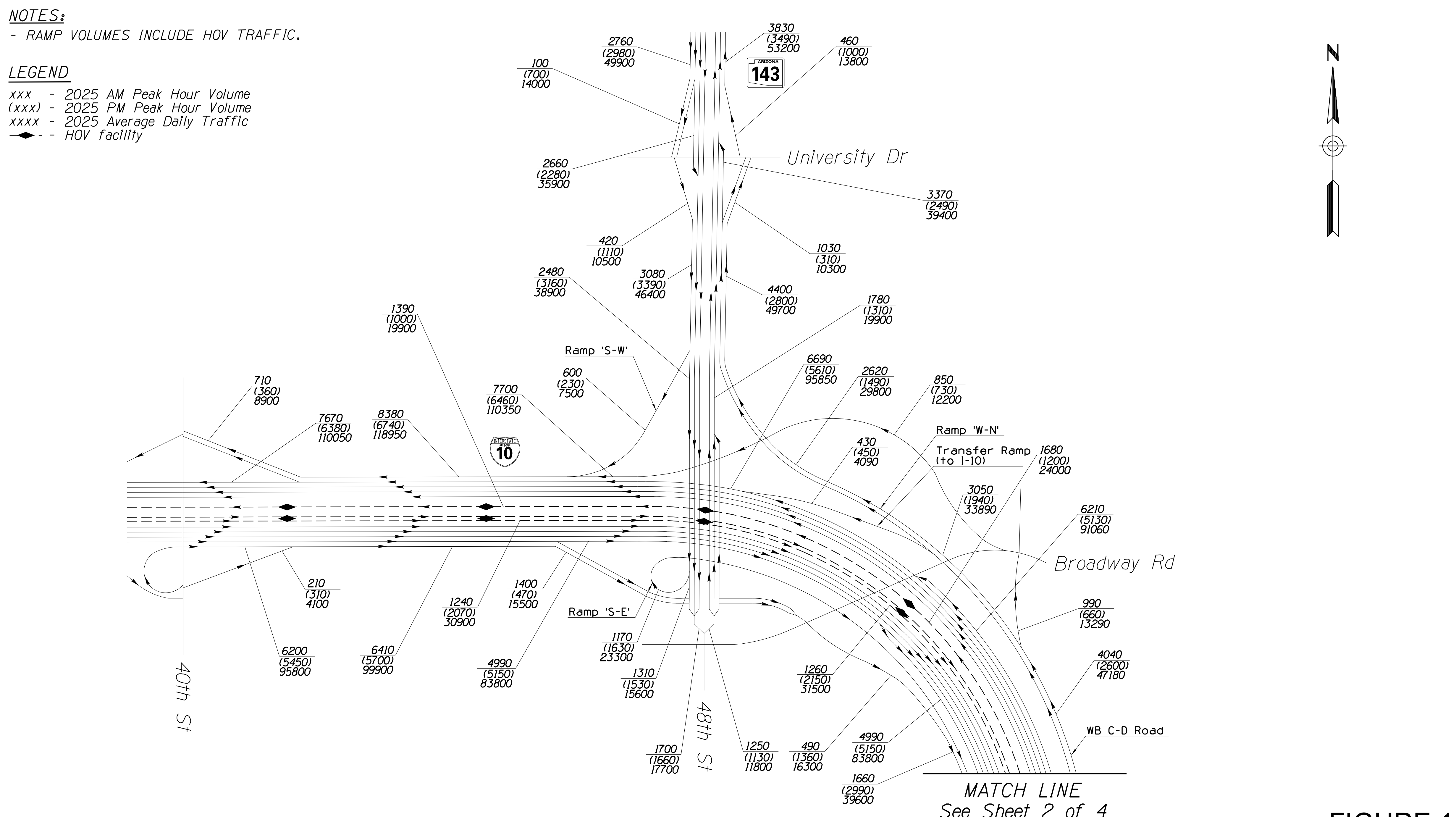


I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 11
2025 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 1
VOLUMES & LANE CONFIGURATION
SHEET 1 OF 4

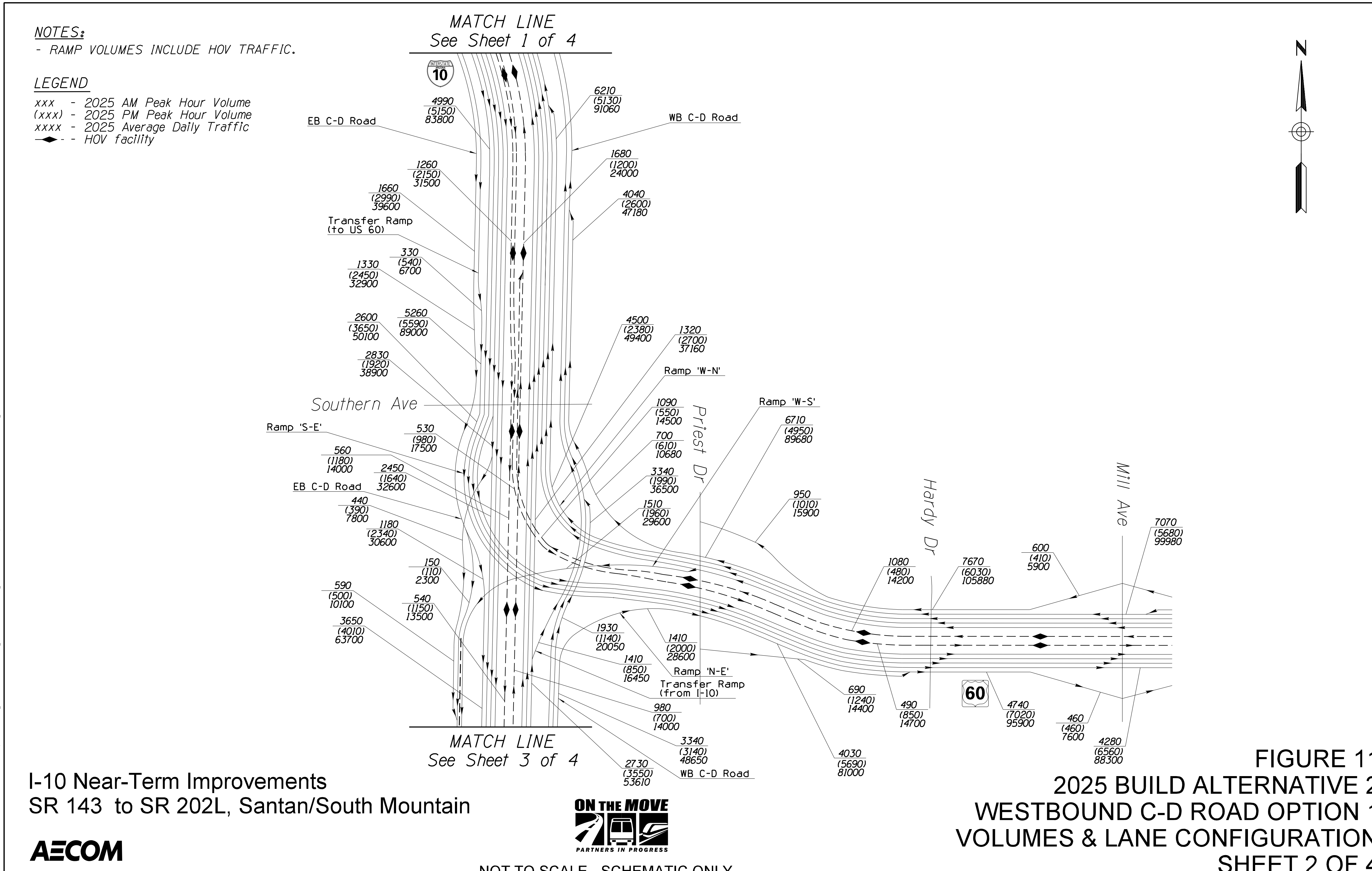
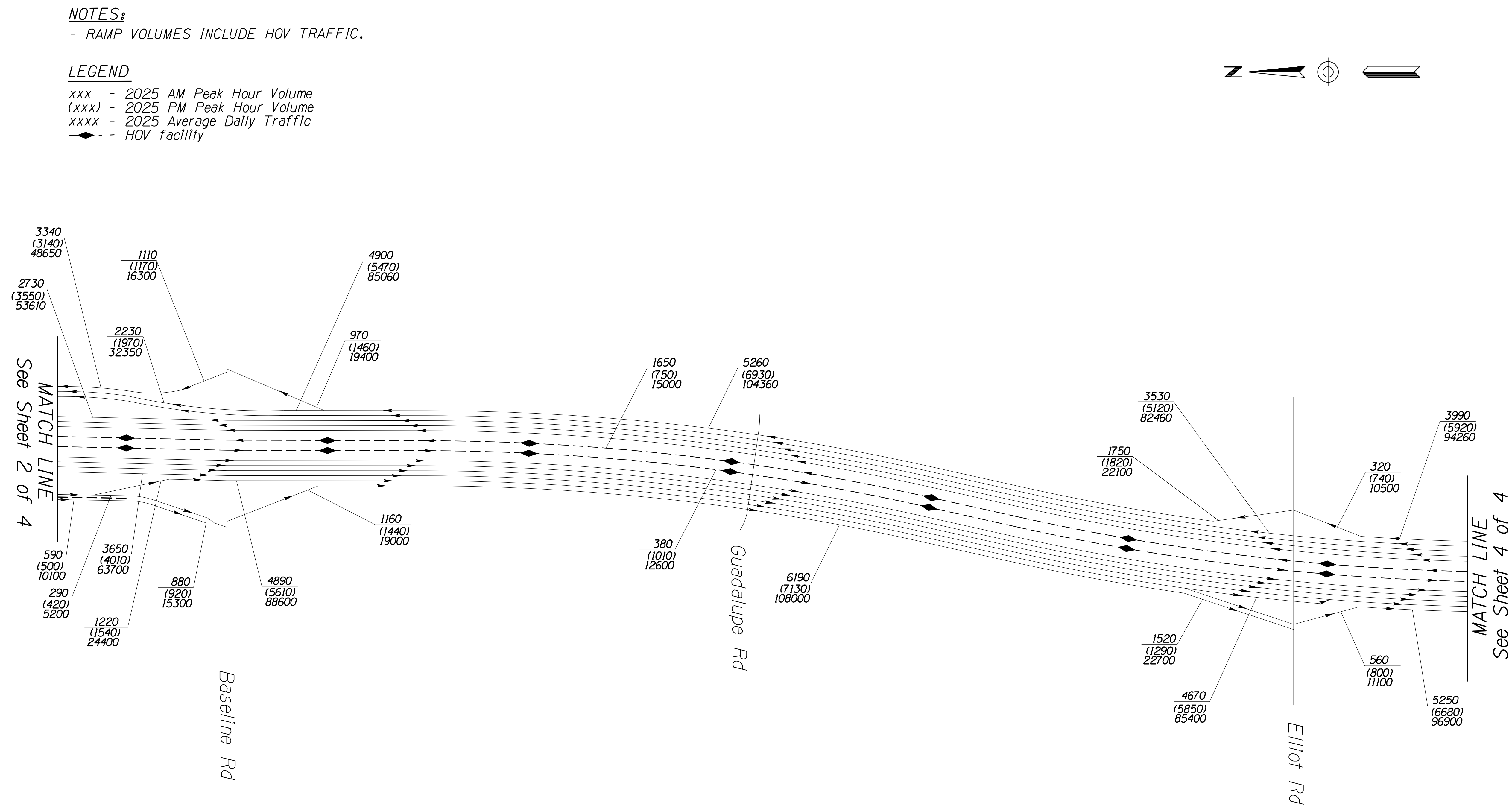


FIGURE 11
2025 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 1
VOLUMES & LANE CONFIGURATION
SHEET 2 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

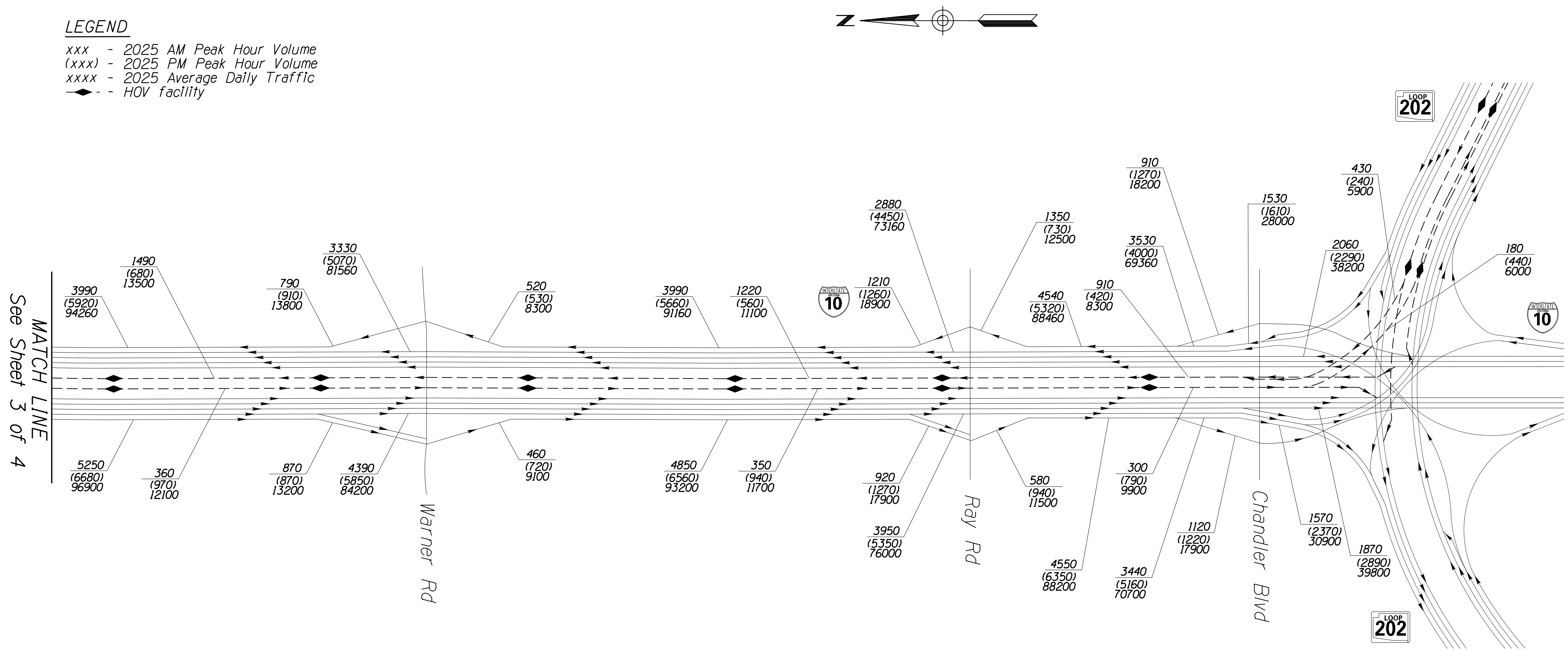
ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 11
2025 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 1
VOLUMES & LANE CONFIGURATION
SHEET 3 OF 4

NOTES:
- RAMP VOLUMES INCLUDE HOV TRAFFIC.

LEGEND
xxx - 2025 AM Peak Hour Volume
(xxx) - 2025 PM Peak Hour Volume
xxxx - 2025 Average Daily Traffic
HOV facility



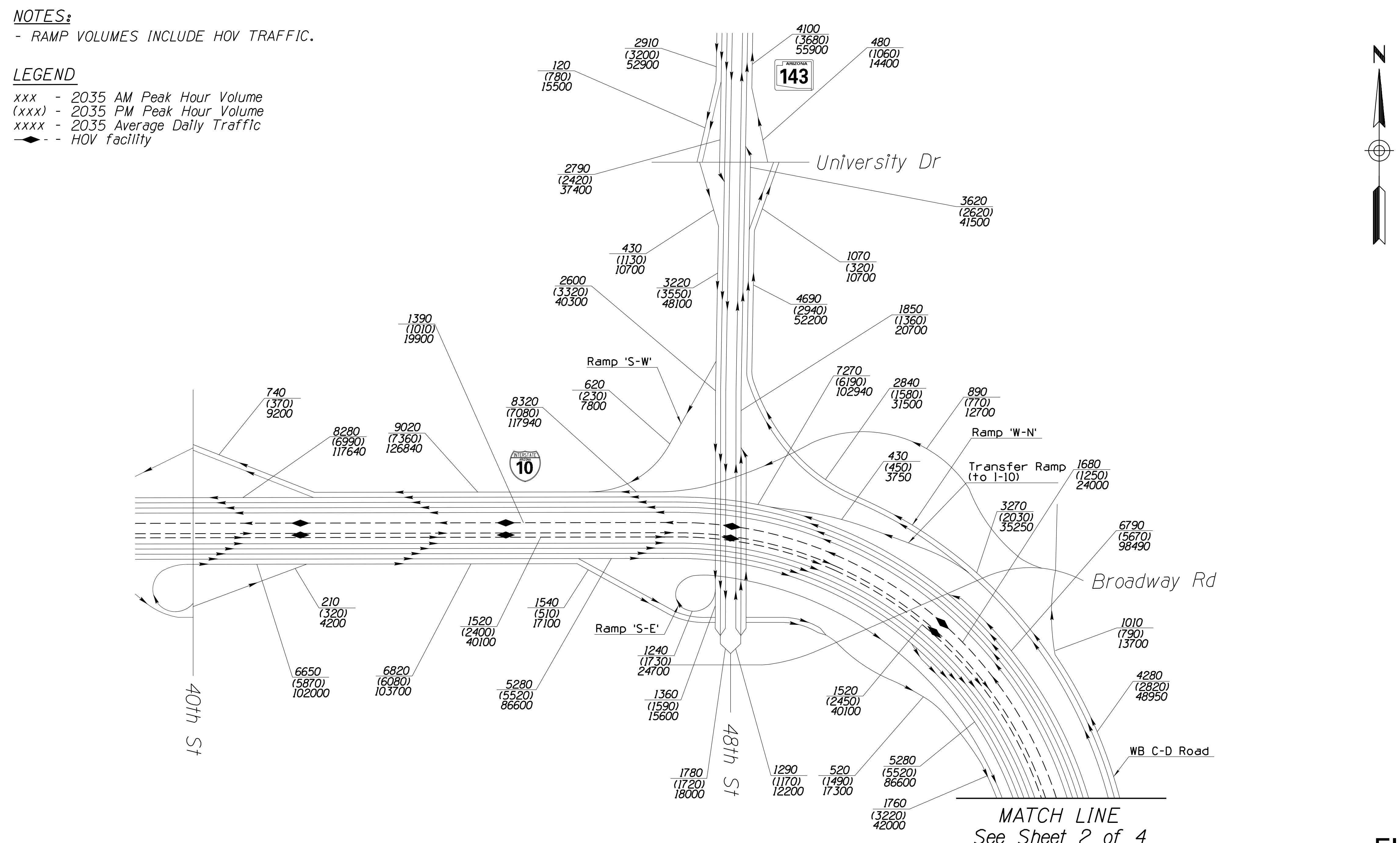
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 11
2025 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 1
VOLUMES & LANE CONFIGURATION
SHEET 4 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 12
2035 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 2
VOLUMES & LANE CONFIGURATION
SHEET 1 OF 4

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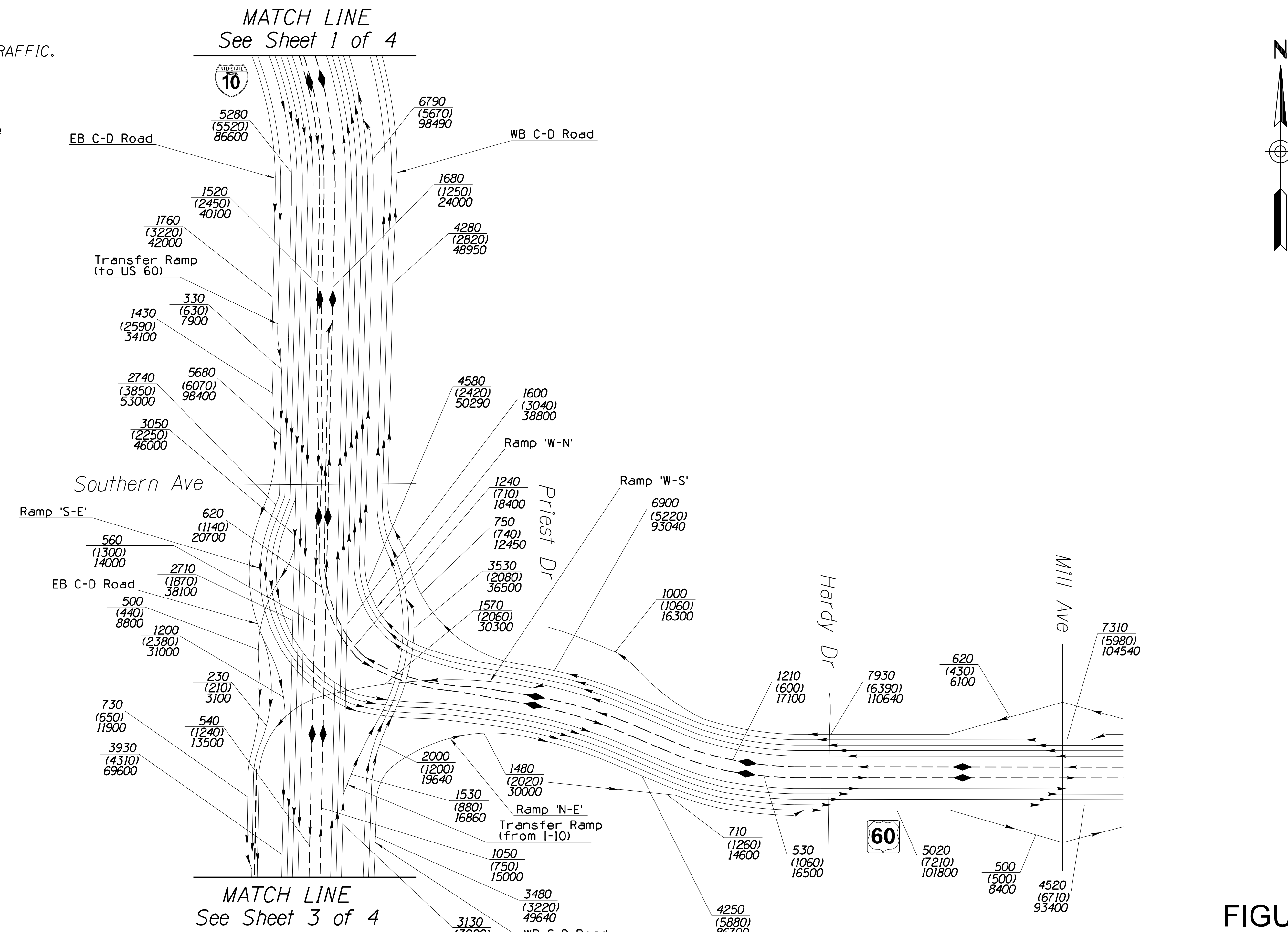
7/24/2015

NOTES:
- RAMP VOLUMES INCLUDE HOV TRAFFIC.

LEGEND
xxx - 2035 AM Peak Hour Volume
(xxx) - 2035 PM Peak Hour Volume
xxxx - 2035 Average Daily Traffic
—◆— - HOV facility



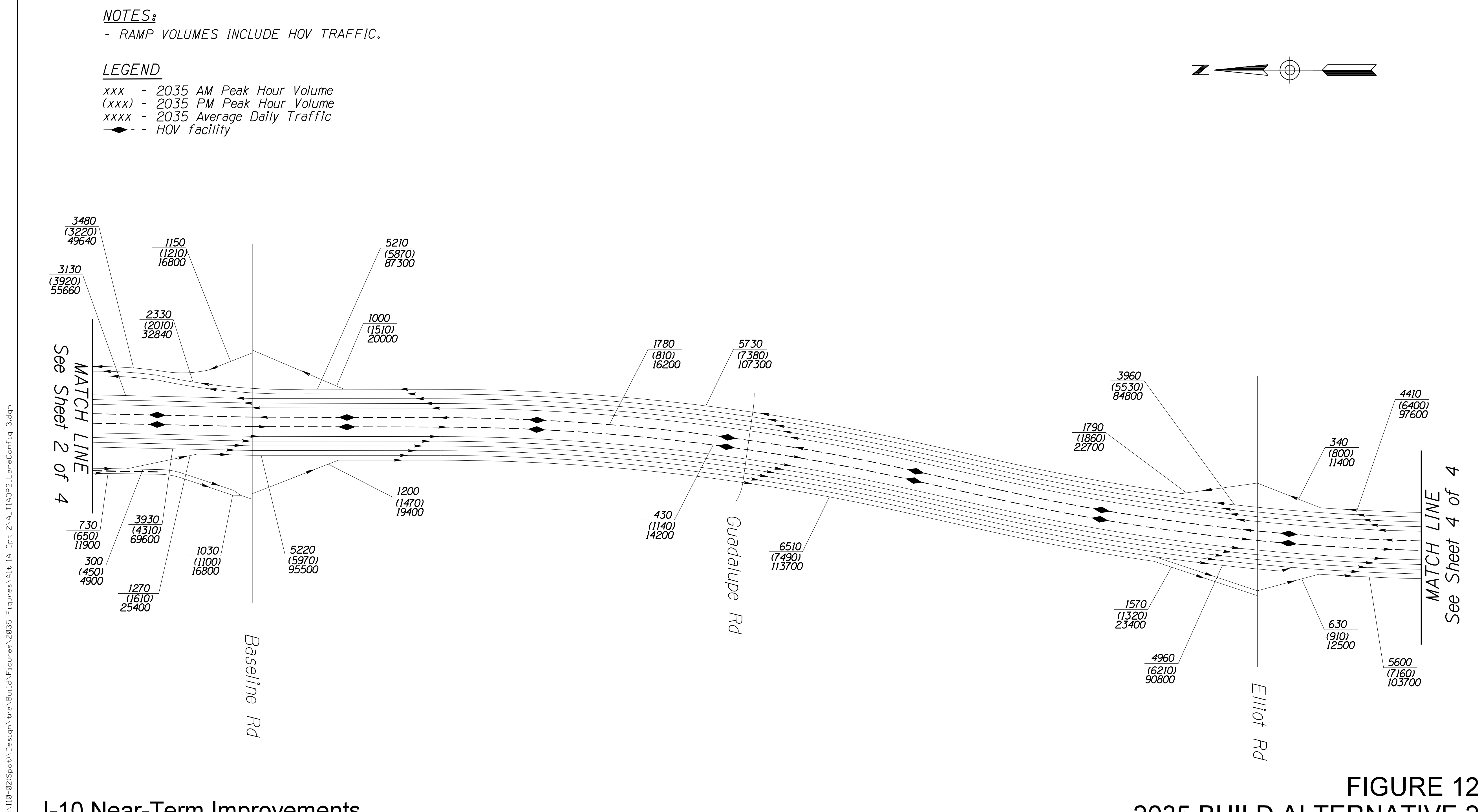
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 12
2035 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 2
VOLUMES & LANE CONFIGURATION
SHEET 2 OF 4



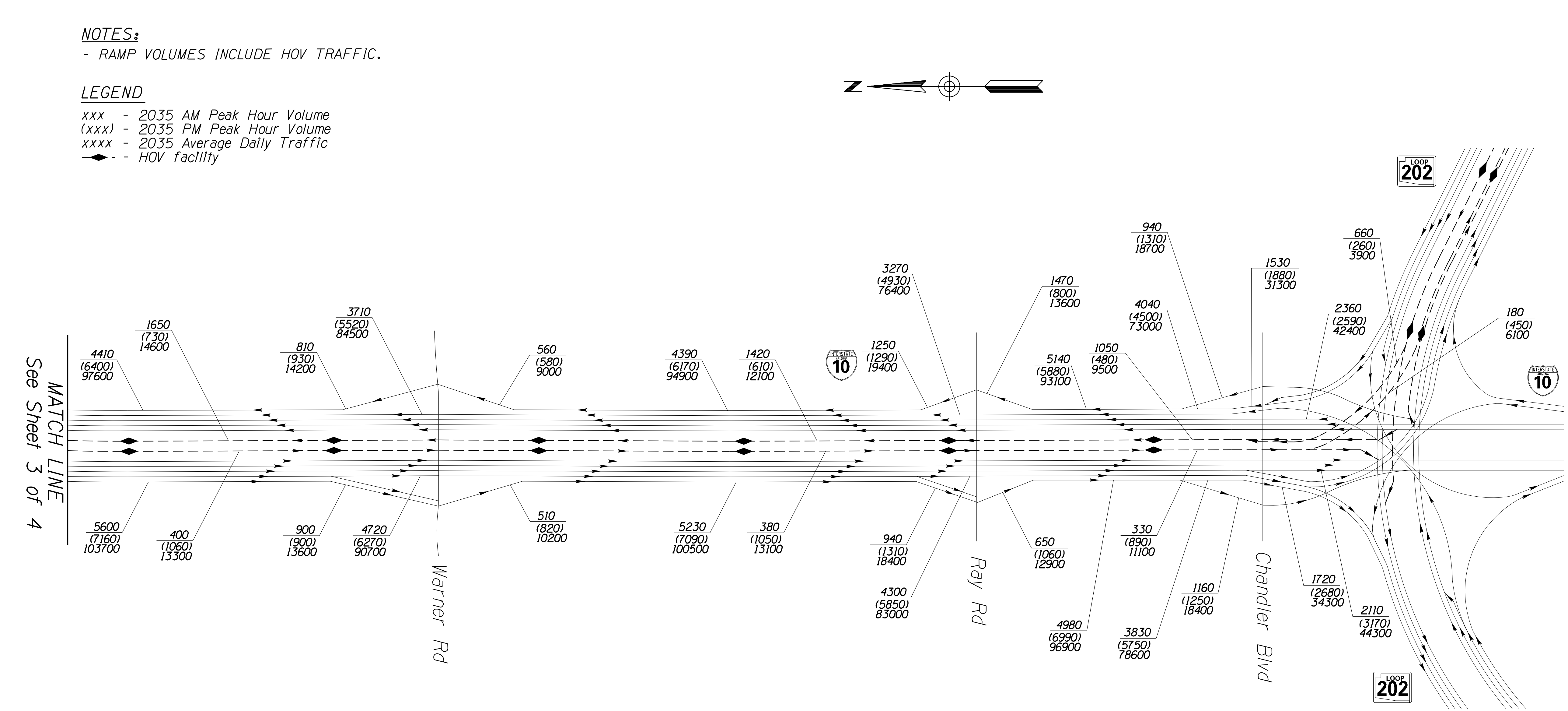
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 12
2035 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 2
VOLUMES & LANE CONFIGURATION
SHEET 3 OF 4



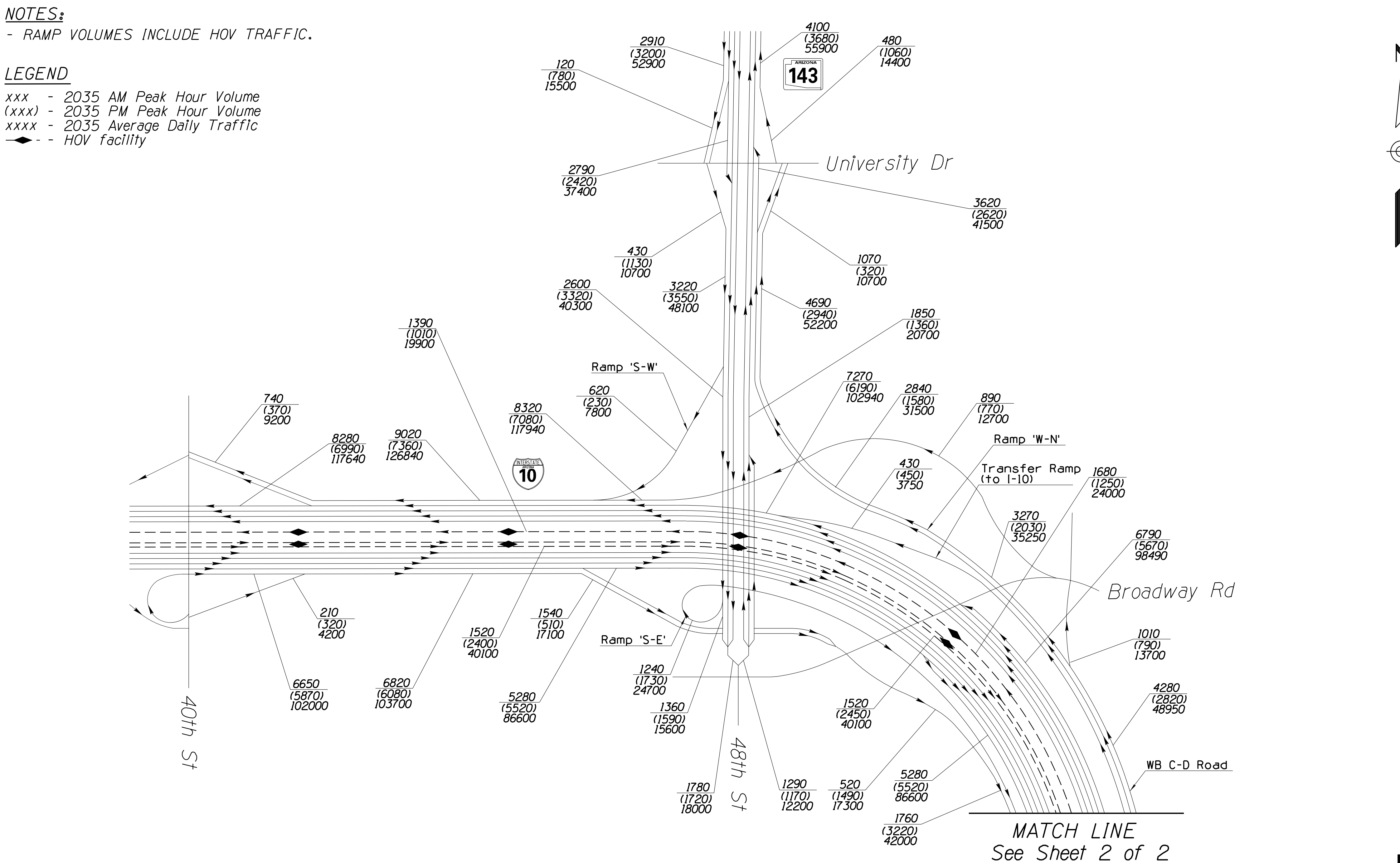
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 12
2035 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 2
VOLUMES & LANE CONFIGURATION
SHEET 4 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 13
2035 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 3
VOLUMES & LANE CONFIGURATION
SHEET 1 OF 2

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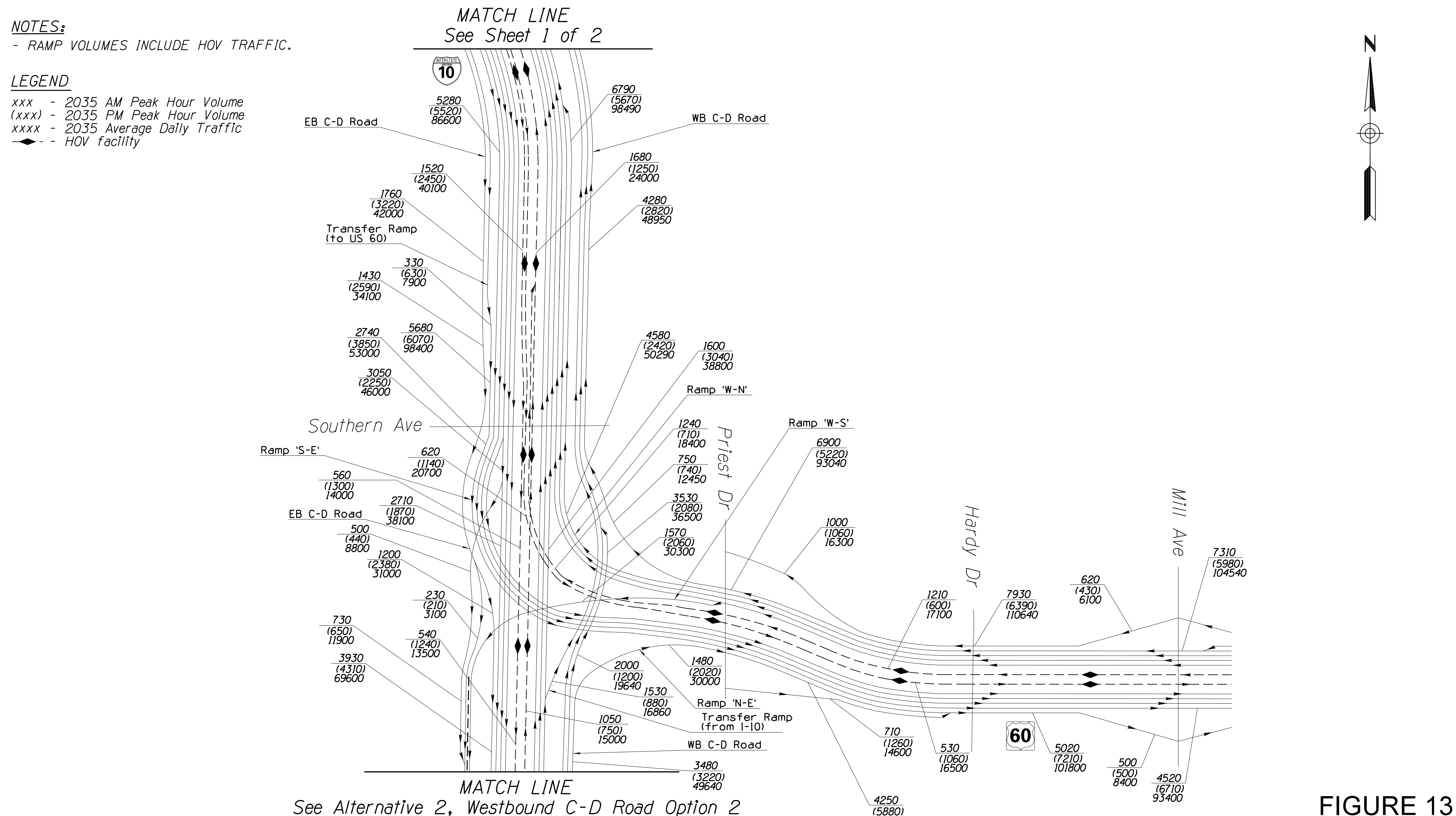
7/24/2015



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 13
2035 BUILD ALTERNATIVE 2
WESTBOUND C-D ROAD OPTION 3
VOLUMES & LANE CONFIGURATION
SHEET 2 OF 2

2.5 OPERATIONAL ANALYSIS RESULTS

2.5.1 Existing Conditions

Figure 14 (on pages 73-76) and Figure 15 (on pages 77-80) summarize the level-of-service analysis results for the existing conditions A.M. and P.M. peak hours. The results of the level-of-service analysis and field observation indicate the corridor currently operates with significant congestion (LOS 'E' or 'F') at the following locations:

- A.M. Peak Hour:
  - Westbound I-10 between the I-10/SR143 TI Ramp 'S-W' entrance and the Ray Road exit ramp
  - Westbound C-D Road between the I-10 entrance and the Baseline Road entrance ramp
  - Westbound US 60 between the I-10/US60 TI and Mill Avenue

- P.M. Peak Hour:
  - Eastbound I-10 between Elliot Road exit ramp and the I-10/US 60 TI Ramp 'W-S' entrance
  - Eastbound I-10 between I-10/US60 TI Ramp 'S-E' exit and 40th Street
  - Southbound SR 143 between the I-10/SR143 TI Ramp 'S-E' and the north study limit
  - Westbound US 60 at the Mill Avenue entrance ramp
  - I-10/US60 TI Ramp 'W-S'
  - I-10/US60 TI Ramp 'N-E'

Significant congestion is currently occurring throughout the I-10 corridor during the A.M. and P.M. peak travel periods and will continue into the future`.

2.5.2 No-Build Alternative

Figure 16 (on pages 81-84) and Figure 17 (on pages 85-88) summarize the level-of-service analysis results for the 2035 No-Build Alternative during the A.M. and P.M peak hours. The results of the level-of-service analysis for Years 2020 and 2035 indicate the corridor would operate with significant congestion (LOS 'E' or 'F') at the following locations:

- 2020 A.M. Peak Hour:
  - Westbound I-10 between the I-10/SR143 TI Ramp 'S-W' entrance and the I-10/SR202LTI
  - Westbound US 60 between the I-10/US60 TI and Mill Avenue

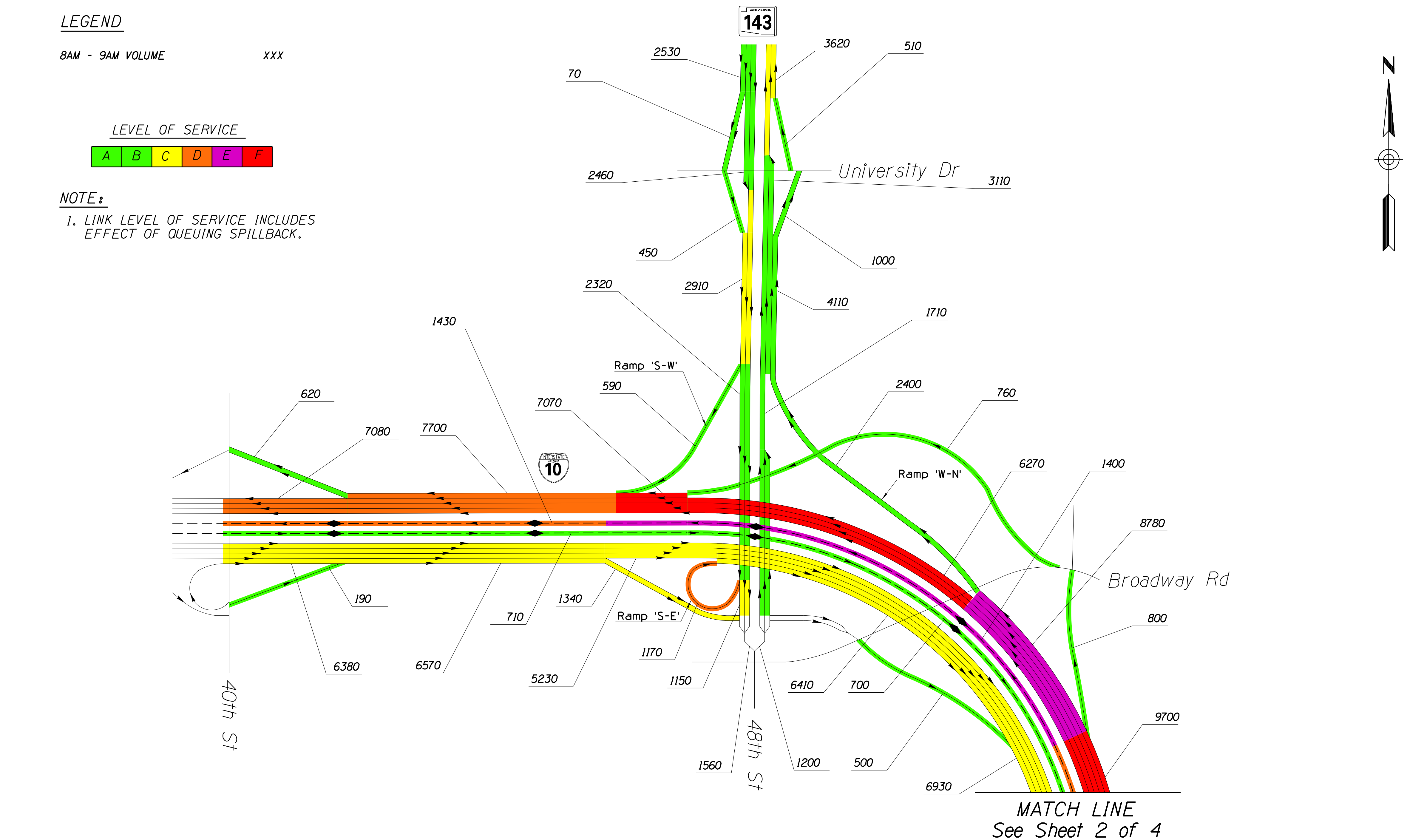
- 2020 P.M. Peak Hour:
  - Eastbound I-10 between the Elliot Road exit ramp and the I-10/US60 TI Ramp 'W-S' entrance
  - Eastbound I-10 between the I-10/US60 TI Ramp 'S-E' exit and 40th Street
  - Southbound SR 143 between the I-10/SR143 TI Ramp 'S-E' and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp 'W-S'
  - I-10/US60 TI Ramp 'N-E'

- 2035 A.M. Peak Hour:
  - Westbound I-10 between the I-10/SR143 TI Ramp 'W-N' exit and the I-10/SR202L TI
  - Westbound US 60 between the I-10/US60 TI and Mill Avenue

- 2035 P.M. Peak Hour:
  - Westbound I-10 between the Broadway Road exit ramp and the Elliot Road exit ramp
  - Westbound I-10 between the Warner Road entrance ramp and the Ray Road entrance ramp
  - Eastbound I-10 between Ray Road and the Elliot Road entrance ramp
  - Eastbound I-10 between the Elliot Road exit ramp and the I-10/US60 TI Ramp 'W-S' entrance
  - Eastbound I-10 between the I-10/US60 TI Ramp 'S-E' exit and 40th Street
  - Southbound SR 143 between the I-10/SR143 TI Ramp 'S-E' and the north study limit
  - Westbound US 60 between the I-10/US60 TI and Mill Avenue
  - I-10/US60 TI Ramp 'W-S'
  - I-10/US60 TI Ramp 'N-E'

The projected growth in travel demand within the I-10 corridor will result in increased congestion that would result in significantly longer traffic queues in both the A.M. and P.M. peak travel periods. Therefore, the No-Build Alternative would not achieve the primary project goal to provide LOS 'D' or better operational characteristics on I-10 between SR 143 and SR 202L. However, the No-Build Alternative will be carried forward for further evaluation in the environmental document.

[Text resumes on page 89]



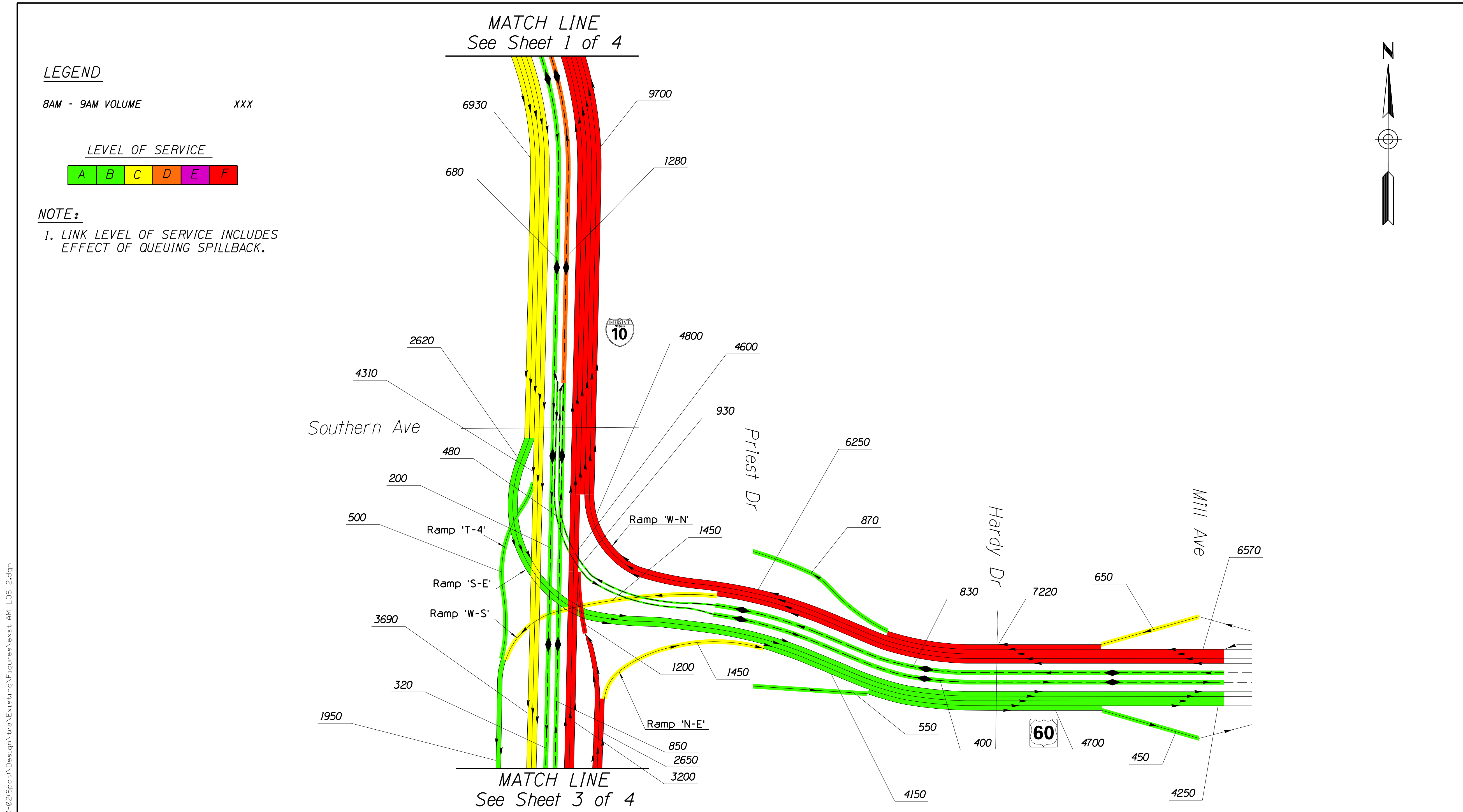
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 14
2014 EXISTING AM VOLUMES
& LEVEL OF SERVICE
SHEET 1 OF 4



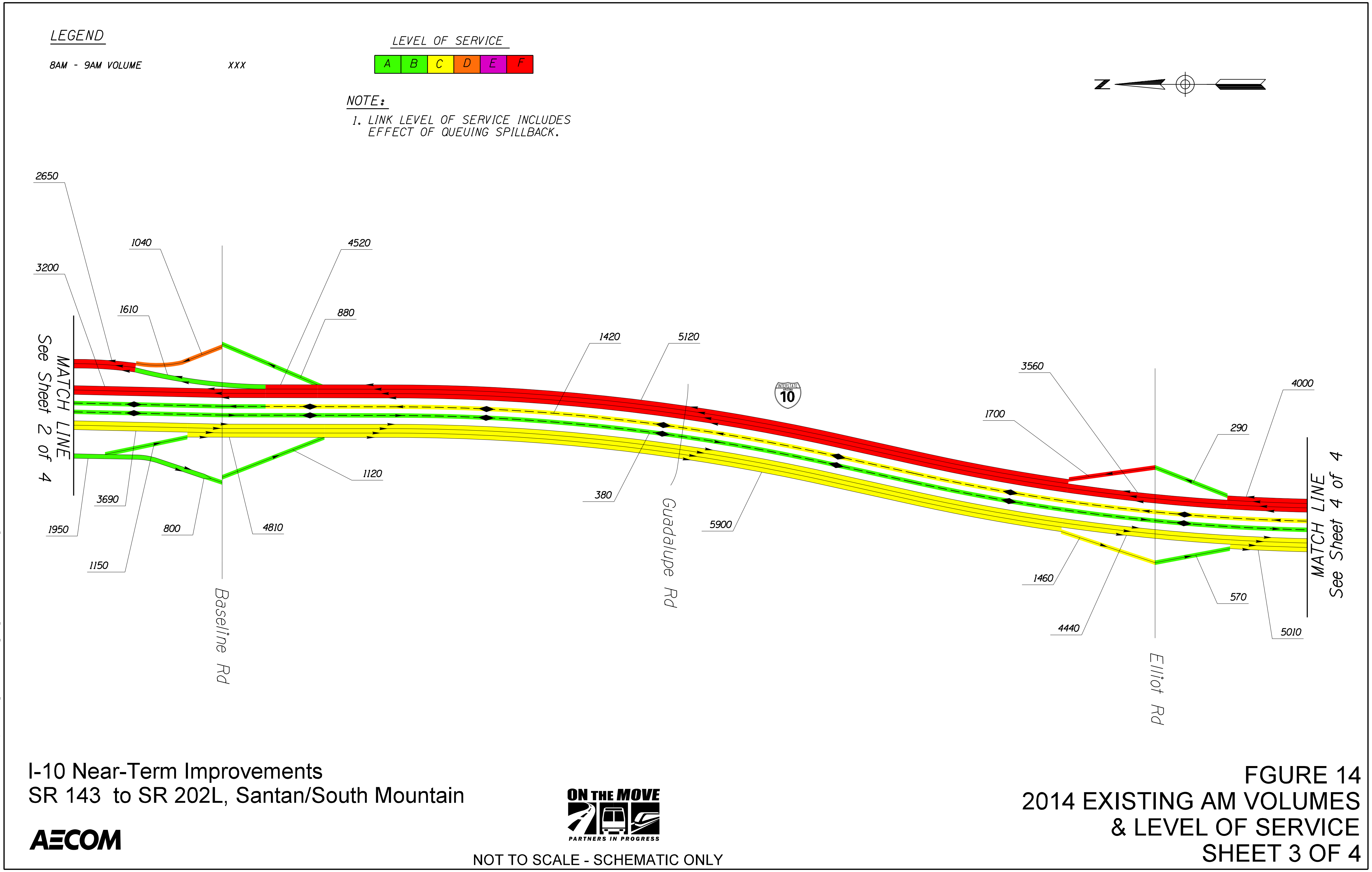
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

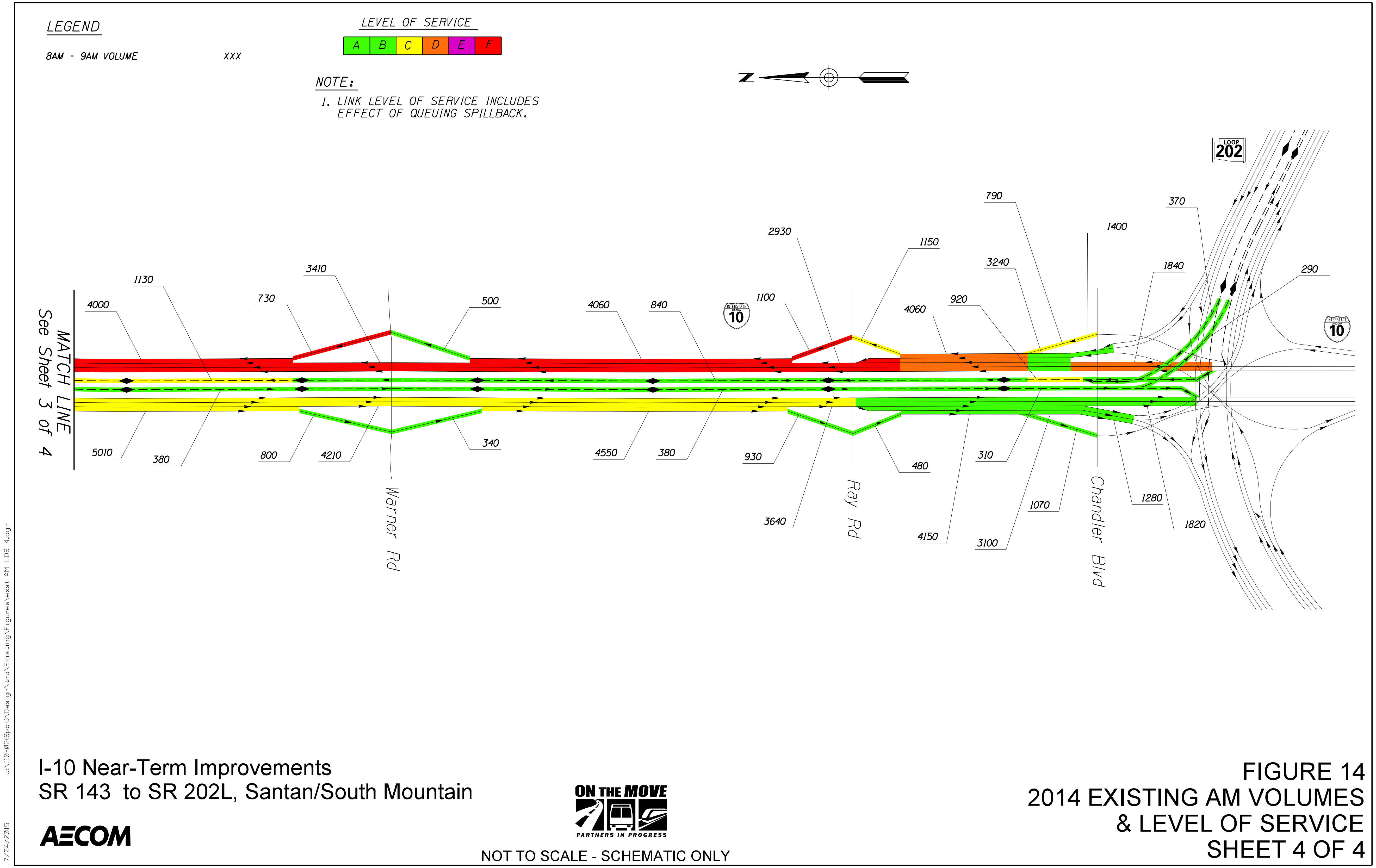
FIGURE 14
2014 EXISTING AM VOLUMES
& LEVEL OF SERVICE
SHEET 2 OF 4

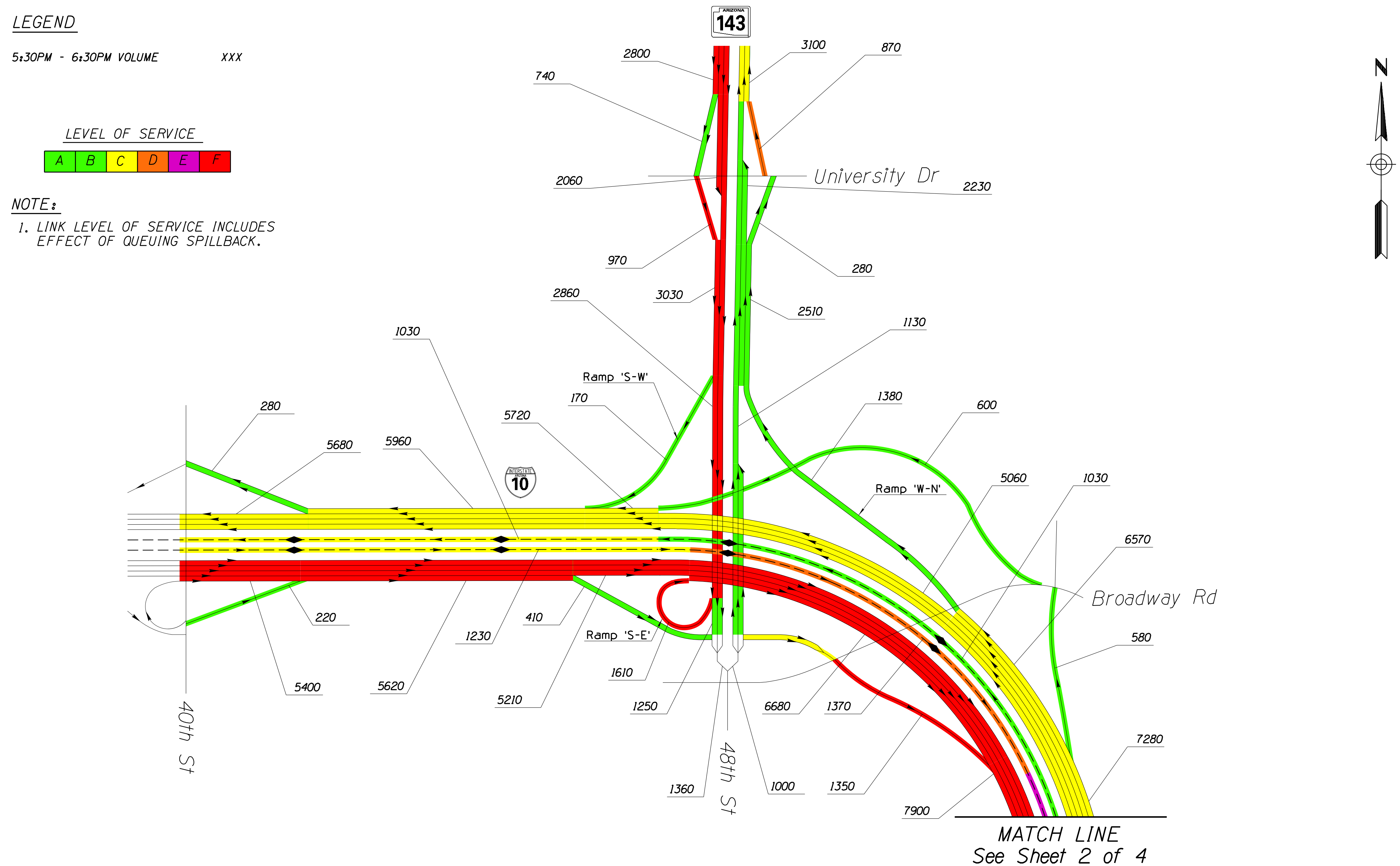


I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

FGURE 14
2014 EXISTING AM VOLUMES
& LEVEL OF SERVICE
SHEET 3 OF 4


LEGEND
8AM - 9AM VOLUME XXX
LEVEL OF SERVICE
A B C D E F
NOTE:
1. LINK LEVEL OF SERVICE INCLUDES EFFECT OF QUEUING SPILLBACK.
MATCH LINE
See Sheet 3 of 4
Warner Rd
Ray Rd
Chandler Blvd
202
10
4000
1130
730
3410
500
4060
840
1100
2930
1150
4060
920
3240
790
1400
370
1840
290
5010
380
800
4210
340
4550
380
930
3640
480
4150
310
3100
1070
1280
1820
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain
AECOM
NOT TO SCALE - SCHEMATIC ONLY
FIGURE 14
2014 EXISTING AM VOLUMES
& LEVEL OF SERVICE
SHEET 4 OF 4



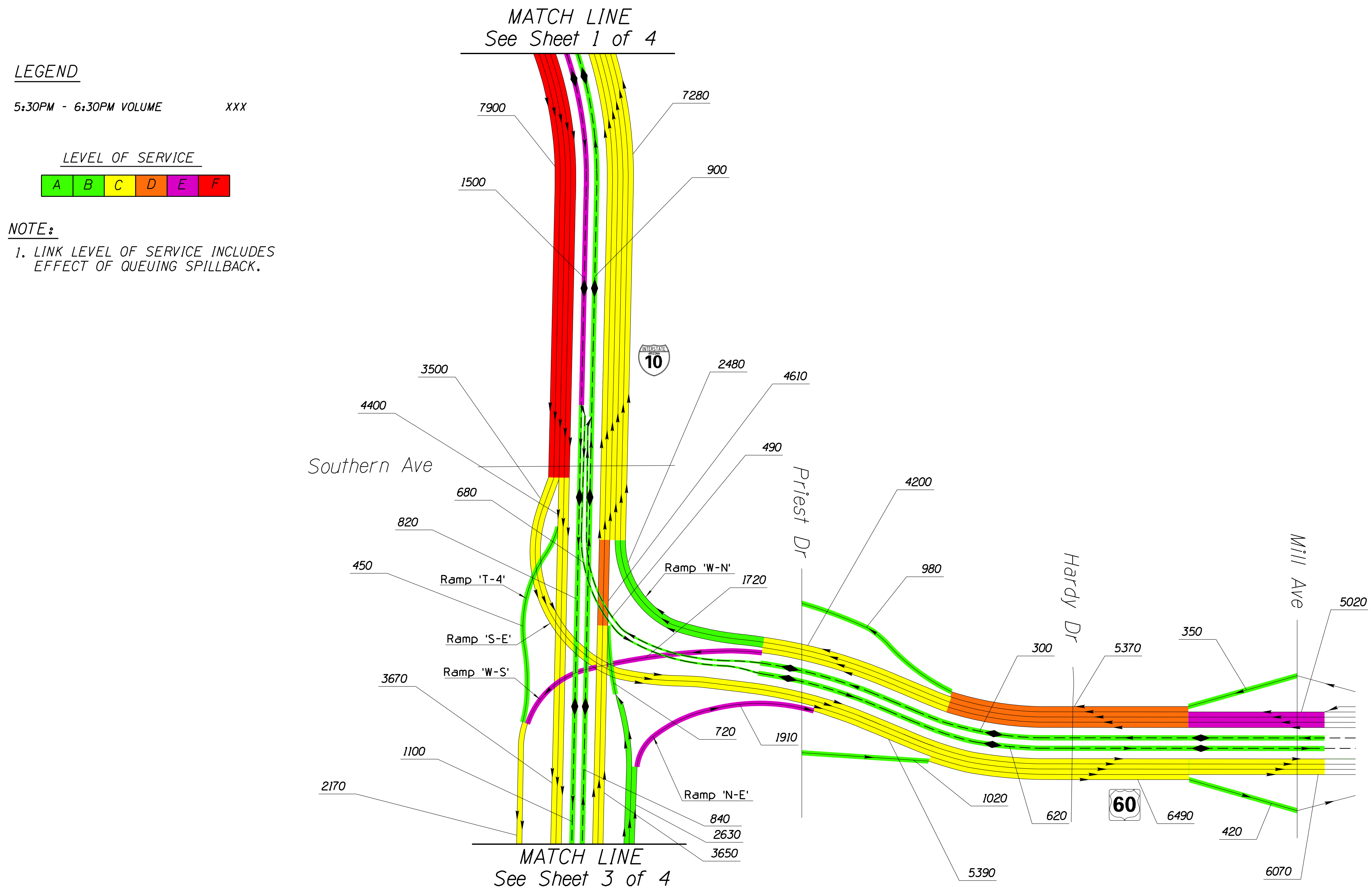
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 15
2014 EXISTING PM VOLUMES
& LEVEL OF SERVICE
SHEET 1 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 15
2014 EXISTING PM VOLUMES
& LEVEL OF SERVICE
SHEET 2 OF 4

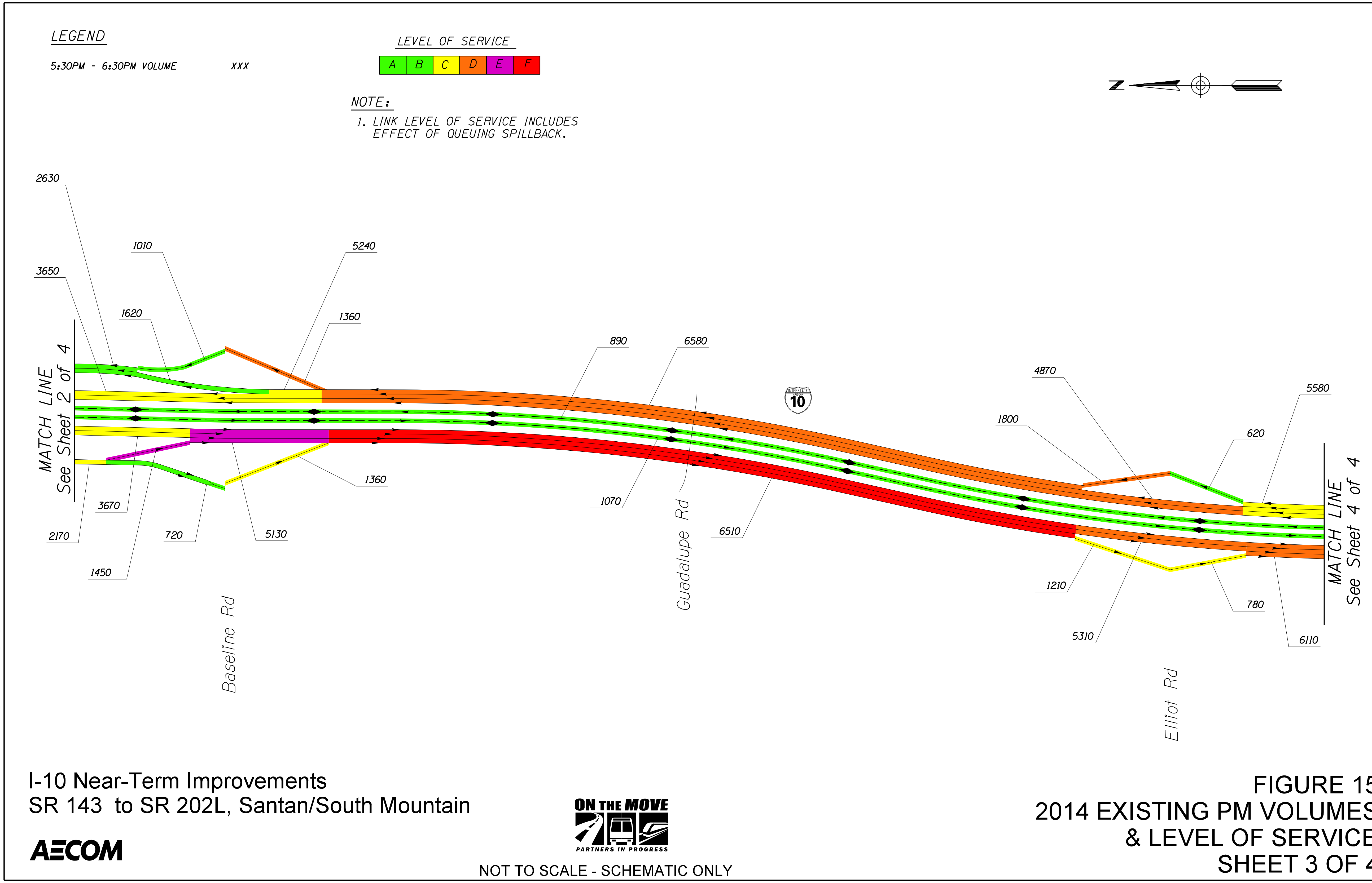


FIGURE 15
2014 EXISTING PM VOLUMES & LEVEL OF SERVICE
SHEET 3 OF 4

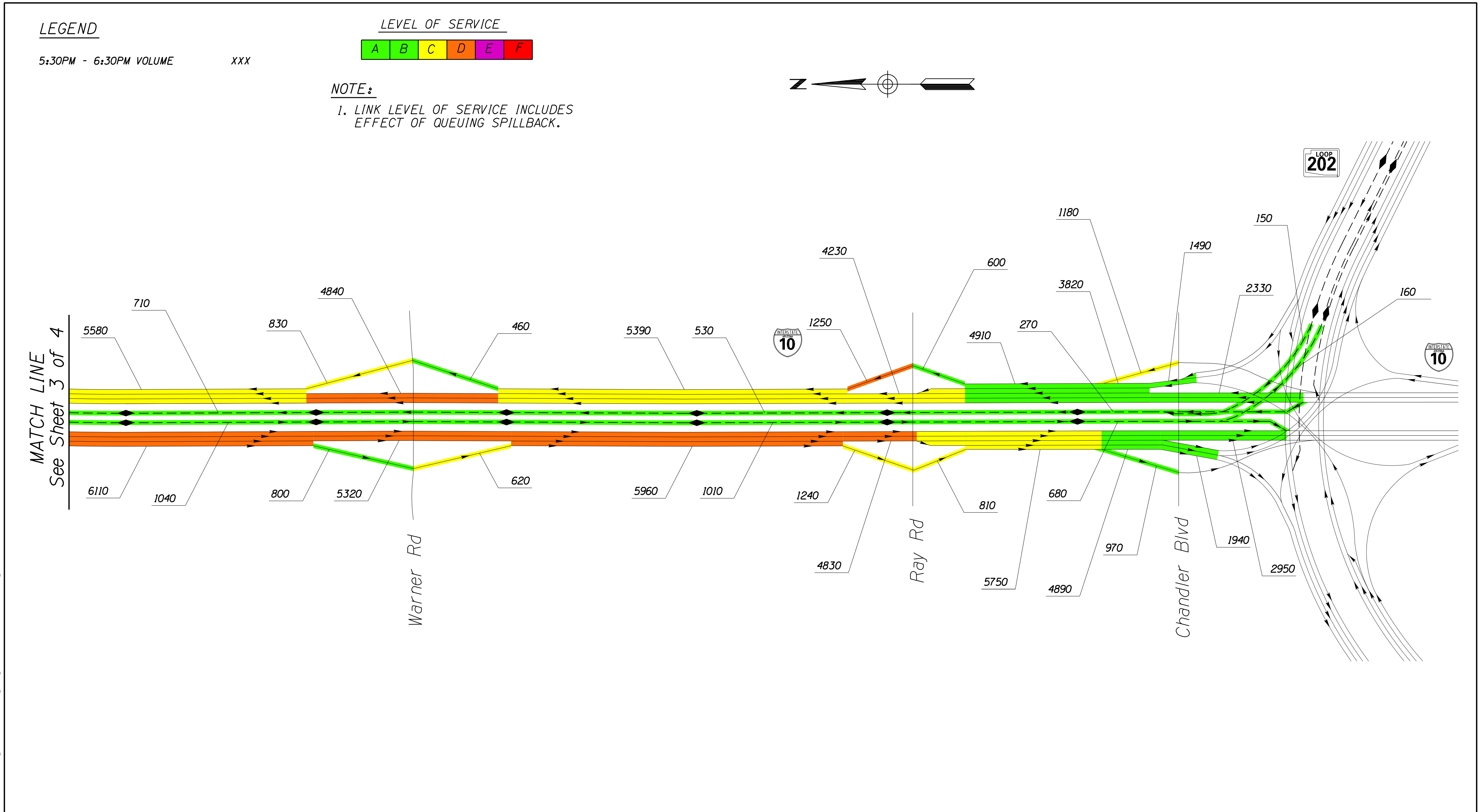
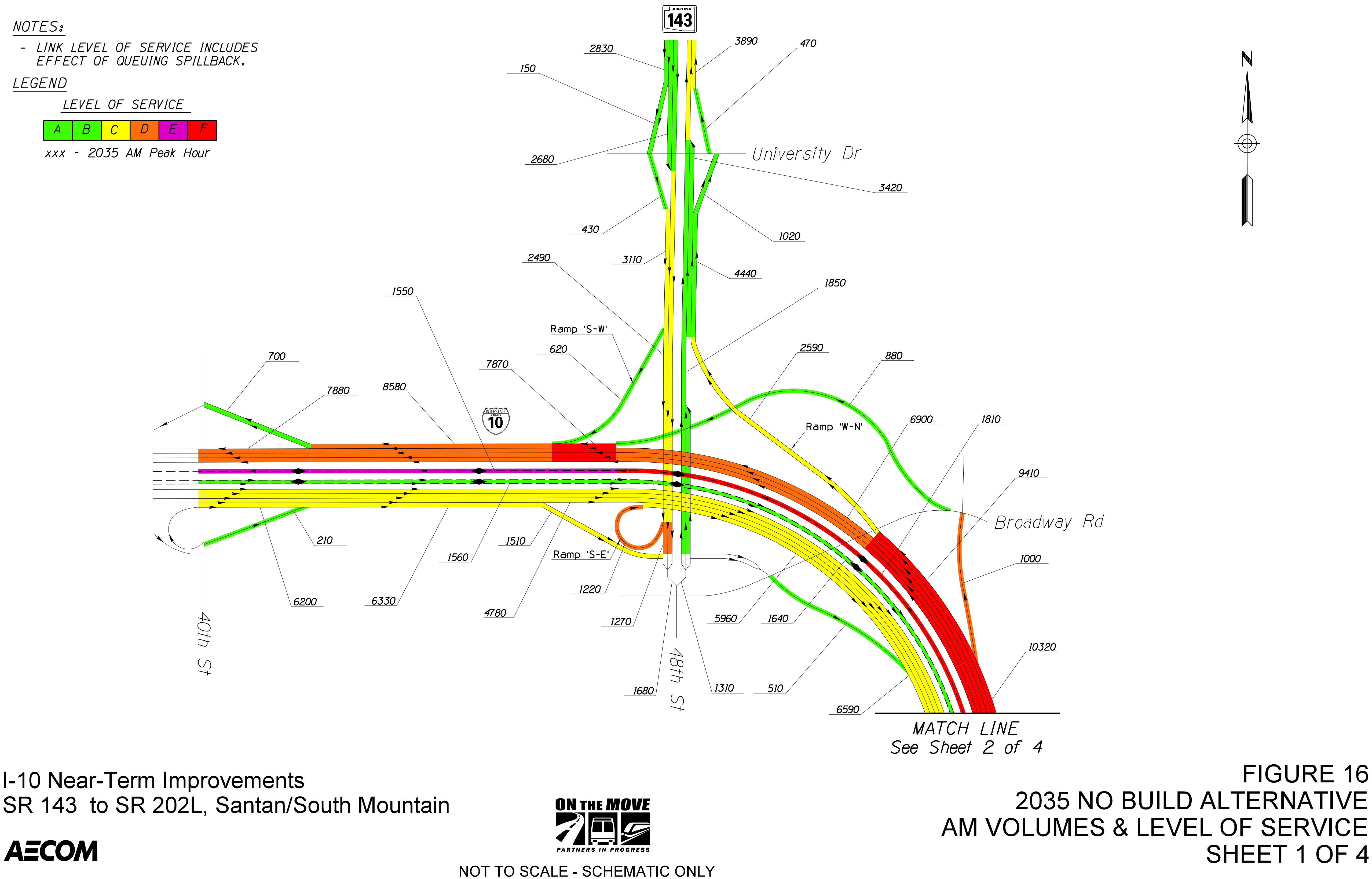


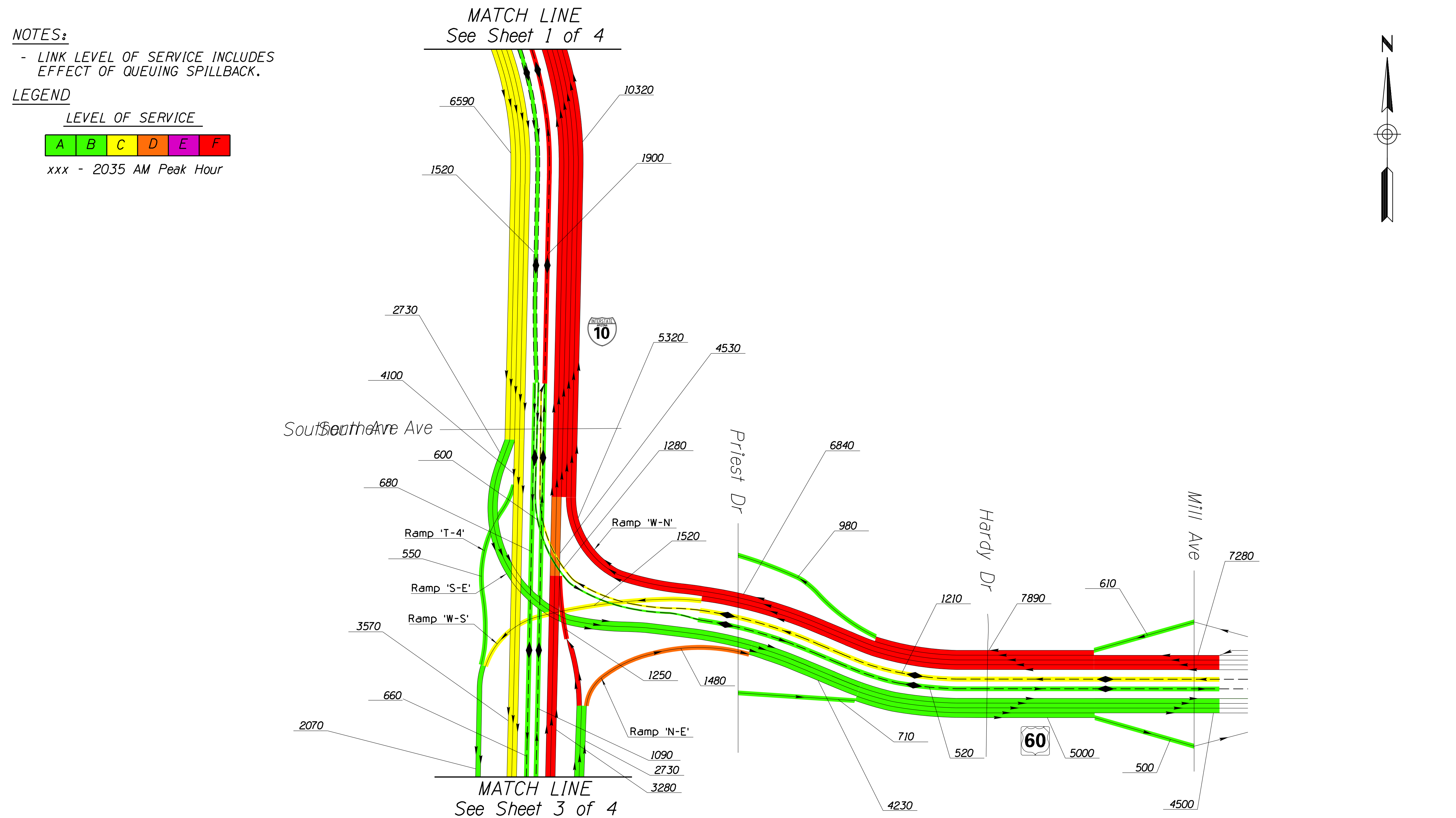
FIGURE 15
2014 EXISTING PM VOLUMES & LEVEL OF SERVICE
SHEET 4 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

FIGURE 16
2035 NO BUILD ALTERNATIVE
AM VOLUMES & LEVEL OF SERVICE
SHEET 1 OF 4



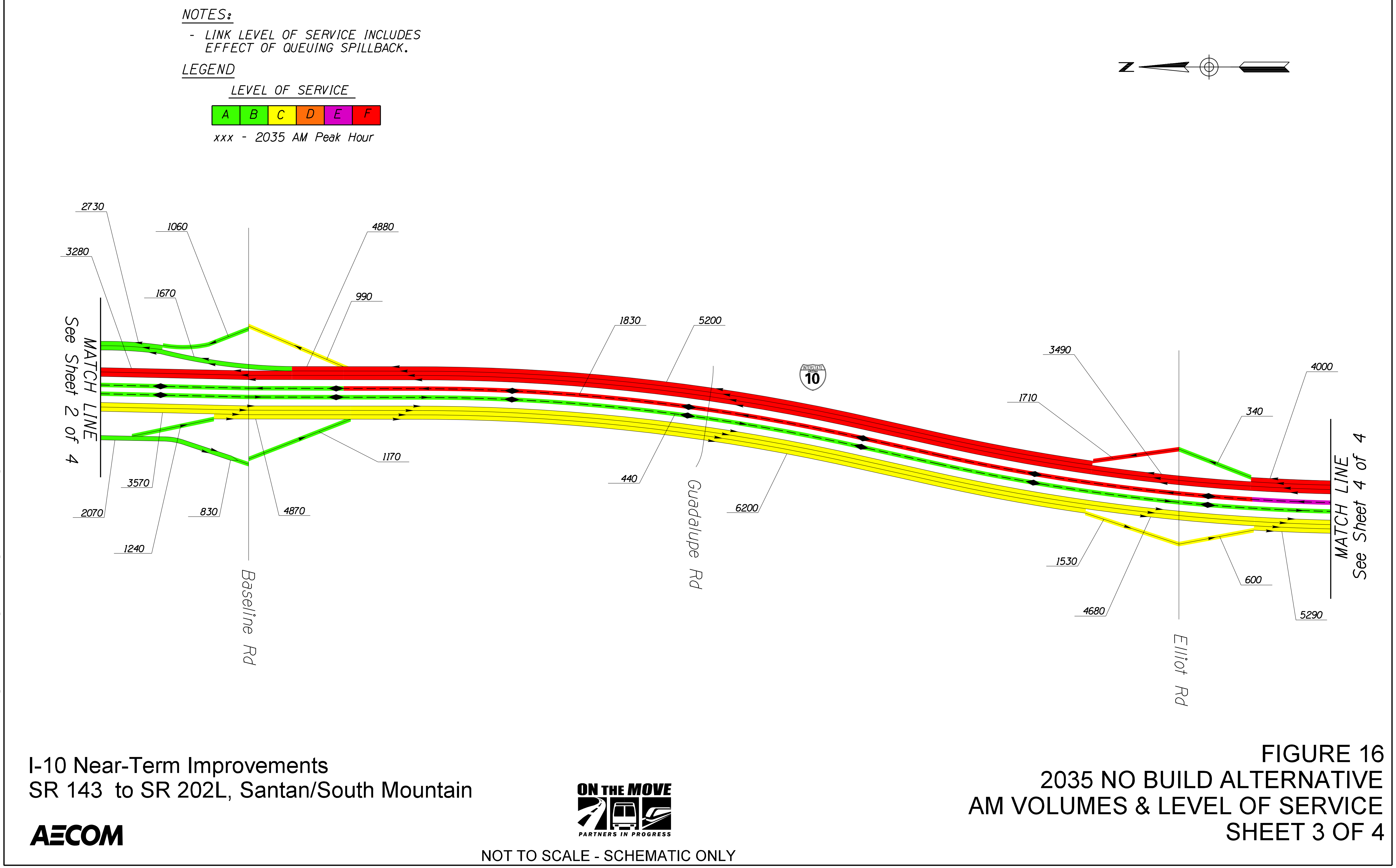
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

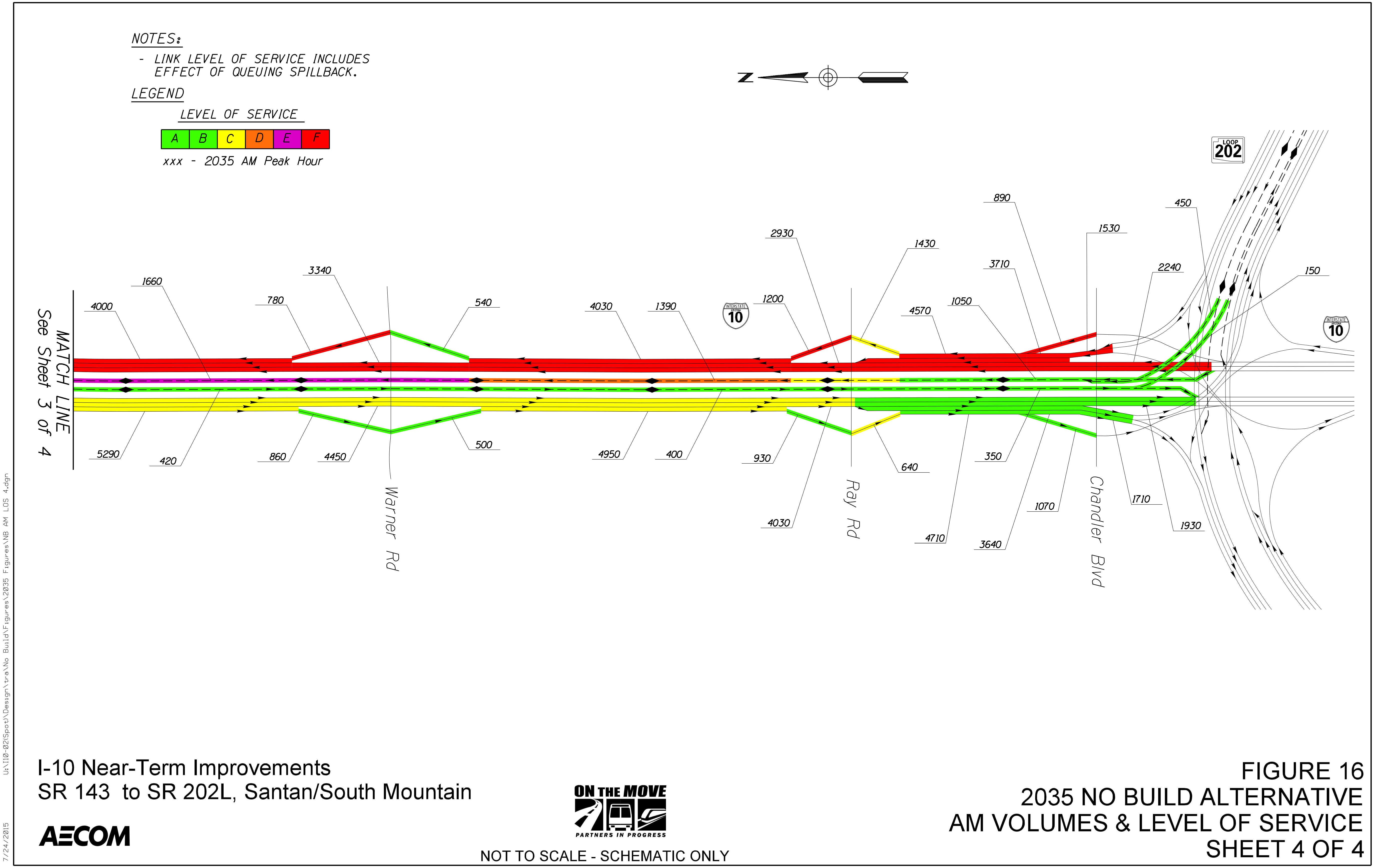
NOT TO SCALE - SCHEMATIC ONLY

FIGURE 16
2035 NO BUILD ALTERNATIVE
AM VOLUMES & LEVEL OF SERVICE
SHEET 2 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

FIGURE 16
2035 NO BUILD ALTERNATIVE
AM VOLUMES & LEVEL OF SERVICE
SHEET 3 OF 4


NOTES:
- LINK LEVEL OF SERVICE INCLUDES EFFECT OF QUEUING SPILLBACK.
LEGEND
LEVEL OF SERVICE
A B C D E F
xxx - 2035 AM Peak Hour
MATCH LINE
See Sheet 3 of 4
4000
1660
780
3340
540
4030
1390
1200
2930
1430
890
3710
4570
1050
1530
450
2240
150
5290
420
860
4450
500
4950
400
930
4030
640
4710
350
3640
1070
1710
1930
Warner Rd
Ray Rd
Chandler Blvd
10
202
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain
AECOM
ON THE MOVE
PARTNERS IN PROGRESS
NOT TO SCALE - SCHEMATIC ONLY
FIGURE 16
2035 NO BUILD ALTERNATIVE
AM VOLUMES & LEVEL OF SERVICE
SHEET 4 OF 4

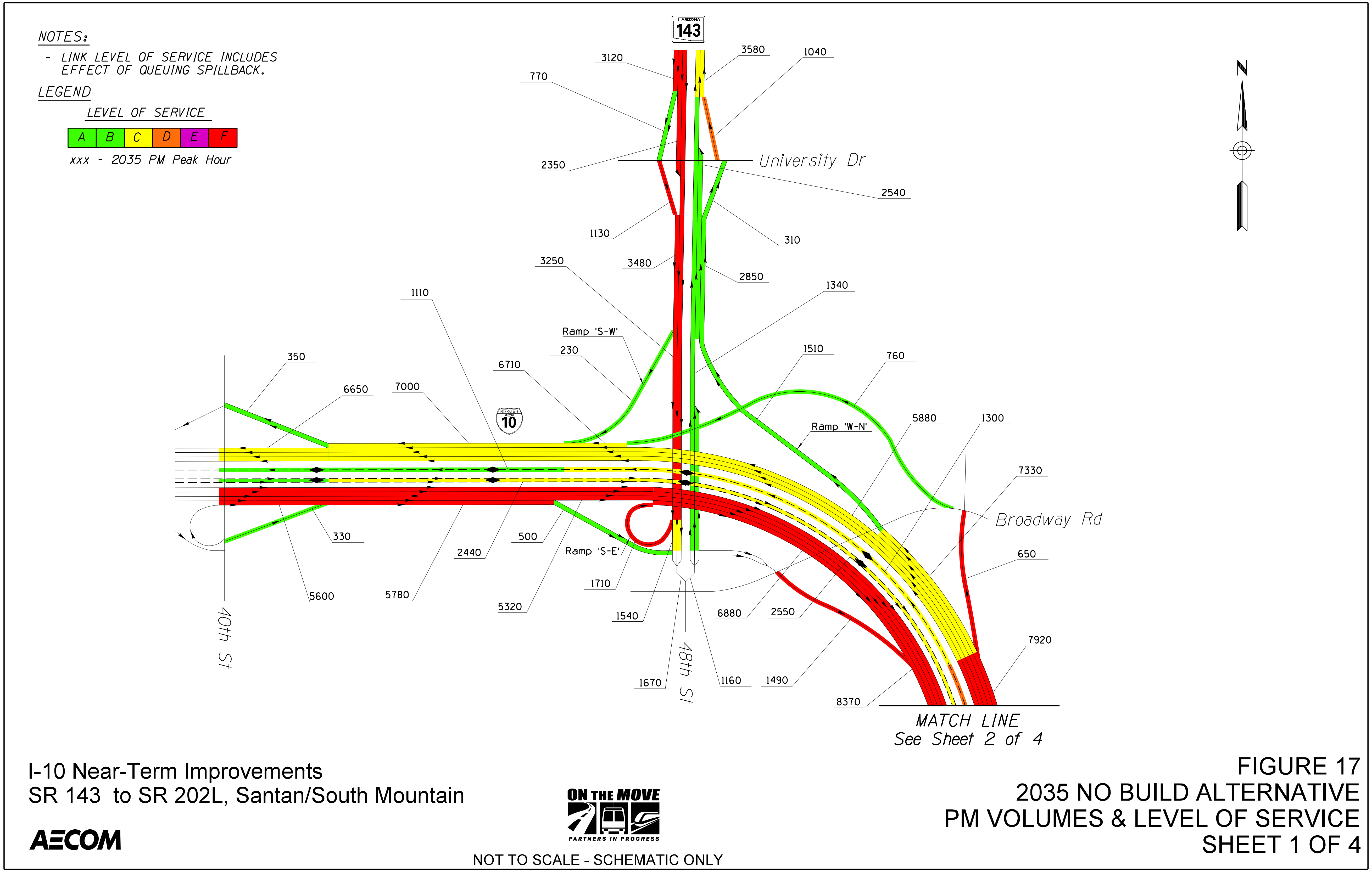
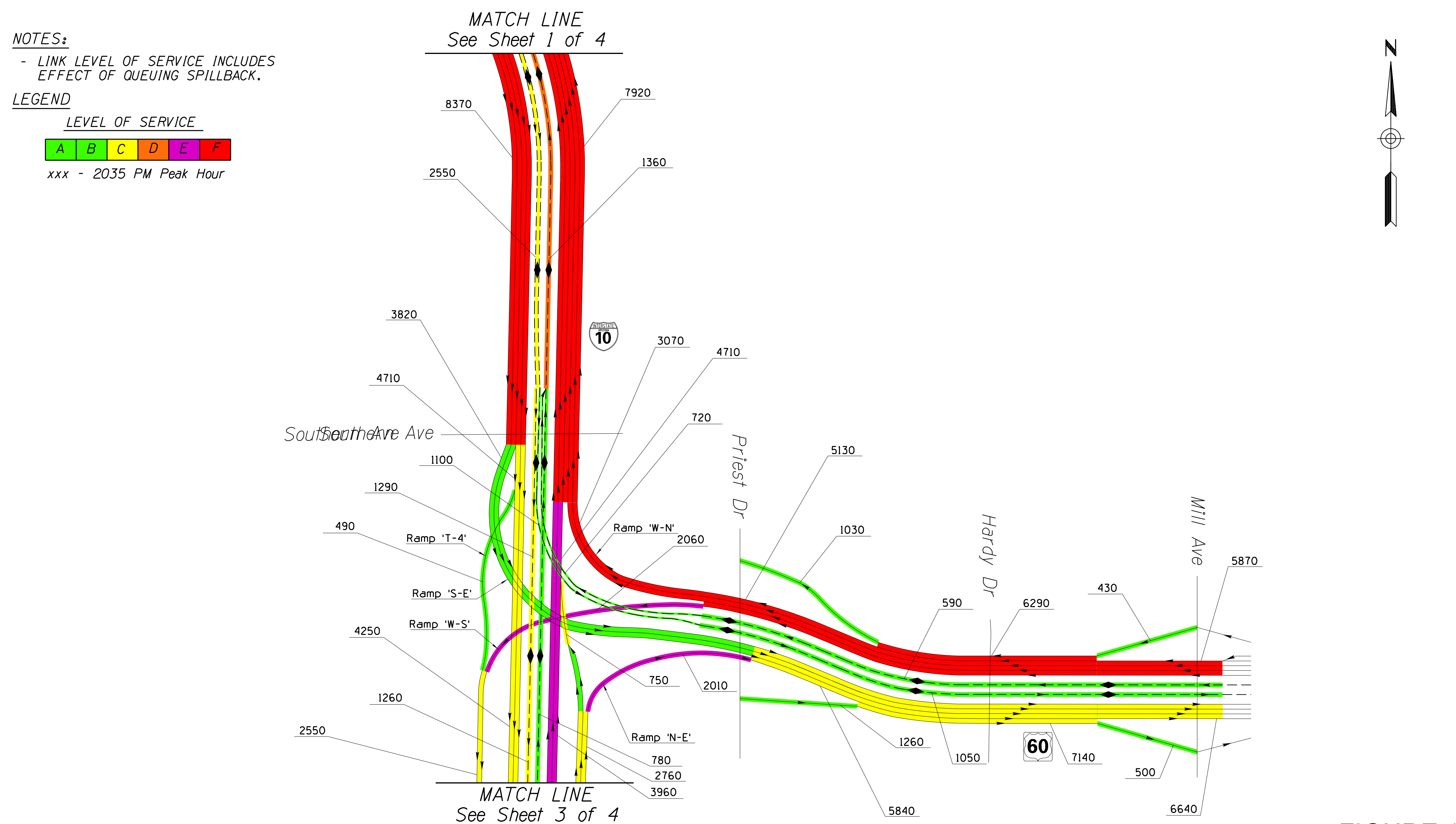


FIGURE 17
2035 NO BUILD ALTERNATIVE
PM VOLUMES & LEVEL OF SERVICE
SHEET 1 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 17
2035 NO BUILD ALTERNATIVE
PM VOLUMES & LEVEL OF SERVICE
SHEET 2 OF 4

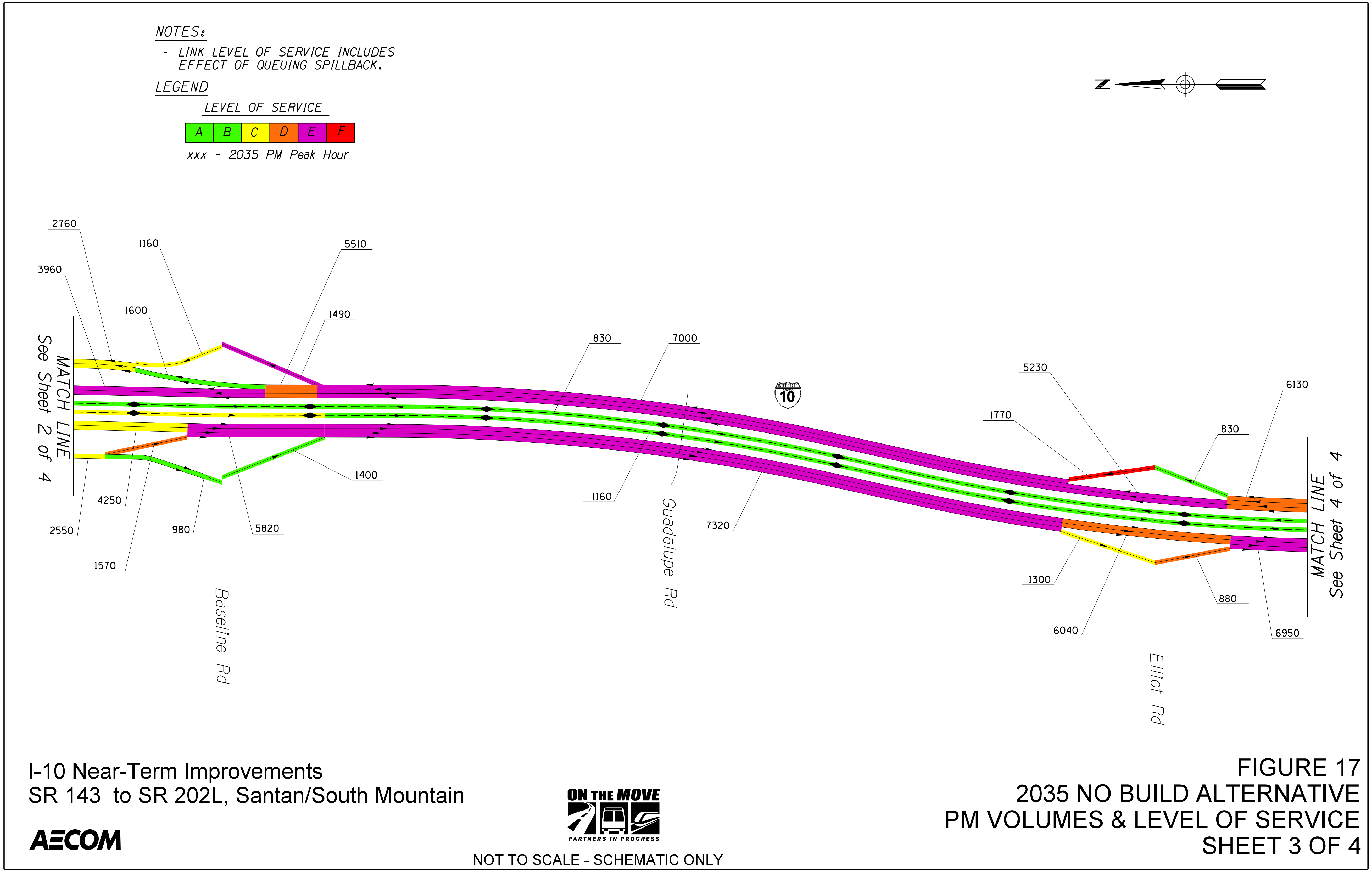
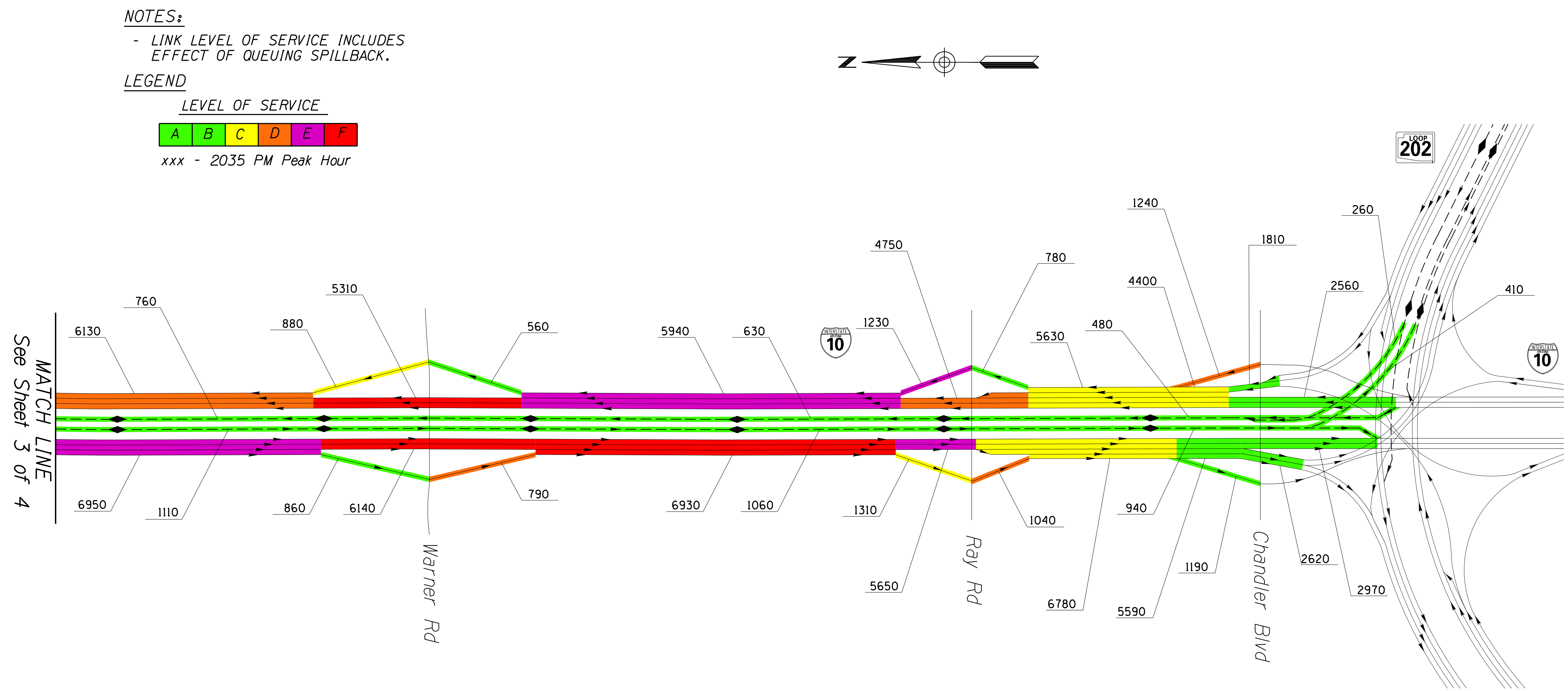


FIGURE 17
2035 NO BUILD ALTERNATIVE
PM VOLUMES & LEVEL OF SERVICE
SHEET 3 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 17
2035 NO BUILD ALTERNATIVE
PM VOLUMES & LEVEL OF SERVICE
SHEET 4 OF 4

2.5.3 Alternative 1, With Ramp 'N-E' Option 1

Figures summarizing the Alternative 1, with Ramp 'N-E' Option 1 level-of-service analysis results in years 2020, 2025, 2030, and 2035 are located in Appendix G. The results of the level-of-service analysis in the A.M. and P.M. peak hours indicate the corridor would operate with significant congestion (LOS 'E' or 'F') at the following locations:

- 2020 A.M. Peak Hour:
  - All segments of the I-10 mainline, C-D Roads, US 60 and SR 143 operate at LOS 'D' or better

- 2020 P.M. Peak Hour:
  - All segments of the I-10 mainline, westbound C-D Road and US 60 would operate at LOS 'D' or better
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 TI Ramp 'S-E' and the north study limit
  - I-10/US60 TI Ramp 'W-S'
  - I-10/US60 TI Ramp 'N-E'

- 2025 A.M. Peak Hour:
  - Westbound I-10 between the Elliot Road exit ramp and the Warner Road exit ramp

- 2025 P.M. Peak Hour:
  - All segments of the I-10 mainline and westbound C-D Road operate at LOS 'D' or better
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 TI Ramp 'S-E' and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp 'W-S'
  - I-10/US60 TI Ramp 'N-E'

- 2030 A.M. Peak Hour:
  - Westbound I-10 between the Broadway Road entrance ramp and Broadway Road (after the second lane-drop on the mainline)
  - Westbound I-10 between the Elliot Road exit ramp and the Warner Road exit ramp

- 2030 P.M. Peak Hour:
  - Westbound I-10 between the Baseline Road exit ramp and Elliot Road entrance ramp
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 TI Ramp 'S-E' and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp 'W-S'
  - I-10/US60 TI Ramp 'N-E'

- 2035 A.M. Peak Hour:
  - Westbound I-10 between the Broadway Road entrance ramp and Broadway Road (after the second lane-drop on the mainline)
  - Westbound I-10 between the Elliot Road exit ramp and the Warner Road exit ramp

- 2035 P.M. Peak Hour:
  - Westbound I-10 between the Baseline Road exit ramp and the Elliot Road entrance ramp
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 Ramp 'W-S' and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp 'W-S'

2.5.4 Alternative 1, With Ramp 'N-E' Option 2

Figures summarizing the Alternative 1, with Ramp 'N-E' Option 2 level-of-service analysis results in years 2020, 2025, 2030, and 2035 are located in Appendix G. The level-of-service analysis results figures for this configuration were prepared only for the area where the Ramp 'N-E' reconfiguration would be influenced between Option 1 and Option 2. The level-of-service analysis results for Option 2 for the other areas of the project were the same as Option 1. The results of the level-of-service analysis in the A.M. and P.M. peak hours indicate significant congestion (LOS 'E' or 'F') would occur at the following locations where different from Option 1:

- 2020 A.M. and P.M. Peak Hours:
  - The I-10/US60 TI Ramp 'N-E' would have improved operations when compared with Ramp 'N-E' Option 1

- 2025 A.M. P.M. Peak Hour:
  - Westbound C-D Road between the westbound US 60 ramp entrance and the I-10 "Mainline to C-D Road" transfer ramp

- 2030 A.M. Peak Hour:
  - Westbound C-D Road between the westbound US 60 ramp entrance and the I-10 "Mainline to C-D Road" transfer ramp

- 2035 A.M. Peak Hour:
  - Westbound C-D Road between the westbound US 60 ramp entrance and the I-10 "Mainline to C-D Road" transfer ramp.

2.5.5 Alternative 1, With Ramp 'N-E' Option 3

Figures summarizing the Alternative 1, with Ramp 'N-E' Option 3 level-of-service analysis results in Years 2020, 2025, 2030, and 2035 are located in Appendix G. The level-of-service analysis results figures for this configuration were prepared only for the project area where the Ramp 'N-E' reconfiguration would be influenced between Option 1 and Option 3. The level-of-service analysis results for Option 3 for the other areas of the project were the same as Option 1 and Option 2. The results of the level-of-service analysis in the A.M. and P.M. peak hours indicate significant congestion (LOS 'E' or 'F') would occur at the following locations where different from Option 1 and Option 2:

- 2020 P.M. Peak Hour:
  - The I-10/US60 TI Ramp 'N-E' would have improved operations compared with Ramp 'N-E' Option 1, and similar operations as Option 2

- 2025 A.M. Peak Hour:
  - The operations of the westbound C-D Road between the westbound US 60 ramp entrance and the I-10 "Mainline to C-D Road" transfer ramp would be similar to Option 1, and improved when compared to Option 2

- 2030 A.M. Peak Hour:
  - The operations of the westbound C-D Road between the westbound US 60 ramp entrance and the I-10 "Mainline to C-D Road" transfer ramp would be similar to Option 1, and improved when compared to Option 2

- 2035 A.M. Peak Hour:
  - The operations of the westbound C-D Road between westbound US 60 ramp entrance and the I-10 "Mainline to C-D Road" transfer ramp would be similar to Option 1, and improved when compared to Option 2

2.5.6 Alternative 2, With Westbound C-D Road Option 1

Figures summarizing the Alternative 2, with Westbound C-D Road Option 1 level-of-service analysis results in years 2020 and 2025 are located in Appendix G. The results of the level-of-service analysis in the A.M. and P.M. peak hours indicate the corridor would operate with significant congestion (LOS 'E' or 'F') at the following locations:

- 2020 A.M. Peak Hour:
  - All segments of the I-10 mainline, eastbound C-D Road, US 60 and SR 143 would operate at LOS 'D' or better
  - Westbound C-D Road between the Broadway Road exit ramp and Alameda Drive

- 2020 P.M. Peak Hour:
  - All segments of the I-10 mainline, westbound C-D Road, and US 60 would operate at LOS 'D' or better
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between I-10/SR143 TI Ramp 'S-E' and the north study limit
  - I-10/US60 TI Ramp 'W-S'
  - I-10/US60 TI Ramp 'N-E`

- 2025 A.M. Peak Hour:
  - Westbound C-D Road from the Broadway Road exit ramp to the I-10 "Mainline to C-D Road" transfer ramp
  - Westbound I-10 between the I-10 "Mainline to C-D Road" transfer ramp to the Baseline Road exit ramp
  - Westbound I-10 between Elliot Road exit ramp and the Warner Road exit ramp

- 2025 P.M. Peak Hour:
  - All segments of the I-10 mainline would operate at LOS 'D' or better
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 TI Ramp 'S-E' and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp 'W-S'
  - I-10/US60 TI Ramp 'N-E'

Beginning with the 2025 A.M. peak hour, significant congestion would be anticipated to occur on the westbound C-D Road. Vehicle queuing on the C-D Road would be expected to extend from the Broadway Road exit ramp onto the I-10 mainline, and on the I-10 mainline to the Baseline Road exit ramp. Alternative 2, with Westbound C-D Road Option 1 would not achieve the traffic operational goals established for the project and was eliminated from further consideration.

For this reason, Alternative 2, Option 1 was not evaluated past Year 2025. Two additional westbound C-D Road Options were developed with Alternative 2 to increase the capacity of the Westbound C-D Road to attempt to eliminate the congestion between Broadway Road and the I-10/US60 TI.

2.5.7 Alternative 2, With Westbound C-D Road Option 2

Figures summarizing the Alternative 2, With Westbound C-D Road Option 2 level-of-service analysis results for Years 2030 and 2035 are located in Appendix G. The results of the level-of-service analysis in the A.M. and P.M. peak hours indicate the corridor would operate with significant congestion (LOS 'E' or 'F') at the following locations:

- 2030 A.M. Peak Hour:
  - Westbound I-10 between Elliot Road exit ramp and the Warner Road exit ramp

- 2030 P.M. Peak Hour:
  - Westbound I-10 between the Baseline Road exit ramp and the Elliot Road entrance ramp
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 TI Ramp 'S-E' and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp 'W-S'
  - I-10/US60 TI Ramp 'N-E'

- 2035 A.M. Peak Hour:
  - Westbound I-10 between the Elliot Road exit ramp and the Ray Road entrance ramp

- 2035 P.M. Peak Hour:
  - Westbound I-10 between the Baseline Road exit ramp and the Elliot Road entrance ramp
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 TI Ramp ‘S-E’ and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp ‘W-S’
  - I-10/US60 TI Ramp ‘N-E’

2.5.8 Alternative 2, With Westbound C-D Road Option 3

Figures summarizing the Alternative 2, with Westbound C-D Road Option 3 level-of-service analysis results in Years 2030 and 2035 are located in Appendix G. The level-of-service analysis results figures for this configuration were prepared for the portion of the project in which the configuration differs between Option 2 and Option 3. The level-of-service analysis results for Option 3 for the other areas of the project were the same as Option 2.

The results of the level-of-service analysis in the A.M. and P.M. peak hours indicate the corridor in the area which was analyzed would operate with similar characteristics as Option 2.

2.6 PREFERRED ALTERNATIVE

2.6.1 Description

Based on the operational analysis results and other criteria described in Chapter 3, a modified version of Alternative 2 with a combination of the Westbound C-D Road Option 2 and I-10/US60 TI Ramp ‘N-E’ Option 3 was selected as the Preferred Alternative. The Preferred Alternative was developed to provide additional capacity and reduce congestion on the I-10 mainline needed for the projected 2035 traffic demand, and to conform to current geometric design criteria and freeway design practice.

The Preferred Alternative would include the use of C-D roads to reconfigure the interchange ramps between SR 143 and Baseline Road to separate the ramp traffic from the I-10 mainline traffic, thereby eliminating the current weaving maneuvers that contribute to severe congestion on the Broadway Curve during the peak travel periods. Additional general-purpose lanes would be provided on eastbound and westbound I-10 between Baseline Road and Ray Road. Auxiliary lanes would be provided in each direction between successive entrance and exit ramps. The Year 2035 traffic volume projections and lane diagram for the Preferred Alternative are shown in Figure 18 (on pages 94-97). A detailed description of the Build Alternative is included in Chapter 4.

2.6.2 Operational Analysis Results

Figure 19 on (pages 98-101) and Figure 20 (on pages 102-105) summarize the level-of-service analysis results for the 2035 Preferred Alternative during the A.M. and P.M peak hours. Figures summarizing the level-of-service analysis for the year 2020, 2025, 2030 and 2035 are included in Appendix G. The results of the level-of-service analysis indicate the corridor would operate with significant congestion (LOS ‘E’ or ‘F’) at the following locations:

- 2020 A.M. Peak Hour:
  - All segments of the I-10 mainline, C-D Roads, US 60, and SR 143 would operate at LOS ‘D’ or better

- 2020 P.M. Peak Hour:
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 TI Ramp ‘S-E’ and the north study limit
  - I-10/US60 TI Ramp ‘W-S’

- 2025 A.M. Peak Hour:
  - Westbound I-10 between the Elliot Road exit ramp and the Warner Road exit ramp

- 2025 P.M. Peak Hour:
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 TI Ramp ‘S-E’ and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp ‘W-S’

- 2030 A.M. Peak Hour:
  - Westbound I-10 between the Elliot Road exit ramp and the Warner Road exit ramp

- 2030 P.M. Peak Hour:
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/SR143 TI Ramp ‘S-E’ and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp ‘W-S’

- 2035 A.M. Peak Hour:
  - Westbound I-10 between the Elliot Road exit ramp and the Warner Road exit ramp

- 2035 P.M. Peak Hour:
  - Eastbound C-D Road between the I-10 entrance and SR 143
  - Southbound SR 143 between the I-10/US60 TI Ramp ‘S-E’ and the north study limit
  - Westbound US 60 at Mill Avenue
  - I-10/US60 TI Ramp ‘W-S’

2.7 RAMP METER EVALUATION

2.7.1 Analysis Methodology

ADOT's Transportation Technology Group (TTG) recently published the *Ramp Metering Design Guide* (November 2013) which provides guidance to determine ramp metering warrant analyses as well as the vehicle storage length required on freeway entrance ramps.

In accordance with the *Ramp Metering Design Guide* two ramp meter warrants must be met in order to justify the installation of a ramp meter, which include the following:

1. Freeway Right-lane and Entrance Ramp Flow Rate: During a typical 15-minute period, the combined flow rate of the entrance ramp and the right-most freeway lane is greater than 2,050 vehicles per hour; and during the same period the entrance ramp flow rate is greater than 400 vehicles per hour.
2. Freeway Speed: During a typical 15-minute period the vehicle speed within the freeway general-purpose lanes (not including HOV, auxiliary, and entrance ramp lanes) is less than 50 mph due to recurring congestion adjacent to or within 2 miles downstream of the entrance ramp.

Per the *Ramp Metering Design Guide*, the ramp meter vehicle storage distance is calculated with the following formula:

$$Queue = \left[\frac{(Rate_{ramp} - Rate_{meter}) \times Time \times \left(L_{car}\left(1 - \frac{T}{100}\right) + L_{trucks}\left(\frac{T}{100}\right)\right)}{Lanes}\right]$$

Where,

$Queue$: Queue storage distance (ft)
$Rate_{ramp}$: Entrance ramp design flow rate (vph).
$Rate_{meter}$: Design metering rate (vph) (840 vph is the typical design value)
Time: Design period that ramp metering operates at design metering rate (hour) (0.5 hr is the typical design value)
Lanes: Number of metered lanes
L_{car}: Average car plus gap length (ft/veh) (28 ft/veh is the typical design value)
L_{Truck}: Average truck plus gap length (ft/veh) (75 ft/veh is the typical design value)
T: Percentage of trucks in entrance ramp traffic (percent) (2% trucks may be used as a typical design value)

2.7.2 Analysis Results

The ramp meter warrant analysis was conducted for each entrance ramp that would be part of the new construction with the Preferred Alternative, and for each existing entrance ramp that does not currently include a ramp meter. The ramps that were evaluated included the Ray Road eastbound entrance ramp, the Broadway Road eastbound entrance ramp and the Baseline Road westbound entrance ramp. The warrant analysis was conducted using the 2025 Preferred Alternative VISSIM mode output. The 15-minute flow rates were calculated using the existing peak hour factor (PHF) for each facility. Results of these warrant analyses are shown in Table 19.

Table 19 – Ramp Meter Warrant Analysis Results

Entrance Ramp	Peak Hour	Right-most Freeway Lane 15-min Volume (vph)	Ramp 15-min Volume (vph)	Combined Volume (vph)	Warrant Volume	Lowest 15-min Freeway Speed (mph)	Warrant Speed (mph)	Ramp Warrants Satisfied
Ray Road (EB)	A.M.	1,560	560	2,120	2,050	62	50	No
	P.M.	1,800	1,000	2,800	2,050	54	50	
Broadway Road (EB)	A.M.	1,280	440	1,720	2,050	50	50	Yes
	P.M.	1,520	1,200	2,720	2,050	11	50	
Baseline Road (WB)	A.M.	720	960	1,680	2,050	54	50	No
	P.M.	560	840	1,400	2,050	49	50	

The ramp meter queue evaluation was conducted for each entrance ramp where either the ramp meter warrant was achieved, or the ramps where existing ramp meters are operational. The analysis was conducted using the 2035 volumes for the Preferred Alternative. The results of this analysis for each ramp are shown in Tables 20 and 21.

Table 20 – Eastbound Entrance Ramp Meter Storage Length Calculations

Ramp	2035 Volume (vph)		% Trucks	No. of Lanes	Meter Rate (vph)	A.M. Peak Calculated Queue Length (ft)	P.M. Peak Calculated Queue Length (ft)	Design Storage Length (ft)
	A.M.	P.M.						
Broadway Road	520	1,490	5.0%	2	840	400	4,932	990
Baseline Road	1,200	1,470	5.0%	2	840	2,732	4,780	1,160
Elliot Road	630	910	5.0%	2	840	400	531	950
Warner Road	510	820	5.0%	2	840	400	400	900
Priest Drive	710	1260	5.0%	2	840	400	3,187	970

Note: Queue lengths shown are per lane

Table 21 – Westbound Entrance Ramp Meter Storage Length Calculations

Ramp	2035 Volume (vph)		% Trucks	No. of Lanes	Meter Rate (vph)	A.M. Peak Calculated Queue Length (ft)	P.M. Peak Calculated Queue Length (ft)	Design Storage Length (ft)
	A.M.	P.M.						
Ray Road	1,250	1,290	5.0%	2	840	3,111	3,414	740
Warner Road	810	930	5.0%	2	840	400	683	1,170
Elliot Road	1,790	1,860	5.0%	2	840	7,208	7,739	800

Note: Queue lengths shown are per lane

2.7.3 Recommendations

The results of this ramp meter analysis indicates the Ray Road eastbound entrance ramp and the Baseline Road westbound entrance ramp do not meet ramp meter warrants.

The storage length analyses indicates five of the entrance ramp locations would not meet ramp meter storage length requirements. It is recommended that ramp meter timing be evaluated during final design, and that the ramps be monitored by the Traffic Operations Center to adjust the meter timing as the traffic demand varies over time.

[Text resumes on page 106]

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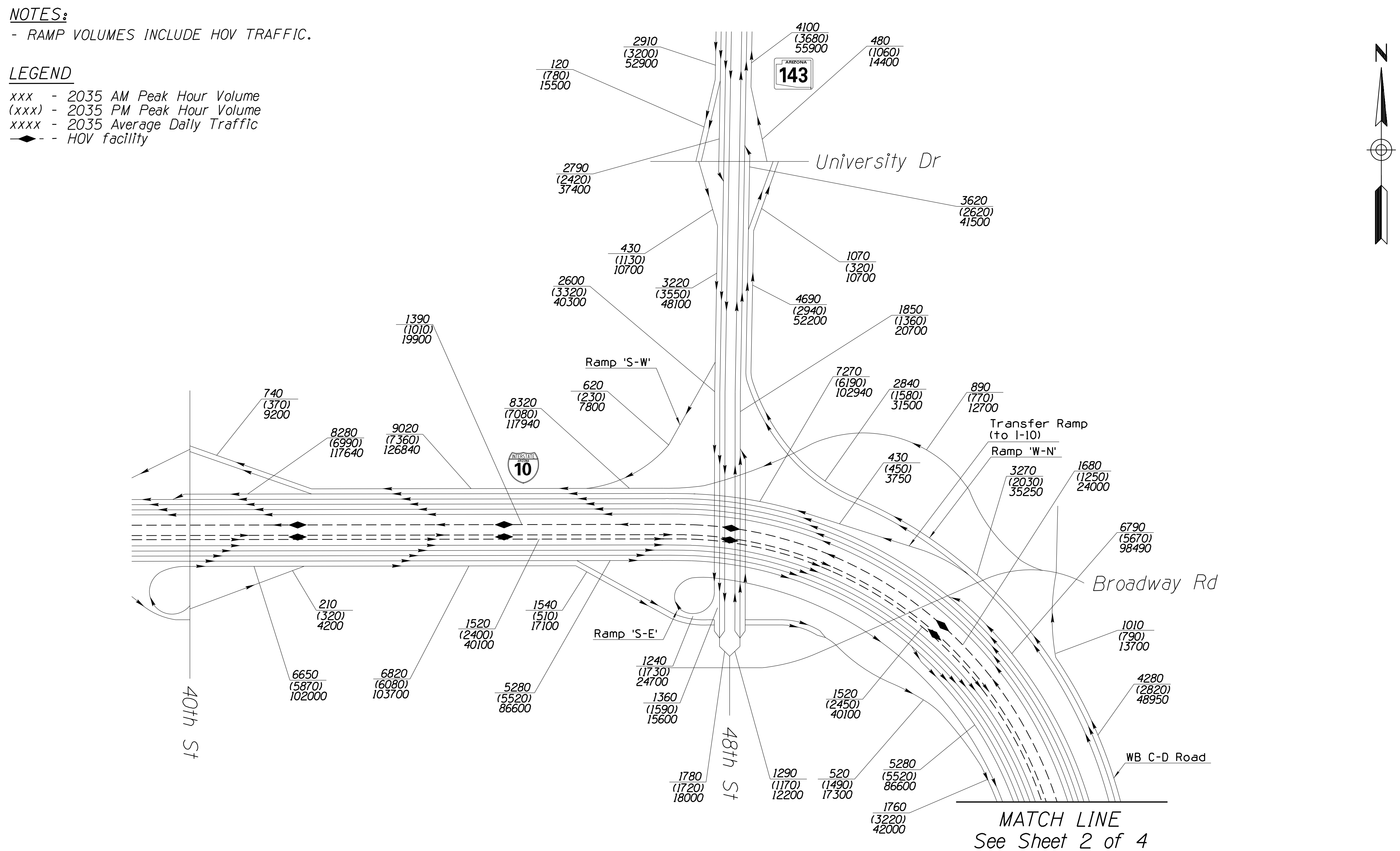


I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

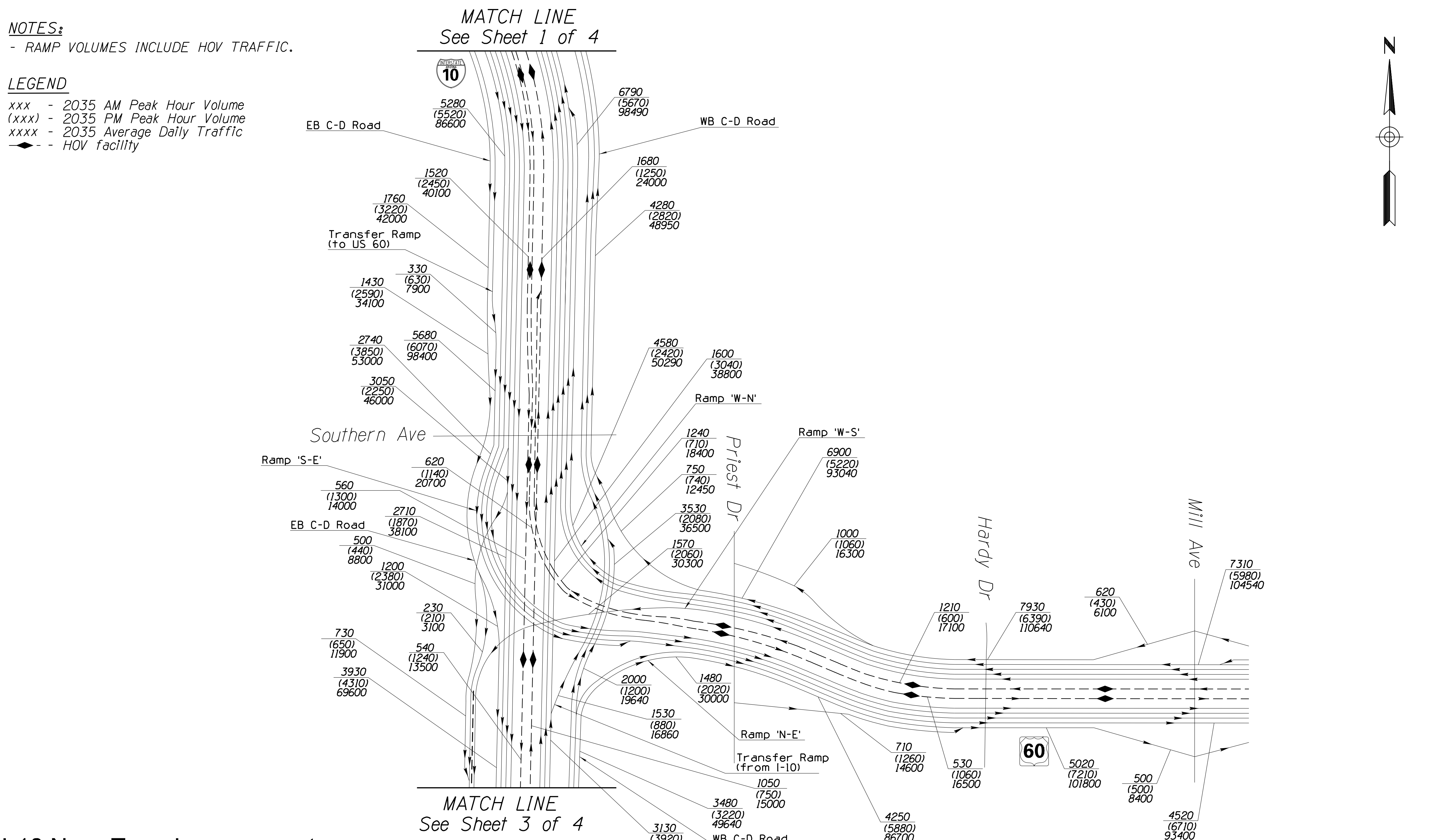
AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 18
2035 PREFERRED ALTERNATIVE
VOLUMES & LANE CONFIGURATION
SHEET 1 OF 4

11/25/2015 U:\110-02\Spot\Design\tre\Build\Figures\2035 Figures\PREFERRED\Preferred_build volume 1.dgn



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 18
2035 PREFERRED ALTERNATIVE
VOLUMES & LANE CONFIGURATION
SHEET 2 OF 4

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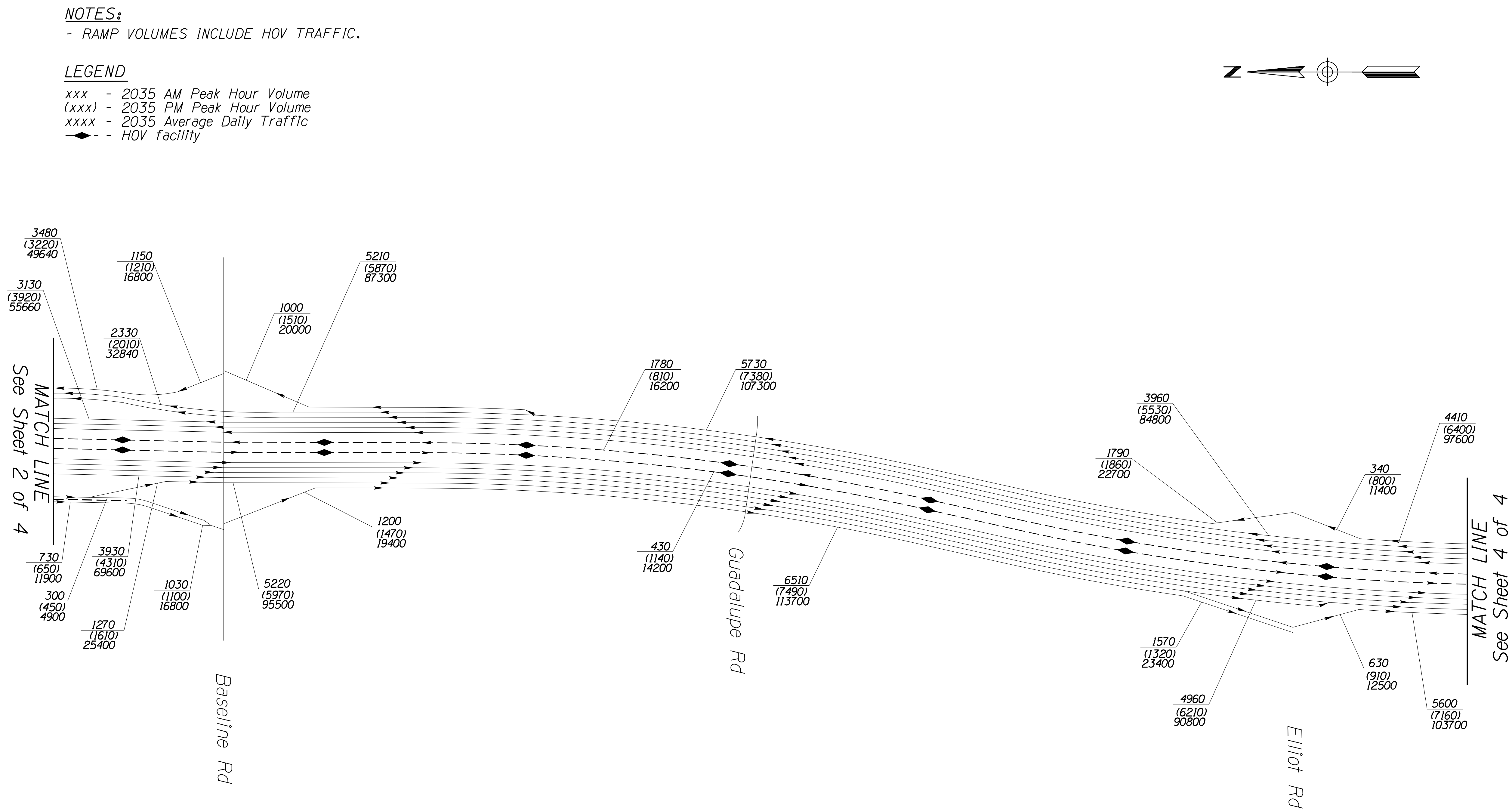
11/25/2015



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

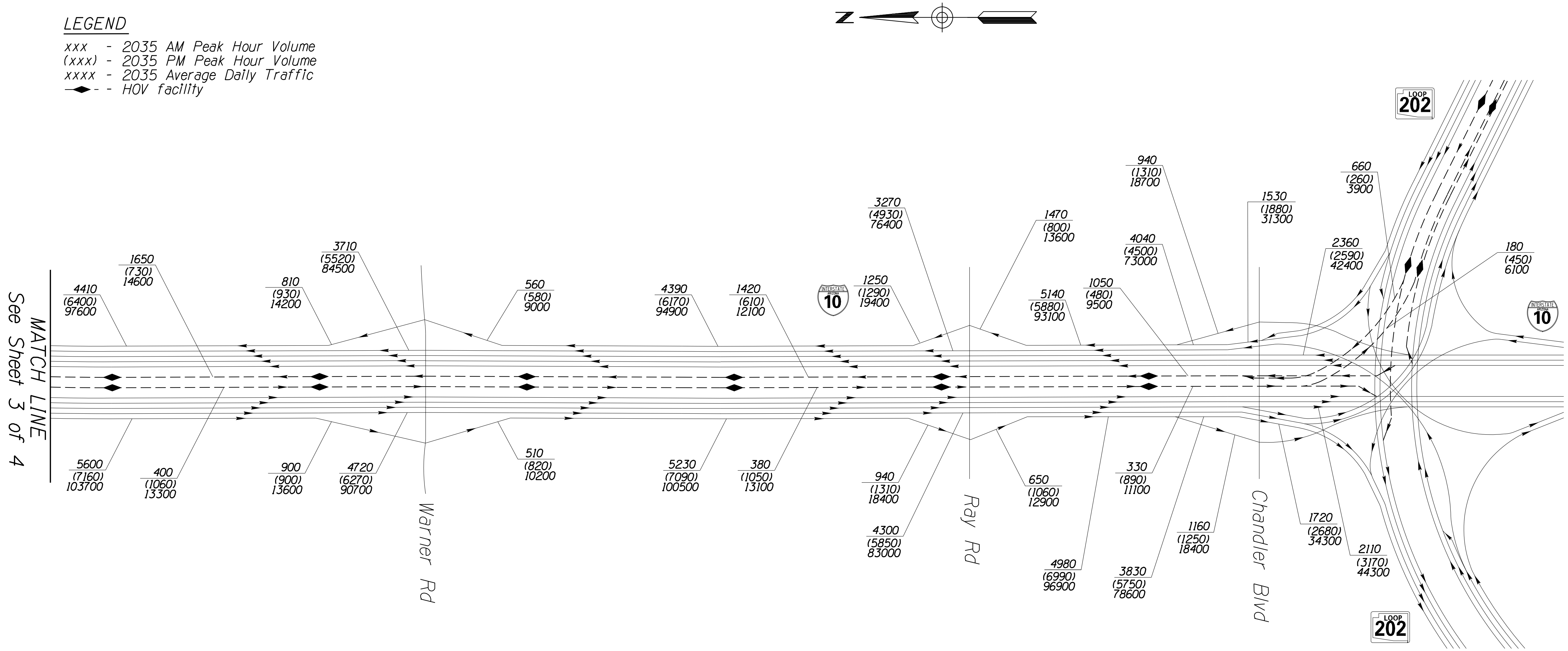
NOT TO SCALE - SCHEMATIC ONLY

FIGURE 18
2035 PREFERRED ALTERNATIVE
VOLUMES & LANE CONFIGURATION
SHEET 3 OF 4

11/25/2015 U:\I10-02\Spot\Design\tra\Build\Figures\2035 Figures\PREFERRED\Preferred_build volume 3.dgn

NOTES:
- RAMP VOLUMES INCLUDE HOV TRAFFIC.

LEGEND
xxx - 2035 AM Peak Hour Volume
(xxx) - 2035 PM Peak Hour Volume
xxxx - 2035 Average Daily Traffic
—◆— - HOV facility



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 18
2035 PREFERRED ALTERNATIVE
VOLUMES & LANE CONFIGURATION
SHEET 4 OF 4

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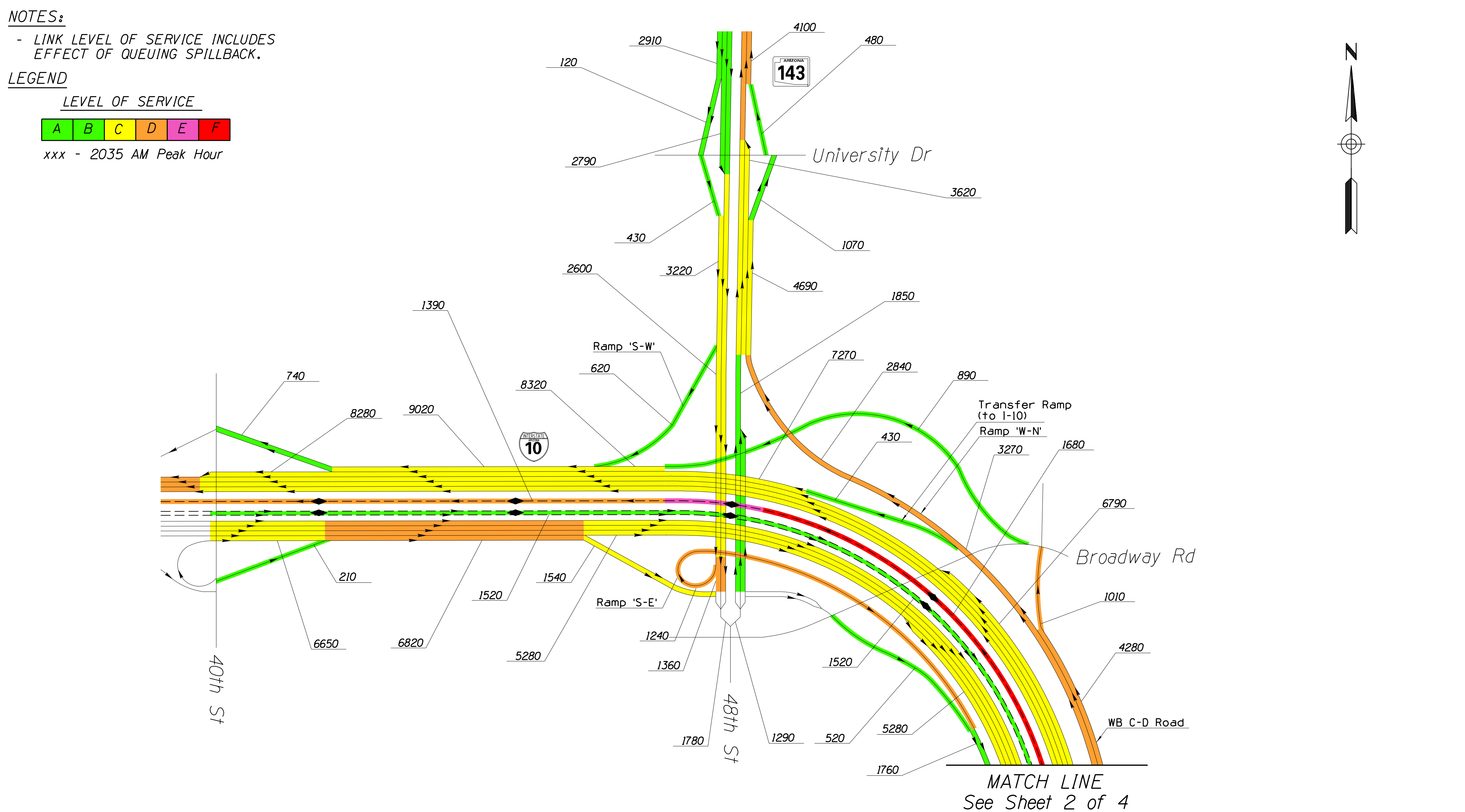
11/25/2015

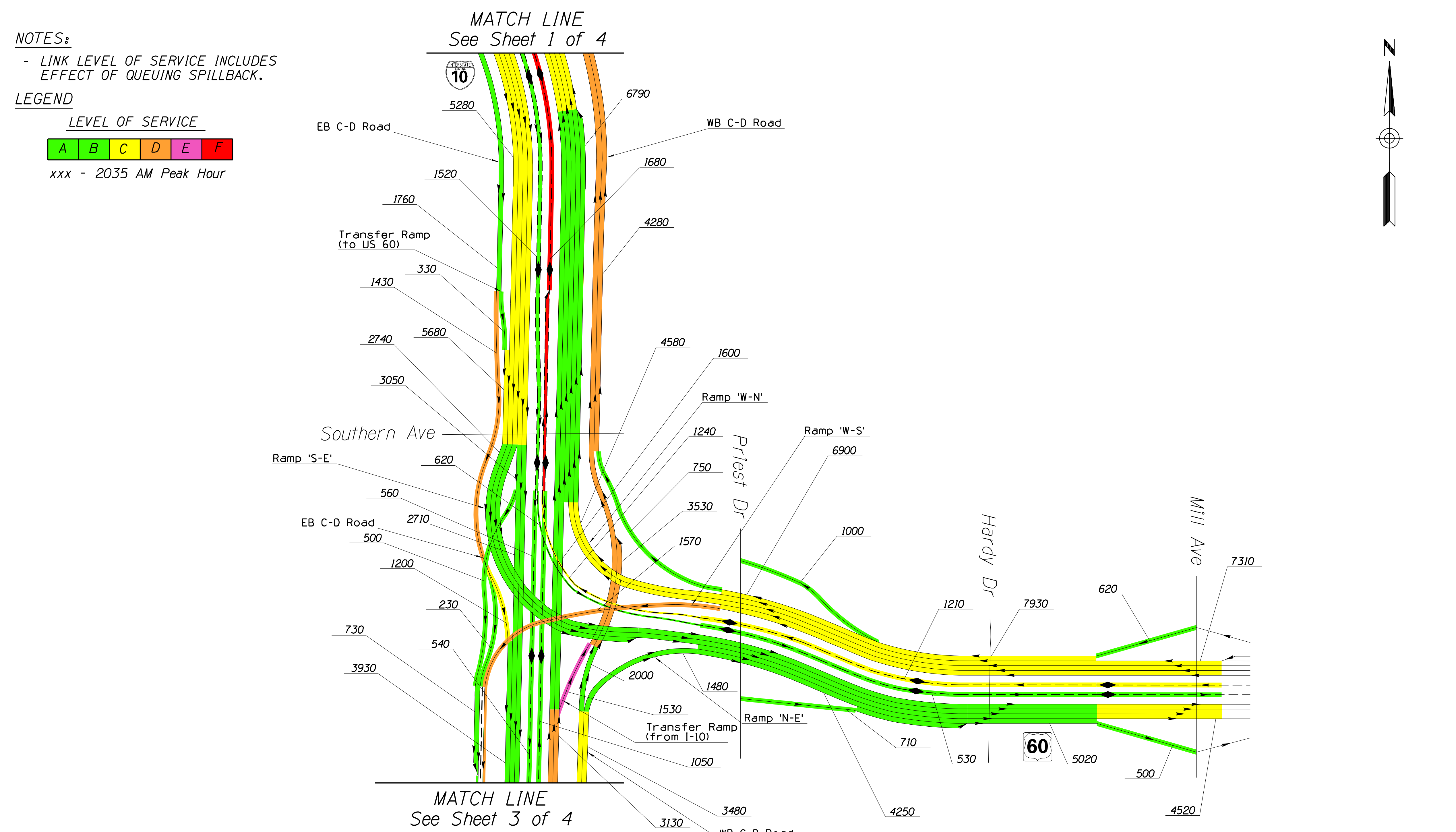


I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 19
2035 PREFERRED ALTERNATIVE
AM VOLUMES & LEVEL OF SERVICE
SHEET 1 OF 4

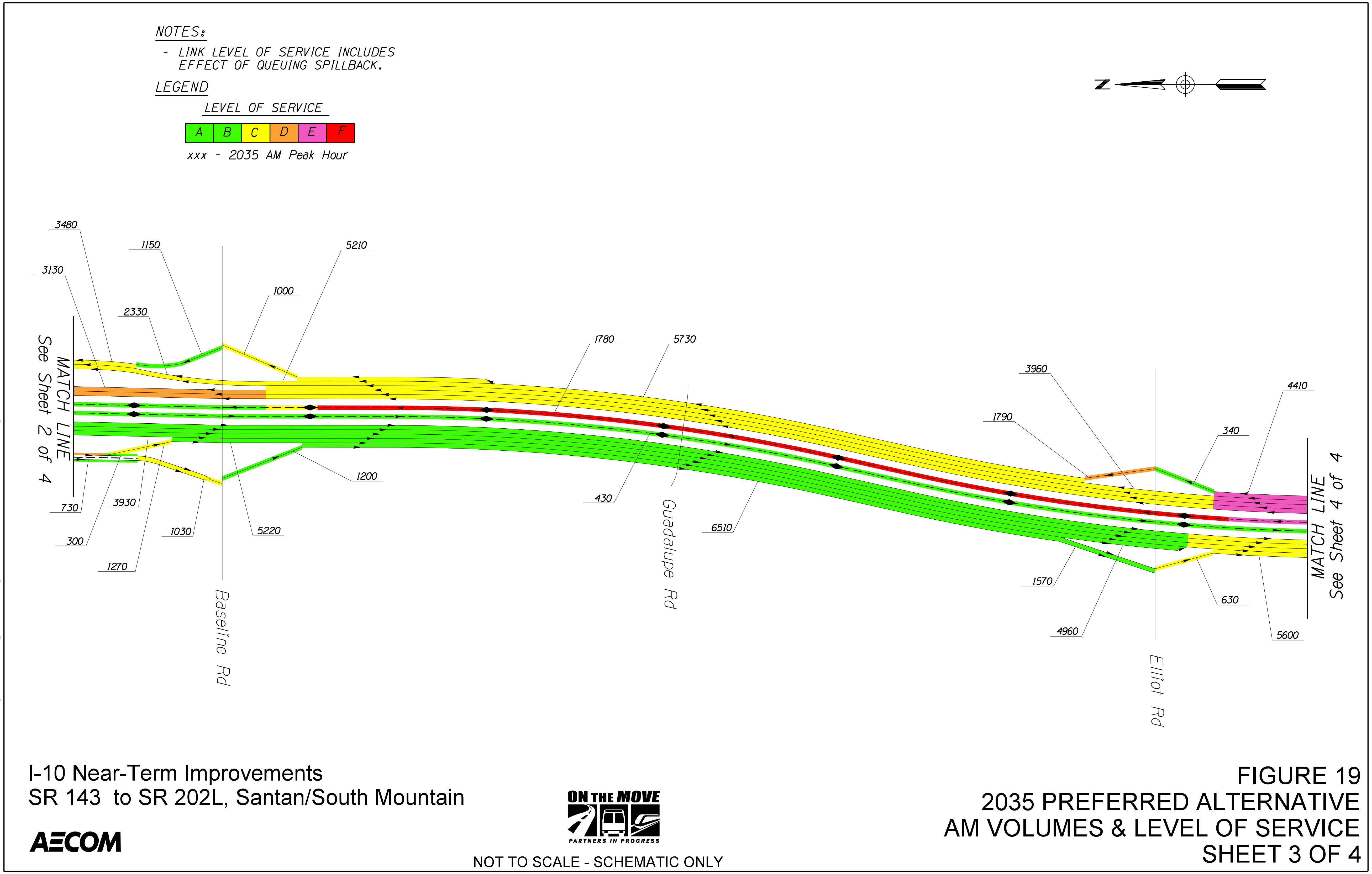


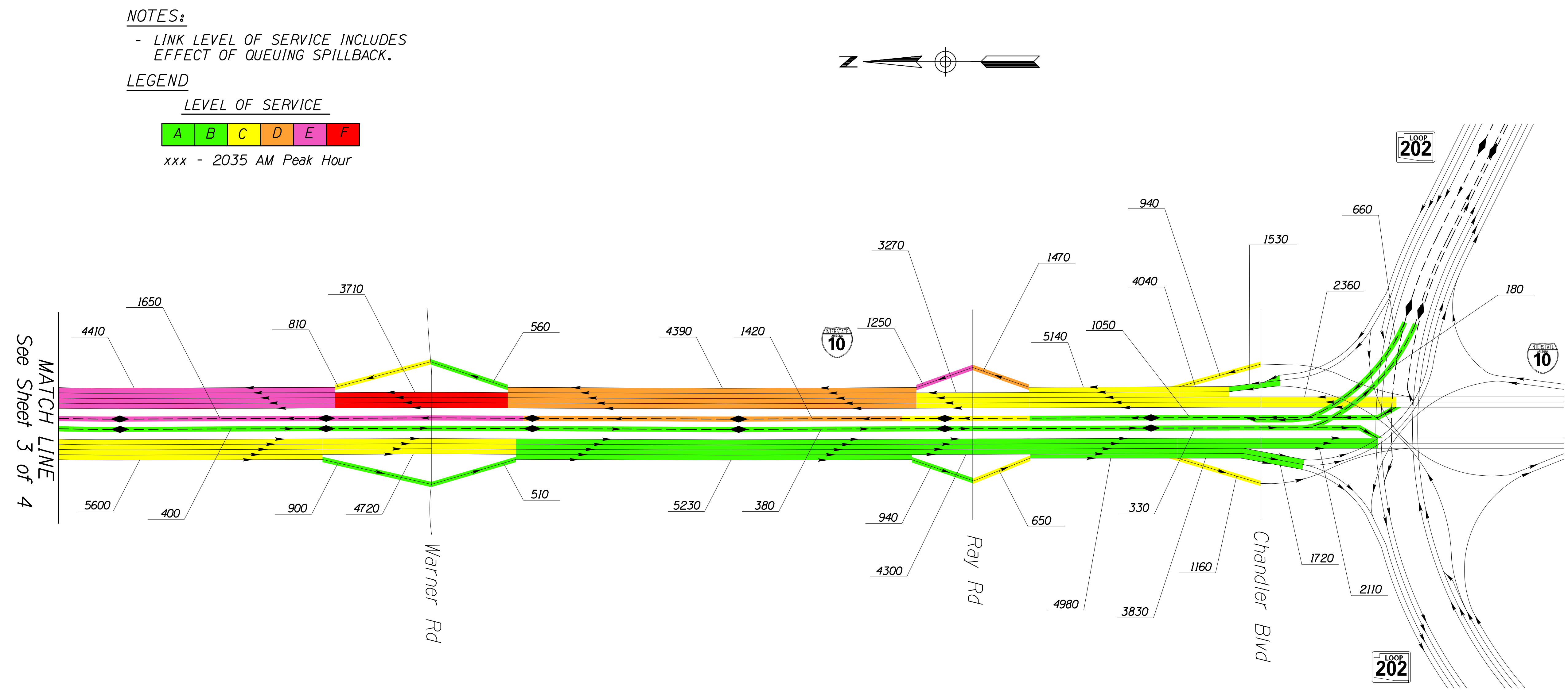
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 19
2035 PREFERRED ALTERNATIVE
AM VOLUMES & LEVEL OF SERVICE
SHEET 2 OF 4


NOTES:
- LINK LEVEL OF SERVICE INCLUDES EFFECT OF QUEUING SPILLBACK.
LEGEND
LEVEL OF SERVICE
A B C D E F
xxx - 2035 AM Peak Hour
MATCH LINE See Sheet 2 of 4
MATCH LINE See Sheet 4 of 4
Baseline Rd
Guadalupe Rd
Elliot Rd
3480
3130
1150
2330
1000
5210
730
300
3930
1270
1030
5220
1200
1780
5730
430
6510
3960
1790
340
4410
1570
4960
630
5600
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain
AECOM
ON THE MOVE
PARTNERS IN PROGRESS
NOT TO SCALE - SCHEMATIC ONLY
FIGURE 19
2035 PREFERRED ALTERNATIVE
AM VOLUMES & LEVEL OF SERVICE
SHEET 3 OF 4



I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 19
2035 PREFERRED ALTERNATIVE
AM VOLUMES & LEVEL OF SERVICE
SHEET 4 OF 4

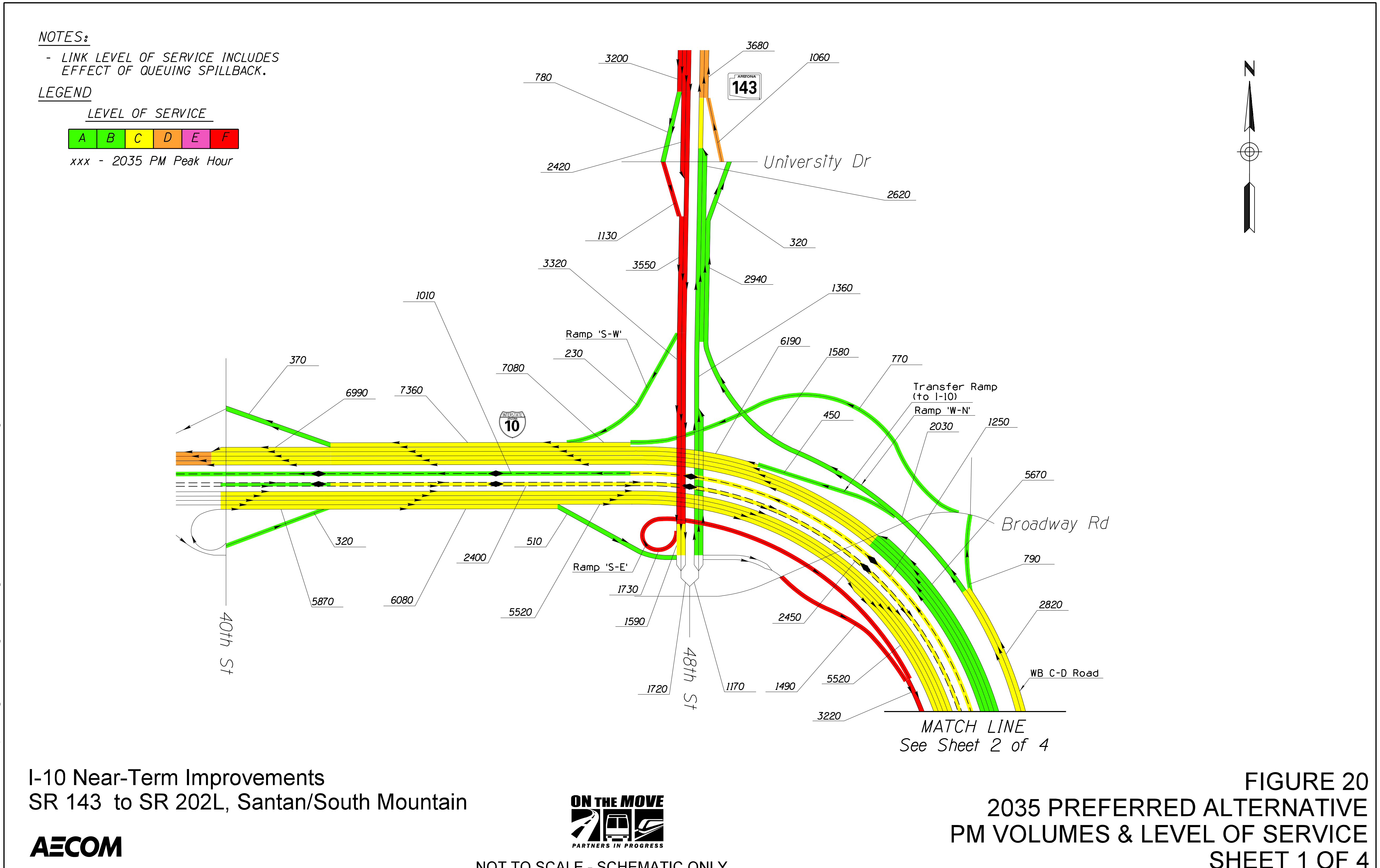
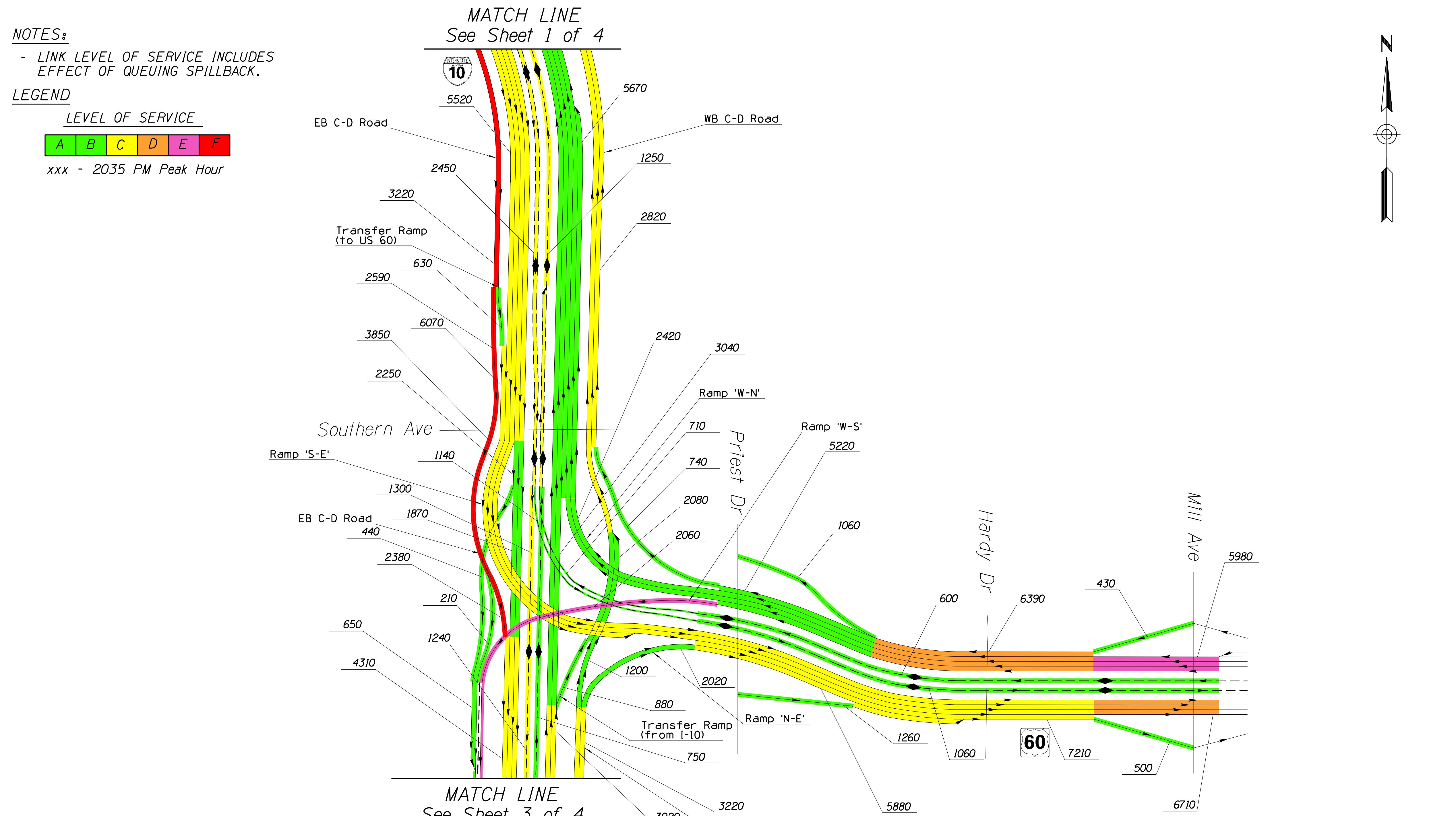


FIGURE 20
2035 PREFERRED ALTERNATIVE
PM VOLUMES & LEVEL OF SERVICE
SHEET 1 OF 4



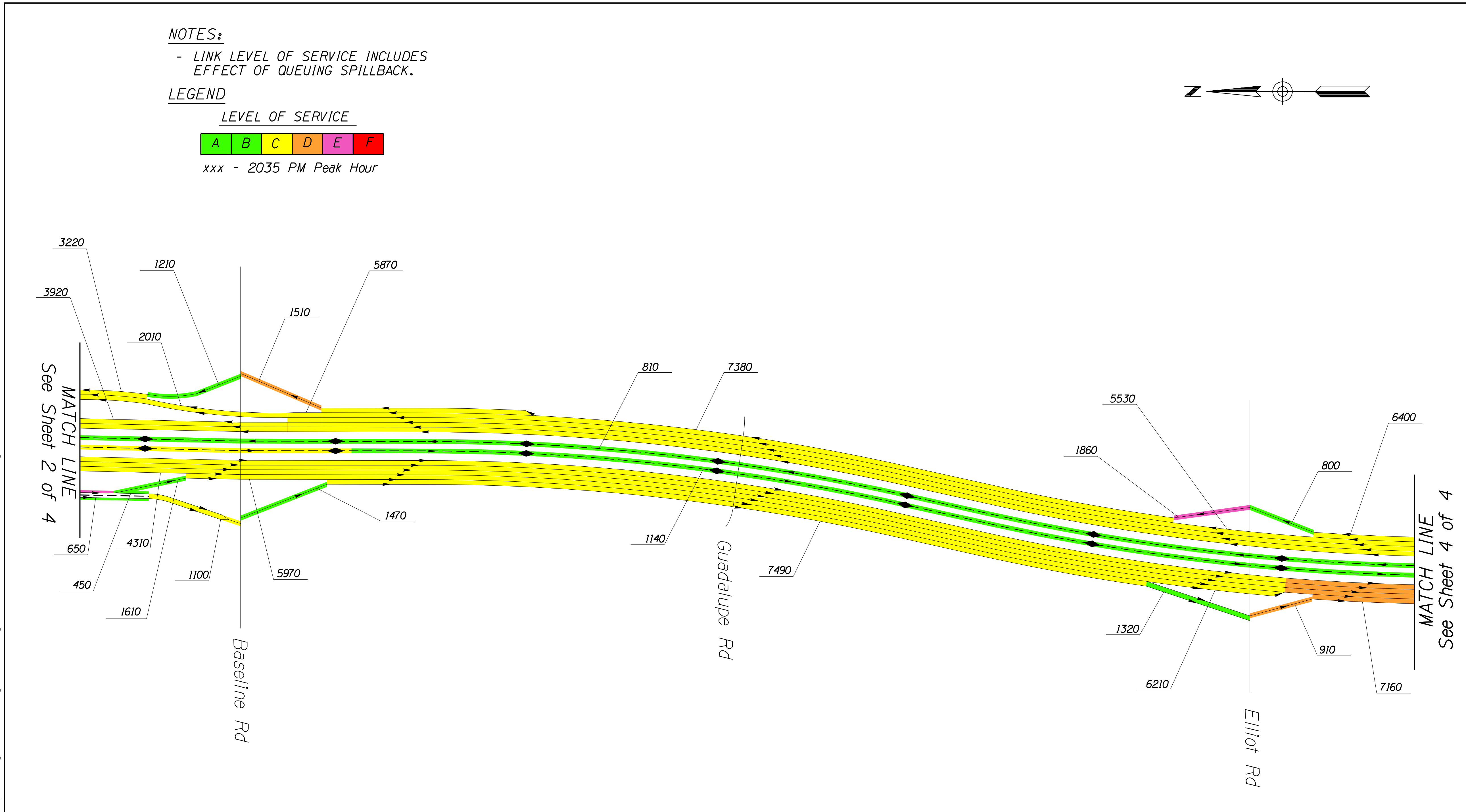
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

ON THE MOVE
PARTNERS IN PROGRESS

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 20
2035 PREFERRED ALTERNATIVE
PM VOLUMES & LEVEL OF SERVICE
SHEET 2 OF 4

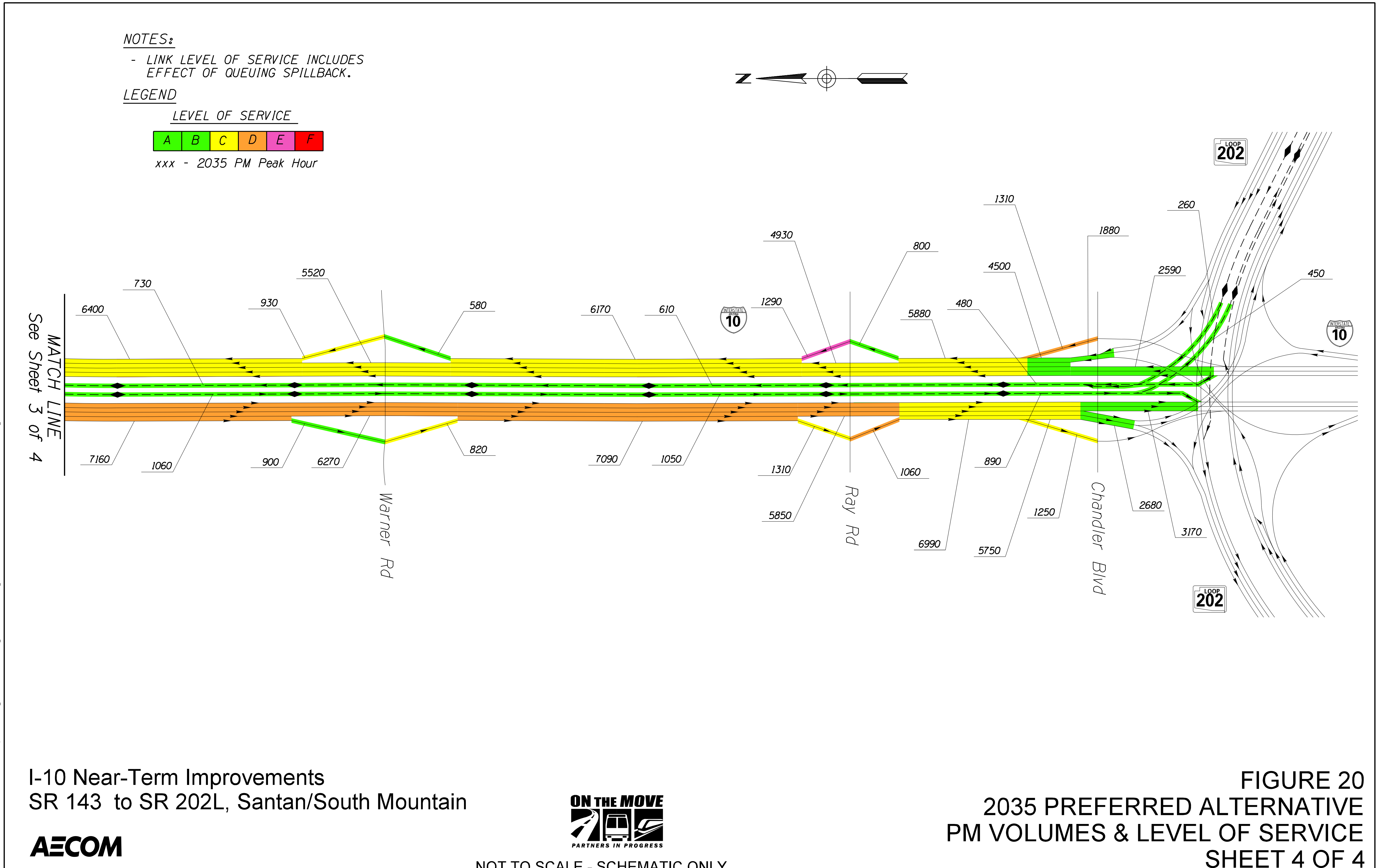


I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain

AECOM

NOT TO SCALE - SCHEMATIC ONLY

FIGURE 20
2035 PREFERRED ALTERNATIVE
PM VOLUMES & LEVEL OF SERVICE
SHEET 3 OF 4


NOTES:
- LINK LEVEL OF SERVICE INCLUDES EFFECT OF QUEUING SPILLBACK.
LEGEND
LEVEL OF SERVICE
A B C D E F
xxx - 2035 PM Peak Hour
MATCH LINE
See Sheet 3 of 4
Warner Rd
Ray Rd
Chandler Blvd
6400
730
930
5520
580
6170
610
1290
4930
800
5880
480
4500
1310
1880
260
2590
450
7160
1060
900
6270
820
7090
1050
1310
5850
1060
6990
890
5750
1250
2680
3170
10
202
I-10 Near-Term Improvements
SR 143 to SR 202L, Santan/South Mountain
AECOM
ON THE MOVE
PARTNERS IN PROGRESS
NOT TO SCALE - SCHEMATIC ONLY
FIGURE 20
2035 PREFERRED ALTERNATIVE
PM VOLUMES & LEVEL OF SERVICE
SHEET 4 OF 4

3.0 DESIGN CONCEPT ALTERNATIVES

3.1 INTRODUCTION

Design concept alternatives have been developed to improve the traffic carrying capacity of I-10 between State Route 143 and the Santan Freeway while retaining access at the existing system and service interchanges within the study area. The alternatives were developed to conform to the adopted regional transportation plans, improve traffic operational performance, achieve engineering design standards, minimize right-of-way and utility impacts, minimize environmental impacts and obtain local agency and public support.

Each alternative would include the use of Collector-Distributor (C-D) Roads to reconfigure the interchange ramps between SR 143 and Baseline Road to separate the ramp traffic from the I-10 mainline traffic, thereby eliminating the current weaving maneuvers that contribute to severe congestion on the Broadway Curve during the peak travel periods. The C-D Road concept is shown on the picture (to the right) that represents the existing Highway 401 in Toronto, Canada.

Additional general-purpose lanes would be provided on eastbound and westbound I-10 between Baseline Road and Ray Road. Auxiliary lanes would be provided in each direction between successive entrance and exit ramps.

Public agencies that have been involved in the alternative development and evaluation process include ADOT; FHWA; MAG; Maricopa County; the Town of Guadalupe; and the cities of Phoenix, Tempe and Chandler.

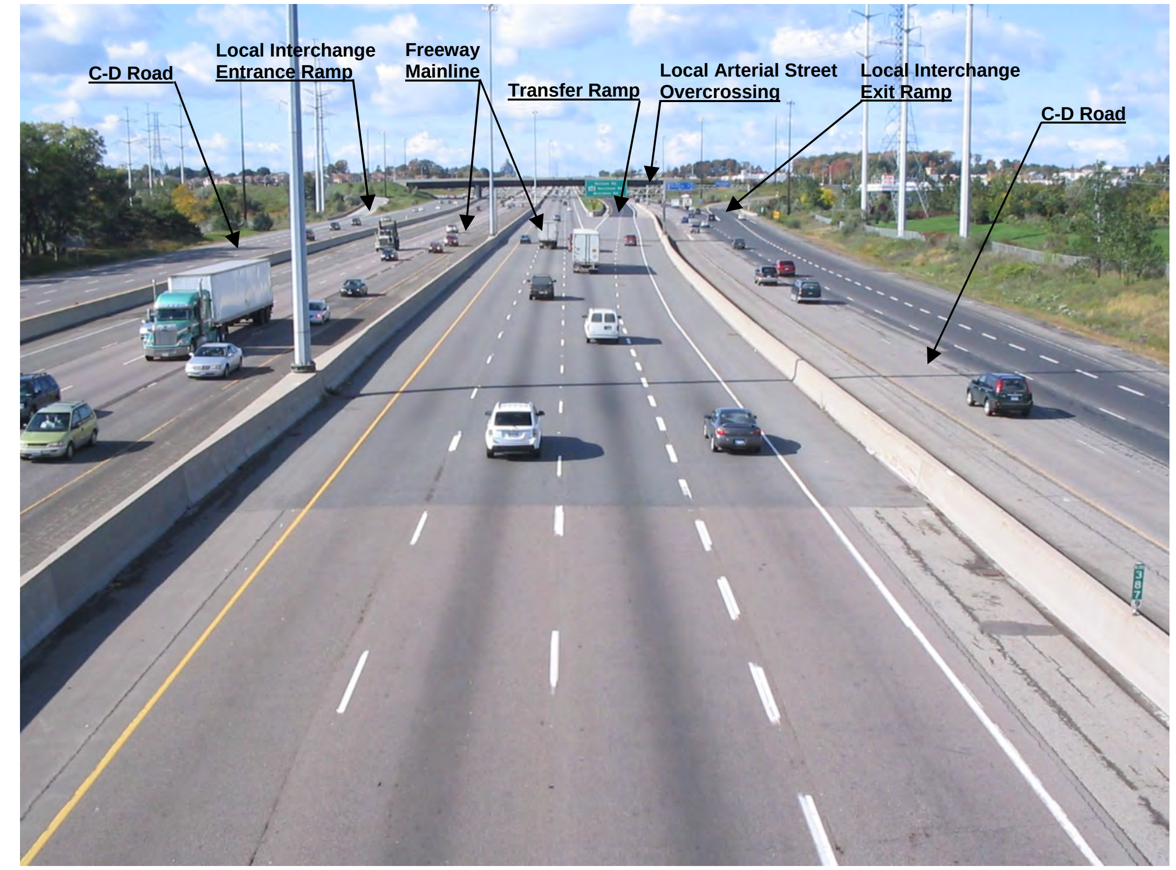
3.2 EVALUATION CRITERIA

Six evaluation criteria were developed to evaluate the Build and No-Build Alternatives for the I-10 Near-Term Improvements. Each of the evaluation criteria is described as follows

- Conformance with Adopted Regional Transportation Plans: This criterion evaluated the ability of the alternatives to achieve the goals and objectives of the RTPFP.

- Traffic Operational Performance: The alternatives must provide a benefit to the operational performance and level-of-service of the I-10 mainline within the study area. The I-10 and US 60 general-purpose lanes and auxiliary lanes should provide level-of-service (LOS) “D” or better operational characteristics based on Design Year 2035 traffic volume projections provided by MAG.

  The C-D Roads should operate with LOS ‘D’ or better operational characteristics based on Design Year 2035 traffic volume projections provided by MAG. The C-D Roads may operate with a lower level-of-service, but should not queue traffic to the extent that would negatively impact the operations of the I-10 or US 60 mainline general-purpose lanes approaching the C-D Roads.



Highway 401 Collector-Distributor Roads

  Southbound SR 143 could operate with congested traffic conditions as a result of the I-10 Near-Term Improvement project. Capacity improvements for the I-10/SR143 TI that would reduce congestion on the southbound SR 143 mainline will be addressed with the ongoing I-10/I-17 Corridor Master Plan study currently being performed by MAG.

- Ability to Achieve Engineering Standards: The alternatives must achieve AASHTO and ADOT geometric design standards to optimize highway safety and operational characteristics and minimize owner liability. The termini of the I-10 widening alternatives must connect with I-10, SR 143 and US 60 in a manner that would maintain lane balance and lane continuity in accordance with current ADOT design practice.

  The configuration of the ramp connections between the freeway system and service interchange must be designed in accordance with ADOT design standards and practice.

  AASHTO and ADOT geometric design standards are mandatory, unless a formal AASHTO design exception can be obtained from the FHWA, or an ADOT design variance can be obtained from ADOT’s Roadway Group.

- Right-of-Way and Utility Impacts: The alternatives should minimize the need for new right-of-way and potential conflicts with existing public utilities.

The alternatives must avoid the Fairmont Commerce Center property located west of I-10 and south of Fairmont Drive, along with an existing public utility easement adjacent to the west I-10 right-of-way between Fairmont Drive and Southern Avenue. The alternatives must also minimize potential impacts to the existing parking lot at Tempe Diablo Stadium.

- Environmental Considerations: This criterion evaluated the alternatives for its social and economic considerations, amount of disturbance to developed areas and vegetation, potential noise and air quality impacts, potential changes in visual character and quality, potential impacts to cultural and biological resources and hazardous materials issues. No environmental fatal-flaw issues should be identified that could not be mitigated with the project.

- Agency Acceptance: The ability of the alternatives to obtain local agency acceptance is vital for project implementation.

3.3 DESIGN CONCEPT ALTERNATIVES CONSIDERED

3.3.1 Introduction

Two freeway capacity improvement alternatives with various design options were developed for I-10 based on the features required to meet the operational goals for the projected traffic volumes and anticipated travel patterns. These alternatives include the following:

- No-Build Alternative
- Alternative 1, with Ramp 'N-E' Option 1
  - Would provide new eastbound and westbound C-D Roads between the I-10/SR143 TI and Baseline Road
  - Provides one additional general-purpose lane in each direction between Baseline Road and Ray Road
  - Would provide auxiliary lanes between successive service interchange entrance and exit ramps.
- Alternative 1, with Ramp 'N-E' Option 2
  - Same as Alternative 1, with Ramp 'N-E' Option 1
  - Would modify the configuration of the I-10/US60 TI Ramp 'N- E'.
- Alternative 1, with Ramp 'N-E' Option 3
  - Same as Alternative 1, with Ramp 'N-E' Options 1 and 2
  - Would reconfigure the I-10/US60 TI Ramp 'N-E'.
- Alternative 2, with Westbound C-D Road Option 1
  - Would provide new eastbound and westbound C-D Roads between the I-10/SR143 TI and Baseline Road
  - Provides one additional general-purpose lane in each direction between Baseline Road and Ray Road
  - Would provide auxiliary lanes between successive service interchange entrance and exit ramps.
  - Would relocate the westbound C-D Road to I-10 mainline transfer ramp connection from north of Southern Avenue (in Alternative 1) to 48th Street
  - The eastbound exit ramps at Warner Road and Ray Road would be designed as two lane ramps
- Alternative 2, with Westbound C-D Road Option 2
  - Same as Alternative 2, with Westbound C-D Road Option 1
  - Would increase the number of westbound C-D Road lanes to provide a three lane roadway between the I-10/US60 TI and the Broadway Road exit ramp
- Alternative 2, with Westbound C-D Road Option 3
  - Same as Alternative 2, with Westbound C-D Road Option 2
  - Would increase the number of westbound C-D Road lanes to provide a three lane roadway between the I-10/US60 TI and the I-10/SR143 TI

No modifications are proposed to the existing horizontal and vertical alignments of I-10, SR 143 and US 60. Each alternative would retain the existing HOV lanes to encourage carpooling and support the existing and planned Bus Rapid Transit (BRT) and express bus routes that use the HOV lanes.

3.3.2 No-Build Alternative

The No-Build Alternative would not result in any of the improvements identified in the RTP. The congested freeway conditions currently being experienced during the peak travel periods would be expected to worsen on I-10, SR 143, US 60 and the local arterial street system as the traffic demand continues to grow in the future.

This alternative would also retain the current configuration of the I-10/SR 143 TI with the existing loop ramp for traffic on southbound SR 143 that are destined for eastbound I-10. The existing signalized intersection would also remain for the freeway-to-freeway and local movements between I-10, SR 143, 48th Street and Broadway Road.

However, the No-Build Alternative will continue to be carried forward for evaluation in the DCR and environmental document. The evaluation of the No-Build Alternative and the Build alternatives will allow for an evaluation of the benefits of an improved transportation system and the impact to adjacent development and the environment.

3.3.3 Build Alternative 1, With Ramp 'N-E' Option 1

Eastbound I-10 Mainline

The Alternative 1 with Ramp 'N-E' Option 1 concept plans are provided in Figure 21 (on pages 111-118). Four existing general-purpose lanes and one HOV lane are provided on the eastbound I-10 mainline approaching Broadway Road. One additional general-purpose lane would be developed south of Broadway Road to provide five general-purpose lanes and one HOV lane approaching the I-10/US60 TI. Traffic on I-10 that is destined for eastbound US 60 (on Ramp 'S-E') would depart the I-10 mainline lanes with a three lane exit.

Ramp 'S-E' would be developed with a mandatory exit from the outside two lanes, and the third lane designed as an optional lane with the I-10 through movement. Three general-purpose lanes and one HOV lane would continue to the south on I-10 through the I-10/US60 TI. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. HOV traffic that is destined for US 60 would exit I-10 at the existing HOV directional ramp.

A transfer ramp (1 lane) would provide a connection between the eastbound C-D Road and Ramp 'S-E' in the vicinity of Fairmont Drive. The transfer ramp lane would merge with Ramp 'S-E' (3 lanes) to develop four lanes that continue to the east on US 60. The existing Ramp 'S-E' bridge over Southern Avenue would be widened to provide the roadway width necessary to accept the additional lane from the transfer ramp. The existing Ramp 'S-E' bridge over I-10 was originally constructed with the roadway width necessary to accept the additional lane from the transfer ramp.

One lane would continue to the south on the eastbound C-D Road between Fairmont Drive and the I-10 entrance ramp. The C-D Road lane would merge with the eastbound I-10 mainline just south of the I-10/US60 TI to develop four general-purpose lanes and one HOV lane that continue to the south.

The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp 'W-S') (1 lane) would merge with the Baseline Road exit ramps to develop a combined connector road (3 lanes) approaching the Baseline Road TI. The Baseline Road ramp lanes (2 lanes) would be separated from Ramp 'W-S' (1 lane) by a concrete median barrier to eliminate current weaving maneuvers. The Baseline Road exit ramp (2 lanes) would depart the connector road with a two lane mandatory exit. Ramp 'W-S' would also be able to access Baseline Road at the exit ramp. Ramp 'W-S' would enter the I-10 mainline with a "lane-add" configuration to provide five general-purpose lanes and one HOV lane between Baseline Road and Elliot Road. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Elliot Road exit ramp.

The Elliot Road exit ramp (2 lanes) would be realigned with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. An American Association of State Highway Transportation Officials (AASHTO) lane drop would occur prior to the Elliot Road entrance ramp gore to provide four general-purpose lanes and one HOV lane that would continue to the south between Elliot Road and Ray Road. The Elliot Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Warner Road exit ramp.

The Warner Road exit ramp (1 lane) would be realigned with a mandatory exit from the auxiliary lane. The Warner Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Ray Road exit ramp.

The Ray Road exit ramp (1 lane) would be developed as a mandatory exit from the auxiliary lane. Four general-purpose lanes and one HOV lane would continue to the south to match into the existing I-10 mainline approaching the I-10/SR202L (Santan/South Mountain) TI.

South of Baseline Road, the roadway widening on I-10 would be constructed within the existing right-of-way. The Guadalupe Road, Elliot Road, Warner Road and Ray Road underpasses were originally constructed with sufficient span lengths to support the roadway widening recommended with this alternative.

East of I-10, the US 60 eastbound roadway would be widened to match the existing five general-purpose lanes and one HOV lane between Priest Drive and the Mill Avenue exit ramp. The northbound I-10 to eastbound US 60 (Ramp 'N-E') directional ramp (1 lane) would be realigned to develop an additional eastbound general-purpose lane. The Priest Drive entrance ramp would be realigned and merge with eastbound US 60 with a parallel entrance configuration.

Eastbound C-D Road

The existing southbound SR 143 to eastbound I-10 loop ramp (1 lane) would initiate the eastbound C-D Road at Broadway Road. The Broadway Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional C-D Road lane (2 lanes total) that continues to the south.

A transfer ramp would be provided between the eastbound C-D Road and the eastbound US 60 ramp (Ramp 'S-E') in the vicinity of Fairmont Drive. The transfer ramp (1 lane) would merge with Ramp 'S-E' (3 lanes) to develop four lanes that continue to the east on US 60.

The C-D Road (1 lane) would continue to the south between Fairmont Drive and the I-10 entrance ramp. The C-D Road would merge with the eastbound general-purpose lanes (3 lanes) just south of the I-10/US60 TI to develop four general-purpose lanes and one HOV lane that continue to the south. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. New bridges would be provided for the eastbound C-D Road over Southern Avenue, the Baseline Road exit ramp (from I-10) and the Western Canal.

Westbound I-10 Mainline

The original I-10/SR202L (Santan/South Mountain) TI project widened the westbound I-10 mainline to provide four general-purpose lanes and one HOV lane approaching Ray Road from the south. An AASHTO lane-drop was provided to transition to the existing roadway width of three general-purpose lanes and one HOV lane north of Ray Road.

An additional westbound general-purpose lane would be developed on I-10 by removing the AASHTO lane drop and extending the fourth general-purpose lane to the north. The Ray Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Warner Road exit ramp. Westbound I-10 would include four general-purpose lanes and one HOV lane between Ray and Elliot Roads.

The Warner Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane. The entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Elliot Road exit ramp. The Elliot Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane.

Elliot Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional lane between Elliot Road and Baseline Road. Five general-purpose lanes and one HOV lane would be provided on I-10 approaching the initial westbound C-D Road transfer ramp (and eastbound US 60) near Baseline Road. The Baseline Road exit ramp would be developed with a single-lane tapered exit configuration from the outside general-purpose lane. The initial C-D Road transfer ramp would be developed as a two lane mandatory exit from the outside general-purpose lanes.

Three general-purpose lanes and one HOV lane would continue to the north approaching the I-10/US60 TI. A second C-D Road transfer ramp (1 lane) would be developed immediately south of US 60 to provide additional access to the westbound C-D Road. This ramp would be developed with a tapered exit configuration from the outside general-purpose lane. Three general-purpose lanes and one HOV lane would continue to the north through the I-10/US60 TI.

Four general-purpose lanes, an auxiliary lane and one HOV lane are provided on westbound US 60 west of Mill Avenue. The Priest Drive exit ramp (1 lane) would be reconfigured to a single-lane ramp with a mandatory exit from the auxiliary lane. The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp ‘W-S’) (1 lane) would be reconfigured with a parallel “left-exit” configuration.

The westbound US 60 to westbound C-D Road ramp (1 lane) would be developed as a mandatory exit from the outside general-purpose lane. Three lanes would continue to the west on Ramp ‘W-N’ to connect to the westbound I-10 mainline.

Ramp ‘W-N’ (3 lanes) would combine with the westbound I-10 general-purpose lanes (3 lanes) to develop six general-purpose lanes and one HOV lane departing I-10/US60 TI. A new bridge would be constructed for Ramp ‘W-N’ over the westbound C-D Road.

The US 60 HOV lane would enter the westbound I-10 mainline and combine with the I-10 HOV lane (from the south) with a parallel entrance configuration. One westbound HOV lane would continue to the west between US 60 and I-17.

Six general-purpose lanes and one HOV lane would depart the I-10/US60 TI. One lane drop would occur immediately north of Southern Avenue to accommodate the “C-D Road to I-10 Mainline” transfer ramp. The transfer ramp would merge with the I-10 mainline with a parallel entrance configuration that transitions into an additional general-purpose lane. Two additional lane drops would occur between Alameda Drive and Broadway Road to transition the westbound I-10 mainline from six general-purpose lanes to four general-purpose lanes (and one HOV lane) prior to the Broadway Road underpass.

Westbound C-D Road

Travelers destined for the westbound local lanes, or eastbound US 60 (via Ramp ‘N-E’), would depart I-10 just south of Baseline Road. The westbound transfer ramp exit would be developed as a two lane mandatory exit from the outside general-purpose lanes. The existing westbound C-D Road would remain in its current configuration but widened to provide full lane and shoulder widths.

The westbound C-D Road (2 lanes) would continue to the north immediately east of the I-10 mainline. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Ramp ‘N-E’ exit. The Ramp ‘N-E’ exit (1 lane) would depart the westbound C-D Road as a mandatory exit from the auxiliary lane. Two C-D Road lanes would continue to the north.

A second C-D Road transfer ramp (1 lane) would be provided just south of US 60. The transfer ramp would merge with the C-D Road lanes with a “lane-add” configuration. The outside C-D Road lane would terminate prior to the US 60 entrance ramp to develop three lanes approaching Southern Avenue.

The two lanes from I-10 (from the south) would merge with the ramp from westbound US 60 (1 lane) to develop three C-D Road lanes. The outside C-D Road lane would terminate south of Alameda Drive to develop two C-D Road lanes approaching the I-10/SR143 TI. A new bridge would be provided for the C-D Road crossing over Southern Avenue.

The westbound I-10 to northbound SR 143 (Ramp ‘W-N’) directional ramp (2 lanes) would be retained in its current configuration. A new C-D Road transfer ramp would be provided north of Southern Avenue to allow a connection between the C-D Road and the westbound I-10 mainline. The C-D Road transfer ramp would be configured as a tapered “left exit” from the inside C-D Road lane.

3.3.4 Build Alternative 1, With Ramp ‘N-E’ Option 2

Alternative 1, with Ramp ‘N-E’ Option 2 includes the same roadway configuration as Alternative 1, with Ramp ‘N-E’ Option 1. However, the Ramp ‘N-E’ Design Option 2 would reconfigure the I-10/US60 TI Ramp ‘N-E’ exit to depart the westbound C-D Road as a two lane mandatory exit from the outside C-D Road lanes as shown on Figure 22 (on page 119). One lane would continue on the westbound C-D Road to the north.

Ramp ‘S-E’ would be reconfigured east of the I-10 overpass to develop a lane drop prior to the Ramp ‘N-E’ gore. Ramp ‘N-E’ (2 lanes) would be reconfigured to provide a two lane parallel entrance that transitions into additional general-purpose lanes. Five general-purpose lanes and one HOV lane would continue on the eastbound US 60 mainline east of Hardy Drive.

Once Ramp ‘N-E’ diverges from the westbound C-D Road, one C-D Road lane would continue to the north. The westbound transfer ramp from I-10 (1 lane) would merge with the westbound C-D Road to develop a two lane roadway. The C-D Road (two lanes) would continue to the north and merge with the westbound US 60 ramp (1 lane), at which point the roadway configuration matches Alternative 1 with Ramp ‘N-E’ Option 1.

3.3.5 Build Alternative 1, With Ramp ‘N-E’ Option 3

Alternative 1, with Ramp ‘N-E’ Option 3 includes the same roadway configuration as Alternative 1, with Ramp ‘N-E’ Option 2. Design Option 3 would reconfigure the I-10/US60 TI Ramp ‘N-E’ exit (2 lanes) to depart the westbound C-D Road with a one lane mandatory exit from the auxiliary lane, and a second lane designed as an optional lane with the C-D Road through movement as shown on Figure 22 (on page 119). Two lanes would continue on the westbound C-D Road to the north. Following the Ramp 'N-E' exit from the westbound C-D Road, the Ramp 'N-E' entrance configuration with US 60 matches Ramp 'N-E' Option 2, while the configuration of the westbound C–D Road matches Ramp 'N-E' Option 1.

[Text resumes on page 120]

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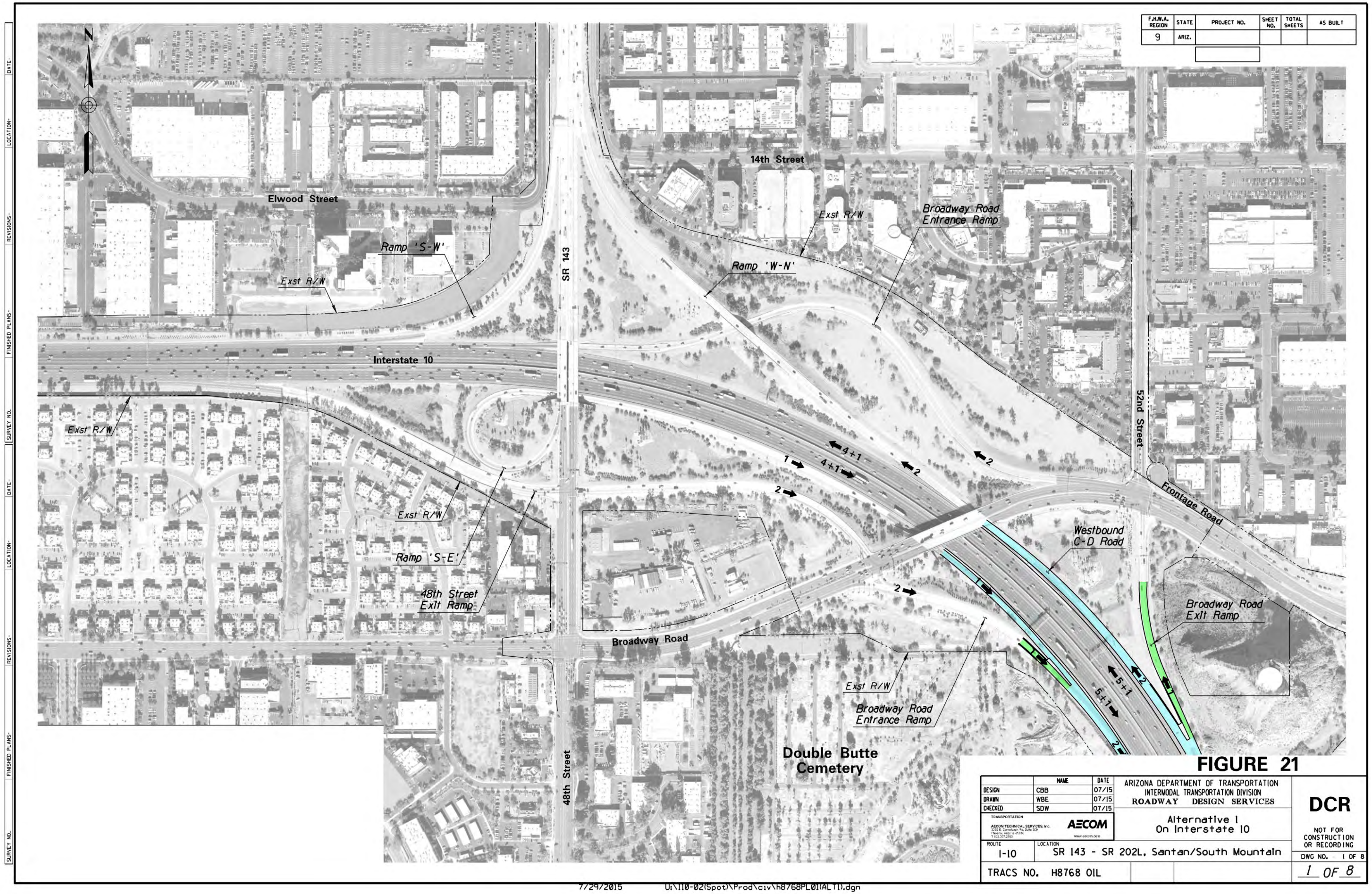
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Elwood Street
Exst R/W
Broadway Road Entrance Ramp
Ramp 'S-W'
SR 143
Ramp 'W-N'
Interstate 10
52nd Street
Frontage Road
Westbound C-D Road
Ramp 'S-E'
48th Street Exit Ramp
Broadway Road
Broadway Road Exit Ramp
Double Butte Cemetery
48th Street
FIGURE 21
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DCR
Alternative I On Interstate 10
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
1 OF 8
7/29/2015
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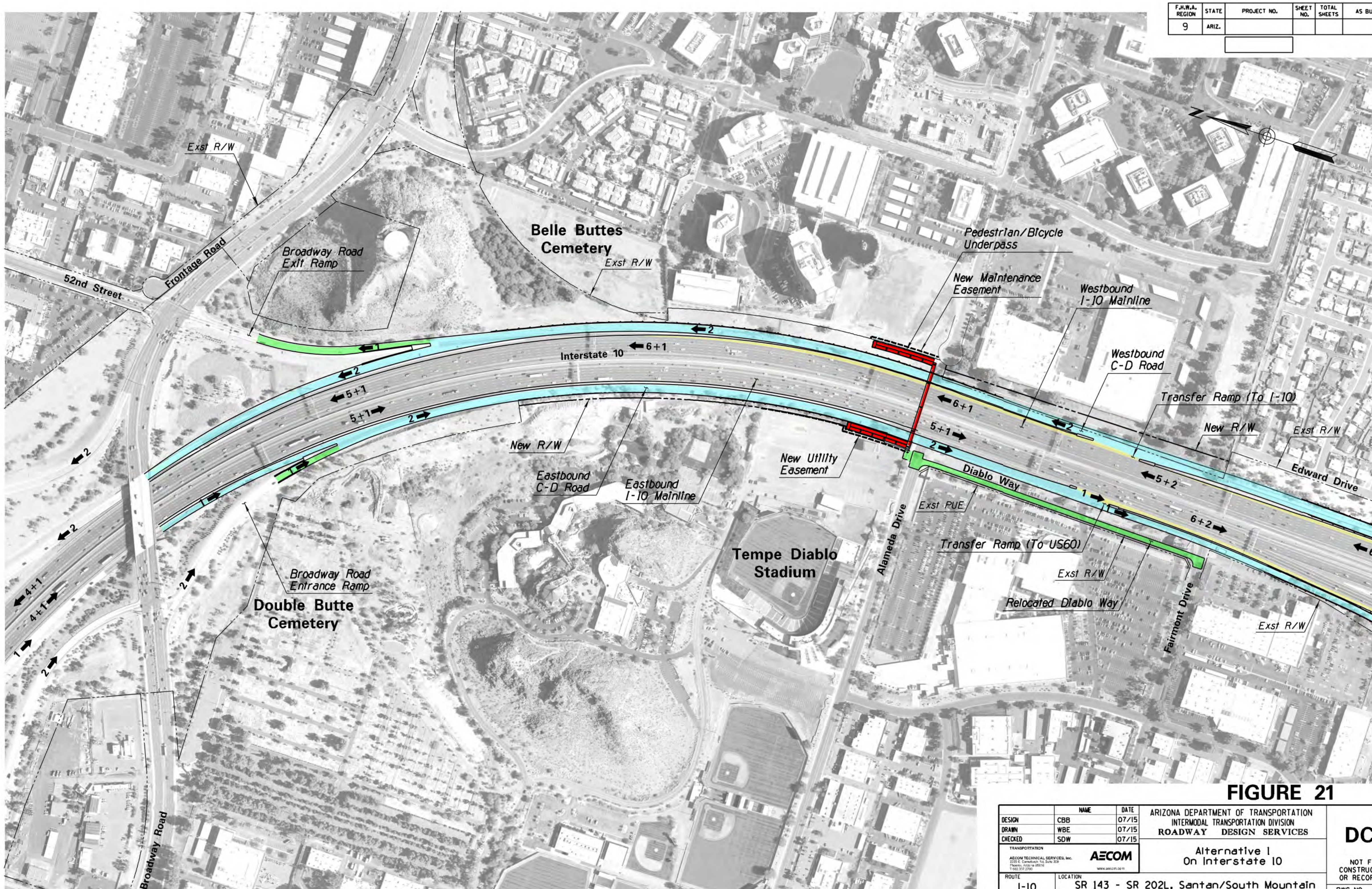


FIGURE 21

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

	NAME	DATE
DESIGN	CBB	07/15
DRAWN	WBE	07/15
CHECKED	SDW	07/15

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

AECOM

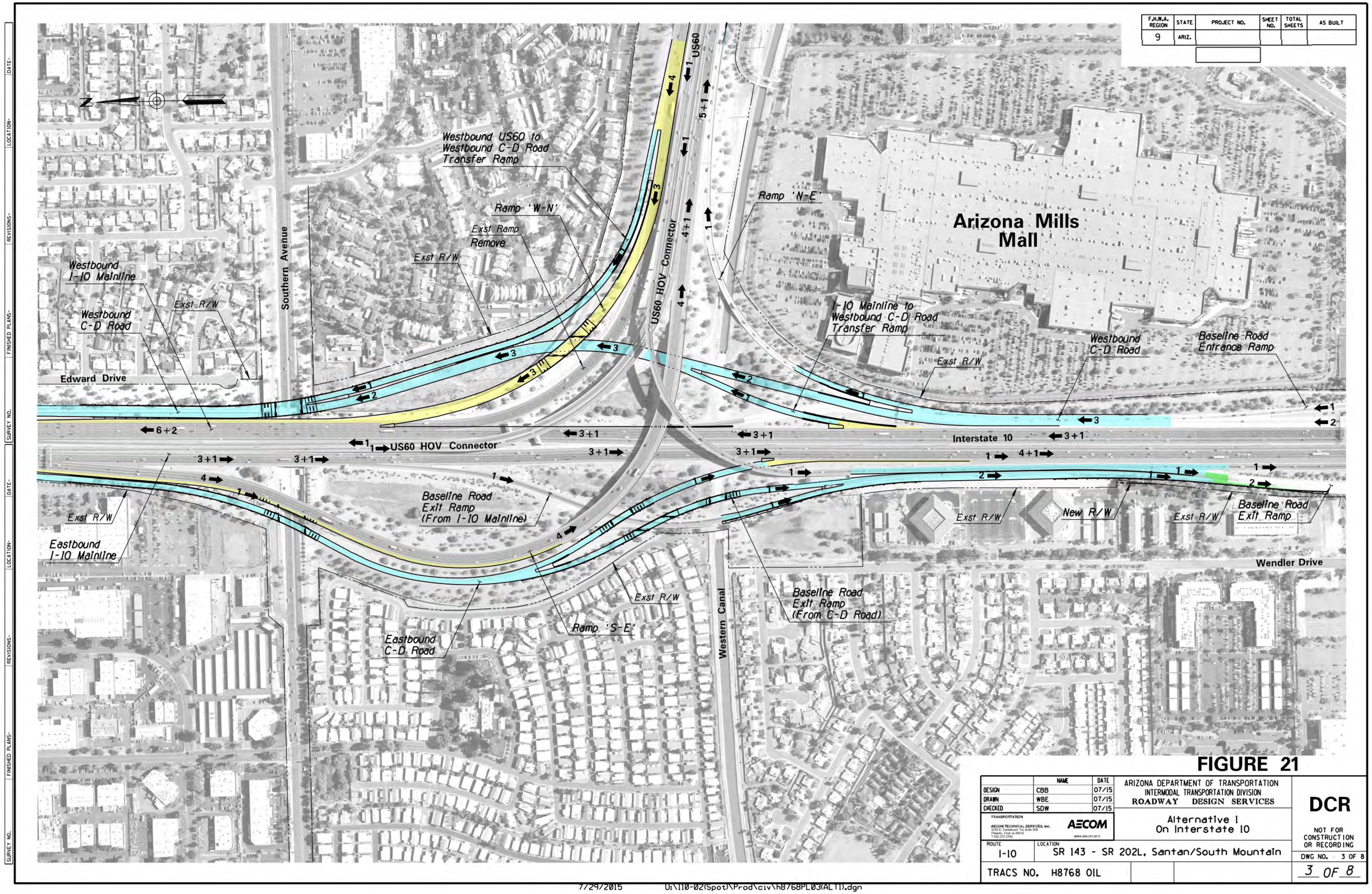
Alternative 1
On Interstate 10

DCR

NOT FOR CONSTRUCTION OR RECORDING

ROUTE I-10
LOCATION SR 143 - SR 202L, Santan/South Mountain
DWG NO. 2 OF 8
TRACS NO. H8768 01L
2 OF 8

7/29/2015 U:\I10-02(Spot)\Prod\civ\h8768PL02(ALT1).dgn


Westbound US60 to
Westbound C-D Road
Transfer Ramp
Ramp 'W-N'
Exst Ramp
Remove
Exst R/W
Westbound
I-10 Mainline
Westbound
C-D Road
Edward Drive
Southern Avenue
US60 HOV Connector
US60
Ramp 'N-E'
Arizona Mills
Mall
I-10 Mainline to
Westbound C-D Road
Transfer Ramp
Westbound
C-D Road
Baseline Road
Entrance Ramp
Interstate 10
Baseline Road
Exit Ramp
(From I-10 Mainline)
New R/W
Baseline Road
Exit Ramp
Wendler Drive
Eastbound
I-10 Mainline
Ramp 'S-E'
Western Canal
Baseline Road
Exit Ramp
(From C-D Road)
Eastbound
C-D Road
FIGURE 21
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DCR
Alternative I
On Interstate 10
NOT FOR
CONSTRUCTION
OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
3 OF 8
7/29/2015
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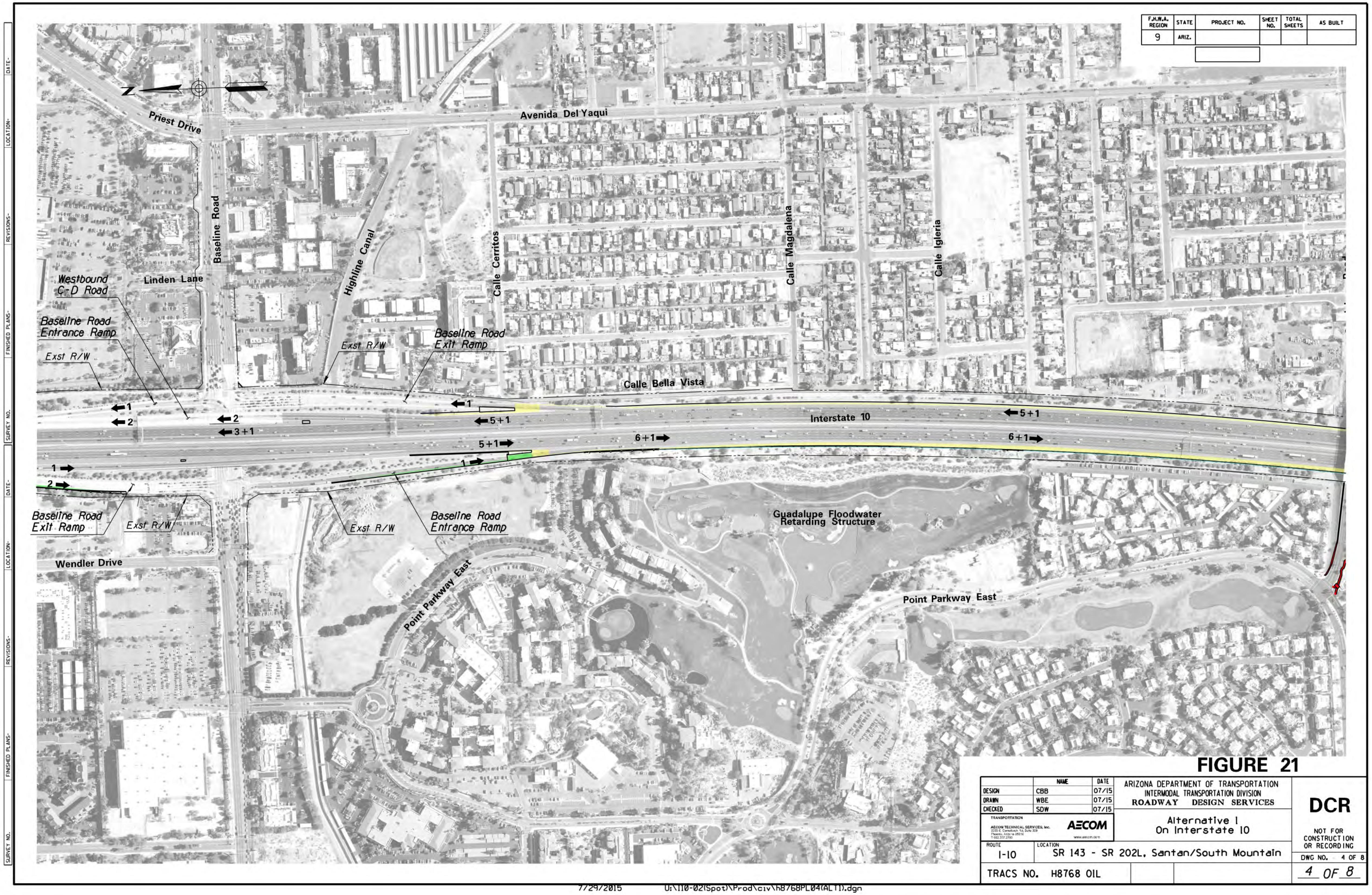
Priest Drive
Avenida Del Yaqui
Baseline Road
Highline Canal
Calle Cerritos
Calle Magdalena
Calle Igleria
Westbound C-D Road
Linden Lane
Baseline Road Entrance Ramp
Exst R/W
Baseline Road Exit Ramp
Calle Bella Vista
Interstate 10
Guadalupe Floodwater Retarding Structure
Baseline Road Exit Ramp
Baseline Road Entrance Ramp
Wendler Drive
Point Parkway East
FIGURE 21
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Alternative I On Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
4 OF 8
7/29/2015
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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

FIGURE 21

	NAME	DATE
DESIGN	CBB	07/15
DRAWN	WBE	07/15
CHECKED	SDW	07/15

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

AECOM

Alternative I
On Interstate 10

DCR

NOT FOR CONSTRUCTION OR RECORDING

ROUTE I-10 | LOCATION SR 143 - SR 202L, Santan/South Mountain | DWG NO. 5 OF 8

TRACS NO. H8768 01L | 5 OF 8

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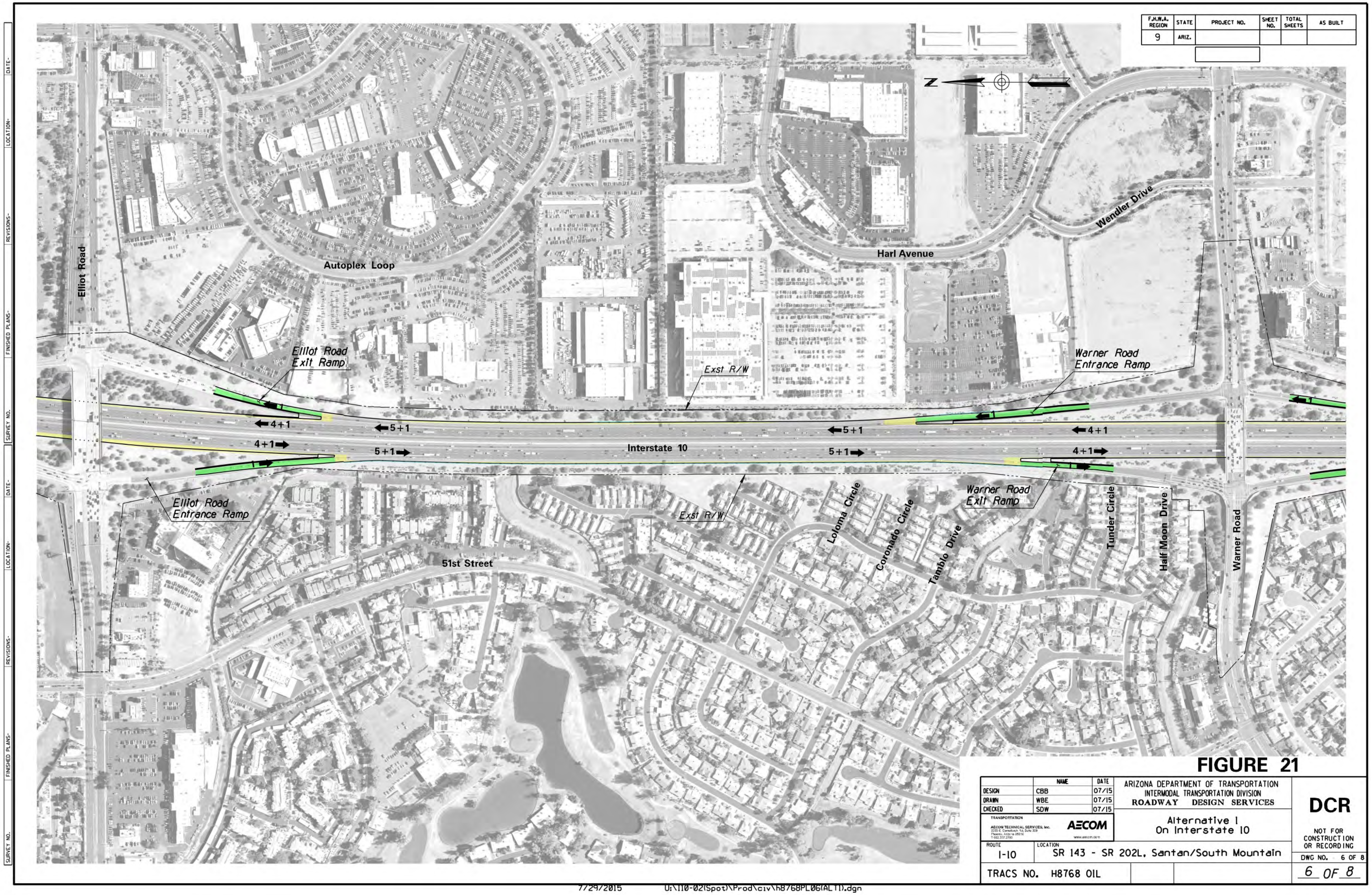
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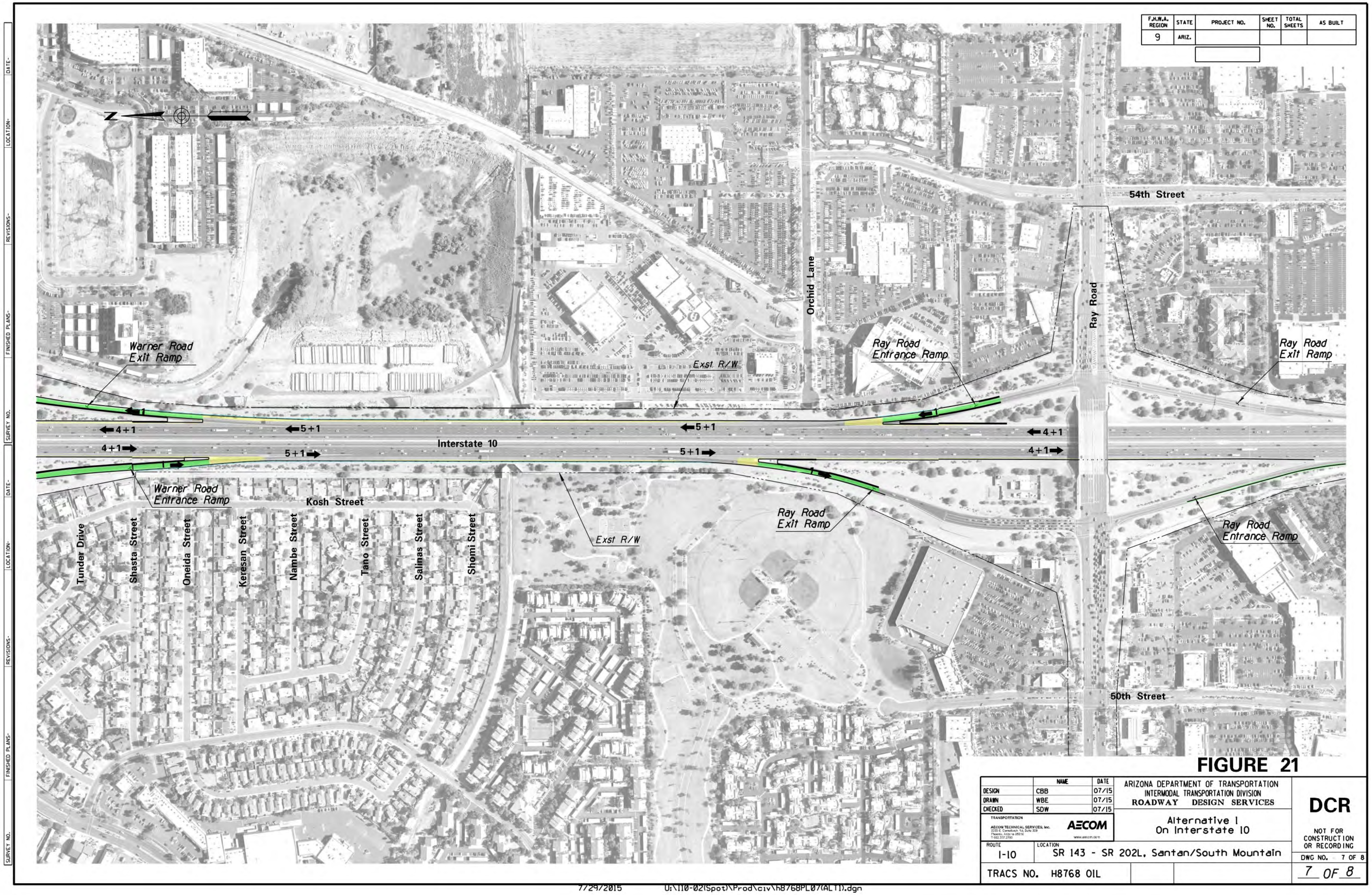
Autoplex Loop
Harl Avenue
Wendler Drive
Elliot Road Exit Ramp
Exst R/W
Warner Road Entrance Ramp
4+1
5+1
Interstate 10
Elliot Road Entrance Ramp
Warner Road Exit Ramp
51st Street
Loloma Circle
Coronado Circle
Tambio Drive
Tunder Circle
Half Moon Drive
Warner Road
FIGURE 21
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DCR
Alternative 1
On Interstate 10
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
6 OF 8


54th Street
Orchid Lane
Ray Road
Warner Road Exit Ramp
Exst R/W
Ray Road Entrance Ramp
Ray Road Exit Ramp
4+1
5+1
Interstate 10
Warner Road Entrance Ramp
Kosh Street
Tunder Drive
Shasta Street
Oneida Street
Keresan Street
Nambe Street
Tano Street
Salinas Street
Shomi Street
Exst R/W
Ray Road Exit Ramp
Ray Road Entrance Ramp
50th Street
FIGURE 21
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DCR
Alternative 1
On Interstate 10
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
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7/29/2015
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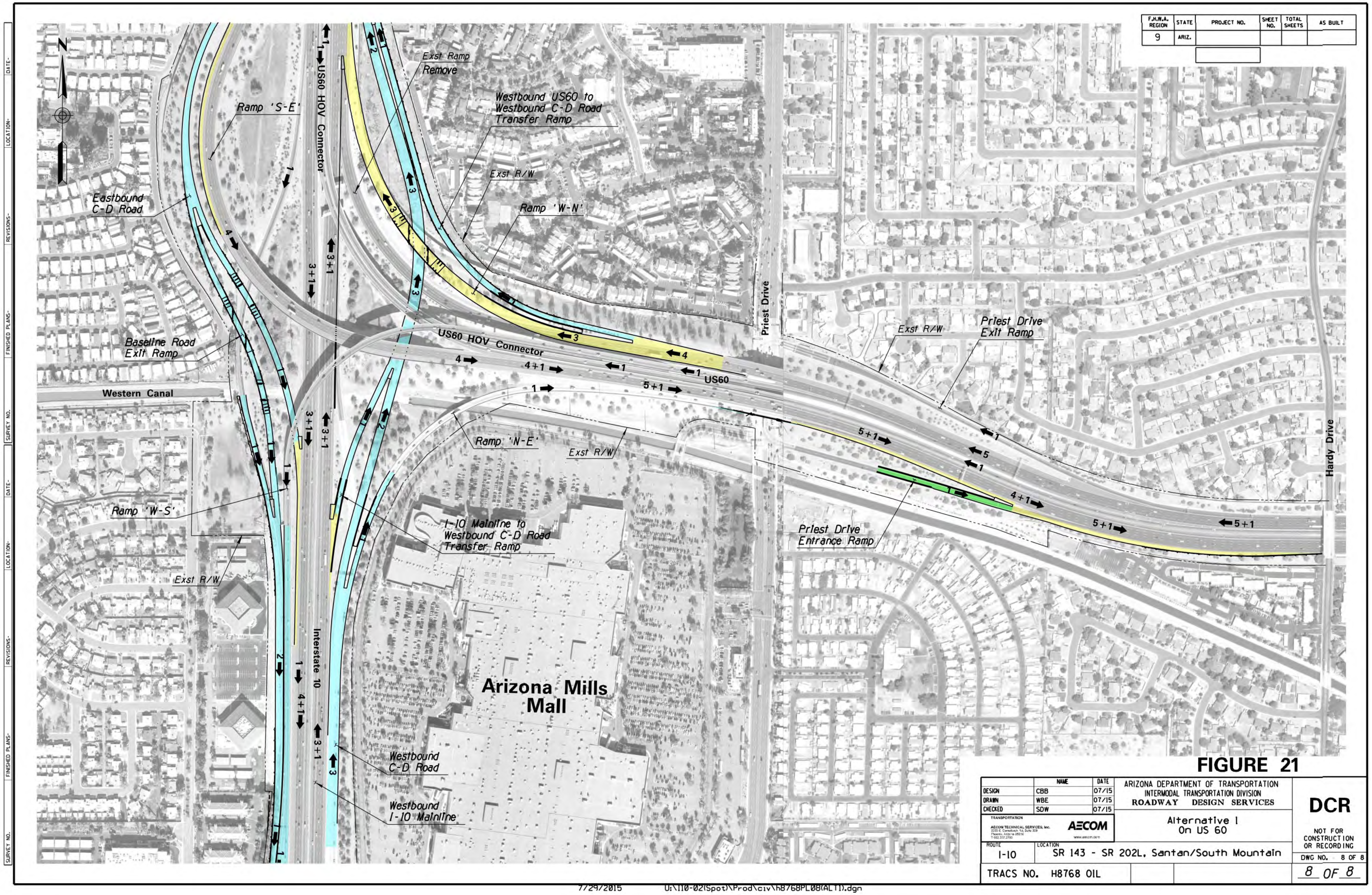
Exst Ramp Remove
Westbound US60 to Westbound C-D Road Transfer Ramp
Ramp 'S-E'
US60 HOV Connector
Exst R/W
Ramp 'W-N'
Eastbound C-D Road
Priest Drive
Priest Drive Exit Ramp
Baseline Road Exit Ramp
Western Canal
US60
Ramp 'N-E'
Hardy Drive
Ramp 'W-S'
I-10 Mainline to Westbound C-D Road Transfer Ramp
Priest Drive Entrance Ramp
Interstate 10
Arizona Mills Mall
Westbound C-D Road
Westbound I-10 Mainline
FIGURE 21
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DCR
DESIGN CBB 07/15
DRAWN WBE 07/15
CHECKED SDW 07/15
AECOM
Alternative 1
On US 60
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
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7/29/2015
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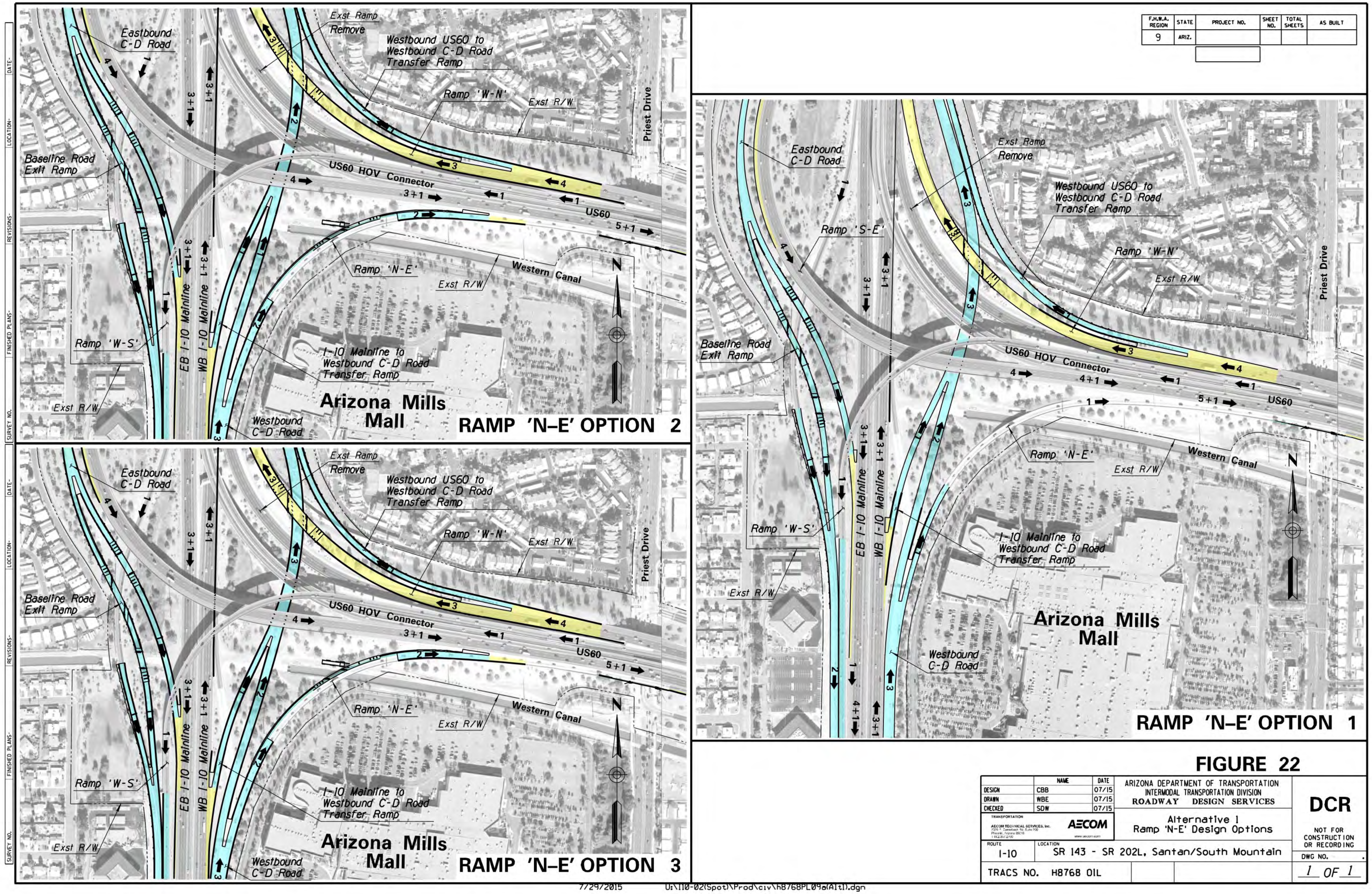
Eastbound C-D Road
Exst Ramp Remove
Westbound US60 to Westbound C-D Road Transfer Ramp
Ramp 'W-N'
Exst R/W
Priest Drive
Baseline Road Exit Ramp
US60 HOV Connector
US60
Ramp 'N-E'
Western Canal
Ramp 'W-S'
EB I-10 Mainline
WB I-10 Mainline
I-10 Mainline to Westbound C-D Road Transfer Ramp
Arizona Mills Mall
Westbound C-D Road
RAMP 'N–E' OPTION 2
RAMP 'N–E' OPTION 3
Ramp 'S-E'
RAMP 'N–E' OPTION 1
FIGURE 22
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Alternative 1
Ramp 'N-E' Design Options
DCR
NOT FOR CONSTRUCTION OR RECORDING
DESIGN CBB 07/15
DRAWN WBE 07/15
CHECKED SOW 07/15
AECOM
ROUTE I-10
LOCATION SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
DWG NO. 1 OF 1
7/29/2015
U:\I10-02(Spot)\Prod\civ\h8768PL09a(Alt1).dgn

3.3.6 Alternative 2, With Westbound C-D Road Option 1

Eastbound I-10 Mainline

The Alternative 2 concept plans are provided in Figure 23 (on pages 123-130). Four existing general-purpose lanes and one HOV lane are provided on the eastbound I-10 mainline approaching Broadway Road. One additional general-purpose lane would be developed south of Broadway Road to provide five general-purpose lanes and one HOV lane approaching the I-10/US60 TI. Traffic on I-10 that is destined for eastbound US 60 (on Ramp ‘S-E’) would depart the I-10 mainline lanes with a three lane exit.

Ramp ‘S-E’ would be developed with a mandatory exit from the outside two lanes, and the third lane designed as an optional lane with the I-10 through movement. Three general-purpose lanes and one HOV lane would continue to the south on I-10 through the I-10/US60 TI. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. HOV traffic that is destined for US 60 would exit I-10 at the existing HOV directional ramp.

A transfer ramp (1 lane) would provide a connection between the eastbound C-D Road and Ramp ‘S-E’ in the vicinity of Fairmont Drive. The transfer ramp lane would merge with Ramp ‘S-E’ (3 lanes) to develop four lanes that continue to the east on US 60. The existing Ramp ‘S-E’ bridge over Southern Avenue would be widened to provide the roadway width necessary to accept the additional lane from the transfer ramp. The existing Ramp ‘S-E’ bridge over I-10 was originally constructed with the roadway width necessary to accept the additional lane from the transfer ramp.

One lane would continue to the south on the eastbound C-D Road between Fairmont Drive and the I-10 entrance ramp. The C-D Road lane would merge with the eastbound I-10 mainline just south of the I-10/US60 TI to develop four general-purpose lanes and one HOV lane that continue to the south.

The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp ‘W-S’) (1 lane) would merge with the Baseline Road exit ramps to develop a combined connector road (3 lanes) approaching the Baseline Road TI. The Baseline Road ramp lanes (2 lanes) would be separated from Ramp ‘W-S’ (1 lane) by a concrete median barrier to eliminate current weaving maneuvers. The Baseline Road exit ramp (2 lanes) would depart the connector road with a two lane mandatory exit. Ramp ‘W-S’ would also be able to access Baseline Road at the exit ramp. Ramp ‘W-S’ would enter the I-10 mainline with a “lane-add” configuration to provide five general-purpose lanes and one HOV lane between Baseline Road and Elliot Road. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Elliot Road exit ramp.

The Elliot Road exit ramp (2 lanes) would be realigned with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. An American Association of State Highway Transportation Officials (AASHTO) lane drop would occur prior to the Elliot Road entrance ramp gore to provide four general-purpose lanes and one HOV lane that would continue to the south between Elliot Road and Ray Road. The Elliot Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Warner Road exit ramp.

The Warner Road exit ramp (2 lanes) would be realigned with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. The Warner Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Ray Road exit ramp.

The Ray Road exit ramp (2 lanes) would be developed as a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. Four general-purpose lanes and one HOV lane would continue to the south to match into the existing I-10 mainline approaching the I-10/SR202L (Santan/South Mountain) TI.

South of Baseline Road, the roadway widening on I-10 would be constructed within the existing right-of-way. The Guadalupe Road, Elliot Road, Warner Road and Ray Road underpasses were originally constructed with sufficient span lengths to support the roadway widening recommended with this alternative.

East of I-10, the US 60 eastbound roadway would be widened to match the existing five general-purpose lanes and one HOV lane between Priest Drive and the Mill Avenue exit ramp. The northbound I-10 to eastbound US 60 (Ramp ‘N-E’) directional ramp (1 lane) would be realigned to develop an additional eastbound general-purpose lane. The Priest Drive entrance ramp would be realigned and merge with eastbound US 60 with a parallel entrance configuration.

Eastbound C-D Road

The existing southbound SR 143 to eastbound I-10 loop ramp (1 lane) would initiate the eastbound C-D Road at Broadway Road. The Broadway Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional C-D Road lane (2 lanes total) that continue to the south.

A transfer ramp would be provided between the eastbound C-D Road and the eastbound US 60 ramp (Ramp ‘S-E’) in the vicinity of Fairmont Drive. The transfer ramp (1 lane) would merge with Ramp ‘S-E’ (3 lanes) to develop four lanes that continue to the east on US 60.

The C-D Road (1 lane) would continue to the south between Fairmont Drive and the I-10 entrance ramp. The C-D Road would merge with the eastbound general-purpose lanes (3 lanes) just south of the I-10/US60 TI to develop four general-purpose lanes and one HOV lane that continue to the south. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. New bridges would be provided for the eastbound C-D Road over Southern Avenue, the Baseline Road exit ramp (from I-10) and the Western Canal.

Westbound I-10 Mainline

The original I-10/SR202L (Santan/South Mountain) TI project widened the westbound I-10 mainline to provide four general-purpose lanes and one HOV lane approaching Ray Road from the south. An AASHTO lane-drop was provided to transition to the existing roadway width of three general-purpose lanes and one HOV lane north of Ray Road.

An additional westbound general-purpose lane would be developed on I-10 by removing the AASHTO lane drop and extending the fourth general-purpose lane to the north. The Ray Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Warner Road exit ramp. Westbound I-10 would include four general-purpose lanes and one HOV lane between Ray and Elliot Roads.

The Warner Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane. The entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Elliot Road exit ramp. The Elliot Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane.

Elliot Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional lane between Elliot Road and Baseline Road. Five general-purpose lanes and one HOV lane would be provided on I-10 approaching the initial westbound C-D Road transfer ramp (and eastbound US 60) near Baseline Road. The Baseline Road exit ramp would be developed with a single-lane tapered exit configuration from the outside general-purpose lane. The initial C-D Road transfer ramp would be developed as a two lane mandatory exit from the outside general-purpose lanes.

Three general-purpose lanes and one HOV lane would continue to the north approaching the I-10/US60 TI. A second C-D Road transfer ramp (1 lane) would be developed immediately south of US 60 to provide additional access to the westbound C-D Road. This ramp would be developed with a tapered exit configuration from the outside general-purpose lane. Three general-purpose lanes and one HOV lane would continue to the north through the I-10/US60 TI.

Four general-purpose lanes, an auxiliary lane and one HOV lane are provided on westbound US 60 west of Mill Avenue. The Priest Drive exit ramp (1 lane) would be reconfigured to a single-lane ramp with a tapered exit from the outside general-purpose lane. The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp ‘W-S’) (1 lane) would be reconfigured with a parallel “left-exit” configuration.

The westbound US 60 to westbound C-D Road ramp (1 lane) would be developed as a mandatory exit from the outside general-purpose lane. Three lanes would continue to the west on Ramp ‘W-N’ to connect to the westbound I-10 mainline.

Ramp ‘W-N’ (3 lanes) would combine with the westbound I-10 general-purpose lanes (3 lanes) to develop six general-purpose lanes and one HOV lane departing I-10/US60 TI. A new bridge would be constructed for Ramp ‘W-N’ over the westbound C-D Road.

The US 60 HOV lane would enter the westbound I-10 mainline and combine with the I-10 HOV lane (from the south) with a parallel entrance configuration. One westbound HOV lane would continue to the west between US 60 and I-17.

Six general-purpose lanes and one HOV lane would depart the I-10/US60 TI. Two lane drops would occur between Alameda Drive and Broadway Road to transition the westbound I-10 mainline to four general-purpose lanes and one HOV lane prior to the Broadway Road underpass.

A C-D Road transfer ramp (1 lane) would be provided north of Broadway Road. The transfer ramp would merge with the I-10 general-purpose lanes with a tapered entrance configuration near 48^{th} Street.

Westbound C-D Road

Travelers destined for the westbound local lanes, or eastbound US 60 (via Ramp ‘N-E’), would depart I-10 just south of Baseline Road. The westbound transfer ramp exit would be developed as a two lane mandatory exit from the outside general-purpose lanes. The existing westbound C-D Road would remain in its current configuration but widened to provide full lane and shoulder widths.

The westbound C-D Road (2 lanes) would continue to the north immediately east of the I-10 mainline. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Ramp ‘N-E’ exit. The Ramp ‘N-E’ exit (1 lane) would depart the westbound C-D Road as a mandatory exit from the auxiliary lane. Two C-D Road lanes would continue to the north.

A second C-D Road transfer ramp (1 lane) would be provided just south of US 60. The transfer ramp would merge with the C-D Road lanes with a “lane-add” configuration. The outside C-D Road lane would terminate prior to the US 60 entrance ramp to develop three lanes approaching Southern Avenue.

The two lanes from I-10 (from the south) would merge with the ramp from westbound US 60 (1 lane) to develop three C-D Road lanes that continue to approximately Alameda Drive. The outside C-D Road lane would then merge with the adjacent lane to develop two C-D Road lanes approaching the I-10/SR 143 TI. A new bridge would be provided for the C-D Road crossing over Southern Avenue.

The westbound I-10 to northbound SR 143 (Ramp ‘W-N’) directional ramp (2 lanes) would be retained in its current configuration. A new C-D Road transfer ramp would be provided north of Broadway Road to allow a connection between the C-D Road and the westbound I-10 mainline near 48^{th} Street.

3.3.7 Alternative 2, With Westbound C-D Road Option 2

Alternative 2, with Westbound C-D Road Option 2 is configured similar to Alternative 2, with Westbound C-D Road Option 1. The outside lane drop on the westbound C-D Road near Alameda Drive would be eliminated to provide a continuous three lane roadway between the I-10/US60 TI and the Broadway Road exit ramp. The Broadway Road exit ramp (1 lane) would be developed as a mandatory exit from the outside C-D Road lane. Two lanes would continue to the north to connect with the I-10/SR143 TI Ramp ‘W-N’.

3.3.8 Alternative 2, With Westbound C-D Road Option 3

Alternative 2, with Westbound C-D Road Option 3 would be configured similar to Alternative 2, with Westbound C-D Road Option 2. Three lanes would be provided between the I-10/US60 TI and the I-10/SR143 TI. The Broadway Road exit ramp would be reconfigured to a tapered exit from the outside lane. The I-10/SR143 TI Ramp 'W-N' (2 lanes) would be configured as a mandatory exit from the outside C-D Road lanes. The left C-D Road lane would continue to develop the transfer ramp to provide a connection to westbound I-10 near 48th Street.

[Text resumes on page 131]

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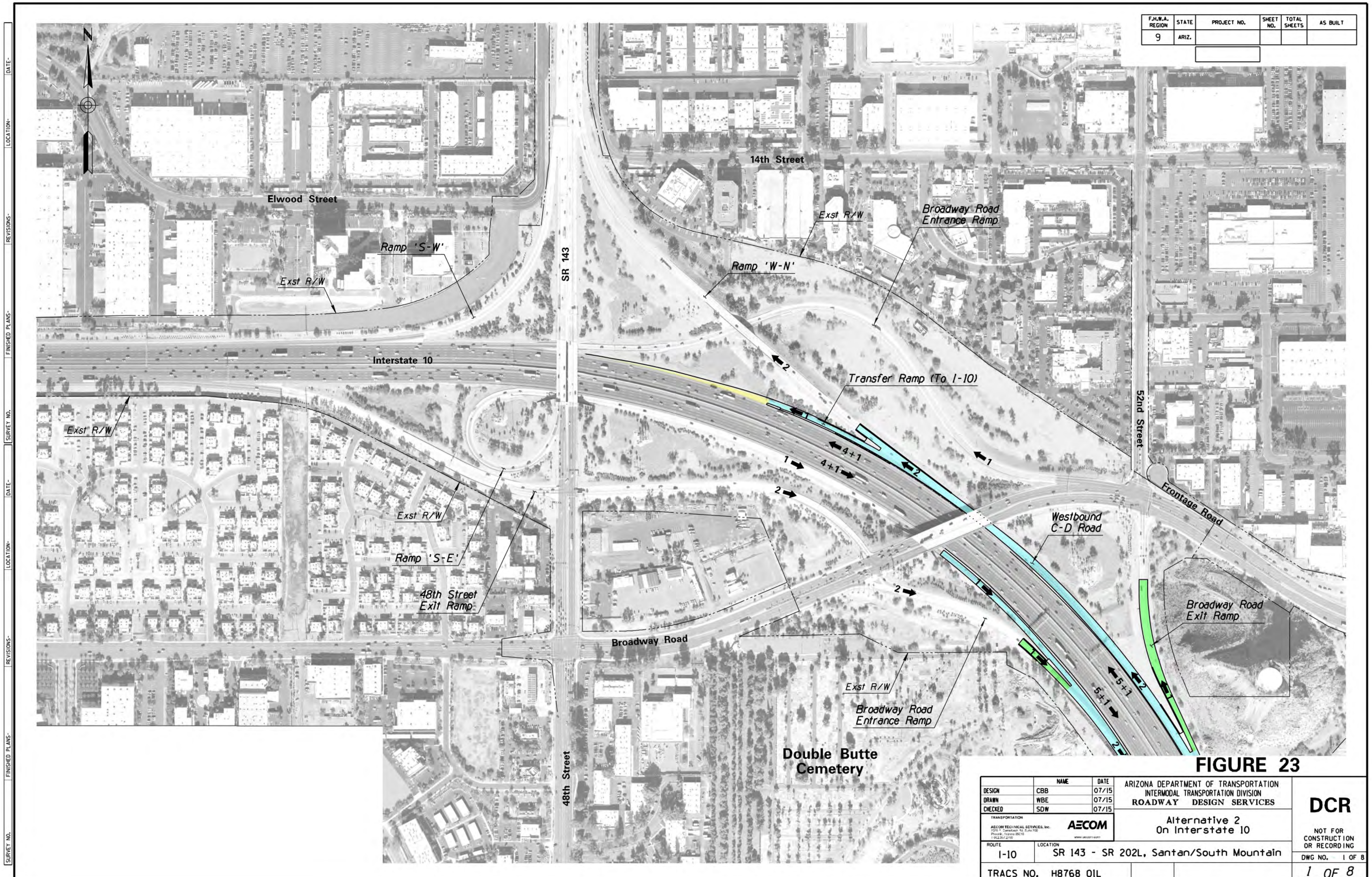
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14th Street
Exst R/W
Broadway Road Entrance Ramp
Ramp 'S-W'
Ramp 'W-N'
SR 143
Interstate 10
Transfer Ramp (To I-10)
52nd Street
Frontage Road
Westbound C-D Road
Ramp 'S-E'
48th Street Exit Ramp
Broadway Road
Broadway Road Exit Ramp
Double Butte Cemetery
48th Street
FIGURE 23
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DCR
Alternative 2 On Interstate 10
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
1 OF 8
7/29/2015
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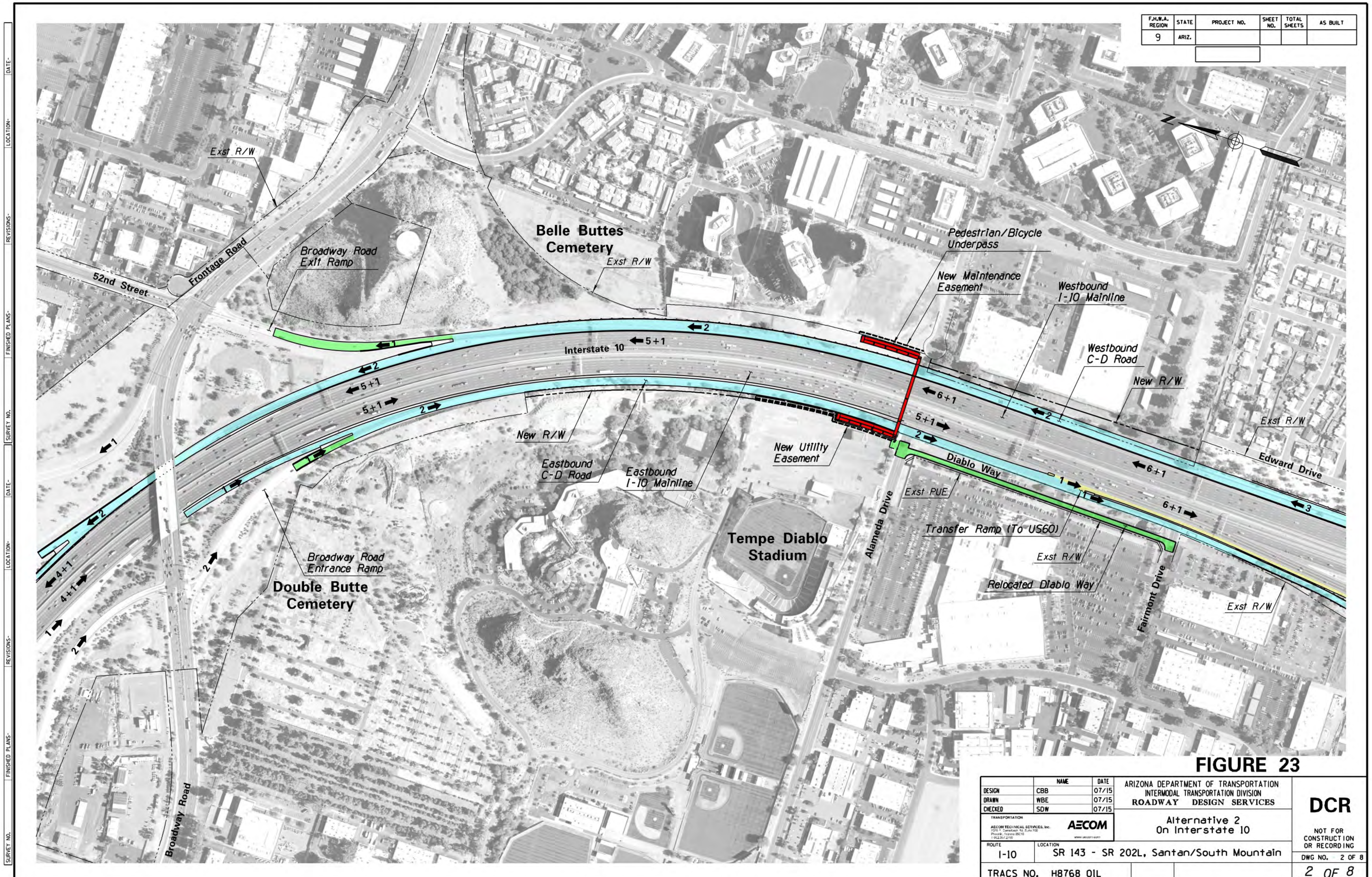
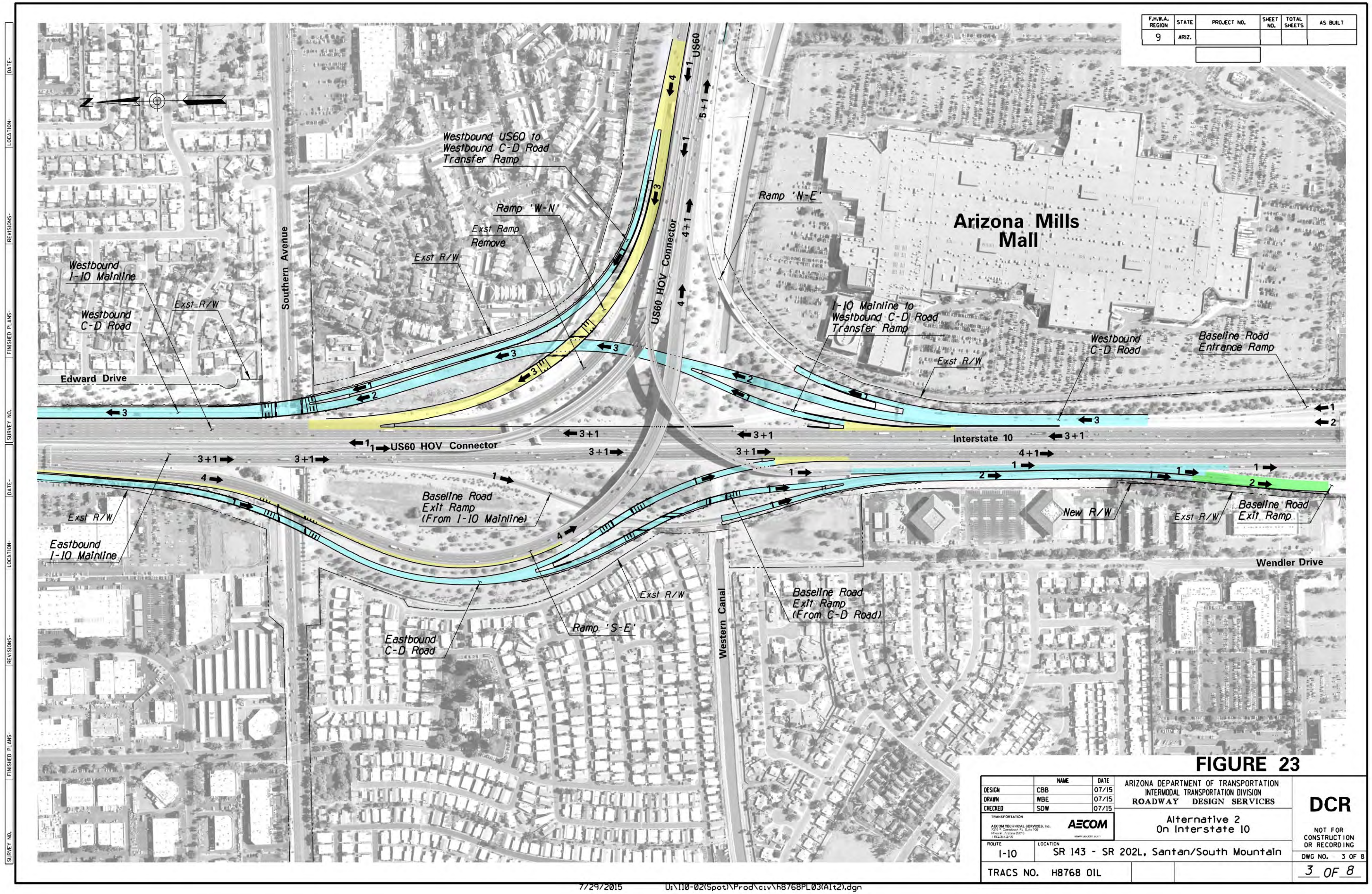

Exst R/W
Broadway Road Exit Ramp
Belle Buttes Cemetery
Frontage Road
52nd Street
Pedestrian/Bicycle Underpass
New Maintenance Easement
Westbound I-10 Mainline
Westbound C-D Road
New R/W
Interstate 10
New R/W
Eastbound C-D Road
Eastbound I-10 Mainline
New Utility Easement
Diablo Way
Edward Drive
Exst PUE
Transfer Ramp (To US60)
Alameda Drive
Tempe Diablo Stadium
Broadway Road Entrance Ramp
Double Butte Cemetery
Relocated Diablo Way
Fairmont Drive
Broadway Road
FIGURE 23
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DCR
Alternative 2
On Interstate 10
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
2 OF 8
7/29/2015


Westbound US60 to Westbound C-D Road Transfer Ramp
Ramp 'W-N'
Exst Ramp Remove
Exst R/W
Westbound I-10 Mainline
Westbound C-D Road
Edward Drive
Southern Avenue
US60 HOV Connector
US60
Ramp 'N-E'
Arizona Mills Mall
I-10 Mainline to Westbound C-D Road Transfer Ramp
Westbound C-D Road
Baseline Road Entrance Ramp
Interstate 10
Baseline Road Exit Ramp (From I-10 Mainline)
Eastbound I-10 Mainline
New R/W
Baseline Road Exit Ramp
Wendler Drive
Baseline Road Exit Ramp (From C-D Road)
Ramp 'S-E'
Eastbound C-D Road
Western Canal
FIGURE 23
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DCR
Alternative 2 On Interstate 10
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
3 OF 8
7/29/2015
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Priest Drive
Avenida Del Yaqui
Baseline Road
Highline Canal
Calle Cerritos
Calle Magdalena
Calle Igleria
Linden Lane
Westbound C-D Road
Baseline Road Entrance Ramp
Exst R/W
Baseline Road Exit Ramp
Calle Bella Vista
Interstate 10
5+1
6+1
3+1
Baseline Road Exit Ramp
Exst R/W
Baseline Road Entrance Ramp
Wendler Drive
Guadalupe Floodwater Retarding Structure
Point Parkway East
FIGURE 23
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DESIGN CBB 07/15
DRAWN WBE 07/15
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AECOM
Alternative 2 On Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
4 OF 8
7/29/2015

FIGURE 23

DESIGN	CBB	07/15
DRAWN	WBE	07/15
CHECKED	SOW	07/15

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

Alternative 2
On Interstate 10

DCR
NOT FOR CONSTRUCTION OR RECORDING

ROUTE I-10 LOCATION SR 143 - SR 202L, Santan/South Mountain

TRACS NO. H8768 01L

DWG NO. 5 OF 8

5 OF 8

7/29/2015 U:\I10-02(Spot)\Prod\civ\h8768PL05(Alt2).dgn

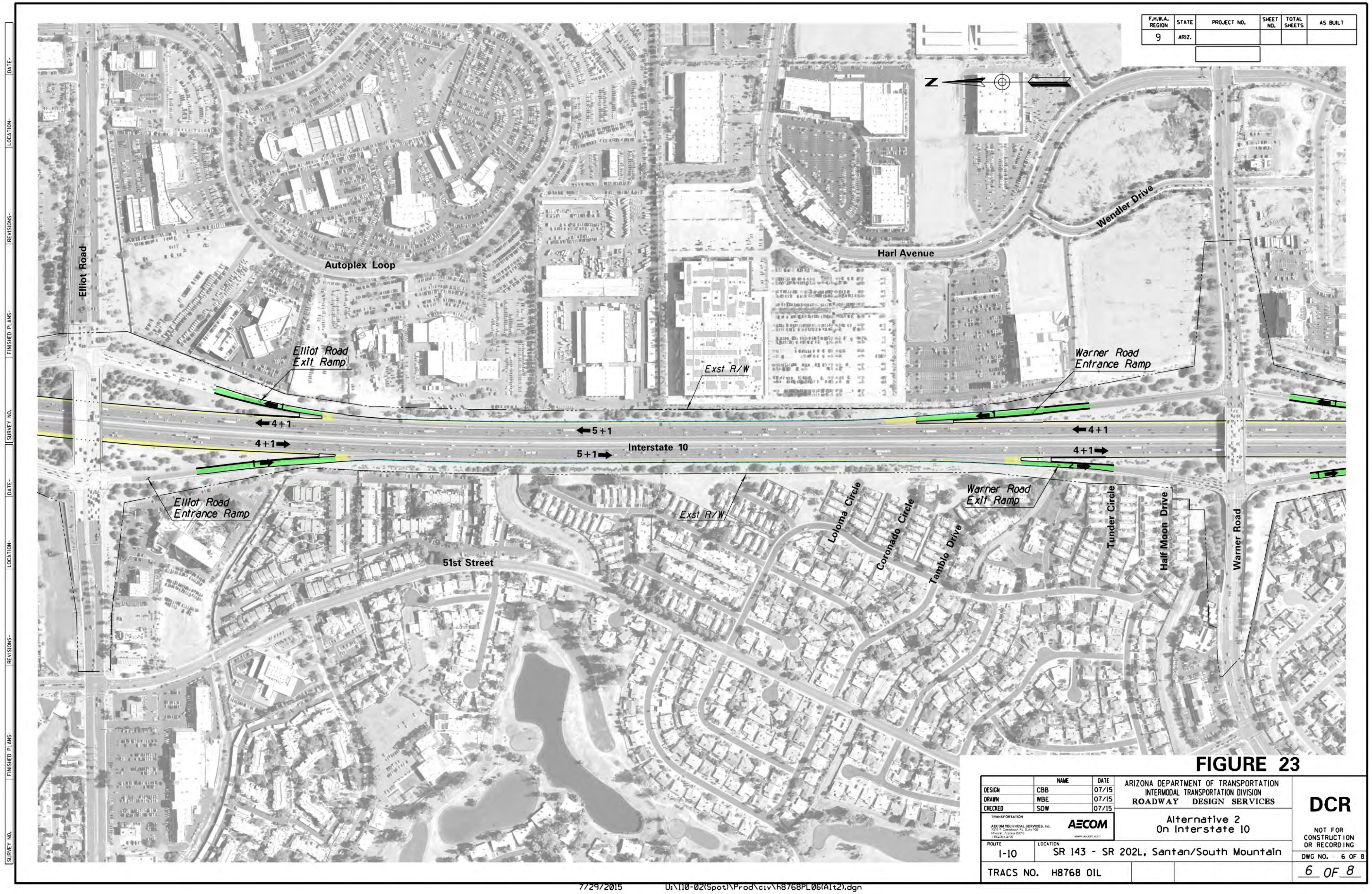
Elliot Road
Autoplex Loop
Harl Avenue
Wendler Drive
Elliot Road Exit Ramp
Exst R/W
Warner Road Entrance Ramp
4+1
5+1
Interstate 10
Elliot Road Entrance Ramp
51st Street
Loloma Circle
Coronado Circle
Tambio Drive
Warner Road Exit Ramp
Tunder Circle
Half Moon Drive
Warner Road
F.H.W.A. REGION 9
STATE ARIZ.
PROJECT NO.
SHEET NO.
TOTAL SHEETS
AS BUILT
DESIGN CBB 07/15
DRAWN WBE 07/15
CHECKED SDW 07/15
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
AECOM
Alternative 2
On Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
ROUTE I-10
LOCATION SR 143 - SR 202L, Santan/South Mountain
DWG NO. 6 OF 8
TRACS NO. H8768 01L
6 OF 8
7/29/2015
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FIGURE 23

FIGURE 23

	NAME	DATE
DESIGN	CBB	07/15
DRAWN	WBE	07/15
CHECKED	SDW	07/15

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

Alternative 2
On Interstate 10

DCR

NOT FOR CONSTRUCTION OR RECORDING

ROUTE I-10 LOCATION SR 143 - SR 202L, Santan/South Mountain

DWG NO. 7 OF 8

TRACS NO. H8768 01L

7 OF 8

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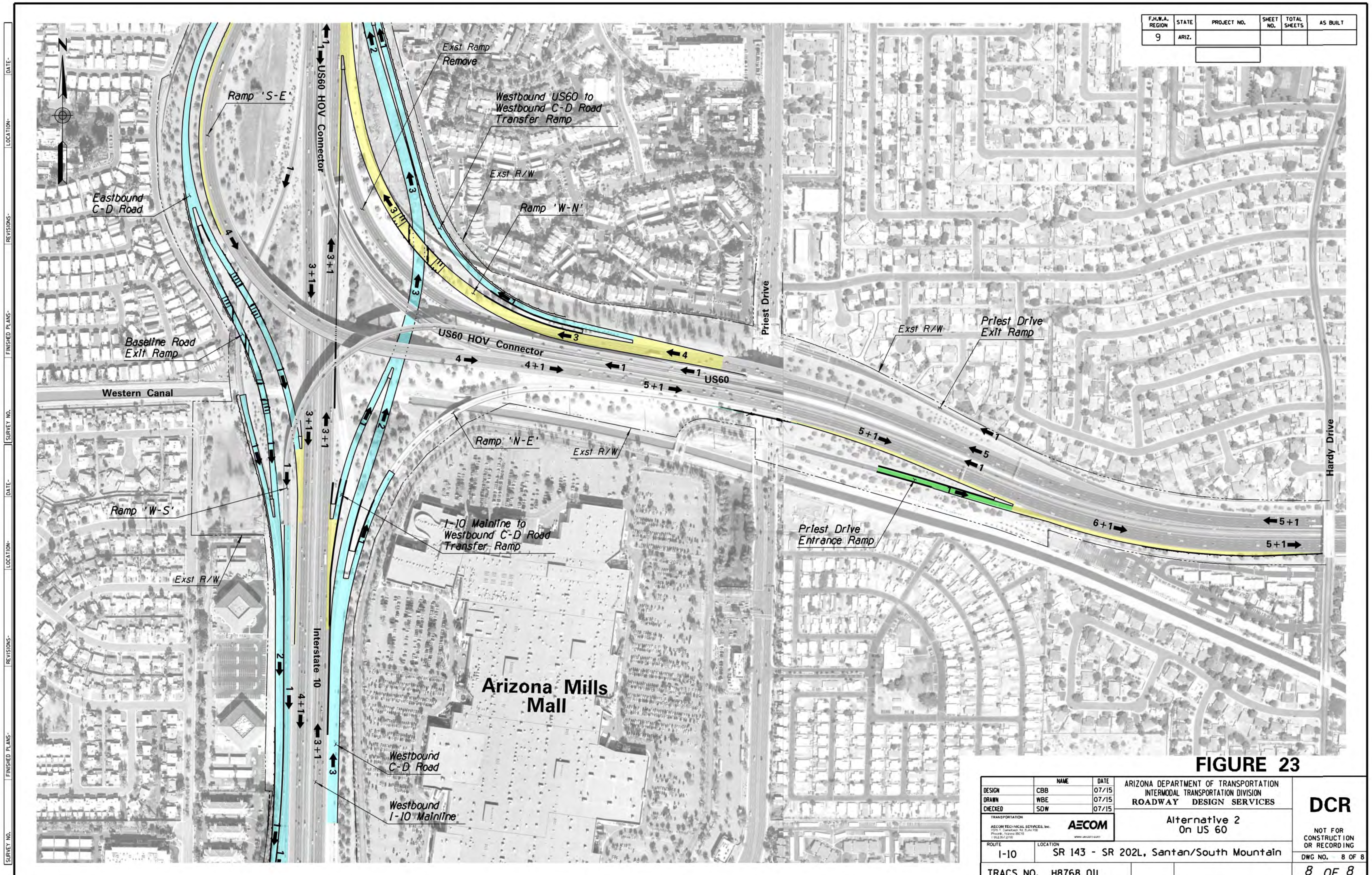

FIGURE 23

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

	NAME	DATE
DESIGN	CBB	07/15
DRAWN	WBE	07/15
CHECKED	SOW	07/15

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DCR

Alternative 2
On US 60

NOT FOR CONSTRUCTION OR RECORDING

ROUTE I-10 LOCATION SR 143 - SR 202L, Santan/South Mountain

DWG NO. 8 OF 8

TRACS NO. H8768 01L

8 OF 8

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3.4 EVALUATION OF THE DESIGN CONCEPT ALTERNATIVES

3.4.1 Introduction

The No-Build and Build alternatives were evaluated in terms of their technical merits and environmental impacts when compared with the evaluation criteria.

3.4.2 No-Build Alternative

The following is a summary of the No-Build Alternative when compared to the evaluation criteria:

- Conformance with Adopted Regional Transportation Plans: This alternative does not achieve the goals and objectives of the voter approved Regional Transportation Plan.
- Traffic Operational Performance: This alternative results in the lowest performing traffic operations as discussed in Chapter 2.0. The freeway currently operates at deficient levels-of-service during the A.M. and P.M. peak travel periods and will continue to degrade over time to cause severe congestion throughout the study area in the A.M. and P.M. peak travel periods.
- Ability to Achieve Engineering Standards: This alternative does not include any changes to the existing roadways, which would remain in their current configurations.
- Right-of-Way and Utility Impacts: This alternative does not result in any right-of-way or utility impacts.
- Environmental Considerations: This alternative would result in the fewest environmental impacts However, with increased congestion levels, the potential for higher levels of mobile source air toxins would increase.

Based on the evaluation of the traffic operational performance of the existing roadway, and the non-conformance with the RTP, the No-Build Alternative has been determined to be inadequate and was eliminated from further consideration.

3.4.3 Build Alternative 1, With Ramp ‘N-E’ Option 1

Evaluation of Alternative

The following is a summary of Alternative 1 (with Ramp ‘N-E’ Design Option 1) when compared to the evaluation criteria.

- Conformance with Adopted Regional Transportation Plans: This alternative is consistent with the goals and objectives of the voter-approved Regional Transportation Plan. This alternative would add freeway capacity along I-10 throughout the study area.
- Traffic Operational Performance:

  Based on the operational analysis conducted with this alternative, congestion (LOS ‘E’ or ‘F’) would be anticipated to occur at the following locations in each of the Design Years evaluated for this project:

  - A.M. Peak Hour:
    - Westbound I-10 between the Broadway Road entrance ramp and the Broadway Road exit ramp (after the second lane-drop on the mainline)(Years 2030, 2035)
    - Westbound I-10 between the Elliot Road exit ramp and the Warner Road exit ramp (Years 2025, 2030, 2035)
  - P.M. Peak Hour:
    - Westbound I-10 between the Baseline Road exit ramp and the Elliot Road entrance ramp (Years 2030, 2035)
    - Eastbound C-D Road between the I-10 entrance and SR 143 (Years 2020, 2025, 2030, 2035)
    - Southbound SR 143 between the I-10/SR143 TI Ramp ‘W-S’ and the north study limit (Years 2020, 2025, 2030, 2035)
    - Westbound US 60 at Mill Avenue (Years 2025, 2030, 2035)
    - I-10/US60 TI Ramp ‘W-S’ (Years 2020, 2025, 2030, 2035)
    - I-10/US60 TI Ramp ‘N-E’ (Years 2020, 2025, 2030, 2035)

  A significant benefit would be provided on the I-10 and US 60 mainlines with the implementation of Alternative 1. The I-10 mainline general-purpose lanes would operate at LOS ‘D’ or better within the limits of the C-D Roads at the Broadway Curve for all design years. Due to the elimination of the current “bottleneck” at the Broadway Curve, the segments of I-10 and US 60 approaching the Broadway Curve would also experience LOS ‘D’ or better until approximately Year 2025, where some congestion would occur on westbound I-10 near Broadway Road, westbound I-10 approaching the new C-D Road exit, and on westbound US 60 at Mill Avenue.

  The eastbound C-D Road and southbound SR 143 would experience congestion throughout the study period during the P.M. peak hour. Potential capacity improvements for this traffic movement will be evaluated with the I-10/I-17 Corridor Master Plan study.

  The Ramp ‘N-E’ Design Option 1 would continue to experience congestion on Ramp ‘N-E’ in the future since the existing single-lane ramp configuration would be retained with this option.

- Ability to Achieve Engineering Standards: Alternative 1 would generally achieve the requirements of the AASHTO and ADOT RDG design standards and current design practice.

  However, the westbound “C-D Road to I-10 Mainline” transfer ramp connection to I-10 would occur immediately downstream of the I-10/US60 TI Ramp ‘W-N’ entrance. The location of this transfer ramp would require the Ramp ‘W-N’ outside lane to merge into the adjacent lane (lane-drop) prior to the C-D Road transfer ramp entrance. Two additional lane-drops would then occur between the C-D Road transfer ramp and Broadway Road (3 lane-drops between the I-10/US60 TI and Broadway Road). This roadway configuration would be undesirable when compared to Alternative 2.

The configuration of the westbound C-D Road approaching the I-10/US60 TI Ramp ‘N-E’ would continue with Ramp ‘N-E’ (1 lane) departing the C-D Road with a mandatory exit from the auxiliary lane. This exit configuration would be undesirable because it currently requires all traffic on the C-D Road (from westbound I-10) that is destined for eastbound US 60 to make a minimum of one lane change (to the right) to access Ramp ‘N-E’. This travel maneuver conflicts with travelers entering the C-D Road from Baseline Road (that are destined to westbound I-10) that are required to make one lane change (to the left) to continue to the west on the C-D Road. This lane configuration is currently undesirable and would not be recommended to be carried forward into the future.

- Right-of-Way and Utility Impacts: The estimated land acquisition required for this alternative would be 2.73 acres, with an estimated cost of $10 million.

  This alternative would avoid impacting the Fairmont Commerce Center property and minimize the impacts to the Tempe Diablo Stadium parking lot. Alternative 1 would also avoid the existing public utility corridor adjacent to the existing west I-10 right-of-way between Fairmont Drive and Southern Avenue.

- Environmental Considerations: No fatal flaw environmental issues have been identified with this alternative. New noise walls would be placed at locations warranted by the noise technical study.

- Agency and Public Acceptance: Since the westbound “C-D Road to I-10 Mainline” transfer ramp would be located between the I-10/US60 TI and Broadway Road, the lane configuration on westbound I-10 departing the I-10/US60 TI would not maintain lane continuity in accordance with current ADOT design practice. Therefore, the agency stakeholders did not support this alternative.

Recommendation

Alternative 1 would not meet current ADOT design practice for lane balance and lane continuity on westbound I-10 departing the I-10/US60 TI, and did not obtain agency support. The project team recommends this alternative be eliminated from further consideration.

The I-10/US60 TI Ramp ‘N-E’ Option 1 is recommended to be eliminated from further consideration because it would remain a single lane ramp, and the approach roadway configuration on the westbound C-D Road would retain the inefficient “double weave” traffic maneuvers approaching the Ramp ‘N-E’ exit.

3.4.4 Build Alternative 1, With Ramp ‘N-E’ Option 2

The evaluation of the overall Alternative 1 configuration was previously discussed in Section 3.4.3. This section will evaluate Ramp ‘N-E’ Option 2.

Evaluation of Ramp ‘N-E’ Option 2

The following is a summary of Ramp ‘N-E’ Option 2 when compared to the evaluation criteria.

- Conformance with Adopted Regional Transportation Plans: This alternative is consistent with the goals and objectives of the voter-approved Regional Transportation Plan. This alternative would add freeway capacity along I-10 throughout the study area.

- Traffic Operational Performance: Based on the operational analysis conducted with this design option, the anticipated level-of-service on Ramp ‘N-E’ would improve when compared with Design Option 1. However, congestion would be anticipated to occur on the westbound C-D Road between the westbound US60 ramp entrance and the I-10 “Mainline to C-D Road” transfer ramp in Years 2030 and 2035. The congestion is due to providing only 1 C-D Road lane north of the Ramp ‘N-E’ exit.

- Ability to Achieve Engineering Standards: Ramp ‘N-E’ Option 2 would generally achieve the requirements of the AASHTO and ADOT RDG design standards and current design practice in the vicinity of the westbound C-D Road. The configuration of the Ramp ‘N-E’ exit from the westbound C-D Road would be preferred over Option 1 since traffic on the C-D Road would not be required to make a lane change to access eastbound US 60 (via Ramp ‘N-E’).

  The modified Ramp ‘N-E’ (2 lanes) entrance onto eastbound US 60 would occur with a parallel entrance configuration that transitions into two additional general-purpose lanes on the eastbound US 60 mainline. Ramp ‘S-E’ would be reconfigured to merge the outside Ramp ‘S-E’ lane into the adjacent lane (lane drop) prior to the Ramp ‘N-E’ gore. This roadway configuration on Ramp ‘S-E’ would not achieve current ADOT design practice for lane continuity departing a system interchange.

  The configuration of the westbound C-D Road approaching Ramp ‘N-E’ would be modified with Ramp ‘N-E’ (2 lanes) departing the C-D Road with a mandatory exit from the outside lanes. This exit configuration would be undesirable because it would require all traffic on the C-D Road (from Baseline Road) that is destined for westbound I-10 to make a minimum of two lane changes (to the left) to access the C-D Road. This lane configuration would be undesirable and would not be recommended to be carried forward into the future.

- Right-of-Way and Utility Impacts: Ramp ‘N-E’ Option 2 would be similar to Option 1.

- Environmental Considerations: Ramp ‘N-E’ Option 2 would be similar to Option 1.

- Agency Acceptance: The local agencies did not support this design option because Ramp ‘S-E’ would not maintain lane continuity on this high volume directional ramp. The C-D Road roadway configuration approaching Ramp 'N-E' would also provide inefficient operations by only providing one C-D Road lane north of the Ramp 'N-E' exit, and requiring travelers entering from Baseline Road to make two lane changes (to the left) to continue on the C-D Road.

Recommendation

Ramp 'N-E' Option 2 would not meet current design practice for lane continuity on Ramp 'S-E' departing the I-10/US60 TI and would develop additional congestion on the westbound C-D Road north of the Ramp 'N-E' exit. Therefore, the project team recommends this Ramp 'N-E' Option 2 be eliminated from further consideration.

3.4.5 Build Alternative 1, With Ramp 'N-E' Option 3

The evaluation of the overall Alternative 1 configuration was previously discussed in Section 3.4.3. This section will evaluate Ramp 'N-E' Option 3.

Evaluation of Alternative

The following is a summary of Ramp 'N-E' Option 3 when compared to the evaluation criteria.

- Conformance with Adopted Regional Transportation Plans: This alternative is consistent with the goals and objectives of the voter-approved Regional Transportation Plan. This alternative would add freeway capacity along I-10 throughout the study area.

- Traffic Operational Performance: Based on the operational analysis conducted with this design option, the anticipated level-of-service on Ramp 'N-E' would improve when compared with Option 1 and on the westbound C-D Road when compared with Option 2.

- Ability to Achieve Engineering Standards: Ramp 'N-E' Option 3 would generally achieve the requirements of the AASHTO and ADOT RDG design standards and current design practice in the vicinity of the westbound C-D Road. The configuration of the Ramp 'N-E' exit from the westbound C-D Road would be preferred over Option 1 and Option 2 since traffic on the C-D Road would not be required to weave to the adjacent lane to access eastbound US 60, Baseline Road traffic destined for I-10 would only have to make 1 lane change (to the left) to access the C-D Road, and two C-D Road lanes would continue to the north through the I-10/US60 TI.

  The modified Ramp 'N-E' (2 lanes) entrance onto eastbound US 60 would occur with a parallel entrance configuration that transitions into two additional general-purpose lanes on the eastbound US 60 mainline. Ramp 'S-E' would be reconfigured to merge the outside ramp lane into the adjacent lane (lane drop) prior to the Ramp 'N-E' gore. This roadway configuration on Ramp 'S-E' would not achieve current design practice for the roadways departing a system interchange.

- Right-of-Way and Utility Impacts: Ramp 'N-E' Option 3 would be similar to Options 1 and 2.

- Environmental Considerations: Ramp 'N-E' Option 3 would be similar to Options 1 and 2.

- Agency and Public Acceptance: The local agencies did not initially support this design option because Ramp 'S-E' would not maintain lane continuity on this high volume directional ramp. The stakeholder agencies did support the lane configurations on the westbound C-D Road and the Ramp 'N-E' exit.

Recommendation

Ramp 'N-E' Option 3 would meet current design practice for lane continuity on Ramp 'S-E' departing the I-10/US60 TI. Since the fourth ramp lane is developed from the eastbound C-D Road transfer ramp, the outside lane would function as a parallel entrance that merges into the adjacent travel lane prior to the Ramp 'N-E' gore. The Ramp 'N-E' Option 3 is recommended for further consideration.

3.4.6 Build Alternative 2, With Westbound C-D Road Option 1

Evaluation of Alternative

The following is a summary of Alternative 2 (with Westbound C-D Road Option 1) when compared to the evaluation criteria.

- Conformance with Adopted Regional Transportation Plans: This alternative is consistent with the goals and objectives of the voter-approved Regional Transportation Plan. This alternative would add freeway capacity along I-10 throughout the study area.

- Traffic Operational Performance:

  Based on the operational analysis conducted with this alternative, congestion (LOS 'E' or 'F') would be anticipated to occur at the following locations in each of the Design Years evaluated for this project:

  - A.M. Peak Hour:
    - Westbound C-D Road from the Broadway Road exit ramp to the I-10 "Mainline to C-D Road" transfer ramp (Year 2025)
    - Westbound I-10 between the I-10 "Mainline to C-D Road" transfer ramp to the Baseline Road exit ramp (Year 2025)
    - Westbound I-10 between the Elliot Road exit ramp and the Warner Road exit ramp (Year 2025)

- P.M. Peak Hour:
  - Eastbound C-D Road between the I-10 entrance and SR 143 (Year 2025)
  - Southbound SR 143 between the I-10/SR143 TI Ramp 'W-S' and the north study limit (Year 2025)
  - Westbound US 60 at Mill Avenue (Year 2025)
  - I-10/US60 TI Ramp 'W-S' (Year 2025)
  - I-10/US60 TI Ramp 'N-E' (Year 2025)

Beginning with the 2025 A.M. peak hour, significant congestion would be anticipated to occur on the westbound C-D Road. Vehicle queuing on the C-D Road would be expected to extend from the Broadway Road exit ramp onto the I-10 mainline, and on the I-10 mainline to the Baseline Road exit ramp. Therefore Alternative 2, with Westbound C-D Road Option 1 would not achieve the traffic operational goals established for the project and was eliminated from further consideration.

For this reason two additional westbound C-D Road options were developed with Alternative 2 to increase the capacity of the westbound C-D Road to attempt to eliminate the congestion between Broadway Road and the I-10/US60 TI.

3.4.7 Build Alternative 2, With Westbound C-D Road Option 2

Evaluation of Alternative

The following is a summary of Alternative 2 (with Westbound C-D Road Option 1) when compared to the evaluation criteria.

- Conformance with Adopted Regional Transportation Plans: This alternative is consistent with the goals and objectives of the voter-approved Regional Transportation Plan. This alternative would add freeway capacity along I-10 throughout the study area.

- Traffic Operational Performance:

  Based on the operational analysis conducted with this alternative, congestion (LOS 'E' or 'F') would be anticipated to occur at the following locations in each of the Design Years evaluated for this project:

  - A.M. Peak Hour:
    - Westbound I-10 between the Elliot Road exit ramp and the Warner Road exit ramp (Year 2025, 2030)
    - Westbound I-10 between the Elliot Road exit ramp and the Ray Road entrance (Year 2035)
  - P.M. Peak Hour:
    - Eastbound C-D Road between the I-10 entrance and SR 143 (Year 2020, 2025, 2030, 2035)
    - Southbound SR 143 between the I-10/SR143 TI Ramp 'W-S' and the north study limit (Year 2020, 2025, 2030, 2035)
    - Westbound US 60 at Mill Avenue (Year 2025, 2030, 2035)
    - I-10/US60 TI Ramp 'W-S' (Year 2020, 2025, 2030, 2035)
    - I-10/US60 TI Ramp 'N-E' (Year 2020, 2025, 2030, 2035)

  A significant benefit would be provided on the I-10 and US 60 mainlines with the implementation of Alternative 2, Westbound C-D Road Option 2. The I-10 mainline general-purpose lanes would operate at LOS 'D' or better within the limits of the C-D Roads at the Broadway Curve for all design years. Due to the elimination of the current "bottleneck" at the Broadway Curve, the segments of I-10 and US 60 approaching the Broadway Curve would also experience LOS 'D' or better until approximately Year 2025, where some congestion would occur on westbound I-10 approaching the new C-D Road exit, and on westbound US 60 at Mill Avenue.

  The eastbound C-D Road and southbound SR 143 would experience congestion throughout the study period during the P.M. peak hour. Potential capacity improvements for this traffic movement will be evaluated with the I-10/I-17 Corridor Master Plan study.

- Ability to Achieve Engineering Standards: Alternative 2 would achieve the requirements of the AASHTO and ADOT RDG design standards and current design practice.

- Right-of-Way and Utility Impacts: The estimated land acquisition required for this alternative would be 2.73 acres, with an estimated cost of $10 million.

  This alternative would avoid impacting the Fairmont Commerce Center property and minimize the impacts to the Tempe Diablo Stadium parking lot. Alternative 2 would also avoid the existing public utility corridor adjacent to the existing west I-10 right-of-way between Fairmont Drive and Southern Avenue.

- Environmental Considerations: No fatal flaw environmental issues have been identified with this alternative. New noise walls would be placed at locations warranted by the noise technical study.

- Agency and Public Acceptance: Since the westbound C-D Road would operate with LOS 'D' or better traffic operations, the agency stakeholders supported this alternative and C-D Road design option.

Recommendation

Alternative 2, with Westbound C-D Road Option 2 would meet the traffic current design practice and would provide a significant benefit to the traffic operations on I-10 and US 60. The project team recommends this scenario be selected as the Recommended Alternative.

3.4.8 Build Alternative 2, With Westbound C-D Road Option 3

Build Alternative 2, with Westbound C-D Road Option 3 is similar to Build Alternative 2, with Westbound C-D Road Option 2 for all of the evaluation criteria. However, Design Option 3 would extend three lanes on the westbound C-D Road from the Broadway Road exit ramp to the I-10/SR143 TI Ramp 'W-N'. The existing east span of the Broadway Road underpass includes a span length that would only support a two lane roadway. Therefore, Option 3 was eliminated from further consideration.

3.5 INITIAL AGENCY ALTERNATIVES SCREENING MEETING

Representatives of the consultant team, ADOT, MAG and the FHWA met on May 14, 2015 to discuss the alternatives and confirm an initial recommendation for the Recommended Alternative. After discussion, the agency representatives unanimously concurred with the recommendation of Alternative 2 (Westbound C-D Road Option 2) as the Recommended Alternative. Additional design features included with the Recommended Alternative would include the following:

- I-10/US60 TI Ramp 'N-E' Option 3 (Modified): Ramp 'N-E' would depart the westbound C-D Road with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the C-D Road through movement. Two C-D lanes would continue to the north. Ramp 'N-E' (2 lanes) would continue on the ramp and enter eastbound US 60 with a "lane-add" configuration.

- Eastbound Warner Road and Ray Road Exit Ramps: The Warner Road and Ray Road exit ramps (1 lane) would be designed with a parallel exit configuration with a mandatory exit from the auxiliary lane.

- I-10/US60 TI Ramp 'W-S' Exit: The I-10/US60 TI Ramp 'W-S' exit would be configured as a mandatory "left-exit" from the inside general-purpose lane (match the existing condition).

- The 4' wide HOV buffer would be eliminated on eastbound I-10 between the I-10/US60 TI and Ray Road, and on westbound I-10 throughout the study limits.

3.6 FINAL AGENCY ALTERNATIVE SELECTION MEETING

Representatives of the consultant team, ADOT, MAG and the FHWA met on October 8, 2015 to discuss potential refinements to the Recommended Alternative that should be considered for inclusion with the Preferred Alternative. Additional design features the meeting participants determined should be included with the Preferred Alternative include the following:

- Westbound C-D Road Entrance Ramp to I-10 (near 48th Street): The westbound C-D Road entrance ramp (1 lane) would be reconfigured to a "lane-add" design that would provide one additional travel lane on the westbound I-10 mainline that would continue to the west and connect to the existing westbound general-purpose lanes near 36th Street. The median shoulder, HOV lane, and general-purpose lane widths would be reduced to match the existing roadway configuration west of 36th Street.

- Westbound Baseline Road Exit Ramp: The westbound Baseline Road exit ramp would be modified to provide a parallel exit configuration.

3.7 AGENCY COORDINATION MEETINGS

The Project Team has been meeting regularly with representatives of ADOT; FHWA; MAG; Maricopa County; the Town of Guadalupe; and the cities of Phoenix, Tempe and Chandler. The Preferred Alternative includes a plan that is supported by each of these agencies.

4.0 MAJOR DESIGN FEATURES OF THE PREFERRED ALTERNATIVE

4.1 INTRODUCTION

This section describes the design controls and design features for the Preferred Alternative and the associated system and service interchanges within the study limits.

4.2 DESIGN CRITERIA

I-10 is classified as a controlled access Urban Principal – Interstate. A summary of the design controls for the I-10 mainline is provided in Table 22.

Table 22 – Design Controls for the I-10 Mainline

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2035
Design Speed:	65 mph
Superelevation:	Match existing (0.10 ft./ft. maximum)
Cross Slope:	2.0%
Lane Width:	12 ft.
Shoulder Width:	
- Median:	12 ft.
- Outside:	12 ft. (minimum)
HOV Buffer Width:	N/A
Maximum Horizontal Curve:	4 degree, 16 minutes (for 10% superelevation)
Maximum Gradient:	Not applicable, match existing
Taper Rate:	65:1
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.
- Railroad overpass:	23.5 ft.

New Collector-Distributor (C-D) Roads would parallel the I-10 mainline between Broadway Road and Baseline Road. The design criterion for the C-D Roads is provided in Table 23.

Table 23 – Design Controls for Collector-Distributor (C-D) Roads

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2035
Design Speed:	55 mph
Superelevation:	0.06 ft./ft. maximum
Cross Slope:	2.0%
Lane Width:	12 ft.
Shoulder Width:	
- Left shoulder:	4 ft., plus 2 ft. offset to barrier (minimum)
- Right shoulder:	10 ft.
Maximum Horizontal Curve:	5 degree, 24 minutes
Maximum Gradient:	Not applicable, match existing
Taper Rate:	55:1
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

US 60 is classified as a controlled access Urban Principal Arterial – Other Freeway. A summary of the design controls for US 60 is provided in Table 24.

Table 24 – Design Controls for US 60

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2035
Design Speed (Existing):	Match existing (60 mph – east of Hardy Drive)
Superelevation:	Match existing (0.06 ft./ft. maximum)
Cross Slope:	2.0%
Lane Width:	12 ft.
Shoulder Width:	
- Median:	10 ft.
- Outside:	12 ft.
HOV Buffer Width:	N/A
Maximum Horizontal Curve:	4 degree, 18 minutes
Maximum Gradient:	Not applicable, match existing
Taper Rate:	60:1
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

A summary of the design controls for the system interchange ramp and C-D Road transfer ramps is provided in Table 25 (on page 137).

Table 25 – Design Controls for System Interchange and Transfer Ramps

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2035
Design Speed:	
- To I-10 Mainline	55 mph
- From I-10 Mainline	55 mph
- US 60 Ramp 'W-N'	55 mph
- WB CD Ramp 'T-2'	50 mph
- Existing Ramps to Remain	
• US 60 Ramp 'S-E'	50 mph
• US 60 Ramp 'N-E'	50 mph
• US 60 Ramp 'W-S'	45 mph
• US 60 HOV Ramp	55 mph
Superelevation:	
- New Ramps	0.06 ft/ft maximum (or match existing pavement)
- Existing Ramps to Remain	
• US 60 Ramp 'S-E'	Match existing (0.10 ft./ft. maximum)
• US 60 Ramp 'N-E'	Match existing (0.10 ft./ft. maximum)
• US 60 Ramp 'W-S'	Match existing (0.10 ft./ft. maximum)
• US 60 HOV Ramp	Match existing (0.08 ft./ft. maximum)
Pavement Width:	
- Single Lane Ramp	28 ft. (or match existing)
- Two Lane Ramps	
• Directional ramp	36 ft., plus 2 ft. offset to barrier
• Transfer ramp	36 ft., plus 2 ft. offset to barrier (or match existing)
- Three Lane Ramps	48 ft., plus 2 ft. offset to barrier (or match existing)
- Four Lane Ramps	60 ft., plus 2 ft. offset to barrier (or match existing)
Lane Width:	12 ft.
Shoulder Width:	
- Directional Ramps	
• Inside shoulder	4 ft., plus 2 ft. offset to barrier (or match existing)
• Outside shoulder	8 ft., plus 2 ft. offset to barrier (or match existing)
- Transfer Ramps	
• Inside shoulder	4 ft.
• Outside shoulder	8 ft.
Maximum Horizontal Curvature:	Varies based on design speed and superelevation
Maximum Gradient:	+4%, -5%
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure	16.5 ft.
- Pedestrian overpass	17.5 ft.

A summary of design controls for the service interchange ramps is provided in Table 26.

Table 26 – Design Controls for Service Interchange Ramps

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2035
Design Speed:	
- Nose of gore (exit ramps):	55 mph (with C-D Roads) 60 mph (with I-10 Mainline)
- Nose of gore (entrance ramps):	50 mph (with C-D Roads) 55 mph (with I-10 Mainline)
- Ramp body:	50 mph
- Ramp terminal:	35 mph
Superelevation:	0.06 ft./ft. maximum
Pavement Width:	
- Single lane exit ramp:	22 ft., plus 2 ft. offset to barrier
- Two lane exit ramp:	34 ft., plus 2 ft. offset to barrier
- Entrance ramp:	28 ft., plus 2 ft. offset to barrier
Lane Width:	12 ft.
Maximum Horizontal Curve:	6 degree, 53 minute
Maximum Gradient:	+4%, -5%, +/- 3% at crossroad
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

The local arterial streets will be designed in accordance with the local jurisdiction functional classification requirements.

4.3 DESCRIPTION OF THE PREFERRED ALTERNATIVE

The Preferred Alternative was developed to provide additional capacity on the I-10 mainline needed for the future projected travel demand, conform to established geometric design standards and current design practice, and minimize right-of-way and environmental impacts to the adjacent community. The Preferred Alternative is depicted on Figure 24 (on pages 140-147). Detailed roadway plans are provided in Appendix H. Design year (2020, 2025, 2030, 2035) traffic volume projections, lane diagrams, and level-of-service analysis results are included in Appendix G.

The Preferred Alternative would include the use of collector-distributor (C-D) roads to reconfigure the interchange ramps between the I-10/SR143 TI and the I-10/US60 TI to separate the ramp traffic from the I-10 mainline traffic, thereby eliminating the current weaving maneuvers that contribute to severe congestion on the Broadway Curve during the peak travel periods. Additional general-purpose lanes would be provided on eastbound and westbound I-10 between Baseline Road and Ray Road. Auxiliary lanes would be provided in each direction between successive entrance and exit ramps.

Eastbound I-10 Mainline

Four existing general-purpose lanes and one HOV lane are provided on the eastbound I-10 mainline approaching Broadway Road. One additional general-purpose lane would be developed south of Broadway Road to provide five general-purpose lanes and one HOV lane approaching the I-10/US60 TI. Traffic on I-10 that is destined for eastbound US 60 (on Ramp 'S-E') would depart the I-10 mainline lanes with a three lane exit. Ramp 'S-E' would be developed with a mandatory exit from the outside two lanes, and the third lane designed as an optional lane with the I-10 through movement. Three general-pupose lanes and one HOV lane would continue to the south on I-10 through the I-10/US60 TI. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. HOV traffic that is destined for US 60 would exit I-10 at the existing HOV directional ramp.

A transfer ramp (1 lane) would provide a connection between the eastbound C-D Road and Ramp 'S-E' in the vicinity of Fairmont Drive. The transfer ramp lane would merge with Ramp 'S-E' (3 lanes) to develop four lanes that continue to the east on US 60. The existing Ramp 'S-E' bridge over Southern Avenue would be widened to provide the roadway width necessary to accept the additional lane from the transfer ramp. The existing Ramp 'S-E' bridge over I-10 was originally constructed with the roadway width necessary to accept the additional lane from the transfer ramp.

One lane would continue to the south on the eastbound C-D Road between Fairmont Drive and the I-10 entrance. The C-D Road lane would merge with the eastbound I-10 mainline (with an "add-lane" configuration) just south of the I-10/US60 TI to develop four general-purpose lanes and one HOV lane that continue to the south.

The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp 'W-S') (1 lane) would merge with the Baseline Road exit ramps to develop a combined connector road (3 lanes) approaching the Baseline Road TI. The Baseline Road ramp lanes (2 lanes) would be separated from Ramp 'W-S' (1 lane) by a concrete median barrier to eliminate current weaving maneuvers. The Baseline Road exit ramp (2 lanes) would depart the connector road with a two lane mandatory exit. Ramp 'W-S' traffic would also be able to access Baseline Road at the exit ramp. Ramp 'W-S' would enter the I-10 mainline with a "lane-add" configuration to provide five general-purpose lanes and one HOV lane between Baseline Road and Elliot Road. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Elliot Road exit ramp.

The Elliot Road exit ramp (2 lanes) would be realigned with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. An American Association of State Highway Transportation Officials (AASHTO) lane drop would occur prior to the Elliot Road entrance ramp gore to provide four general-purpose lanes and one HOV lane that would continue to the south between Elliot Road and Ray Road. The Elliot Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Warner Road exit ramp.

The Warner Road exit ramp (1 lane) would be realigned with a mandatory exit from the auxiliary lane. The Warner Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Ray Road exit ramp.

The Ray Road exit ramp (1 lane) would be developed as a mandatory exit from the auxiliary lane. Four general-purpose lanes and one HOV lane would continue to the south to match into the existing I-10 mainline approaching the I-10/SR202L (Santan/South Mountain) TI.

South of Baseline Road, the roadway widening on I-10 would be constructed within the existing right-of-way. The Guadalupe Road, Elliot Road, Warner Road and Ray Road underpasses were originally constructed with sufficient span lengths to support the roadway widening recommended with this alternative.

Ramp S'-E' would be reconfigured east of the I-10 overpass to develop a lane drop prior to the Ramp 'N-E' gore. Ramp 'N-E' (2 lanes) would be reconfigured to provide a two lane parallel entrance that transitions into additional general-purpose lanes. Five general-purpose lanes and one HOV lane would continue to the east of Hardy Drive. The Priest Drive entrance ramp would be a parallel entrance configuration that merges into the adjacent lane prior to the Hardy Drive underpass.

Eastbound C-D Road

The existing southbound SR 143 to eastbound I-10 loop ramp (1 lane) would initiate the eastbound C-D Road at Broadway Road. The Broadway Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional C-D Road lane (2 lanes total) that continues to the south.

A transfer ramp would be provided between the eastbound C-D Road and the eastbound US 60 ramp (Ramp 'S-E') in the vicinity of Fairmont Drive. The transfer ramp (1 lane) would merge with Ramp 'S-E' (3 lanes) to develop four lanes that continue to the east on US 60.

The C-D Road (1 lane) would continue to the south between Fairmont Drive and the I-10 entrance ramp. The C-D Road would merge with the eastbound general-purpose lanes (3 lanes) just south of the I-10/US60 TI (with a "lane-add" configuration) to develop four general-purpose lanes and one HOV lane that continue to the south. The Baseline Road exit ramp would be developed as a single-lane ramp with a tapered exit configuration. New bridges would be provided for the eastbound C-D Road over Southern Avenue, the Baseline Road exit ramp (from I-10) and the Western Canal.

Westbound I-10 Mainline

The original I-10/SR202L (Santan/South Mountain) TI project widened the westbound I-10 mainline to provide four general-purpose lanes and one HOV lane approaching Ray Road from the south. An AASHTO lane-drop was provided to transition to the existing roadway width of three general-purpose lanes and one HOV lane north of Ray Road.

An additional westbound general-purpose lane would be developed on I-10 by removing the AASHTO lane drop and extending the fourth general-purpose lane to the north. The Ray Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Warner Road exit ramp. Westbound I-10 would include four general-purpose lanes and one HOV lane between Ray and Elliot Roads.

The Warner Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane. The entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Elliot Road exit ramp. The Elliot Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane.

Elliot Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional lane between Elliot Road and Baseline Road. Five general-purpose lanes and one HOV lane would be provided on I-10 approaching the initial westbound C-D Road transfer ramp (and eastbound US 60) near Baseline Road. The Baseline Road exit ramp would be developed with a single-lane parallel exit configuration from the outside general-purpose lane. The initial C-D Road transfer ramp would be developed as a two lane mandatory exit from the outside general-purpose lanes.

Three general-purpose lanes and one HOV lane would continue to the north approaching the I-10/US60 TI. A second C-D Road transfer ramp (1 lane) would be developed immediately south of US 60 to provide additional access to the westbound C-D Road. This ramp would be developed with a tapered exit configuration from the outside general-purpose lane. Three general-purpose lanes and one HOV lane would continue to the north on the I-10 mainline through the I-10/US60 TI.

Five general-purpose lanes and one HOV lane would be provided on westbound US 60 west of Mill Avenue. The Priest Drive exit ramp (1 lane) would be reconfigured to a single-lane ramp with a tapered exit from the outside general-purpose lane. The westbound US 60 to eastbound (southbound) I-10 directional ramp (Ramp 'W-S') (1 lane) would continue with the current mandatory "left-exit" configuration from the inside general-purpose lane.

The westbound US 60 to westbound C-D Road ramp (1 lane) would be developed as a mandatory exit from the outside general-purpose lane. Three lanes would continue to the west on Ramp 'W-N' to connect to the westbound I-10 mainline.

Ramp 'W-N' (3 lanes) would combine with the westbound I-10 general-purpose lanes (3 lanes) to develop six general-purpose lanes and one HOV lane departing I-10/US60 TI. A new bridge would be constructed for Ramp 'W-N' over the westbound C-D Road.

The US 60 HOV lane would enter the westbound I-10 mainline and combine with the I-10 HOV lane (from the south) with a parallel entrance configuration. One westbound HOV lane would continue to the west between US 60 and I-17.

Six general-purpose lanes and HOV lane would depart the I-10/US60 TI. Two lane drops would occur between Southern Avenue and Broadway Road to transition the westbound I-10 mainline from six general-purpose lanes to four general-purpose lanes (and one HOV lane) prior to the Broadway Road underpass.

A C-D Road transfer ramp (1 lane) would be provided north of Broadway Road. The transfer ramp would transition into the I-10 general-purpose lanes with a parallel "lane-add" design near 48th Street. The additional lane would continue on the westbound I-10 mainline to connect to the existing general-purpose lane locations near 36th Street.

Westbound C-D Road

Travelers destined for the westbound local lanes, or eastbound US 60 (via Ramp 'N-E'), would depart I-10 just south of Baseline Road. The westbound transfer ramp exit would be developed as a two lane mandatory exit from the outside general-purpose lanes. The existing westbound C-D Road would remain in its current configuration but widened to provide full lane and shoulder widths.

The westbound C-D Road (2 lanes) would continue to the north immediately east of the I-10 mainline. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Ramp 'N-E' exit. The Ramp 'N-E' exit (2 lanes) would depart the westbound C-D Road with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the C-D lane through movement. Two C-D Road lanes would continue to the north on the C-D Road.

A second C-D Road transfer ramp (1 lane) would be provided just south of US 60. The transfer ramp would merge with the C-D Road lanes with a "lane-add" configuration. The outside C-D Road lane would terminate prior to the US 60 entrance ramp to develop three lanes approaching Southern Avenue.

The two lanes from I-10 (from the south) would merge with the ramp from westbound US 60 (1 lane) to develop three C-D Road lanes that continue to the Broadway Road TI exit ramp. The Broadway Road exit ramp (1 lane) would be designed as a mandatory exit from the outside C-D Road lane. Two C-D Road lanes would be provided approaching the I-10/SR143 TI. A new bridge would be provided for the C-D Road crossing over Southern Avenue. A new C-D Road transfer ramp would be provided north of Broadway Road to allow a connection between the C-D Road and the westbound I-10 mainline near 48th Street.

4.4 ACCESS CONTROL

Access control already exists and will be maintained in accordance with ADOT and FHWA Access Control Policy requirements.

(Text resumes on page 149)

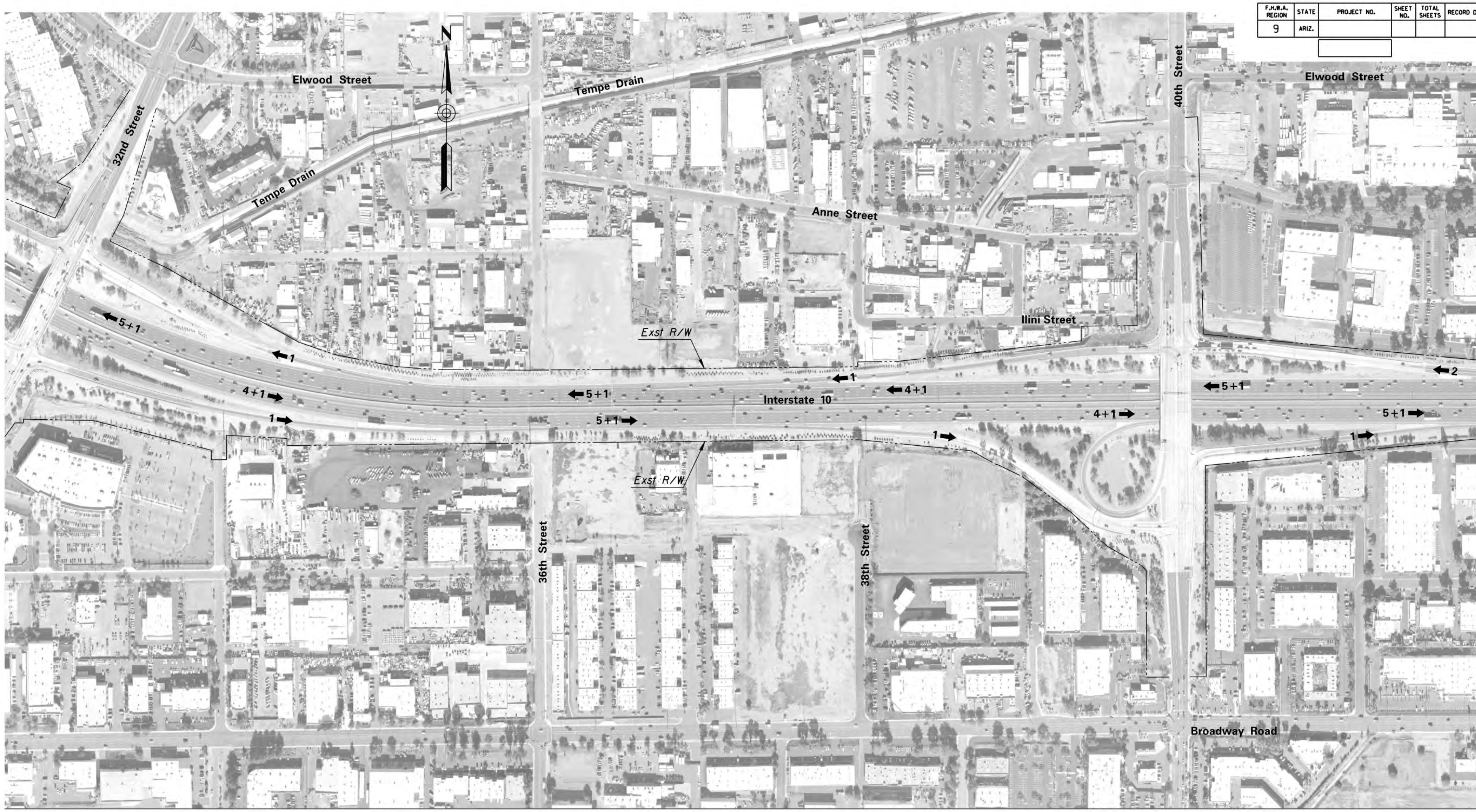


FIGURE 24

	NAME	DATE
DESIGN	CBB	12/15
DRAWN	WBE	12/15
CHECKED	SDW	12/15

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

Preferred Alternative
On Interstate 10

DCR

NOT FOR CONSTRUCTION OR RECORDING

ROUTE I-10 LOCATION SR 143 - SR 202L, Santan/South Mountain

DWG NO. 1 OF 9

TRACS NO. H8768 01L

1 OF 9

1/4/2016 U:\I10-02(Spot)\Prod\civ\h8768PL01a(Spot).dgn

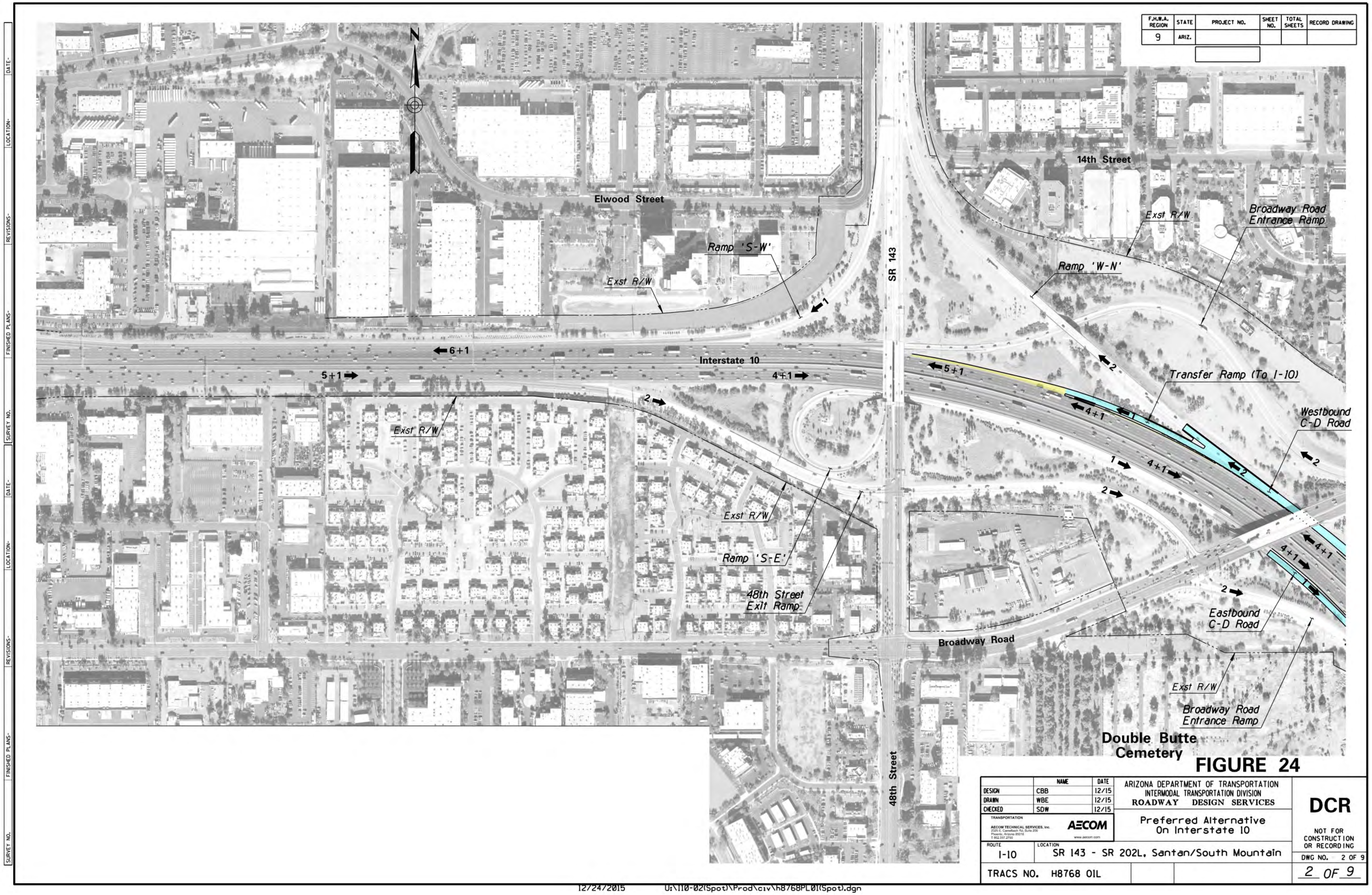
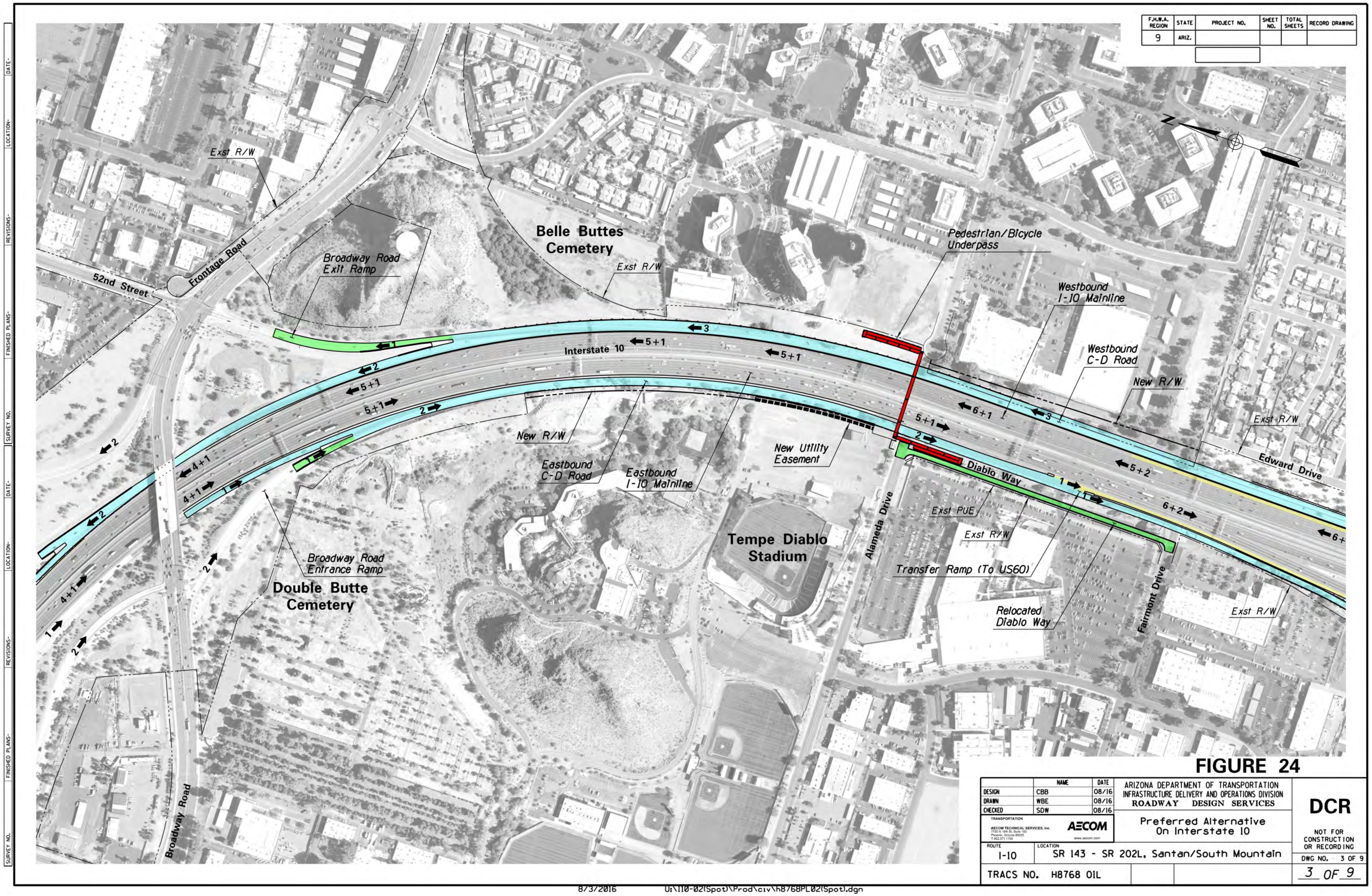
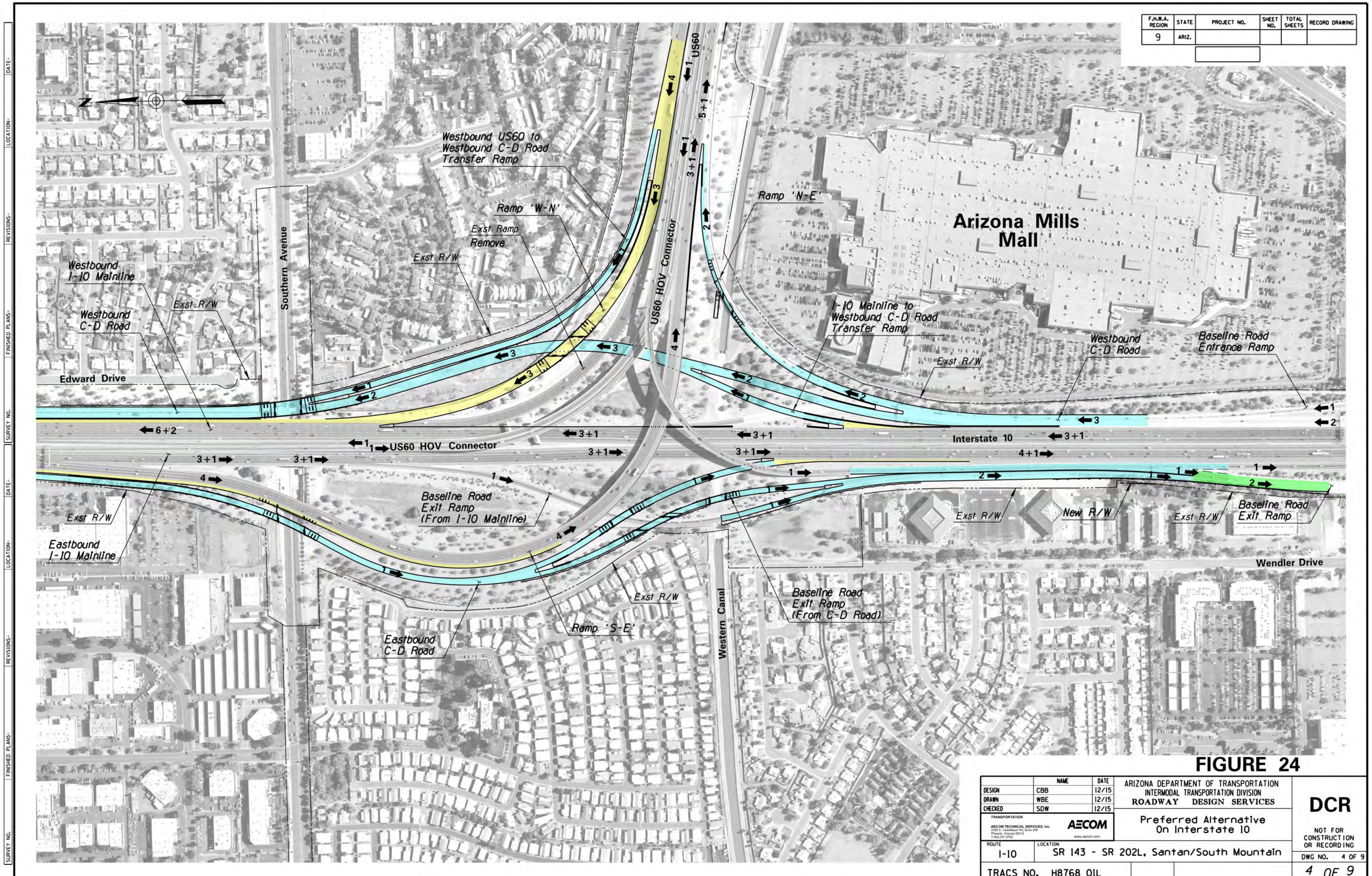

Elwood Street
14th Street
SR 143
Interstate 10
Ramp 'S-W'
Ramp 'W-N'
Exst R/W
Broadway Road Entrance Ramp
Transfer Ramp (To I-10)
Westbound C-D Road
Eastbound C-D Road
Ramp 'S-E'
48th Street Exit Ramp
Broadway Road
48th Street
Double Butte Cemetery
6+1
5+1
4+1
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DESIGN CBB 12/15
DRAWN WBE 12/15
CHECKED SDW 12/15
AECOM TECHNICAL SERVICES, Inc.
Preferred Alternative On Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
ROUTE I-10
LOCATION SR 143 - SR 202L, Santan/South Mountain
DWG NO. 2 OF 9
TRACS NO. H8768 01L
2 OF 9
12/24/2015
U:\I10-02(Spot)\Prod\civ\h8768PL01(Spot).dgn

FIGURE 24


Belle Buttes Cemetery
Double Butte Cemetery
Tempe Diablo Stadium
Interstate 10
52nd Street
Frontage Road
Broadway Road
Broadway Road Exit Ramp
Broadway Road Entrance Ramp
Exst R/W
New R/W
Eastbound C-D Road
Eastbound I-10 Mainline
Westbound I-10 Mainline
Westbound C-D Road
Pedestrian/Bicycle Underpass
New Utility Easement
Alameda Drive
Diablo Way
Exst PUE
Transfer Ramp (To US60)
Relocated Diablo Way
Fairmont Drive
Edward Drive
FIGURE 24
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADWAY DESIGN SERVICES
DCR
Preferred Alternative On Interstate 10
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
3 OF 9
8/3/2016
U:\I10-02(Spot)\Prod\civ\h8768PL02(Spot).dgn



12/22/2015 U:\I10-02(Spot)\Prod\civ\h8768PL03(Spot).dgn

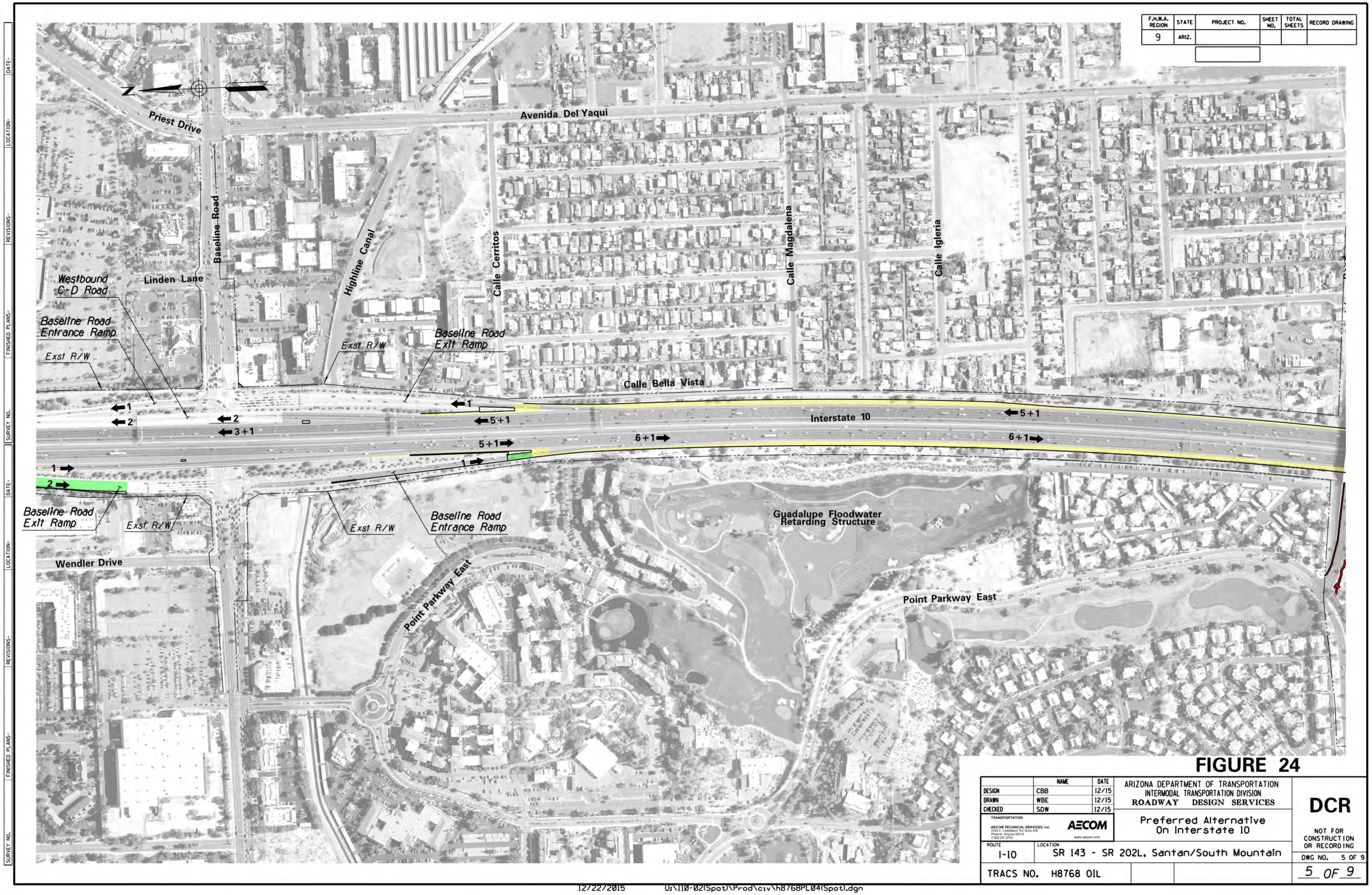

Priest Drive
Avenida Del Yaqui
Baseline Road
Highline Canal
Calle Cerritos
Calle Magdalena
Calle Iglesia
Westbound C-D Road
Linden Lane
Baseline Road Entrance Ramp
Exst R/W
Baseline Road Exit Ramp
Calle Bella Vista
Interstate 10
5+1
6+1
3+1
Baseline Road Exit Ramp
Exst R/W
Baseline Road Entrance Ramp
Guadalupe Floodwater Retarding Structure
Wendler Drive
Point Parkway East
Point Parkway East
FIGURE 24
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
DESIGN CBB 12/15
DRAWN WBE 12/15
CHECKED SDW 12/15
AECOM
Preferred Alternative On Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
ROUTE I-10
LOCATION SR 143 - SR 202L, Santan/South Mountain
DWG NO. 5 OF 9
TRACS NO. H8768 01L
5 OF 9
12/22/2015
U:\I10-02(Spot)\Prod\civ\h8768PL04(Spot).dgn

FIGURE 24

	NAME	DATE
DESIGN	CBB	12/15
DRAWN	WBE	12/15
CHECKED	SDW	12/15

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DCR

TRANSPORTATION
AECOM TECHNICAL SERVICES, Inc.
2325 E. Camelback Rd, Suite 200
Phoenix, Arizona 85016
T 602.337.2700
AECOM
www.aecom.com

Preferred Alternative
On Interstate 10

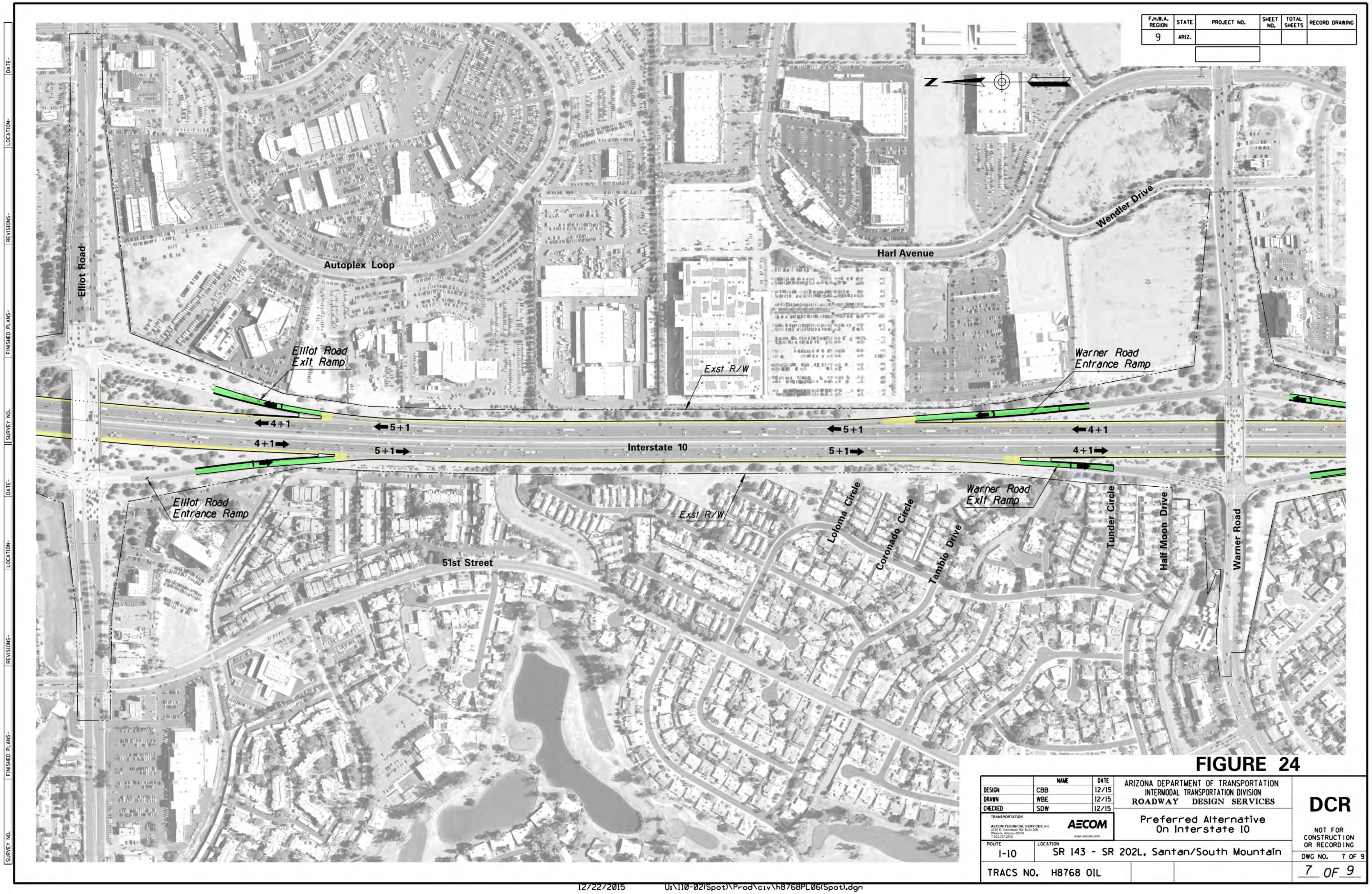
NOT FOR CONSTRUCTION OR RECORDING

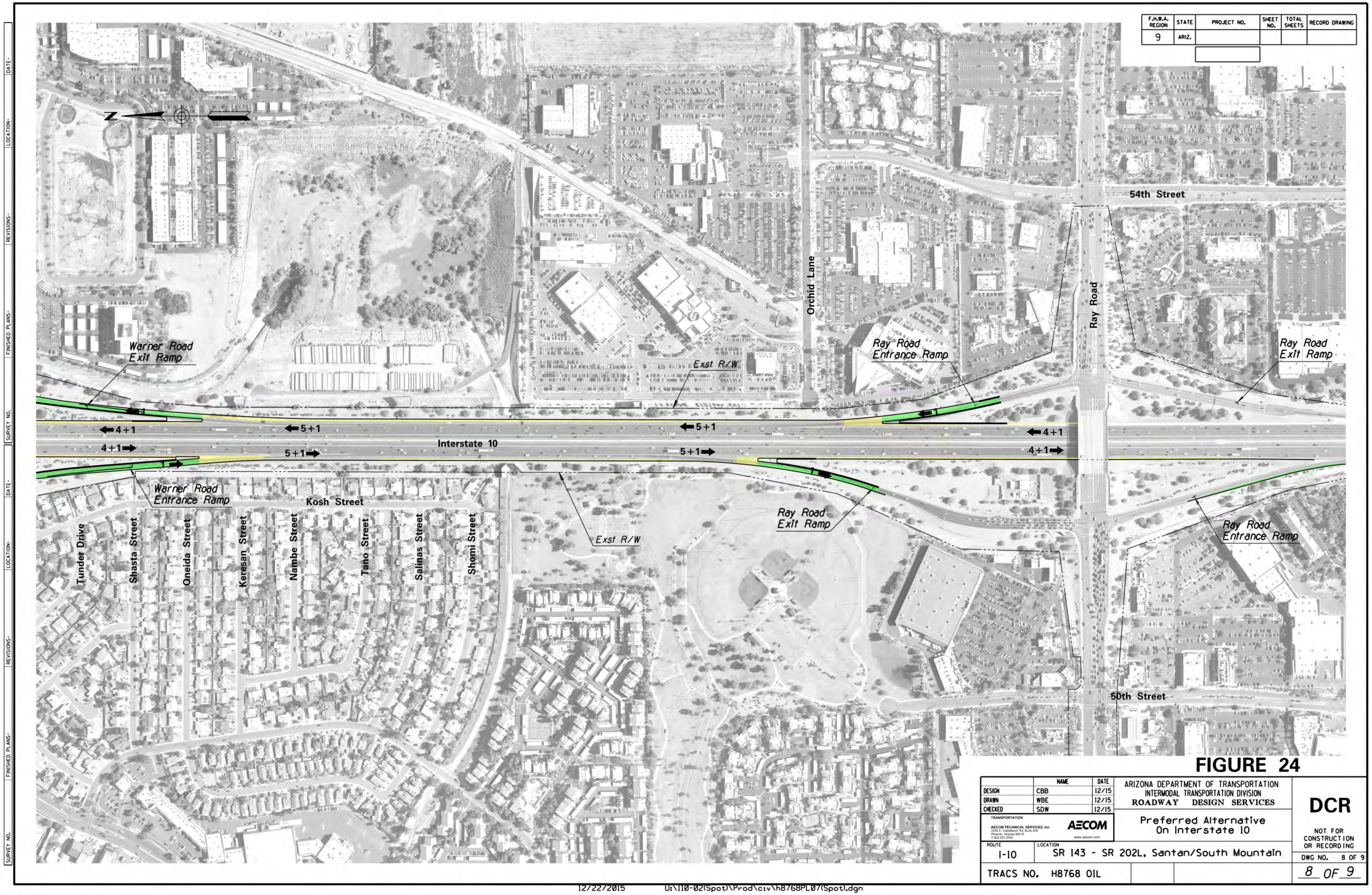
ROUTE I-10 | LOCATION SR 143 - SR 202L, Santan/South Mountain | DWG NO. 6 OF 9

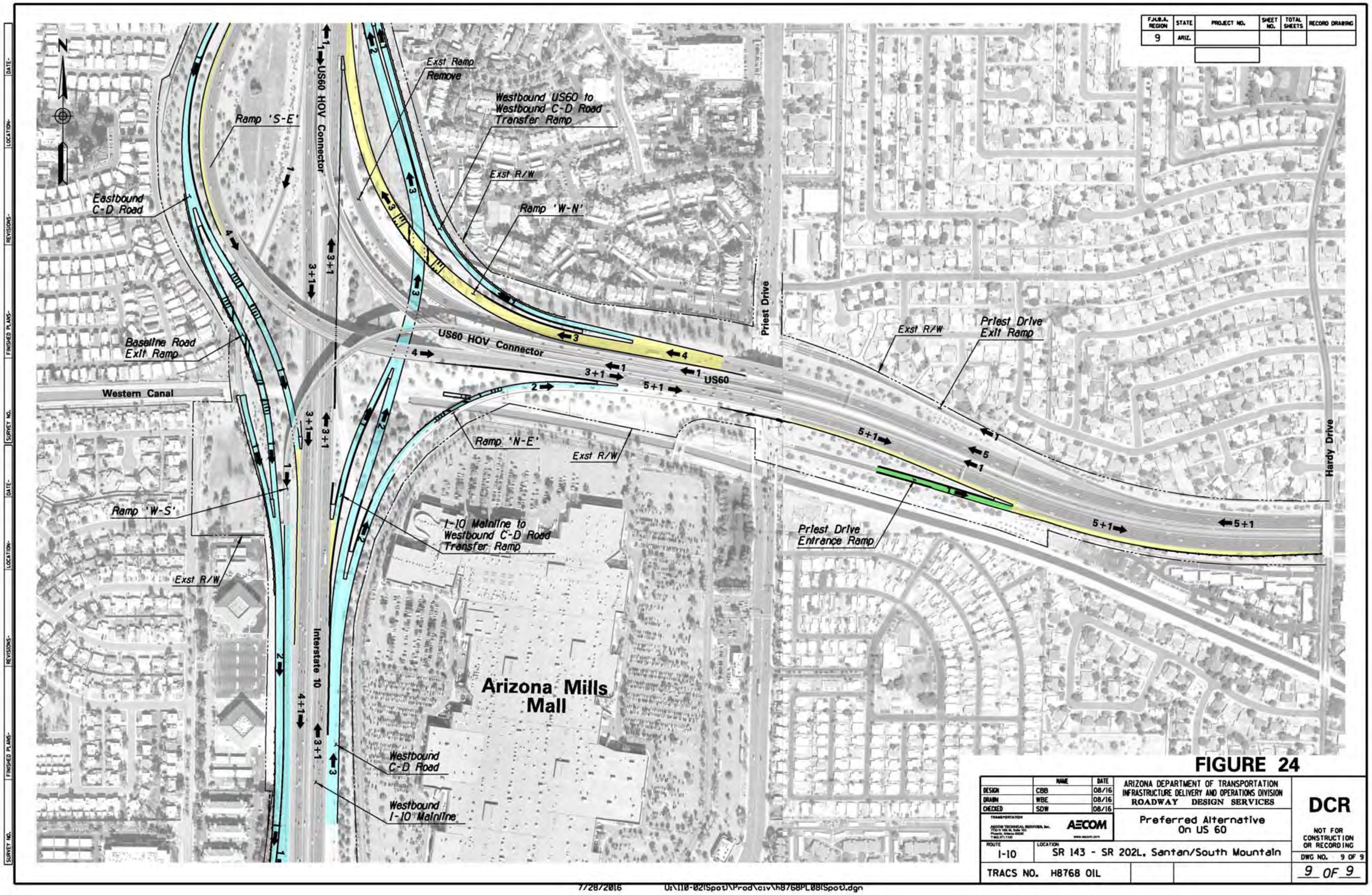
TRACS NO. H8768 01L

6 OF 9

12/22/2015 U:\I10-02(Spot)\Prod\civ\h8768PL05(Spot).dgn


Elliot Road
Autoplex Loop
Harl Avenue
Wendler Drive
Elliot Road Exit Ramp
Exst R/W
Warner Road Entrance Ramp
Interstate 10
4+1
5+1
Elliot Road Entrance Ramp
Exst R/W
Warner Road Exit Ramp
51st Street
Loloma Circle
Coronado Circle
Tamblo Drive
Tunder Circle
Half Moon Drive
Warner Road
FIGURE 24
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Preferred Alternative On Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
7 OF 9
12/22/2015
U:\I10-02(Spot)\Prod\civ\h8768PL06(Spot).dgn


54th Street
Orchid Lane
Ray Road
Warner Road Exit Ramp
Exst R/W
Ray Road Entrance Ramp
Ray Road Exit Ramp
Interstate 10
4+1
5+1
Warner Road Entrance Ramp
Kosh Street
Tunder Drive
Shasta Street
Oneida Street
Keresan Street
Nambe Street
Tano Street
Salinas Street
Shomi Street
50th Street
FIGURE 24
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES
Preferred Alternative On Interstate 10
DCR
NOT FOR CONSTRUCTION OR RECORDING
DESIGN CBB 12/15
DRAWN WBE 12/15
CHECKED SDW 12/15
ROUTE I-10
LOCATION SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
DWG NO. 8 OF 9
8 OF 9
12/22/2015
U:\I10-02(Spot)\Prod\civ\h8768PL07(Spot).dgn


Exst Ramp Remove
Westbound US60 to Westbound C-D Road Transfer Ramp
Ramp 'S-E'
US60 HOV Connector
Exst R/W
Ramp 'W-N'
Eastbound C-D Road
Baseline Road Exit Ramp
Western Canal
Priest Drive
Priest Drive Exit Ramp
US60
Ramp 'N-E'
Ramp 'W-S'
I-10 Mainline to Westbound C-D Road Transfer Ramp
Priest Drive Entrance Ramp
Hardy Drive
Interstate 10
Arizona Mills Mall
Westbound C-D Road
Westbound I-10 Mainline
FIGURE 24
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADWAY DESIGN SERVICES
DCR
Preferred Alternative On US 60
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
9 OF 9
7/28/2016

4.5 RIGHT-OF-WAY

The proposed right-of-way requirements are shown on the Preferred Alternative Plans in Appendix H. The total estimated right-of-way acquisition required for this alternative is 2.73 acres, with a total anticipated cost of approximately $10 million.

A Maintenance Easement, Drainage Easement and Public Utility Easement will be required in the vicinity of the Alameda Drive pedestrian/bicycle underpass. Temporary Construction Easements (TCE's) will be required for the construction of the Preferred Alternative. The TCE locations and limits will be determined during final design.

4.6 DRAINAGE

This section includes a general overview of the proposed modifications to the drainage systems necessary to support the proposed roadway improvements. A graphic depiction is provided with Figure 25 (on pages 149-150). Additional information regarding the proposed drainage systems is provided in the *I-10 Near-Term Improvement Study* (State Route 143 – Santan Freeway) *Pre-Initial Drainage Concept Report, (July 2015).*

4.6.1 Off-Site Drainage Systems

Segment 1

An Intergovernmental Agreement (IGA) between ADOT, the City of Tempe, the City of Phoenix, the Salt River Valley Water Users Association (SRVWUA), the Salt River Project Agricultural Improvement and Power District (SRP), and the Flood Control District of Maricopa County (FCDMC) was developed in 1989 to designate discharges to the Tempe Drain from each participant. The proposed roadway and storm drain improvements will not increase ADOT's contribution to the Tempe Drain above the agreed upon IGA peak discharge. This is accomplished by increasing detention basins volume in some locations and using SWMM to model the attenuation effects of the detention basins that reduce flow in the storm drain systems.

Along the Broadway Curve, some existing offsite area catch basins and roadside ditches would be relocated to accommodate the new roadway improvements. The new ditches and inlets would be placed adjacent to the new and widened roadways. Extensions of the lateral storm drain pipes that discharge into the roadside ditches would also be coordinated with the proposed improvements.

Segment 2

The only change to the existing offsite drainage systems in this segment would be extension of the existing offsite cross culverts to accommodate the widened roadways.

4.6.2 On-Site Drainage Systems

Segment 1

The proposed roadway improvements within Segment 1 would increase the pavement area resulting in increased storm water runoff. The existing trunkline would be preserved as much as possible and the existing laterals under the mainline would be extended and catch basins relocated to the new roadway limits. A new trunkline is proposed along the eastbound C-D Road to accommodate new onsite roadway drainage and avoid over taxing the existing trunkline within I-10. This new trunkline starts south of Alameda Drive and outlets into Basin C2 (at the I-10/SR143 TI). Basin C2 should be excavated further to accommodate the additional flow from this stormdrain.

South of the I-10/US60 TI, the existing catch basins would be relocated to the new curb line but the existing main lines would remain.

An existing trunk line is located along the existing westbound I-10 roadway that was recently reconstructed between Southern Avenue and Basin 'E'. This trunk line was constructed with the purpose of conveying the runoff generated from the westbound C-D Road between Alameda Drive and Southern Avenue. The combined flows from these trunk lines would increase the discharges into Basin 'E'. However, due to the attenuation of Basin 'E', the flow increase in the storm drain system at 48th Street is minor and below the IGA maximum allowed flow.

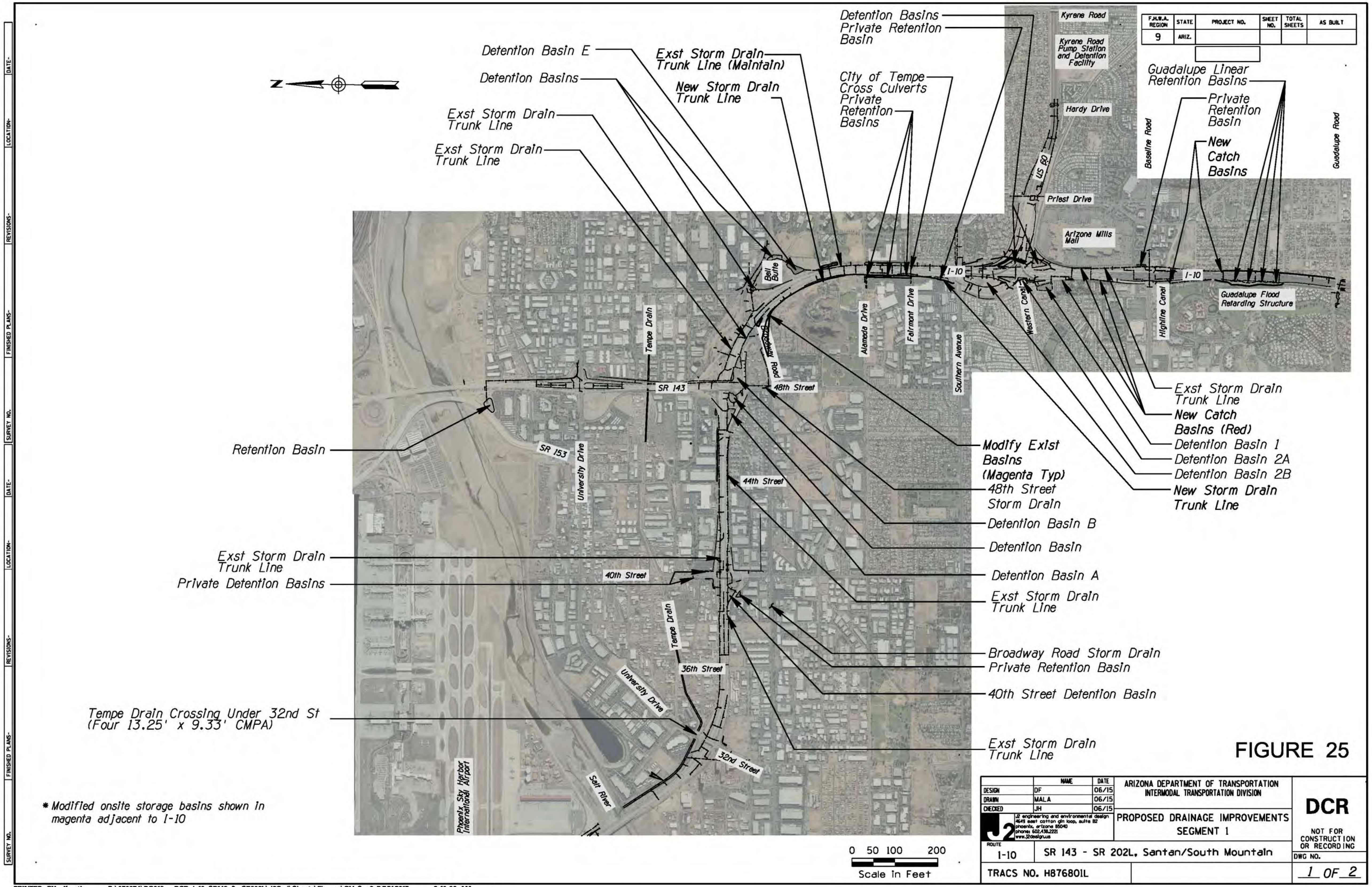
Along US 60, the roadway widening is not anticipated to dramatically increase peak discharges to the existing storm drains, or affect maintenance access to the existing storm drain system. As a result, no new trunk lines are anticipated along US 60. Only minor relocation of catch basins and extension of existing laterals would be required.

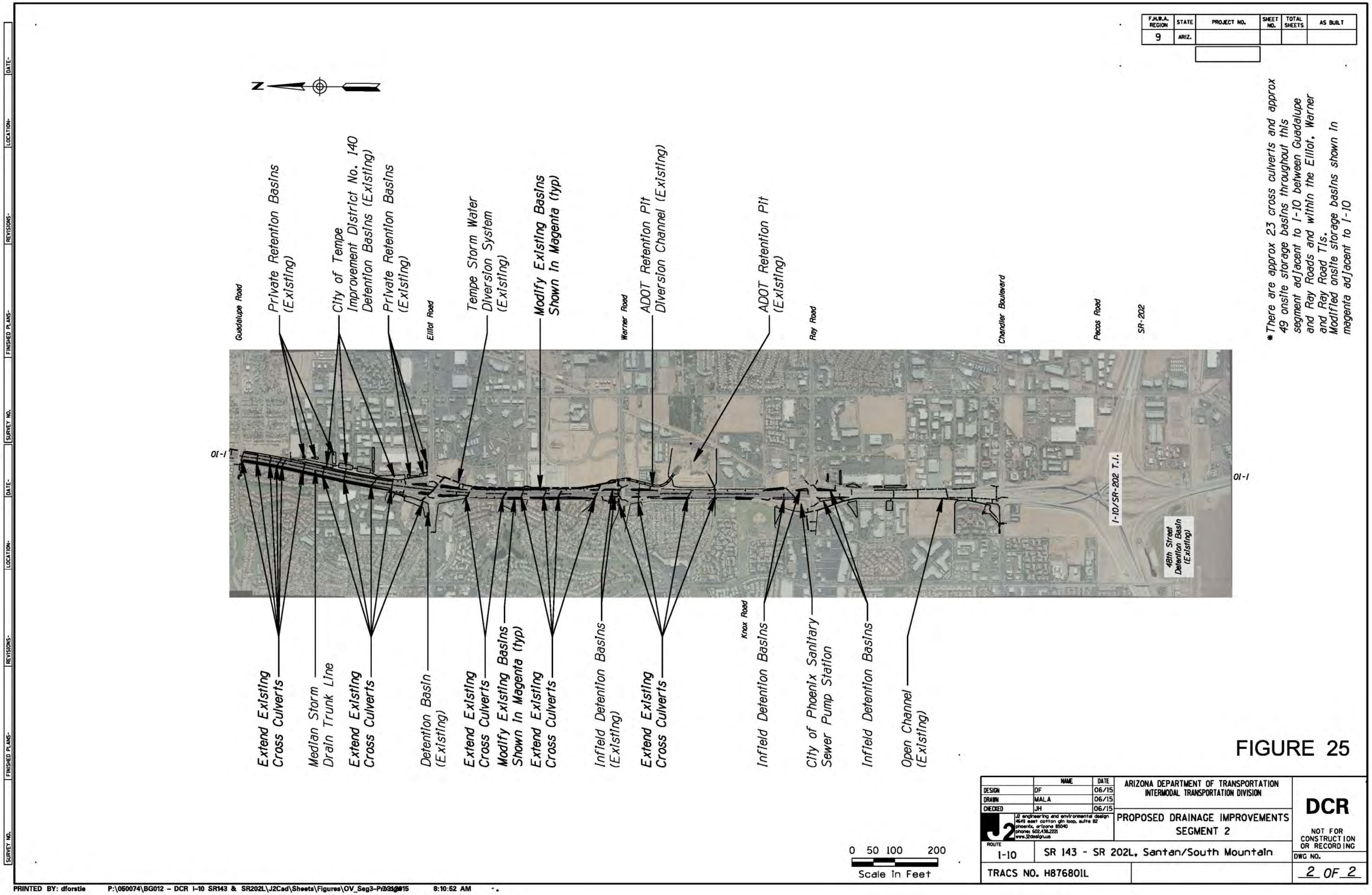
SWMM was utilized to determine peak flows contributing to the storm drain systems and the modeling of the storm drain systems. Flow routing within a conduit link in SWMM is governed by the conservation of mass and momentum equations for gradually varied, unsteady flow (i.e., the Saint Venant flow equations). Dynamic Wave routing solves the complete one-dimensional Saint Venant flow equations and therefore produces the most theoretically accurate results. Table 27 summarizes the proposed trunk line on the west side of I-10, adjacent to the eastbound C-D Road, and north of the I-10/US60 TI that will be needed between Fairmont Drive to Basin C2.

Table 27 – Proposed New Storm Drain Trunk Lines in Eastbound C-D Road

Storm Drain Segment	SWMM Pipe	Peak Flow (cfs)	Slope (ft./ft.)	Recommended Diameter (ft)
8156+30 to 8147+30	P_Pr24	9.14	0.002	2.5
8147+30 to 8133+50	P_Pr17	24.32	0.002	2.5
8133+50 to 8127+00	P_Pr13	27.76	0.002	2.5
8127+00 to 8122+60	P_Pr8	42.48	0.002	3
8122+60 to Basin C2	P_Pr1	45.21	0.002	3

(Text resumes on page 152)


Detention Basin E
Detention Basins
Exst Storm Drain Trunk Line
Exst Storm Drain Trunk Line
Exst Storm Drain Trunk Line (Maintain)
New Storm Drain Trunk Line
Detention Basins
Private Retention Basin
City of Tempe Cross Culverts
Private Retention Basins
Kyrene Road
Kyrene Road Pump Station and Detention Facility
Hardy Drive
US 60
Priest Drive
Arizona Mills Mall
Baseline Road
Guadalupe Linear Retention Basins
Private Retention Basin
New Catch Basins
Guadalupe Road
I-10
Guadalupe Flood Retarding Structure
Highline Canal
Western Canal
Southern Avenue
Fairmont Drive
Alameda Drive
Broadway Road
48th Street
Bell Butte
Tempe Drain
SR 143
SR 153
University Drive
44th Street
40th Street
36th Street
32nd Street
Salt River
Phoenix Sky Harbor International Airport
Retention Basin
Exst Storm Drain Trunk Line
Private Detention Basins
Tempe Drain Crossing Under 32nd St (Four 13.25' x 9.33' CMPA)
Exst Storm Drain Trunk Line
New Catch Basins (Red)
Detention Basin 1
Detention Basin 2A
Detention Basin 2B
New Storm Drain Trunk Line
Modify Exist Basins (Magenta Typ)
48th Street Storm Drain
Detention Basin B
Detention Basin
Detention Basin A
Exst Storm Drain Trunk Line
Broadway Road Storm Drain
Private Retention Basin
40th Street Detention Basin
Exst Storm Drain Trunk Line
* Modified onsite storage basins shown in magenta adjacent to I-10
0 50 100 200
Scale in Feet
FIGURE 25
F.H.W.A. REGION 9 STATE ARIZ.
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
DESIGN DF 06/15
DRAWN MALA 06/15
CHECKED JH 06/15
PROPOSED DRAINAGE IMPROVEMENTS SEGMENT 1
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H876801L
1 OF 2
PRINTED BY: dforstie


Guadalupe Road
Private Retention Basins (Existing)
City of Tempe Improvement District No. 140 Detention Basins (Existing)
Private Retention Basins (Existing)
Elliot Road
Tempe Storm Water Diversion System (Existing)
Modify Existing Basins Shown In Magenta (typ)
Warner Road
ADOT Retention Pit Diversion Channel (Existing)
ADOT Retention Pit (Existing)
Ray Road
Chandler Boulevard
Pecos Road
SR-202
I-10/SR-202 T.I.
48th Street Detention Basin (Existing)
* There are approx 23 cross culverts and approx 49 onsite storage basins throughout this segment adjacent to I-10 between Guadalupe and Ray Roads and within the Elliot, Warner and Ray Road TIs. Modified onsite storage basins shown in magenta adjacent to I-10
Extend Existing Cross Culverts
Median Storm Drain Trunk Line
Extend Existing Cross Culverts
Detention Basin (Existing)
Extend Existing Cross Culverts
Modify Existing Basins Shown In Magenta (typ)
Extend Existing Cross Culverts
Infield Detention Basins (Existing)
Extend Existing Cross Culverts
Knox Road
Infield Detention Basins
City of Phoenix Sanitary Sewer Pump Station
Infield Detention Basins
Open Channel (Existing)
0 50 100 200
Scale In Feet
FIGURE 25
ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
PROPOSED DRAINAGE IMPROVEMENTS
SEGMENT 2
DCR
NOT FOR CONSTRUCTION OR RECORDING
I-10
SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H876801L
2 OF 2

Segment 2

The widening of the I-10 mainline and ramp realignments would fill in some of the existing onsite storage basins that are adjacent to the freeway. In order to preserve and optimize the storage volume in the remaining onsite storage basins, short retaining walls or retaining half barrier would be provided along the new roadway shoulders.

The Modified Rational Equation method was used to determine the runoff volume to each basin under the existing and proposed conditions for the 50-year, 6-hour storm event. Under the existing conditions, the total runoff from the ADOT right-of-way is approximately 15 acre-feet. The total runoff from the ADOT right-of-way with the Recommended Alternative is approximately 16 acre-feet. Therefore, the proposed roadway improvements would increase the total runoff volume by approximately 1 acre-feet.

The use of retaining walls or retaining half barrier combined with additional drainage excavation could increase the cumulative onsite storage volume in the basins from approximately 14 acre-feet in the existing basins to approximately 18 acre-feet. This concept would actually increase the available basin storage volume and improve the current drainage conditions within this portion of the I-10 corridor.

ADOT C-15.92 inlets with storm drain pipes, or openings in the concrete half barrier (rectangular holes approximately 1’ long and 3” high) were two of the options that were considered to collect and convey pavement runoff to the retention basins. Each design alternative was presented to ADOT representatives. The option that incorporates the ADOT C-15.92 inlets with slotted drain has been initially selected as the recommended drainage solution concept.

4.7 STRUCTURES

This section describes the features of the structural elements needed to support the Recommended Alternative. This section also includes recommendations for the new bridge structures, widening of existing bridge structures, extending an existing equipment pass, retaining walls and noise walls.

4.7.1 New Bridge Structures

In recent history, the design and construction of bridges for the Maricopa County Regional Freeway System has produced a knowledge base of economical and constructable bridge configurations for ramp flyovers and typical overpass/underpass structures. Typical bridge types considered in this Design Concept Report include:

- Cast-in-place post-tensioned concrete box girder,
- Precast, prestressed concrete AASHTO girders,
- Structural steel welded plate girders or welded steel box girders.

Table 28 summarizes some of the representative characteristics and the advantages/ disadvantages of each of these structure types.

The use of concrete segmental and/or spliced girder bridges is not anticipated for this project at this stage of design development. Segmental construction requires special equipment and is not cost competitive for conditions on this project. Precast segmental construction becomes more cost competitive when large numbers of repetitive precast segments are required. The use of spliced precast girders spanning directly over traffic in combination with a post-tensioned box girder bridge system has been successful on the Regional Freeway System and would be considered a viable option for longer spans.

Table 28 – Bridge Structure Types

Features	Cast-In-Place Post-Tensioned Concrete Box Girder	Precast, Prestressed Concrete AASHTO Girders	Structural Steel Welded Girders
Practical Span Limit	250’	140’ (+/-) for AASHTO Super VI girders	300’
Corresponding Structure Depth	10’	7.5’	12’
Horizontal Geometry	Cast-in-place concrete can readily conform to any straight or curvilinear geometry and has very high torsional rigidity	Line girders are cast straight and result in chorded spans with eccentric arc-to-chord variations on curvilinear alignments; Girders have moderate torsional rigidity	Welded girders can be fabricated straight or curvilinear; Torsional factors become more critical for longer spans and/or smaller radius of curvature
Flares and Tapers, Gore Areas	Cast-in-place concrete can easily accommodate variable deck widths, ramp merge/diverge conditions, cross slope breaks, and superelevation transitions	Girder framing has limited flexibility in variable deck width, cross slope, and transitions	Girder framing has limited flexibility in variable deck width, cross slope, and transitions
Diaphragms and Pier Caps	Diaphragms and Pier Caps are internally integral with the superstructure	Diaphragms are integral with the superstructure; Pier caps are typically cast below the superstructure; However they can be made integral by using recessed girder ends supported on inverted-T pier caps	Diaphragms (typically steel) are integral with the superstructure; Pier caps are typically cast below the superstructure but can also be made integral
Economy	Very economical for both initial and life cycle cost	Very economical for both initial and life cycle cost	Historically, steel has been higher in initial cost due to lack of local suppliers and fabricators; Inspection and maintenance needs also increase total life cycle costs
Aesthetics and Visual Compatibility	Considered to be the most aesthetically pleasing of these three alternatives	Typically considered to be less aesthetically pleasing than a CIP P/T concrete box girder	Not currently used within the project limits; Steel plate girders are typically considered to be the least desirable; When painted to match concrete structures, steel box girders are considered acceptable in appearance
Constructability	Additional vertical separation is required to allow for falsework depth and to provide minimum construction vertical clearance when constructed over traffic	Can be erected quickly with minimum impacts to traffic; Short term, off-peak closures are necessary during girder erection and deck/barrier concrete placement	Can be erected quickly with minimum impacts to traffic; Short term off-peak closures are necessary during girder erection and deck/barrier concrete placement

Table 29 provides a summary of new bridge structures that are recommended to support the Recommended Alternative.

Table 29 – New Bridge Structure Concepts

Bridge Description	Bridge Length (ft)	Number of Spans	C_L-C_L Span Lengths (ft)	Deck Width (ft)	Max. Superstructure Depth (ft)(1)
EB CD-2 over Southern Avenue(2)	140.81	1	135.18	31.17	7.5
WB CD-1 over Southern Avenue(2)	125.64	1	120.62	Varies (70.83 average)	7.0
Baseline Ramp 'F' over EB CD Ramp 'T-4'	144.86	1	133.91	29.17	7.5
Baseline Ramp 'F' over Western Canal	81.98	1	76.83	29.17	5.5
EB CD-2 over EB CD Ramp 'T-4'	112.39	1	107.39	31.17	6.25
Ramp 'W-N' over WB CD-1	144.86	1	132.67	55.17	7.5
Alameda Drive Pedestrian Underpass	988	14	4 @ 82; 71-111-111-117; 5 @ 56	14	3.0(3)
Guadalupe Road Multi-Use Trail Underpass(4)	286(4)	2(4)	2 @ 140.5(4)	15.17(4)	6.75(4)

Note:
(1) Superstructure depth assumes precast girders are utilized except as noted for the Alameda Drive Pedestrian bridge. Structural lengths, alternatives and selections shall be developed and completed during the next design phase.
(2) Southern Avenue structures were established by lining up abutments with the existing Ramp 'S-E' crossing over Southern Avenue.
(3) For cost purposes, a prefabricated truss structure with a deck-to-bottom-of-chord truss depth of 3'-0" assumed for the 4 spans over the I-10 mainline and CD Roads. The remainder of the bridge is assumed to be a mixture of a rolled steel girder bridges with cast-in-place concrete deck and retaining walls for the shorter ramps. Costs were developed from an existing pedestrian bridge crossing over I-17 (I-17 Pedestrian Bridge Overpass, Structure # 10661, MP 220.35). Structure type, depth, and aesthetics shall be further defined during final design.
(4) The Guadalupe Multi-Use Trail Bridge structure presented here was outlined in a Final Project Assessment prepared by AZTEC Engineering Inc. in January 2008. A copy of the Final Project Assessment is presented in Appendix E.

Special considerations for some of the proposed new bridge structures are included herein.

<u>Baseline Ramp 'F' Over EB CD Ramp 'T-4'</u>

This bridge structure is configured to span over an existing noise wall adjacent to the west side of the I-10 eastbound Baseline Road exit ramp, and continues to span over the Baseline Road exit ramp to provide 10' of clearance to the eastern abutment.

<u>Baseline Road Ramp 'F' Over the Western Canal</u>

This bridge structure spans over the Western Canal to avoid the placement of additional embankment (approximately 25' height) over the existing Western Canal reinforced concrete box culvert hydraulic structure. The abutment faces are located approximately 20' feet away from the box culvert walls. The bridge limits shall be established during final design in consultation with SRP Water.

<u>EB CD-2 Bridge over EB CD Ramp 'T-4'</u>

This new bridge structure would span over the eastbound Baseline Road exit ramp with abutments placed approximately 10' offset from the roadway edges. A small, partial removal of an existing noise wall (on the west side of the ramp) would be required to accommodate the westernmost abutment.

<u>Alameda Drive Pedestrian/Bicycle Underpass</u>

The initial concept for the Alameda Drive Pedestrian/Bicycle Underpass assumes a prefabricated steel structure with a deck-to-bottom-of-chord depth of 3'-0" would be used for the four spans passing over the I-10 mainline and C-D Roads. The remainder of the bridge would be a mixture of rolled steel girder bridges with a cast-in-place concrete deck and retaining walls for the walkway ramps.

The ramp return would be placed on the outside on both sides of the crossing. Special retaining wall details would be required for the wall between the pedestrian bridge and the eastbound C-D Road due to the elevation difference between the walkway ramp and the C-D Road.

The Alameda Drive Pedestrian/Bicycle Underpass cost estimate was developed using recent bid results for a similar underpass that was constructed over I-17 at the Central Arizona Project Canal (CAP) (I-17 Pedestrian Bridge Overpass Structure #10661, MP 220.35). The final structure type, depth, and aesthetic features shall be determined during final design in consultation with ADOT, MAG and the City of Tempe.

<u>Guadalupe Multi-Use Trail Underpass</u>

The *Final Project Assessment* (PA) for the *I-10 Guadalupe Pedestrian Bridge and Pathway from South Mountain Park to Tempe City Line* (January 2008) was prepared by AZTEC Engineering Inc. (see Appendix E). The PA presents a bridge concept that would match the existing AASHTO Type VI girder superstructure of the adjacent Guadalupe Road underpass. Dapped girder ends and an inverted T-shaped pier cap would be utilized to avoid vertical clearance encroachment of the pier cap over the I-10 mainline.

The bridge spans for the multi-use trail crossing would match the existing Guadalupe Road underpass. An existing independent pier column and footing was constructed with the previous Guadalupe Road underpass project to support this multi-use crossing as shown on Figure 26 (on page 154).

Figure 26 – Pier Column For New Guadalupe Road Multi-Use Trail Bridge

4.7.2 Widening of Existing Bridge Structures

Three overpass bridge crossings will be widened to accommodate the additional general-purpose lanes or auxiliary lanes associated with the Recommended Alternative. The existing overpasses that would be widened include:

- Ramp 'S-E' Over Southern Avenue (Structure No. 2305, I-10 Milepost 154.62)
- Priest Drive Overpass Eastbound (Structure No. 2350, US 60 Milepost 172.37)
- Ramp 'N-E' Over Western Canal (Structure No. 2367, I-10 Milepost 155.01)

This study included an evaluation of potential alternatives to widen the existing bridges. This evaluation examined numerous issues including the ability to maintain minimum vertical clearances during construction, minimum vertical clearances for the widened bridge structures, maintenance of traffic during construction, constructability of the widened portion of the bridge, potential impacts to the existing ramps and ramp intersections, aesthetics, and construction costs. While this document is not intended to select the final bridge configuration at each location, the anticipated and feasible structure type(s) are discussed for each location.

4.7.2.1 Structural Considerations

Cast-in-Place Post-Tensioned Concrete Box Girder

Post-tensioned structures are utilized extensively on the Regional Freeway System. The advantages of utilizing post-tensioned box girders for the widening of the existing structures include:

- The accommodation of various roadway geometric situations that occur at interchange ramp taper and gore areas.
- The widened portion of the bridge can be built on falsework above traffic. If the required falsework vertical clearance is not available, the superstructure could be built at the elevation needed to provide the minimum vertical clearance and then hydraulically lowered into the final position. Alternatively, a through-girder concept could be utilized to gain additional temporary clearance.

There are disadvantages of utilizing post-tensioned box girders for the widening of existing structures. Overpass structures located at crossroads would require the bridge to be constructed on falsework while maintaining traffic. The use of falsework would introduce the following issues for evaluation:

- Reduced vertical clearances: A minimum vertical clearance of 16' is required during construction. The falsework clearance has been reduced below this limit on previous projects by using overhead crash beams. However, the use of crash beams for sites with reduced vertical clearance is now discouraged due to safety and operational concerns. The minimum falsework clearance could be mitigated by constructing the widened portion of the bridge on falsework at an elevation higher than the existing bridge, and then lowering the superstructure onto the abutments and piers with hydraulic jacks. Consequently, this adds complexity to the bridge design and construction and increases the cost of the bridge.
- Traffic impacts during construction: The use of falsework towers may reduce the number of open lanes during construction. Precast elements used in conjunction with cast-in-place alternatives can provide increased spans and reduce the number of or eliminate falsework towers. Typical falsework spans are generally limited to a maximum opening of 60'. Increasing the falsework spans beyond 60' is feasible; however, larger spans require larger falsework girders that may not be readily available to the contractor, which could increase the project cost and construction duration. This type of bridge construction will also have an increased number of construction closures.
- Construction costs: Post-tensioned structures are typically more cost effective if constructed on soffit fill. Several of the bridge structures on this project support freeway crossings over existing arterial streets which preclude a soffit fill construction method. At these locations, the widening of the existing bridge structures with this superstructure configuration would require the use of falsework, increasing the cost of construction.
- Reduced Safety: More construction activities will occur over and adjacent to traffic, thereby reducing worker and public safety.

- Construction duration: A cast-in-place post-tensioned superstructure would generally exceed the duration required for precast girder bridge construction by approximately 30 to 60 days. The construction duration would also be increased by approximately 60 days to allow for creep and shrinkage in the post-tensioned, widened structures to occur prior to placing a concrete deck closure pour. The total increase in construction duration by utilizing a post-tensioned box girder option for the bridge structure widening compared to precast girders would be approximately 90 days.
- Multi-span bridges make the construction of falsework and lowering the superstructure into place by hydraulic jacking problematic. The hydraulic jacking of the superstructure must be sequenced carefully to ensure that the unintentional redistribution of forces does not lead to overstressing the superstructure.
- The use of steel through-girders to mitigate temporary construction clearances would add additional cost to the bridge construction, because additional fabrication will be required for non-standard, welded steel plate girders.
- Matching the new and existing bridge decks: Many variables must be considered that affect the long and short term camber of a bridge including temperature, creep and shrinkage. Techniques that can be utilized to ensure the existing and new bridge deck elevations will match at the interface include larger closure pours, the placement of additional deck thickness with subsequent deck milling, placement of an asphalt overlay, developing more detailed camber calculations, providing additional creep and shrinkage testing of the concrete mix, providing additional post-tensioning that can be tensioned or de-tensioned to adjust the bridge structure widening profile, using high performance concrete to reduce creep and shrinkage effects and providing higher construction quality control.

Precast Prestressed Concrete Girders

A significant number of precast, prestressed concrete girder bridge structure widenings have been constructed throughout the Regional Freeway System. AASHTO girders or precast prestressed box beams are an excellent alternative structure type for the widening of both CIP post-tensioned concrete box girder and precast girder bridges.

The advantages of utilizing precast sections include:

- Reduced construction duration: The majority of the creep and shrinkage that would occur in the precast girders would be completed prior to the erection of the girder. Therefore, the widened portion of the bridge deck can be placed with one pour, eliminating the need for a closure pour.
- Falsework: The use of precast girders would eliminate the need for falsework, thereby reducing the impacts to traffic during the construction of the bridge. Crossroad closures would be required during the erection of the girders, placement of stay-in-place deck forms (if applicable), and concrete placement of the deck.

The disadvantages of utilizing precast sections include:

- Depth of superstructure: A precast girder bridge would generally require a deeper superstructure section, which could impact the vertical clearance over the crossroad.
- Roadway geometry: A precast girder superstructure is not as conducive as post-tensioned box girder bridges to accommodate unique roadway geometry situations that occur at traffic interchange ramp connections. Therefore, additional deck area, that would not be used to support traffic, may be necessary at certain locations.

Steel Girders

Steel girders were considered for the bridge structure widenings associated with this project. However, steel girders react to temperature changes more abruptly than concrete structures. All of the structures that would be widened were originally constructed with precast, prestressed concrete girders. Therefore, steel girders may experience greater expansion and contraction than concrete girders in a given day. This may lead to compatibility issues between the existing and widened structure. In addition, steel girders are not typically cost competitive in Arizona, require a long fabrication and delivery schedule, and require additional maintenance. Therefore, steel girder superstructure alternatives for the widening of existing concrete superstructures were conceptually eliminated from consideration.

4.7.2.2 Design and Constructability Requirements

The bridge design and constructability issues were discussed extensively with representatives of ADOT's Bridge Group, Phoenix Construction District, and representatives of the local agencies. Therefore, the initial evaluation of alternatives for the widening of the existing bridge structures included the items shown below.

Vertical Clearance

A minimum vertical clearance of 16'-0", or the existing vertical clearance (whichever is less), over active traffic lanes is desirable during construction. The falsework clearance can be reduced below this limit with the approval of ADOT Bridge Group and Phoenix Construction District and with the use of crash beams. However, the use of crash beams for sites with reduced vertical clearance is now discouraged due to safety and operational concerns. Therefore, the development of alternative bridge widening configurations for this study was based on maintaining a 16'-0" minimum vertical clearance or the existing vertical clearance.

ADOT Bridge Group has requested that the bridge widening alternatives provide 16'-6" vertical clearance over the crossroads in the final condition. If the overpass currently provides less than 16'-6" vertical clearance, then the existing clearance should be maintained for the widened portion of the overpass where practical.

Bridge Barriers

All of the ramp bridges within the project limits would use ADOT Standard 44” height F-shaped half barriers at the edge of the bridge deck. The mainline overpass structure widenings would utilize ADOT Standard 34” height F-shaped half barriers at the edge of the bridge deck.

Concrete Strength

The bridge practice guidelines limit the maximum 28-day compressive strength of concrete to 6,500 psi for precast girders and 6,000 psi for cast-in-place post-tensioned concrete box girders constructed within the Phoenix Metropolitan area. The final designer may consider higher concrete strengths, if needed, with approval from ADOT Bridge Group.

Design Code

ADOT Bridge Group’s current policy is that Load and Resistance Factor Design (LRFD), as amended by the *ADOT Bridge Design Guidelines,* will be required for the design of the widening of existing bridges that were previously designed using the *AASHTO Standard Specifications*. Any new bridge structures shall be designed in accordance with the most current ADOT *Bridge Design Guidelines*.

Design Loads

All of the existing bridge structures were originally designed for HS-20 loading, with provisions for an additional 25 pounds per square foot of deck area for a future wearing surface. The widened structures should be designed utilizing the HL-93 live load and additional dead load conditions.

Maintenance of Traffic Operations

Minimizing impacts to the traveling public will be an important consideration in the bridge widening type selection.

Condition of Existing Bridges

The condition of the existing bridge structures is summarized in the bridge evaluation request form included in the AASHTO Controlling Criteria Report in Appendix D.

4.7.2.3 Evaluation of Bridge Widening Alternatives

The initial alternative consideration for the widening of each bridge is discussed in this section of the report. A summary of the bridge widenings is presented in Table 30 on page 158 following the site-specific discussions. The selection of a bridge widening configuration is a preliminary recommendation that has been used for cost estimating purposes and is based upon the information known at the time of this report. A detailed structure evaluation and selection process will be performed during the next design phase of the project.

Unless noted otherwise, it is anticipated that all or part of the existing concrete deck overhangs on the existing bridges would be removed to allow the widened portion of the bridge to be connected to the existing superstructure.

4.7.2.3.1 Ramp ‘S-E’ Over Southern Avenue (Structure No. 2305, I-10 Milepost 154.62)

Existing Bridge Configuration

The existing directional ramp structure over Southern Avenue consists of a single span, precast prestressed AASHTO Type VI Modified concrete girder bridge. The span length is 133.00’ measured along the construction centerline with a total structure length of 139.06’.

The bridge supports the I-10 eastbound to US 60 eastbound traffic and is constructed within a crest vertical curve and on a horizontal curve with a skew of 25^{o} 14’ 42” (per record drawings) to the crossroad. The bridges are superelevated at a variable rate (5.9% maximum) that slopes down toward the west side of the roadway.

The existing clear roadway width is 56.00’. The widening of the west side of this structure would add an additional lane on the west side of the structure, resulting in a clear roadway width of 68.00’.

Foundation Type

The existing substructure for the bridge consists of partial-height abutments founded on a dual row of drilled shaft foundations. It is anticipated that the substructure for the bridge widening would match the configuration for the existing substructure.

Feasible Structure Types and Traffic Control Requirements

Based on supplemental field survey, the existing vertical clearance for the structure is 15.75’. Therefore, structural options were evaluated to maintain the existing minimum vertical clearance, since matching the existing superstructure type would result in a significantly lower vertical clearance.

One feasible option would be to widen the superstructure with more closely spaced AASHTO Type V girders. The girders would require a release strength of 5,200 psi and a 28-day concrete strength of 7,000 psi. The use of 0.6”-diameter strands would also be necessary to make this option feasible. This would result in a structure depth that is approximately 9” shallower than the existing superstructure.

Another feasible option would utilize a 6’-0” deep CIP post-tensioned concrete box girder that would be constructed above the existing structure’s finished grade on falsework (to achieve a minimum temporary vertical clearance higher than the existing structure’s clearance of 15.75’) and then hydraulically lowered into final position. It is anticipated that at least two lanes on Southern Avenue would be needed to be closed for the placement of falsework towers during construction of the superstructure. It is not anticipated that this would be a cost-effective alternative.

Site Specific Issues

There are no other site-specific issues that would require consideration at this location.

Vertical Clearance

The existing minimum vertical clearance at this structure is 15.75'. Utilizing supplemental field survey data, the minimum vertical clearance for the widened structure utilizing AASHTO Type V girders would be 15.77'. The final vertical clearance shall be verified during the next design stage.

Initial Recommendation

An AASHTO Type V Girder was used for cost estimating purposes. However, both structural alternatives should be evaluated in the next design stage, especially with attention to minimum vertical clearance given the relatively high maximum superelevation on this structure (5.9%).

4.7.2.3.2 Priest Drive Overpass Eastbound (Structure No. 2350, US 60 Milepost 172.37)

Existing Bridge Configuration

The existing bridge structure over Priest Drive consists of a single span, precast prestressed AASHTO Type VI Modified concrete girder bridge. The span length is 127.85' measured along the construction centerline with a total structure length of 133.48'.

The bridge supports US 60 eastbound traffic and is constructed within a crest vertical curve and on a horizontal curve with a skew of 12^{o} 06' 07" (per record drawings) to the crossroad. The bridges are superelevated at 3.4%, sloping down toward the south edge of the bridge structure.

The existing clear roadway width varies along the bridge. The widening of the south side of this structure would add approximately 6' to the existing bridge width.

Foundation Type

The existing substructure consists of full-height abutments founded on an irregular placement of a dual-row of drilled shaft foundations at the southern edge of the bridge. The irregularity of the drilled shaft placement is due to a past widening of original Priest Drive structure that had been conducted in 2002, which resulted in a footing configuration (and shaft placement) to address conflicts with an existing retaining wall and abutment foundation that were also founded on drilled shaft foundations.

It is anticipated that special detailing might be required for the bridge widening with an abutment founded on a dual-row of drilled shaft foundations.

Feasible Structure Types

One feasible structural option for widening the bridge structure would be to utilize AASHTO Type VI Modified girders, matching the existing superstructure type.

While a post-tensioned box structure would be another feasible alternative, it would require hydraulic jacking and falsework in Priest Drive to achieve a desirable minimum temporary vertical clearance of 16'-0". Closures of at least two through lanes on Priest Drive would be required during construction for the placement of falsework towers. Given that the vertical clearance of the existing structure is adequate to support the precast option, it is not anticipated that this would be a cost-effective alternative.

Site Specific Issues

The existing structure utilizes flared MSE walls at the southeast and southwest quadrants of the bridge. Special detailing will be required at the retaining wall or wingwall/MSE wall interface to retain the roadway embankment. Additionally, specially designed retained half-barriers will be required to eliminate additional embankment at the bridge approaches. Non-standard retaining walls at each corner of the overpass are included in the cost of the widened bridge structure.

Vertical Clearance

Based on supplemental field survey, the existing clearance for this bridge structure is 17.39'. It is anticipated that the vertical clearance after widening will be approximately 17.04'. The final vertical clearance shall be verified during the next design stage.

Initial Recommendation

An AASHTO Type VI modified girder widening was assumed for cost estimating purposes. However, both structural alternatives should be evaluated in the next design stage.

4.7.2.3.3 Ramp 'N-E' Over Western Canal (Structure No. 2367, I-10 Milepost 155.01)

Existing Bridge Configuration

The existing bridge structure over the Western Canal consists of a single span, precast prestressed AASHTO Type IV concrete girder bridge. The span length is 89.20' measured along the construction centerline with a total structure length of 99.09'.

The bridge supports Ramp 'N-E' traffic and is constructed within a rising vertical curve and on a horizontal curve with a skew of 55^{o} 53' 25" (per record drawings) to the Western Canal construction centerline. The bridge is superelevated at 9.7%, sloping down toward the east edge of the structure.

The existing clear roadway width is 28.00'. The widening of the west side of this structure would add approximately 12' to the existing bridge width to accommodate one additional lane, resulting in a clear roadway width of 40.00'.

Foundation Type

The existing substructure for the bridge consists of partial-height abutments founded on a single row of drilled shaft foundations. It is anticipated that the substructure for the bridge widening would match the configuration for the existing substructure.

Feasible Structure Types

One feasible structural option for widening the bridge structure would be to utilize AASHTO Type IV girders, matching the existing superstructure type.

While precast box beams may be another feasible alternative, they are typically not cost effective compared to AASHTO girders. Additionally, the high superelevation of the bridge complicates tie-rod placement between adjacent box beams which would require a “stepped” configuration due to the severity of the superelevation. Consequently, the utilization of precast box beams is not anticipated to be a preferred alternative.

Site Specific Issues

The existing abutments are in close proximity to the existing Western Canal bank. As a result, temporary shoring and bracing may be required to facilitate construction of the widened abutment caps and associated wingwalls. Close coordination will be required with SRP.

Additionally, an SRP equipment pass is located immediately north of the bridge that will require extension/reconstruction since the Ramp ‘N-E’ widening improvements would extend beyond the current enclosed west equipment pass limit. Due to the proximity of the equipment pass to the approach slab at the north end of the bridge, the existing anchor slab was originally placed up-station beyond the equipment pass (in lieu of being placed immediately adjacent to the approach slab) to avoid conflicts between the anchor slab lugs and the roof of the equipment pass. The existing anchor slab is anticipated to be widened at its original location on the north side of the structure as a result.

The existing anchor slab on the south side of the bridge is immediately adjacent to the approach slab. However, the severity of the skew requires that a new approach slab and anchor slab be constructed using a 15’ minimum approach slab length. Widening the existing approach slab would not allow for an approach slab at the acute corner of the bridge.

Vertical Clearance

Given that the widening of the structure will occur towards the high side of the superelevated deck, freeboard impacts to the Western Canal or conflicts with the existing equipment underpass are not anticipated.

Initial Recommendation

An AASHTO Type IV girder widening was assumed for cost estimating purposes. However, both structural alternatives should be evaluated in the next design stage.

4.7.2.4 Summary of Preliminary Widening Concepts

The initial bridge widening configurations used for the Order of Magnitude project cost estimates are summarized in Table 30.

Table 30 – Bridge Structure Widening Concepts for the Recommended Alternative

Bridge Description	Bridge Length	Number of Spans	C_L-C_L Span Lengths	Approx Width of Widening(1)	Proposed Superstructure Depth(2)	Existing Superstructure Type	Proposed Widening Concept
Ramp ‘S-E’ Over Southern Avenue	139.06’	1	133.00’	12’	6’-3”	AASHTO Type VI Modified Girders	AASHTO Type V Girders
Priest Drive Overpass (EB)	133.48’	1	127.85’	Varies	7’-0”	AASHTO Type VI Modified Girders	AASHTO Type VI Modified Girders
Ramp ‘N-E’ Over Western Canal	99.09’	1	89.20’	12’	5’-6”	AASHTO Type IV Girders	AASHTO Type IV Girders

(1) Structural widening does not include the width associated with the partial removal of the existing deck.
(2) Proposed superstructure depths are approximate and are subject to refinement during the next design phase.

4.7.3 Western Canal Equipment Underpass Extension

An existing SRP equipment underpass is located immediately north of the Ramp ‘N-E’ Over Western Canal bridge structure (Structure No. 2367, I-10 Milepost 155.01), passing beneath Ramp ‘N-E’ at approximate Station 9+28. The underpass will be required to be extended to the west, along with the reconstruction of the ramp to accommodate the proposed widening of the Ramp ‘N-E’ bridge over the Western Canal.

The existing SRP equipment underpass is a single cell cast-in-place concrete box frame with clear dimensions measuring 16’-0” in width and 14’-0” in height (ADOT Standard B-03.10). The ramps consist of a ‘U’-shaped section consisting of cast-in-place variable height concrete walls supported on a shared cast-in-place concrete footing (which doubles as a driving surface for the ramp). Due to the equipment underpass extension, reprofiling of the underpass ramp would require the removal/replacement of the existing ‘U’-shaped ramp west of Ramp ‘N-E’.

The box extension and reconstructed underpass ramp may require temporary shoring and bracing along the southern edge of the existing equipment underpass to protect the Western Canal, and along the west edge of the existing Ramp ‘N-E’ bridge wingwalls. Additionally, there is an existing sump pump and associated drainage trench that will require relocation and incorporation into the box extension details.

The extension of the existing box frame structure measures approximately 24-4” and the reconstructed ramp measures approximately 79’-6” in length, assuming that the as-built ramp measurements and grades are closely matched and that the same separation between the existing Ramp ‘N-E’ deck edge and the end of the equipment pass in maintained from the widened bridge structure.

4.7.4 Replacement of Existing Pedestrian Fence

During the Risk Assessment Workshop conducted in January 2015, ADOT Phoenix Maintenance District requested the existing chain-link pedestrian fences currently on the crossroad underpasses be removed and replaced with expanded metal pedestrian fencing. Table 31 provides an inventory of the existing underpasses that have chain-link pedestrian fences. Each location is also shown on Figures 27-32.

During a site visit it was noted that the existing parapet at the northeast quadrant of the Elliot Road TI has exhibited some rotation off the bridge along the sidewalk. This is shown in Figure 30 and Figure 31.

Table 31 – Chain-link Fence Inventory

Bridge Name	Chain-link Fence Location	Barrier Type
Broadway Road TI Underpass	Both	ADOT Std. B-21.18, Type A with Barrier-Separated Sidewalk on South Side / ADOT Std. B-21.18 Type A Barrier with no sidewalk on North Side
Guadalupe Road Underpass	South side(1)	ADOT Standard SD-1.01 32" F-shape Barrier (Standard dated 9/99)
Elliot Road TI Underpass	Both	ADOT Standard B-22.60 Parapet with Fence with Barrier-Separated Sidewalk on Both Sides (ADOT Std B-21.18 Type B Barrier)
Warner Road TI Underpass	Both	Non-standard Parapet with Fence with Barrier-Separated Sidewalk on Both Sides (Non-standard F-shape Barrier)(2)

(1) North side utilizes current mesh fencing per ADOT SD 1.05.
(2) Parapets/barriers shown on Warner Road as-builts exhibit similar characteristics to the ADOT standards on Elliot Road although the reinforcement utilized on the Warner Road bridge structure differs from the ADOT standard detailing; these barriers were explicitly detailed on the Warner Road plans.

Figure 27 – Broadway Road TI Underpass Fence (North Side)

Figure 28 – Broadway Road TI Underpass Fence (South Side)

Figure 29 – Guadalupe Road Underpass Fence (South Side)

Figure 30 – Elliot Road TI Underpass Fence (North Side Shown, South Side Similar)

Figure 31 – Elliot Road TI Underpass Fence (Parapet Rotation)

Figure 32 – Warner Road TI Underpass Fence (North Side Shown, South Side Similar)

ADOT Bridge Design Section was consulted to present the existing conditions, and to develop an approach to remove the existing fence and install the new SD 1.05 detail. It was determined it would be feasible to utilize drill-and-epoxy doweled posts. ADOT Bridge Group's recommendations are summarized in Table 32:

Table 32 – Recommended Fence Retrofits

Bridge Name	Recommended Action
Broadway Road TI Underpass	Replace south side chain-link fence only (barrier-separated sidewalk side) with ADOT SD 1.05 fencing
Guadalupe Road Underpass	Replace south side chain-link fence with ADOT SD 1.05 fencing(1)
Elliot Road TI Underpass	Replace the chain-link fence (barrier-separated sidewalks) with ADOT SD 1.05 fencing on both sides of the bridge; Repair the parapet on the northeast side of the bridge
Warner Road TI Underpass	Replace the chain-link fence (barrier-separated sidewalks) with ADOT SD 1.05 fencing on both sides of the bridge

(1) This fence would be addressed with the construction of the adjacent multi-use trail.

A multi-use trail crossing structure is planned adjacent to the south side of the Guadalupe Road underpass. The adjacent multi-use trail bridge will include equestrian fencing that would replace the existing pedestrian fence.

The retrofit of the existing bridges to incorporate the ADOT SD 1.05 detail would include the following items:

- The installation of the SD 1.05 anchors may require more frequent post spacing to achieve structural requirements;
- The barrier/parapet ends may require a partial removal and replacement detail to address the existing fence post conflicts with the placement of new posts/anchors;
- Embedded chain-link fence posts are assumed to be grout-filled after sawcut removal from top of parapets/barriers, where applicable;
- A new parapet and footing will be required outside of the existing bridge limits at the northeast corner of the Elliot Road TI Underpass.

The removal and replacement of the pedestrian fencing may require crossroad lane and sidewalk closures.

4.7.5 Retaining Walls

New retaining walls would be required throughout the corridor to accommodate the roadway widening for the Recommended Alternative. The retaining wall alternatives that could be considered for this project are cantilevered walls on spread footings, cantilevered walls on drilled shaft foundations, L-shape walls, mechanically stabilized earth (MSE) walls, soil nailed walls, and soldier/tieback walls. The design of the walls will utilize the current AASHTO LRFD Specifications and the ADOT *Bridge Design Guidelines*.

The new retaining walls may require special design considerations. At these locations, the following alternatives should be evaluated during final design:

- Offset the new wall from an existing wall to provide sufficient area to construct a new spread footing.
- Provide a specialty wall design that could be founded on:
  - L-shape spread footings.
  - Single or multiple rows of drilled shaft foundations utilizing a shaft cap to transfer the loads from the wall to the shafts.
  - Footings that are doweled into existing box culvert structures. Roadway barriers adjacent to these new walls would be founded on independent moment slabs.
- Tie-back or soil nail walls may be considered. However, the existing roadway embankment may not be suitable for lateral restraint.
- MSE walls.

An evaluation will be required during final design to determine the feasibility of each wall alternative. The evaluation criteria should include right-of-way constraints, construction access availability, the ability to maintain traffic during construction, and estimated construction costs.

Preliminary Recommendations for Retaining Walls

For the purpose of this report, retaining walls are divided into three categories including standard cast-in-place walls, specialty walls, and combination walls. Walls that do not require any special treatment are designated as standard walls. Standard walls are anticipated to be either ADOT standard cast-in-place walls or walls founded on similarly configured spread footing foundations. Walls that would require an unusual footing shape, would be founded on drilled shaft foundations, tie-back, soil nail, MSE walls, or walls greater than 30' in height (non-ADOT standard) are designated as specialty walls. A summary of the retaining walls assumed for cost estimating purposes is provided in Table 33 (on page 162).

Retaining walls that would require additional height to provide noise mitigation are identified as combination walls. Unless specified as a combination/specialty wall, combination walls are anticipated to be founded on spread footings. Some specialty walls may require partial/total removals of existing MSE walls to accommodate new roadway pavements and the cost of these removals are included in the wall cost associated with the new wall. A detailed analysis shall be performed during final design.

Table 33 – New Retaining Wall Summary

Alignment/ Wall No.	Location Description	Approximate Station Limits	Approx. Wall Length (ft.)	Average Wall Height(1) (ft.)	Max. Wall Height(1) (ft.)	Recommended Wall Type
EB CD-1/R1	West edge of EB CD-1 to pedestrian bridge wall	EB CD-1 Station 8120+00 to EB CD-1 Station 8131+00	1100	7	8	Standard Wall
EB CD-2/R1	West edge of EB CD-2 to north end of EB CD-2 bridge over Southern Avenue	EB CD-2 Station 8147+00 to EB CD-2 Station 8156+86	986	12	19	Standard Wall
EB CD-2/L1	East edge of EB CD-2	EB CD-2 Station 8147+00 to EB CD-2 Station 8155+00	800	10	15	Standard Wall
EB CD-2/L2	East edge of EB CD-2 to north end of EB CD-2 bridge over Baseline Road exit ramp	EB CD-2 Station 8172+00 to EB CD-2 Station 8173+70	170	18	33	Specialty Wall (Non-standard wall > 30' height)
EB CD-2/L3	East edge of EB CD-2 starting from south end of EB CD-2 Bridge over Baseline Road exit ramp	EB CD-2 Station 8175+02 to EB CD-2 Station 8176+00	98	18	36	Specialty Wall (Non-standard wall > 30' height)
EB CD-2/R2	West edge of EB CD-2 to north end of EB CD-2 bridge over the Baseline Road exit ramp	EB CD-2 Station 8173+00 to EB CD-2 Station 8173+70	70	13	25	Standard Wall
EB CD-2/R3	West edge of EB CD-2 starting from south end of EB CD-2 bridge over the Baseline Road exit ramp	EB CD-2 Station 8175+02 to EB CD-2 Station 8176+00	98	13	25	Standard Wall
Baseline Road Ramp 'F'/R1	West edge of Baseline Road Ramp 'F' to north end of Baseline Road Ramp 'F' bridge over the Baseline Road exit ramp	Ramp 'F' Station 14+50 to Ramp 'F' Station 20+83	633	23	35	Specialty Wall (Non-standard wall > 30' height)
Baseline Road Ramp 'F'/L1	East edge of Baseline Road Ramp 'F' to north end of Baseline Road Ramp 'F' bridge over the Baseline Road exit ramp	Ramp 'F' Station 19+00 to Ramp 'F' Station 20+26	126	20	33	Specialty Wall (Non-standard wall > 30' height)
Baseline Road Ramp 'F'/R2	West edge of Baseline Ramp 'F' starting from south end of Baseline Road Ramp 'F' bridge over Baseline Road exit ramp to Baseline Road Ramp 'F' over the Western Canal Bridge	Ramp 'F' Station 22+39 to Ramp 'F' Station 23+90	151	12	21	Standard Wall
Baseline Ramp 'F'/L2	East edge of Baseline Ramp 'F' starting from south end of Baseline Road Ramp 'F' bridge over the Baseline Road exit ramp	Ramp 'F' Station 21+76 to Ramp 'F' Station 22+75	99	18	35	Specialty Wall (Non-standard wall > 30' height)
Baseline Road Ramp 'F'/L3	East edge of Baseline Road Ramp 'F' to north end of Baseline Road Ramp 'F' bridge over the Western Canal	Ramp 'F' Station 23+25 to Ramp 'F' Station 23+99	74	14	28	Standard Wall
Baseline Road Ramp 'F'/L4	East edge of Baseline Ramp 'F' starting from south end of Baseline Road Ramp 'F' Bridge over the Western Canal	Ramp 'F' Station 24+99 to Ramp 'F' Station 25+50	51	12	23	Standard Wall
EB 'T-4'/R1	West edge of EB Ramp 'T-4'	EB Ramp 'T-4' Station 29+50 To EB Ramp EB 'T-4' Station 39+00	960(2)	12	17	Specialty Wall (Standard Wall with partial MSE wall removal to accommodate new roadway / offset from existing MSE wall)

Table 33 – New Retaining Wall Summary (continued)

Alignment/ Wall No.	Location Description	Approximate Station Limits	Approx. Wall Length (ft.)	Average Wall Height(1) (ft.)	Max. Wall Height(1) (ft.)	Recommended Wall Type
Baseline Road Ramp 'C'/R1	West edge of Baseline Road Ramp 'C'	Ramp 'C' Station 0+00 to Ramp 'C' Station 12+87(2)	1297(2)	12	16	Specialty Wall (Partial MSE wall removal to accommodate new roadway/ offset from existing MSE wall)
I-10 EB/R1	East edge of I-10 mainline	I-10 Station 8246+50 to I-10 Station 8247+50	100	7	10	Standard Wall
Barrier EB03	I10, between Guadalupe Road and Elliot Road along eastbound I-10	I-10 Station 8263+00 to I-10 Station 8290+00	2736	7	11	Specialty Wall (Combination Wall)
WB CD Ramp' 'T-1'/R1	Between I-10 Westbound and WB CD Ramp 'T-1'	WB CD Ramp 'T-1' Station 18+00 to WB CD Ramp 'T-1' Station 25+00	700	7	9	Soil Nail Wall
WB CD-1/L1	East edge of WB CD-1	WB CD-1 Station 8112+00 to WB CD-1 Station 8137+00	2500	11	17	Standard Wall(3)
WB CD-1/R1	West edge of WB CD-1 to north edge of WB CD-1 bridge over Southern Avenue	WB CD-1 Station 8148+00 to WB CD-1 Station 8157+73	973	13	18	Standard Wall
WB CD-1 & WB CD Ramp 'T-2'/L2	East edge of WB CD-1 and WB CD Ramp 'T-2'	WB CD-1 Station 8148+00 to WB CD Ramp 'T-2' Station 12+97	975	13	19	Specialty Wall (Combination Wall)
WB CD-1/R2	West edge of WB CD-1 from south end of WB CD-1 bridge over Southern Avenue	WB CD-1 Station 8159+37 to WB CD-1 Station 8162+00	263	13	18	Standard Wall
WB CD Ramp 'T-2'/L1	East edge of WB CD Ramp 'T-2' from south end of WB CD-1 bridge over Southern Avenue	WB CD T-2 Station 14+64 to WB CD Ramp 'T-2' Station 34+00	1936	13	25	Specialty Wall (Combination Wall)
WB CD Ramp 'T-2'/R1	West edge of WB CD Ramp 'T-2'	WB CD Ramp 'T-2' Station 22+00 to WB CD Ramp 'T-2' Station 27+00	500	12	19	Standard Wall
Ramp 'W-N'/L1	East edge of Ramp 'W-N' to north end of Ramp 'W-N' bridge over WB CD-1	Ramp' W-N' Station 201+00 to Ramp 'W-N' Station 202+10	110	8	18	Standard Wall
Ramp 'W-N'/R1	West edge of Ramp 'W-N' to north end of Ramp 'W-N' bridge over WB CD-1	Ramp 'W-N' Station 202+25 to Ramp 'W-N' Station 202+82	57	12	21	Standard Wall

Table 33 – New Retaining Wall Summary (continued)

Alignment/ Wall No.	Location Description	Approximate Station Limits	Approx. Wall Length (ft.)	Average Wall Height(1) (ft.)	Max. Wall Height(1) (ft.)	Recommended Wall Type
Ramp 'W-N'/L2	East edge of Ramp 'W-N' starting from south end of Ramp 'W-N' bridge Over WB CD-1	Ramp 'W-N' Station 203+71 to Ramp 'W-N' Station 204+50	79	13	25	Standard Wall
Ramp 'W-N'/R2	East edge of Ramp 'W-N' starting from south end of Ramp 'W-N' bridge Over WB CD-1	Ramp 'W-N' Station 204+29 to Ramp 'W-N' Station 204+75	46	10	20	Standard Wall
Ramp 'N-E'/R1	West edge of Ramp 'N-E', north of Ramp 'N-E' bridge over Western Canal; adjacent to and passing over equipment underpass extension for Western Canal	Ramp' N-E' Station 39+00 to Ramp 'N-E' Station 40+21	121	13	17	Specialty Wall (Non-standard wall requiring Special Footing)(3)
Ramp 'N-E'/R2	West edge of Ramp 'N-E', south of Ramp' N-'E bridge over Western Canal	Ramp 'N-'E Station 41+25 to Ramp 'N-E' Station 43+00	175	8	14	Specialty Wall (Non-standard wall founded on drilled shafts)(3)
US60/R1	South edge of Ramp 'S-E'/US60	Ramp 'S-E' Station 140+00 to US 60 Station 48+14.77(3)	824(3)	11	16	Standard Wall and Specialty Wall (L-shape Footing Requiring MSE Wall Removal and Shoring / Bracing)(3)

(1) For combination walls, height shown reflects retained height only.
(2) Additional 10' of wall length assumed for tie-in to existing wall from offset wall.
(3) See Special Wall Considerations.

Special Consideration for Specific Wall Locations

Site-specific considerations for the construction of new retaining walls WB CD-1/L1, Ramp 'N-E' Walls R1 and R2, and US 60/R1 are discussed below.

Wall WB CD-1/L1

This wall is located along the Belle Buttes Cemetery. The minimum distance between the cemetery and the wall is approximately 14'. No temporary construction easements will be permitted within the cemetery. As a result, a portion of this wall may require a special non-standard wall footing configuration and/or temporary shoring to avoid any disturbance of and encroachment into the cemetery property. A non-standard wall configuration is assumed in the cost estimate for a length of approximately 100'.

Walls Ramp 'N-E' R1 and R2

The construction of these walls is in close proximity to an existing SRP equipment underpass that will be extended due to the widening of Ramp 'N-E' over the Western Canal. Due to the close proximity of the walls to the bridge structure, equipment pass and the Western Canal, special wall details and/or shoring may be required. Special wall details may include (but not be limited to) integrating the retaining wall to the roof of the equipment pass extension in the form of a headwall, as well as the use of drilled shaft foundations and/or L-shape footings to minimize the potential encroachment of wall footings into the bridge structure. Close coordination for the design and construction of these walls, the bridge widening, and the equipment pass extension will be required with SRP.

Wall US 60/R1

A portion of this wall will be built behind an existing MSE wall along the edge of the US 60 eastbound (Ramp 'S-E') roadway. As shown on the record drawings, the existing MSE wall starts at approximate Station 144+33 which terminates at an existing tieback wall (that is located immediately west of and under the Hardy Drive Underpass beginning at approximate Station 148+13).

For preliminary cost estimating purposes a wall concept using temporary shoring, along with the MSE wall removal, was assumed as shown in Figure 33. Alternative wall concepts including a potential soil nail wall, shall be evaluated during the next design stage. Special attention should be made regarding potential MSE wall strap conflicts (from the existing wall) while evaluating wall alternatives.

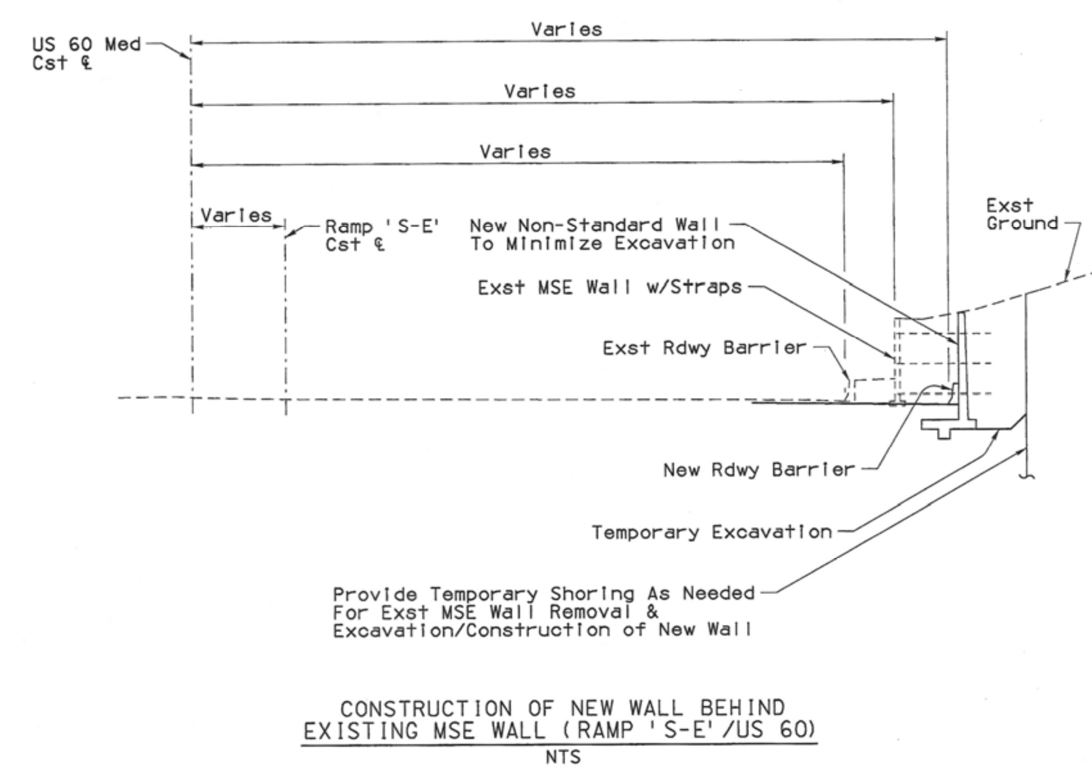


Figure 33 – US 60 Eastbound Wall Concept

4.7.6 Noise Walls

A noise mitigation study is being prepared for this project. The initial findings of the noise analysis is summarized in Table 34.

The new limits and heights of noise barriers are defined in the noise analysis report. It is anticipated that the proposed noise walls shown in the report will require either new wall construction or the removal/reconstruction of existing noise walls. Walls are evaluated at each identified location considering each wall type, right-of-way constraints, constructability and construction cost. The design of new noise walls will utilize AASHTO LRFD Bridge Design Specifications, 4th Edition 2007.

Table 34 – New Noise Wall Summary

Wall No. (1)	Description	Approximate Station Limits along I-10 Med Cst Centerline (Unless Noted Otherwise)	Approx. Wall Length(2) (ft.)	Average Wall Height(3) (ft.)	Max. Wall Height(3) (ft.)	Wall Type
Barrier WB01	Along outside edge of Westbound C-D Road	Station 8143+94 to Station 8148+00	425	14	14	ADOT Standard Concrete Noise Wall
		Station 8148+00 to WB CD Ramp 'T-2' Station 12+97	975	12	12	Specialty Wall (Combination Wall)
		Station 8155+98 to Station 8158+45 (WB CD Ramp 'T-2' Station 14+64_	166	12	12	Non-Standard Concrete Noise Wall on Bridge
Barrier WB02	Along outside edge of WB C-D Ramp 'T-2'	WB CD Ramp 'T-2' Station 14+64 to WB Ramp CD 'T-2' Station 34+00	1936	15	15	Specialty Wall (Combination Wall)
		WB Ramp CD 'T-2' Station 34+00 to WB Ramp CD 'T-2' Station 40+00	600	17	17	ADOT Standard Concrete Noise Wall
Barrier EB03	I-10, between Guadalupe Road and Elliot Road along I-10 eastbound	Station 8263+00.00 to Station 8290+00.00	2,736	20	20	Specialty Wall (Combination Wall)
Barrier SW01	I-10, between Elliot Road and Warner Road along Elliot Road Ramp 'D'	Station 8325+09.69 to Station 8327+68.04	264	15	16	Non-Standard Concrete Noise Wall
Barrier EB05	I-10, between Warner Road and Ray Road along I-10 EB and Ray Road Ramp 'B'	Station 8401+16.50 to Station 8412+79.64	1,172	19	20	ADOT Standard Concrete Noise Wall
	I-10, Between Warner Road and Ray Road along Ray Road Ramp 'B'	Station 8410+75.62 to Station 8416+31.30	600	19	20	ADOT Standard Concrete Noise Wall

(1) Walls designated as "SW" are matching existing noise wall heights and lengths. Walls designated as "Barrier" are new noise mitigation walls recommended by the noise analysis which improve existing noise mitigation.
(2) This wall includes the removal of an existing noise wall (a portion or entire) located in close proximity to the proposed noise wall. A separate cost for the removal of the existing noise wall is included in the cost estimate.
(3) For combination walls, the wall height shown in the table reflects the noise height mitigation only. See the retaining wall table for retained heights.

Special Noise Wall Design Considerations

Special noise wall design considerations at select locations are presented below.

Barrier EB 03

The privacy wall owned by Pinnacle Apartments appears to be an existing masonry wall (no record drawings are available). The new combination noise/retaining wall would be constructed within and parallel to ADOT right-of-way (ROW) line. The new wall is assumed to be offset by approximately 5' from the right-of-way line for construction of the new wall footing. This location would allow the apartment complex's existing wall of parking stalls to remain in-use.

The existing privacy wall will be removed to approximately 2' below grade after constructing the new wall. Temporary shoring may be required to protect the existing privacy wall during construction. It is anticipated that planters adjacent to the existing privacy wall would be extended to the new sound wall.

An existing drainage channel passes through the privacy wall shown in Figure 34. This drainage opening must be included in the design for the new sound wall.

Barrier SW 01

A portion of an existing noise wall along Elliot Road Ramp 'D' is in conflict with the realigned ramp roadway. Subsequently, the wall will be removed and reconstructed along the edge of the new roadway and connect to the existing wall at each end. A non-ADOT standard wall may need to be evaluated during final design depending on the distance between the wall and the proposed roadway shoulder.

An existing single barrel 10' x 4' cast-in-place reinforced concrete box culvert will be extended to accommodate the roadway realignment and the new noise wall. The top of culvert is in close proximity to the roadway surface and may require special detailing at the culvert crossing.

Barrier EB 05

This new noise barrier will consist of two segments. The first segment is located parallel to (with a 5' offset) to the right-of-way line for approximately 200' to avoid existing City of Phoenix sanitary sewer lines. Once the sewer lines veer away from the right-of-way line, this segment will taper to a 3'-3" offset to the ROW line until the wall segment intersects the proposed ramp roadway. The wall will follow Ray Road Ramp 'D' for approximately 290' feet a 3'-3" offset to the end of this segment. The second segment of the wall will overlap with the south end of the first segment of the noise wall and be placed with a 3'-3" offset to the ROW line. An ADOT standard sound wall is anticipated for both segments. The existing FMS lines and traffic power lines along the freeway will need to be relocated for wall construction.

Figure 34 – Existing Drainage Opening in Privacy Wall

4.8 UTILITY, RAILROAD AND VALLEY METRO RAIL COORDINATION

During final design, each city and utility agency will receive and review the preliminary design plans for this project. Utility conflicts will be resolved with cooperation from the affected agencies. Construction plans for the relocations or adjustments of the utilities will be developed by the responsible parties.

All ADOT utilities that are in conflict will be included in the freeway and utility relocation design plans including the conversion of any existing unmetered freeway lighting, traffic signals or other electrical facilities into metered services.

The City of Phoenix has water and sewer pipelines within the project limits. They will be protected in place during freeway construction operations. No major conflicts with these utilities are anticipated, pending utility potholing to be performed during final design.

City of Phoenix

The City of Phoenix has three 24” DIP (ductile iron pipe) sewer force mains along the west I-10 right-of-way, beginning at approximately I-10 Station 8303+75 near the Elliot Road exit ramp. These force mains continue to the south in varying sizes along the ADOT right-of-way, to the Ray Road lift station. A gravity sanitary sewer is also located with the force mains within a portion of this area. The sewer pipelines shall be protected in-place.

City of Tempe

The City of Tempe has numerous water and sewer pipelines located along the I-10 right-of-way, and across I-10 at several cross streets. Many direct and indirect conflicts have been investigated and discussed with City staff and are described below:

South of Broadway Road: The City of Tempe has a 12” CIP (cast iron pipe) water line that crosses the I-10 corridor at Station 8100+60. The proposed construction of the off-site storm drain near the Broadway Road entrance ramp may conflict with the water line on the west side of the freeway.

Tempe Diablo Stadium: Several parking lot light poles electric cabinets, meters and power service lines will be in conflict with the freeway widening and the Alameda Drive pedestrian/bicycle underpass.

Diablo Way: Diablo Way will be relocated to the west as shown in the concept plans. During the acquisition of this property ADOT, the City of Tempe and the property owner agreed to establish a 27’ wide corridor for Diablo Way and the relocation of the public and private utilities shown on Figure 35 (on page 166). An 8’ wide Public Utility Easement (PUE) was also established along the west side of Diablo Way to accommodate private dry utilities.

The west ramp for the pedestrian/bicycle underpass will be placed between the eastbound C-D Road and the relocated Diablo Way.

Southwest Gas has recently abandoned their 2” PE (polyethylene) gas line and it will not be replaced. Zayo has installed eight 1-¼” HDPE (high density polyethylene) conduits and four 2’x3’x2’ pullboxes inside the PUE in 2014. The Zayo record drawings are inconclusive as to how much of the PUE was used for their telecommunication conduits, but it is expected that joint trenching of other utility relocations inside the PUE will proceed in the future as originally planned.

Alameda Drive: The City’s 12” CIP water line, 15” VCP (vitrified clay pipe) sanitary sewer and 24” concrete storm drain that cross I-10 at Alameda Drive may be impacted by the new storm drain proposed along the westbound C-D Road.

Southern Avenue: Construction of the eastbound and westbound C-D Roads over Southern Avenue may impact the City’s 12” CIP water line along the north side of Southern Avenue, and a 6” CIP water line along the south side of Southern Avenue.

AT&T

Alameda Drive (I-10 Station 8130+95): AT&T has six 1-½" HDPE underground fiber optic cable conduits within a 14" steel casing that crosses I-10 at Alameda Drive. The utility owners are under the names of AT&T, PF/Net, NextLink and XO Communications under three ADOT encroachment permits (Permit Nos. 82505, 82506 and 82507). These conduits will require potholing to determine if they will be impacted by the new storm drain.

Fountainhead Commerce Center: The fiber optic conduits in Alameda Drive are also within a joint-trench with Level 3, City Net, Metro Media FiberNetwork and AGL Network along the Fountainhead Commerce Center. This joint trench (including five manholes) will be required to relocate to the new ADOT right-of-way line.

CenturyLink

CenturyLink has numerous underground telecommunication lines and cabinets throughout the freeway corridor. It is anticipated that a majority of these facilities will be impacted and will require relocation.

Diablo Way: The CenturyLink underground telephone lines and pedestals will be relocated to the new 8' PUE along the west side of Diablo Way as shown on Figure 35.

Between Alameda Drive and Southern Avenue on the East Side of I-10: The CenturyLink underground telephone line and pedestals located along the existing I-10 east right-of-way line will be in conflict with the proposed westbound C-D Road and will require relocation.

Southern Avenue: Construction of the eastbound and westbound C-D Roads may conflict with the telecommunication facilities that are located along the south side of Southern Avenue.

Cox Communications

Cox has numerous underground CATV lines throughout the freeway corridor. It is anticipated that many of these facilities will be impacted and will require relocation.

Between Alameda Drive and Southern Avenue on the East Side of I-10: The Cox CATV facilities will be in conflict with the westbound C-D Road and will require relocation.

El Paso Natural Gas (now Kinder Morgan)

The former El Paso Natural Gas (now Kinder Morgan) has several natural gas pipelines that cross the I-10 corridor. The proposed construction is not anticipated to adversely affect these pipeline crossings.

South of Baseline Road (I-10 Station 8222+90): Kinder Morgan has a 4-½" steel natural gas pipeline that crosses I-10 at this location. Direct conflict with this pipeline is not anticipated and will be protected in-place.

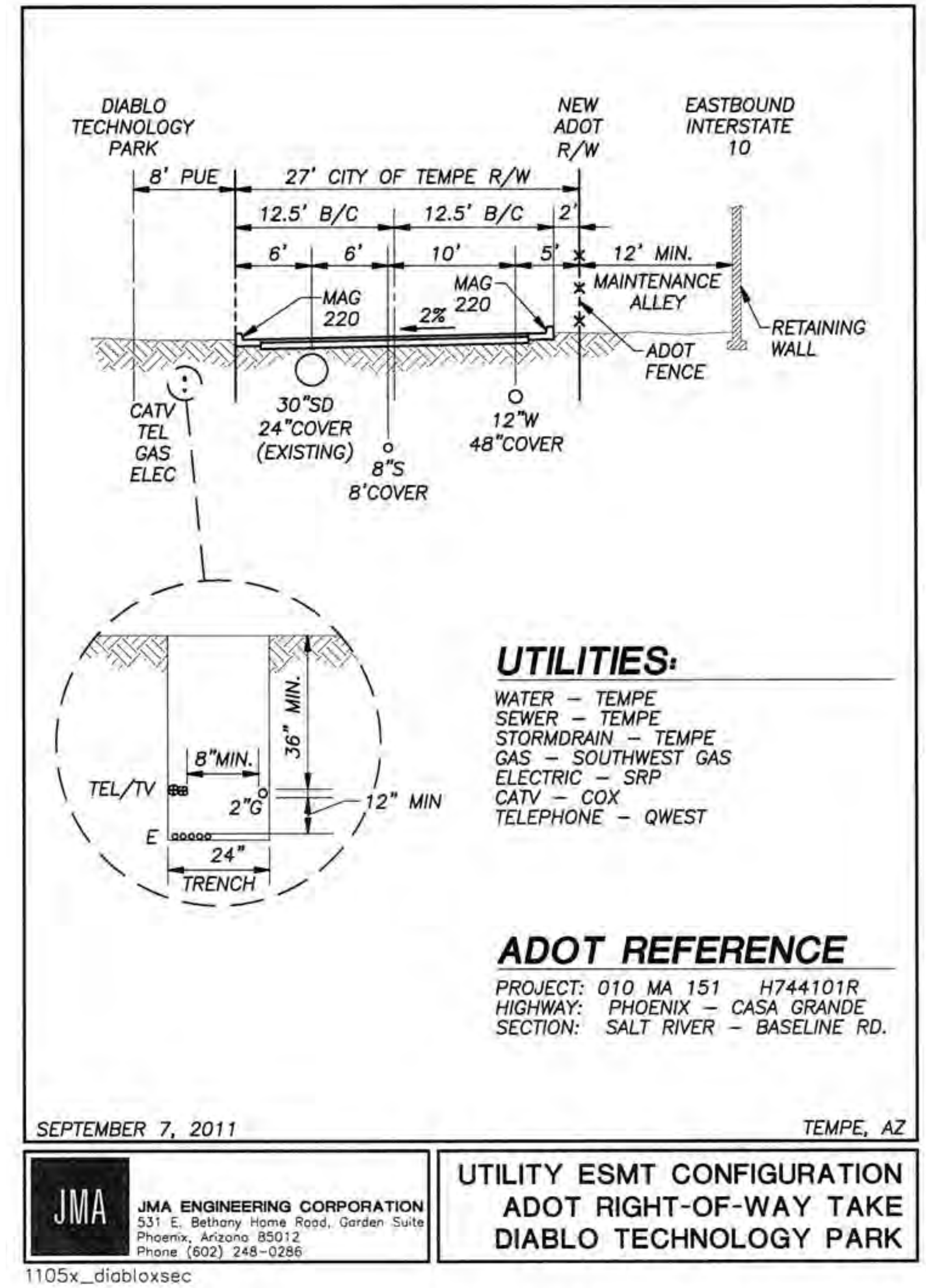


Figure 35 – New Diablo Way Corridor

Guadalupe Road Multi-Use Trail Underpass: It is anticipated the proposed multi-use trail bridge would not conflict with the existing 6-½" natural gas pipeline near I-10 Station 8263+37. This pipeline will be protected in-place.

I-10 Station 8288+35: There is a 16" natural gas pipeline that crosses the freeway at a skewed angle at this location. No conflict is currently anticipated and the gas pipeline will be protected in-place.

Level 3

Alameda Drive (I-10 Station 8130+79): Level 3 has underground fiber optic conduits that cross I-10 at Alameda Drive (ADOT Permit No. 95876). These conduits will require potholing to determine if they are impacted by the new storm drain.

Fountainhead Commerce Center: The Level 3 fiber optic conduits in Alameda Drive are also in a joint trench with AT&T, City Net, Metro Media FiberNetwork and AGL Network. These facilities will be required to relocate to the new right-of-way line.

Salt River Project (SRP): Power Distribution

Tempe Diablo Stadium: Several parking lot light poles electric cabinets, meters and power service lines will be in conflict with the freeway widening and the Alameda Drive pedestrian/bicycle underpass.

Diablo Way: SRP has underground power lines and cabinets located along the existing Diablo Way between Alameda Drive and Fairmont Drive. These facilities are anticipated to be relocated to the PUE shown on Figure 35 (on page 166).

Fairmont Drive East of I-10: An existing 12kV power line (on a wood power pole) on the east side of I-10 at Station 8144+14 is in direct conflict with the westbound C-D Road and will require relocation.

US 60 at Priest Drive: The electric cabinets and transformers on the southwest quadrant of US 60 and Priest Drive will be in conflict with the widening of the freeway overpass and require relocation.

SRP also has underground electric conduit ductbanks that cross the freeway at several cross streets, as well as I-10 Stations 8343+80 and 8362+60. Conflicts with the ductbanks are not anticipated and will be protected in-place.

Salt River Project (SRP): Power Transmission

Western Canal (69kV): SRP has a double-circuit 69kV overhead power line on steel poles along the Western Canal that crosses I-10 on the south side of the I-10/US60 TI. No direct conflicts are anticipated. However, the Ramp 'N-E' widening will place the west edge of the ramp approximately 19' away from one of the poles. SRP has requested the pole be relocated unless the design can be modified to allow for better SRP maintenance access to that pole. In addition, a power line sag survey and the execution of a *Consent to Use Agreement* will be required prior to freeway construction.

Highline Canal (230kV): There will be no construction under the existing double-circuit 230kV EHV power line crossing along the Highline Canal at Station 8214+75. Extreme caution must be exercised while working near this power line. SRP noted that a *Locked Down Sheet* will be required for this location.

I-10 Station 8223+13 (69kV/12kV): SRP has a single-circuit 69kV power with 12kV underbuilt across the freeway at this location. The power poles are located outside of the ADOT right-of-way. The understanding is that a *Locked Down Sheet* will be required at this location.

I-10 Station 8290+90 (69kV/12kV joint use): SRP has a single-circuit 69kV power with double-circuit 12kV and Cox CATV (according to Cox) underbuilt across the freeway at the mid-section line. The power poles are located outside of the ADOT right-of-way and there is no access issues regarding the poles. The understanding is that a *Locked Down Sheet* will be required at this location.

South of Ray Road (69kV): SRP has a multi-circuit 69kV power line across the freeway at Station 8430+90. No impact to the power lines or pole access is anticipated. This power line will be protected in-place.

US 60 at Priest Drive (69kV): SRP has a double-circuit 69kV power line across US 60 at I-10 Station 122+95. No impact to the power lines or pole access is anticipated. This power line will be protected in-place.

Salt River Project (SRP): Water

Western Canal Underpass: The Ramp 'N-E' widening will require an extension of the existing equipment underpass and reconstruction of the west ramp. An existing underpass sump pump will also be relocated with the underpass improvement.

US 60 EB Overpass at Priest Drive: The drilled shaft foundations needed for the widening of the Priest Drive overpass will be near an existing irrigation lateral on the east side of Priest Drive. This lateral will be protected in-place.

Highline Canal: There will not be any construction activities in the immediate vicinity of the Highline Canal. This SRP irrigation delivery facility will be protected in-place.

Southwest Gas

Southwest Gas has several underground gas pipelines throughout the project limits. Several of these facilities will be impacted by this project and will require relocation.

Diablo Way: The existing 2" PE gas line located along the existing Diablo Way has been abandoned and a replacement facility is not anticipated.

Fairmont Drive to Southern Avenue on East Side of I-10: An existing 2" PE gas line will be in conflict with the westbound C-D Road and will require relocation.

Southern Avenue: The eastbound and westbound C-D Road overpasses may conflict with a 4" PE gas line along the south side of Southern Avenue. This gas line serves the Southern Avenue stormwater pump station.

Zayo Group

Alameda Drive (I-10 STA 8130+51): AGL Network (now the Zayo Group) has four 1-½" HDPE underground fiber optic cable conduits within a 7" steel casing that crosses I-10 at Alameda Drive. These conduits will require potholing to determine if they are impacted by the new storm drains.

West Side of the University of Phoenix Parking Lot: The Zayo fiber optic conduits in Alameda Drive are also within a joint trench with AT&T, Level 3, City Net, Metro Media FiberNetwork and AGL Network along the west side of the University of Phoenix parking lot abutting the east ADOT right-of-way line. This joint trench and supporting manholes will be required to relocate.

Diablo Way: Zayo has installed eight 1-¼" HDPE conduits and four 2'x3'x2' pullboxes inside the Diablo Way PUE in 2014. The Zayo record drawings are inconclusive as to determine the portion of the PUE occupied by the telecommunications conduits. It is anticipated that joint trenching of other utility relocations inside the PUE will proceed as originally planned.

4.9 EARTHWORK

Approximately 129,700 cubic yards of excavation and 184,250 cubic yards of borrow are anticipated to be needed for this project.

4.10 GEOTECHNICAL AND PAVEMENT DESIGN

Bridge Structures

With respect to new bridge structures and the widening of existing bridge structures, the site soils are generally considered to be well suited for the use of either shallow spread footing or drilled shaft foundations.

It is anticipated that the majority of foundations for the new bridges would include drilled shaft foundations that derive the majority of their support from skin friction though the variable strata. Drilled shaft foundations are often more practical from a constructability standpoint than spread footings for structures that are located adjacent to existing bridges and roadways. However, spread footings may be used where the soil conditions provide adequate bearing capacity and the site constraints would not limit their use. Table 35 provides a listing of the existing structures that will be impacted, the existing foundation type, and the foundation type recommended for the bridge modifications.

Table 35 - Summary of Existing and Preliminary Recommended Foundation Types for Widened Bridges

Bridge Location (with Project Number)	Existing Foundations	Recommended Foundation Type for Bridge Modifications
Priest Drive OP EB; NH-10-3(317)	Abutments on drilled shaft foundations; Wing walls on drilled shaft foundations	Abutments on drilled shaft foundations; Wing walls on drilled shaft foundations
I-10/US 60 TI Ramp 'S-E' Southern Ave OP, NH-10-3(317)	Abutments on drilled shaft foundations; Wing walls on drilled shaft foundations	Abutments on drilled shaft foundations; Wing walls on drilled shaft foundations
Ramp 'N-E' over Western Canal, NH-10-3(317)	Abutments on drilled shaft foundations; Wing walls on drilled shaft foundations	Abutments on drilled shaft foundations; Retaining walls on drilled shaft foundations

A total of eight new bridge and ramp structures are planned for the project. In general, it is anticipated these new structures would be supported on foundations that are similar to the existing structures located in the vicinity of the new structure. Table 36 (on page 169) provides a listing of the new structures and the preliminary recommended foundation type.

Table 36 – Preliminary Recommended Foundation Types For New Bridges

Structure	Recommended Foundation Type
EB CD Road over Southern Avenue	Abutments on drilled shaft foundations
WB CD Road over Southern Avenue	Abutments on drilled shaft foundations
Baseline Road Ramp 'F' over EB C-D Ramp 'T-4'	Abutments on drilled shaft foundations
Baseline Road Ramp 'F' over the Western Canal	Abutments on drilled shaft foundations
EB CD Road over EB C-D Ramp 'T-4'	Abutments on drilled shaft foundations
Ramp 'W-N' over WB CD Road	Abutments on drilled shaft foundations
Alameda Drive Pedestrian/Bicycle Underpass	Abutments on drilled shaft foundations and pier on spread footing (existing)
Guadalupe Road Multi-Use Trail Underpass	Abutments on drilled shaft foundations and pier on spread footing (existing)

Retaining Walls

Many retaining walls are proposed in support of the Recommended Alternative. It is anticipated that a variety of retaining wall types will be required based on the existing and proposed site conditions. Where site access permits, the majority of new walls can likely be constructed as standard cast-in-place cantilevered walls with spread footings at relatively low to moderate allowable soil bearing pressures.

Variations of the actual wall types selected will likely be based more upon constructability versus soil conditions. Standard wall footings should be constructible provided the new walls are located a sufficient distance from existing walls (laterally and vertically). The use of drilled shaft foundations may be required at some locations depending on proximity to existing structures and in isolated areas as dictated by poor subgrade conditions. Other special design walls, such as MSE or L-shaped footing walls, should also be evaluated for use.

Pavement Design

Given the variety of the existing pavement structural sections that have been utilized within the study area, it is recommended that the widening of the freeway mainline and ramp pavements not be based on the adjacent existing structural pavement section. Dowel baskets were utilized in the existing mainline and high-occupancy vehicle (HOV) lane pavements on I-10 between SR 143 and Baseline Road with the mainline rehabilitation and HOV construction. However, the recent auxiliary lane construction project along westbound I-10 from US 60 to Broadway Road did not include dowel baskets.

It is currently assumed that the pavement widening will utilize plain PCCP (no dowels). The pavement structural section for the widened roadway sections and new roadways should be designed in accordance with ADOT Materials Group policies and procedures for new roadways. The pavement structural sections recommended in Table 37 are based on recently completed projects within the I-10 corridor.

Table 37 – Preliminary Pavement Structural Sections

Location	AB-2 (inches)	AC (Base Mix) (inches)	Plain PCCP (inches)	AR-ACFC (inches)	TOTAL (inches)
Freeway Mainlines (Including C-D Roads)	4	-	15.0	1	20.0
Ramps	4	-	12.0	1	17.0
Gores	4	-	12.0	1	17.0
Shoulders	4	-	15.0	-	19.0

The majority of the existing roadways are underlain by relatively good quality subgrade soils. Areas of surficial man-made embankment materials were identified in the as-built borings that were advanced through existing embankments. Higher plasticity clays are known to exist just south of the Tempe Buttes area on I-10. Final design testing and recommendations should address subgrade treatment for this area.

The final designer shall evaluate the possible need for a special design for the Eastbound C-D Road pavement over the Western Canal.

4.11 TRAFFIC DESIGN

4.11.1 Signing and Pavement Marking

A guide sign concept was prepared to ensure an effective signing plan could be developed for the I-10 Preferred Alternative. The goal of the signing concept is to provide clear advance guide signing for the route, while maintaining the integrity of the signing schemes on the I-10 freeway corridor. A preliminary guide signing plan is provided on the plan sheets in Appendix H.

The existing signs and sign structures would be relocated or replaced to support the proposed freeway widening. The final sign locations will be determined during the development of the final design plans and must consider the existing and new locations of utilities, bridge structures, retaining and noise walls, drainage features, lighting standards, and other appurtenances. Sign lighting will conform to *ADOT Traffic Engineering Guidelines and Processes #790*. The retroreflective sheeting on the existing signs will be upgraded and the sign lighting for the service interchange guide signs will be removed.

The pavement marking concept was developed to incorporate the existing and new lane configurations for the mainline, auxiliary lanes, C-D Roads, service interchange ramps and system interchange ramps. The preliminary pavement marking concept has been developed in accordance with the ADOT *Signing and Marking Standard Drawings* 2014 (and recent updates) that reference the requirements for lane lines, edge lines, and gore striping. In-lane pavement markings should be included to supplement signing approaching the system interchanges.

Curve warning signs with advisory speeds would also be placed on the existing and new roadways at the locations with available stopping sight distances that are less than recommended by AASHTO.

The final designer shall prepare a Traffic Management Plan with the Stage II (30%) Submittal for ADOT review and approval.

Exit panel numbers should be determined by ADOT Traffic Design and ADOT Multi-Modal Planning Division during final design.

4.11.2 Traffic Signals

No changes to the existing traffic signals are anticipated for this project.

4.11.3 Lighting

Continuous freeway lighting is currently provided on I-10 between SR 143 and Ray Road. The new lighting consists of a mixture of high mast poles (100’ to 120’) with 400-Watt HPS high mast fixtures at the I-10/US60 TI, high mast median mounted poles (69’ mounting height) with two 400-Watt HPS high mast fixtures along the I-10 mainline, and vertical offset fixtures between SR 143 and US 60 for the C-D Roads. ADOT is in the process of changing from HPS fixtures to LED high mast fixtures. An evaluation of the existing light pole locations with LED fixtures was conducted to determine if the lighting system could accommodate the additional travel lanes associated with the freeway widening.

Based on the evaluation, the existing lighting would be able to accommodate the added lanes. The lighting evaluation was prepared in conformance with the criteria established in the *American National Standard Practice for Roadway Lighting, ANSI/IES RP-8-00*, published in 2000, ADOT’s current standard. This document identifies nationally recognized design criteria for roadway lighting. In addition, the following criteria listed in ADOT’s *Design Procedures Manual* were used in the lighting analysis:

- freeway lighting provides an average maintained horizontal illuminance in the range of 0.6 to 0.8 footcandles (Fc) on the traveled roadway;
- a minimum illuminance value of 0.2 footcandles;
- an average to minimum uniformity ratio of 3:1 to 4:1;

- a light loss factor (LLF) of 0.81; and
- Light levels were calculated every 6' on the traveled roadway.

Based on the evaluation conducted with this study, the existing lighting locations with LED fixtures would be sufficient for the widened I-10 mainline. The existing light poles located at the interchange ramps would be relocated in accordance with the new ramp alignments.

Currently, ADOT uses the illuminance method for calculating the requirements for lighting along State freeways and highways. This method calculates the amount of light that falls onto the pavement from light fixtures along the roadway (measured in footcandles). The new IES RP-8-2014 Roadway Lighting Report is switching from this method to Luminance Method, which measures the amount of light that is reflected off the pavement and is measured in candelas per square meter.

ADOT is considering adopting the new IES RP-8-2014 and changing to the luminance method. As of this writing, a final decision has not been made for which criteria should be used for this project. Once this decision is finalized, the final designer shall coordinate with ADOT and conduct a lighting analysis based on the final criteria.

The lighting analyses shall include a "spillover" evaluation where the freeway is located adjacent to residential neighborhoods. The lighting analysis for the crossroads shall include an evaluation of the shadow effects of the freeway overpasses and underpasses, along with the use of underdeck lighting to enhance the lighting beneath the bridge structures. All existing unmetered freeway lighting load centers shall be converted to metered load centers.

A preliminary lighting design is provided on the plan sheets in Appendix H. This current design includes offset lighting along the C-D Roads that include foundations that are incorporated into the new retaining walls along the outside of the roadway. The location of these lights, poles and foundations shall be coordinated with ADOT Regional Traffic Design Section, and Bridge Group during final design.

4.11.4 Freeway Management System

The existing Freeway Management System (FMS) includes an integrated system of Dynamic Message Signs (DMS), pull boxes, system detectors, CCTV cameras and ramp meters placed throughout this segment of the I-10 corridor. These FMS features are connected to the ADOT Traffic Control Center by fiber optic cable in three 3" conduits that are located along the eastbound and westbound roadway. These existing FMS features will be required to be relocated within the limits of the freeway widening.

ADOT's *ITS Design Guide* (May 2015) recommends the FMS communication system to be provided with three 3" conduits placed along both sides of the freeway. It is anticipated that conduits at the existing bridges will remain and be reused. The FMS elements along the freeway would be relocated away from the roadway as far as possible within the existing right-of-way. New fiber optic cable will be installed in the relocated conduit.

The system detectors would also be abandoned and replaced with new detectors placed approximately every mile in each direction of travel in advance of each entrance ramp. New DMS sign structures will also be required in conformance with the new sign support requirements.

The FMS system must remain operational at all times during the construction of this project. All FMS equipment should be evaluated during final design to determine potential construction conflicts. ADOT Transportation Technology Group (TTG) shall be involved in reviews and provide guidance for FMS design of the I-10 near-term improvements. The final designer shall coordinate with the cities of Phoenix, Tempe and Chandler with regards to fiber connections between their system and ADOT's FMS system.

A storage length calculation was conducted for all of the service interchange entrance ramps per *ADOT's Ramp Metering Design Guide* (November 2013). The results of the analysis indicate no modifications would be required for the new ramp meters.

Vehicle 'wrong way" detection and signing shall be placed on all service interchange exit ramps in accordance with the current details provided by ADOT TTG.

4.12 CONSTRUCTION PHASING AND TRAFFIC CONTROL

Traffic will be managed by detailed traffic control plans and by procedures and guidelines specified in Part VI of the current version of the *Manual of Uniform Traffic Control Devices* (MUTCD), and by the Arizona Supplement to Part VI of the MUTCD.

Weekend and night closures are preferred over obliteration and restriping where practical. Existing mainline freeway traffic will be maintained with the existing striping during construction. Temporary concrete barrier would be placed adjacent to the existing I-10 outside shoulders. All grading, drainage, pavement widening, bridge widening, sign structure foundations, and other items would be constructed in this phase.

The system and service interchange ramp connections within the limits of the pavement widening would be reconstructed to match the widened mainline roadway. These ramp connections would remain open to traffic wherever feasible. Where the new ramp horizontal and vertical alignments are modified a sufficient amount to preclude keeping the ramp open to traffic, the ramp would be closed for the reconstruction activities. The ramp closure would coincide with the widening of the bridge on the same interchange crossroad. Successive entrance and exit ramps should not be closed to traffic concurrently.

The construction of the widened bridges would impact the traveling public on the crossroads. Feasible bridge widening solutions are available to allow the crossroads to remain open to traffic during the bridge construction activities. However, a number of the bridges that would be widened may require falsework and/or towers for support. At these locations, the number of crossroad lanes would be required to be reduced to one left-turn lane and two through lanes in each direction of travel during bridge widening activities.

Coordination will be required with the local agencies to identify project phasing restrictions that will impact construction. Restrictions due to arterial street capacity constraints, freeway access, and emergency vehicle access could limit the number of crossroads and ramp connections that would be under construction concurrently.

A traffic management plan, final construction phasing and traffic control plans will be developed during the final design.

4.13 AMERICAN WITH DISABILITIES ACT (ADA) FEATURES INVENTORY

The existing pedestrian features located within the ADOT right-of-way were inventoried along 40th Street, 48th Street, Broadway Road, Southern Avenue, Baseline Road, Guadalupe Road, Elliot Road, Warner Road, Ray Road, Chandler Boulevard and Priest Drive. The existing features were evaluated for compliance with the 2010 ADA Standards for Accessible Design (2010 Standards).

Based upon the information included in the ADOT Features Inventory System (FIS) and supplemental AECOM field reviews, it was determined that 429 ADA features are located along these crossroads. Of the 429 ADA features, it was determined that 216 are non-compliant per the 2010 Standards. A summary of the types of features is included in Table 38.

The Department has determined that each of the non-compliant features shall be addressed during the final design and construction of the proposed I-10 improvements. A copy of the Draft ADA Compliance and Feasibility Report for this project is included in Appendix F.

Table 38 – Summary of Features (ADOT FIS and AECOM Field Review)

Feature Type	Compliant	Non-Compliant	Total
Sidewalk	94	34	128
Curb Ramps	21	113	134
Pedestrian Activated Signals	70	10	80
Handrail	21	3	24
Obstructions or Needs	0	27	27
Driveways	3	16	19
Traffic Island Pedestrian Crossings	4	13	17
Total	**213**	**216**	**429**

The following documents shall be used for the design of the pedestrian facilities:

- 2010 American With Disabilities Act Standards for Accessible Design,
- Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way, July 26, 2011.

ADA/PROWAG compliant pedestrian access shall be maintained on at least one side of each crossroad at all times during construction.

4.14 ALAMEDA DRIVE PEDESTIAN/BICYCLE UNDERPASS

Alameda Drive is included in the MAG Metropolitan Phoenix Area Bike Ways Map and numerous City of Phoenix and City of Tempe transportation plans and bikeway maps. Previous studies have identified an underpass at I-10 and Alameda Drive that would provide a continuous bicycle and pedestrian facility along the Roeser Road/Alameda Drive corridor between 7th Avenue (in Phoenix) and Greenfield Road (in Mesa).

It is ADOT policy to include multi-use facilities in major new construction projects when such facilities are funded and maintained by the local agency. Since funding has been identified by MAG for the capital cost, the Alameda Drive underpass will be included in the I-10 near-term improvements project. ADOT and the City of Tempe will execute a Joint Project Agreement (JPA) during final design that will outline specific capital cost, right-of-way, maintenance and aesthetic treatment cost responsibilities

The design concept for the Alameda Drive crossing is depicted in Figure 36 (on page 173). The structure would pass over I-10 immediately north of the existing Alameda Drive roadway. The west ramp would begin within an existing Tempe Diablo Stadium parking lot driveway, with the driveway relocated to the west to retain access to the parking lot. The ramp would continue to the south, and then back to the north, paralleling the freeway to connect with the underpass structure.

The underpass would be anticipated to be a four span structure with piers placed within the I-10 median, and between the new C-D Road and I-10 mainline roadway shoulders. East of I-10, the ramp would extend to the north, and then back to the south, paralleling the freeway right-of-way to connect back to Alameda Drive.

The design of the pedestrian/bicycle overpass shall be in accordance with the AASHTO Bicycle Design Guidelines. The design criteria that shall be used include the following:

- Ramp gradient: 5% maximum
- Landing width: 15 ft. wide minimum at switchbacks
- Landing depth: 15 ft. minimum
- Vertical clearance: 17.5 ft. minimum
- Pathway width: 14 ft. minimum (10 ft. travel width plus 2 ft. each side for clearance)

Existing utilities located within Alameda Drive that currently cross the I-10 corridor include a 15" sanitary sewer (Tempe), 24" water (Tempe), fiber optic telecommunications line (Qwest, and underground power distribution cable (Salt River Project) and an underground telecommunications line (Qwest). The pedestrian structure may conflict with the underground power and telecommunications lines but would avoid the sanitary sewer and water lines.

Coordination with the City of Tempe will be required to reconfigure the existing driveway and reconfigure the existing parking lot at Tempe Diablo Stadium. The goal of the coordination effort is to site the structure, relocate existing utility facilities, and construct the freeway facility in a manner that minimizes the impacts to the stadium parking lot.

4.15 GUADALUPE ROAD MULTI-USE TRAIL UNDERPASS

The Guadalupe Road multi-use trail is intended to be an extension of the Maricopa County Regional Trail System and the Sun Circle/Maricopa Trail that would include equestrian usage. The trail would extend from South Pointe Parkway East to Calle Sahuaro, along the south side of Guadalupe Road. A new structure over I-10 would be provided immediately south of the existing Guadalupe Road underpass using an existing bridge pier that was constructed with a previous construction project.

It is ADOT policy to include multi-use facilities in major new construction projects when such facilities are funded and maintained by the local agency. Since funding has been identified by MAG for the capital cost, the Guadalupe Road multi-use trail will be included in the I-10 near-term improvements project. ADOT, the City of Phoenix, the Town of Guadalupe and Maricopa County Parks and Recreation Department will execute a Joint Project Agreement (JPA) during final design that will outline specific capital cost, maintenance and aesthetic treatment responsibilities

The Preferred Alternative depicted in the *Final Project Assessment; I-10, Guadalupe Road Pedestrian Bridge & Pathway from South Mountain Park to Tempe City Line (January 2008)* is to be utilized as the design basis for the pathway improvements and is included in Appendix E.

West of I-10, the multi-use trail shall be 14' (2'-10'-2') measured from the back of the curb. In locations where the 14' width trail will conflict with the existing privacy wall, the trail width will transition along the wall from 14' to a minimum of 12' (10'-2'). The privacy wall will be relocated by others in the locations required to provide the 12' wide (minimum) multi-use trail.

The trail improvements will include the identified intersection and trail improvements necessary to allow for a connection west of the Pointe Parkway East intersection. The trail surface shall be a rough tined surface similar to the existing multi-use crossing of the SR 101L Pima Freeway at Sweetwater Avenue in Scottsdale.

A new 5' sidewalk will be placed along the north side of Guadalupe Road between Pointe Parkway East and Calle Sahuaro. A pedestrian rail shall be provided at the back of the sidewalk for pedestrian protection along the roadway slope. The pedestrian rail shall include a minimum 6" height concrete curb placed beneath the rail.

The Town of Guadalupe plans to construct a concrete lined channel along the south side of Guadalupe Road between approximate Station 18+50 to Station 22+40, and the north side of Guadalupe Road between approximate Station 23+80 to Station 25+20. The final designer shall coordinate the design of the town's drainage improvements with the multi-use trail and sidewalk improvements. The town's drainage improvement plans will be provided to ADOT for inclusion with the freeway construction project.

[Text resumes on page 174]

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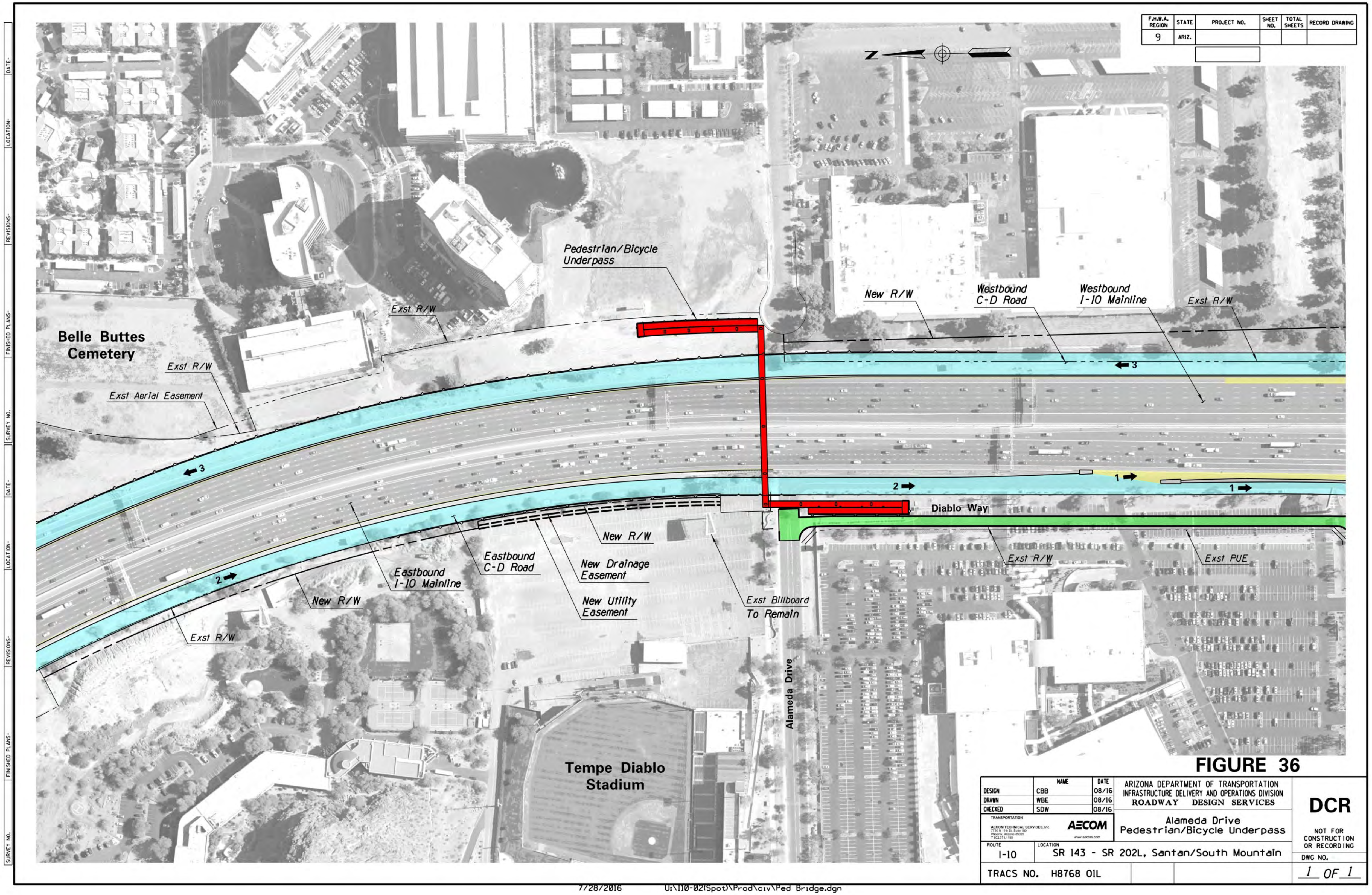
Belle Buttes
Cemetery
Exst R/W
Exst Aerial Easement
Pedestrian/Bicycle
Underpass
New R/W
Westbound
C-D Road
Westbound
I-10 Mainline
Diablo Way
Eastbound
C-D Road
Eastbound
I-10 Mainline
New Drainage
Easement
New Utility
Easement
Exst Billboard
To Remain
Exst PUE
Alameda Drive
Tempe Diablo
Stadium
FIGURE 36
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADWAY DESIGN SERVICES
DCR
Alameda Drive
Pedestrian/Bicycle Underpass
NOT FOR
CONSTRUCTION
OR RECORDING
ROUTE I-10
LOCATION SR 143 - SR 202L, Santan/South Mountain
TRACS NO. H8768 01L
DWG NO. 1 OF 1
DESIGN CBB 08/16
DRAWN WBE 08/16
CHECKED SDW 08/16
AECOM
7/28/2016
U:\I10-02(Spot)\Prod\civ\Ped Bridge.dgn

5.0 ITEMIZED ESTIMATE OF PROBABLE COSTS

5.1 OVERALL PROJECT COST ESTIMATE

The order-of-magnitude estimate of probable project costs for the Preferred Alternative is $150,520,900 which includes $8,905,300 for final design, $10,180,500 for right-of-way, and $131,435,100 for construction as shown in Table 39 (on page 175).

ADOT's *Five-Year Transportation Facilities Construction Program (2017 - 2021)* includes $9,040,000 for final design in Fiscal Year (FY) 2016, $17,180,000 for right-of-way in FY 2016, and $143,970,000 for construction in FY 2019. Funding for the final design and construction of the Alameda Drive pedestrian/bicycle underpass and the Guadalupe Road multi-use trail is included in FY 2019 in the amount of $9,100,000. The total amount currently programmed for the I-10 Near-Term Improvements is $179,290,000.

Potential individual projects with their estimated costs are included in Chapter 6 with the Implementation Plan.

The following is a list of assumptions that are reflected in the cost estimates for the Recommended Alternative:

- The estimated unit costs are based on the unit prices obtained from recent ADOT bid results.
- Pavement structural sections used for this estimate are provided in Section 4.10 of this report.
- New right-of-way is anticipated for this project. The right-of-way acquisition amount was provided by ADOT's Right-of-Way Group.
- Costs for landscaping are only for the restoration of disturbed areas.
- FMS improvements are included in the cost estimates.
- The earthwork factor applied to the project excavation is estimated to be 15% shrink. No additional earthwork quantities were included in anticipation of hazardous materials or unsuitable material sites.
- Environmental mitigation costs are not included in this cost estimate.
- The project costs for Final Design, Right-of-Way and Construction were adjusted to include Indirect Cost Allocation (ICAP) of 10.35%.
- The existing AR-ACFC pavement would be removed and replaced with the project, including the segment of westbound I-10 between approximately 36th Street and 48th Street.
- New freeway lighting would consist of providing additional luminaires to the existing median light poles, adding additional luminaires to the existing high mast light poles within the I-10/US60 TI, adding new light poles along the C-D Roads, and relocating existing light poles within the ramp realignment areas.
- The estimate for the Guadalupe Road multi-use trail was based on the estimate included in Appendix E. The original estimate was adjusted to reflect current unit prices and ADOT cost estimate format procedures.
- The Lump Sum estimate for the Alameda Drive pedestrian/bicycle underpass is based on the underpass constructed over I-17 at the Central Arizona Project (CAP) canal.
- The estimated right-of-way acquisition cost for the Baseline Road ADA improvements is included in the Broadway Road – Baseline Road, Eastbound cost estimate that is shown in Chapter 6.0.
- The Guadalupe Road ADA improvements are included in the Baseline Road – Ray Road, Eastbound cost estimate that is shown in Chapter 6.0.

Table 39 – Order of Magnitude Total Project Cost Estimate

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	23,985	5.00	120,000
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS, AND SLABS	SQ.FT.	19,100	5.00	95,500
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	22,035	10.00	220,400
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	82,528	10.00	825,300
2020034	REMOVAL OF SIGNS	L.SUM	1	81,600	81,600
2020036	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	6,074	10.00	60,800
2020035	REMOVAL OF SIGN BRIDGES	L.SUM	1	240,000	240,000
2020041	REMOVAL OF PIPE	L.FT.	1,541	15.00	23,200
2020052	REMOVE (HANDRAIL)	L.FT.	1,046	20.00	21,000
2020053	REMOVE (CONCRETE SIDEWALK RAMP)	EACH	59	500.00	29,500
2020071	REMOVE GUARDRAIL	L.FT.	2,448	3.00	7,400
2020081	REMOVE BITUMINOUS PAVEMENT (MILLING) (1")	SQ.YD.	855,740	1.00	855,800
2020155	REMOVE (CATCH BASIN)	EACH	62	500.00	31,000
2020156	REMOVE (MANHOLE)	EACH	2	500.00	1,000
2020157	REMOVE (PIPE HEADWALL)	EACH	8	500.00	4,000
2020168	REMOVE (NOISE BARRIER WALL)	SQ.FT.	73,413	5.00	367,100
2020201	SAW CUTTING	L.FT.	46,020	2.00	92,100
2030301	ROADWAY EXCAVATION	CU.YD.	109,705	10.00	1,097,100
2030305	ROCK EXCAVATION	CU.YD.	2,500	200.00	500,000
2030401	DRAINAGE EXCAVATION	CU.YD.	25,860	10.00	258,600
2030901	BORROW	CU.YD.	184,249	10.00	1,842,500
4010010	PORTLAND CEMENT CONCRETE PAVEMENT (RAMPS)	SQ.YD.	23,491	35.00	822,200
4010013	PORTLAND CEMENT CONCRETE PAVEMENT (MAINLINE & CD ROADS)	SQ.YD.	148,940	40.00	5,957,700
4060023	ASPHALTIC CONCRETE (DIABLO WAY)	SQ.YD.	4,232	30.00	127,000
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (NEW PAVEMENT)	SQ.YD.	172,431	5.00	862,200
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (EXISTING PAVEMENT)	SQ.YD.	855,739	5.00	4,278,700
5010107	PIPE, CORRUGATED METAL, SLOTTED, 18"	L.FT.	2,099	65.00	136,500
5012524	STORM DRAIN PIPE, 24"	L.FT.	11,750	70.00	822,500
5012527	STORM DRAIN PIPE, 27"	L.FT.	1,500	85.00	127,500
5012530	STORM DRAIN PIPE, 30"	L.FT.	1,652	90.00	148,700
5012536	STORM DRAIN PIPE, 36"	L.FT.	3,100	110.00	341,000
5012924	PIPE CULVERT, 24"	L.FT.	4	85.00	400
5012930	PIPE CULVERT, 30"	L.FT.	10	95.00	1,000
5012936	PIPE CULVERT, 36"	L.FT.	33	110.00	3,700
5012942	PIPE CULVERT, 42"	L.FT.	17	130.00	2,300
5012948	PIPE CULVERT, 48"	L.FT.	4	140.00	600
5014024	FLARED END SECTION, 24" (C-13.20)	EACH	102	400.00	40,800
5030141	CONCRETE CATCH BASIN (MEDIAN)	EACH	30	3,000.00	90,000
5030604	CONCRETE CATCH BASIN (C-15.92)	EACH	218	3,500.00	763,000
5050001	MANHOLE (C-18.10) (NO. 1) (FOR PIPES 6" TO 36")	EACH	28	4,000.00	112,000
6060036	BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	5	125,000.00	625,000
6060048	BRIDGE SIGN STRUCTURE (SD9.20, TYPE 4F)	EACH	11	150,000.00	1,650,000
6060079	FOUNDATION FOR BRIDGE SIGN STRUCTURE (SD9.20, TYPE 4F)	EACH	14	10,000.00	140,000
6060080	FOUNDATION FOR BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	5	8,000.00	40,000
6060150	CANTILEVER SIGN STRUCTURE	EACH	17	30,000.00	510,000
6060240	FOUNDATION FOR CANTILEVER SIGN STRUCTURE	EACH	17	5,000.00	85,000
6061001	SIGN MOUNT ASSEMBLY (FOR BRIDGE FASCIA)	EACH	7	3,000.00	21,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	480	25.00	12,000
6070004	BREAKAWAY SIGN POST W6X12	L.FT.	608	25.00	15,200
6070006	BREAKAWAY SIGN POST W8X18	L.FT.	84	25.00	2,100
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	32	300.00	9,600
6070024	FOUNDATION FOR BREAKAWAY SIGN POST W6X12	EACH	32	300.00	9,600
6070026	FOUNDATION FOR BREAKAWAY SIGN POST W8X18	EACH	6	300.00	1,800
6070038	SLIP BASE (2 1/2 T)	EACH	144	150.00	21,600
6070057	SIGN POST (PERFORATED) 2 1/2 T)	L.FT.	2,104	8.00	16,900
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	144	175.00	25,200
6080005	WARNING, MARKER, OR REGULATORY SIGN PANEL	SQ.FT.	2,328	20.00	46,600
6080018	EXTRUDED ALUMINUM SIGN PANEL	EACH	13,409	25.00	335,300
6110201	METAL HANDRAIL	L.FT.	1,221	50.00	61,100
7030095	MILEPOST MARKER (S-10)	EACH	32	300.00	9,600
7040070	PAVEMENT MARKING (WHITE THERMOPLASTIC) (0.090")	L.FT.	147,519	0.25	36,900
7040071	PAVEMENT MARKING (YELLOW THERMOPLASTIC) (0.090")	L.FT.	161,363	0.25	40,400
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	280,182	1.00	280,200
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	80	110.00	8,800
7050047	PAVEMENT MARKING, PREFORMED, PATTERNED, WHITE STRIPE	L.FT.	230,609	3.00	691,900
7050048	PAVEMENT MARKING, PREFORMED, PATTERNED, YELLOW STRIPE	L.FT.	24,930	3.00	74,800
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	15,481	3.00	46,500
7080001	PERMANENT PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	285,133	0.10	28,600
7080011	PERMANENT PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	107,575	0.10	10,800
7080101	PERMANENT PAVEMENT MARKING (PAINTED SYMBOL)	EACH	80	100.00	8,000
7310090	POLE (TYPE H) (STANDARD BASE)	EACH	1	1,500.00	1,500
7310162	POLE (TYPE T) (50 FT.)	EACH	22	2,500.00	55,000

Table 39 – Order of Magnitude Total Project Cost Estimate (cont.)

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ()	AMOUNT ($)
7310190	POLE (RELOCATE HIGH MAST POLE AND ASSEMBLY)	EACH	1	20,000.00	20,000
7310201	BREAKAWAY BASE FOR LIGHTING POLE (OVER 30')	EACH	25	500.00	12,500
7310270	POLE FOUNDATION (TYPE H)(STANDARD BASE)	EACH	14	2,500.00	35,000
7310341	POLE FOUNDATION (TYPE T) (40 FT. THRU 55 FT.)	EACH	10	3,000.00	30,000
7310365	POLE FOUNDATION (FOR 150' HIGH MAST)	EACH	1	20,000.00	20,000
7310832	RELOCATE EXISTING LIGHT POLES	EACH	23	1,000.00	23,000
7320050	ELECTRICAL CONDUIT (2")(PVC)	L.FT.	14,105	10.00	141,100
7320072	ELECTRICAL CONDUIT(3-3")(PVC)	L.FT.	25,330	20.00	506,600
7320073	ELECTRICAL CONDUIT(2-3")(PVC)	L.FT.	250	15.00	3,800
7320410	PULL BOX (NO. 5)	EACH	47	500.00	23,500
7320455	PULL BOX (NO. 9)	EACH	39	2,500.00	97,500
7320520	CONDUCTOR (NO. 8)	L.FT.	28,210	0.50	14,200
7320585	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	14,105	0.50	7,100
7320770	FIBER OPTIC CABLE (144 STRAND)	L.FT.	25,330	4.00	101,400
7330221	PEDESTRIAN PUSH BUTTON (MODIFY PUSH BUTTON HEIGHT)	EACH	4	500.00	2,000
7330222	PEDESTRIAN PUSH BUTTON (MODIFY ISLAND CONCRETE)	EACH	2	500.00	1,000
7340105	CONTROL CABINET FOUNDATION	EACH	5	500.00	2,500
7340210	RELOCATE CONTROL CABINET	EACH	5	500.00	2,500
7350030	LOOP DETECTOR FOR TRAFFIC SURVEILLANCE (6'X6')	EACH	62	1,000.00	62,000
7360070	RELOCATE DMS	EACH	5	2,400.00	12,000
7360078	LUMINAIRE (HIGH MAST)(LED)	EACH	381	800.00	304,800
7360104	LUMINAIRE (HORIZONTAL MOUNT)(LED)	EACH	53	600.00	31,800
7360105	LUMINAIRE (VERTICAL MOUNT)(LED)	EACH	74	600.00	44,400
7360405	SIGN LIGHTING (85 WATT IF)	EACH	1	1,100.00	1,100
7360408	TRANSFORMER (FOR INDUCTIVE FLUORESCENT SIGN LIGHTING FIXTURE)	EACH	1	900.00	900
7360420	REMOVE AND SALVAGE EXISTING SIGN LIGHTING	L.SUM	1	500	500
800X002	LANDSCAPING (12 MILES @ $500,000/MI)	EACH	12	500,000.00	6,000,000
8080403	SEWER PIPE, VITRIFIED CLAY, 8"	L.FT.	750	96.00	72,000
8082106	WATER PIPE, DUCTILE IRON, 6"	L.FT.	200	60.00	12,000
8082112	WATER PIPE, DUCTILE IRON, 12"	L.FT.	1,650	120.00	198,000
9050026	GUARD RAIL TERMINAL (TANGENT TYPE)	EACH	21	2,500.00	52,500
9050401	GUARD RAIL TRANSITION, W-BEAM TO CONCRETE BARRIER	EACH	21	3,000.00	63,000
9080084	CONCRETE CURB AND GUTTER (C-05.10)	L.FT.	13,960	15.00	209,400
9080085	CONCRETE CURB AND GUTTER (MAG DET. 220)	L.FT.	1,320	15.00	19,800
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	18,275	3.00	54,900
9080296	CONCRETE SIDEWALK RAMP (NEW)	EACH	61	1,500.00	91,500
9080301	CONCRETE DRIVEWAY (C-05.20)	SQ.FT.	9,000	4.00	36,000
9100000	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (2.5' PAN)	L.FT.	64,571	60.00	3,874,300
9100008	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (2.5' PAN) (ADJ TO RW)	L.FT.	14,491	60.00	869,500
9100009	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (4.5' PAN)	L.FT.	7,099	60.00	426,000
9100012	RETAINING HALF BARRIER	L.FT.	29,547	75.00	2,216,100
9100201	CINCRETE MEDIAN BARRIER	L.FT.	1,591	65.00	103,500
9140107	WALL (COMBINATION WALL) (SOUND WALL PORTION)	SQ.FT.	95,201	31.00	2,951,300
9140115	WALL (SOUND BARRIER WALL) (NON STANDARD ON BRIDGE)	SQ.FT.	1,992	75.00	149,400
9140136	SOUND BARRIER WALL (CONCRETE)	SQ.FT.	49,937	35.00	1,747,800
9140138	WALL (SOIL NAIL WALL)	SQ.FT.	4,755	75.00	356,700
9140153	RETAINING WALL (SD 7.01)	SQ.FT.	92,133	45.00	4,146,000
9140155	RETAINING WALL (SPECIALTY WALL 1)	SQ.FT.	15,016	55.00	825,900
9140156	RETAINING WALL (SPECIALTY WALL 2)	SQ.FT.	1,281	100.00	128,100
9140157	RETAINING WALL (SPECIALTY WALL 3)	SQ.FT.	15,513	50.00	775,700
9140158	RETAINING WALL (SPECIALTY WALL 4)	SQ.FT.	2,992	55.00	164,600
9140180	RETAINING WALL (SPECIALTY WALL 5)	SQ.FT.	5,712	100.00	571,200
9140181	RETAINING WALL (SPECIALTY WALL 6)	SQ.FT.	54,691	50.00	2,734,600
91401XX	RETAINING WALL (SPECIALTY WALL 7)	SQ.FT.	336	75.00	25,200
91401XX	RETAINING WALL (SPECIALTY WALL 8)	SQ.FT.	11,458	55.00	630,200
91401XX	SOUND BARRIER WALL (CONCRETE NON-STANDARD)	SQ.FT.	3,822	40.00	152,900
9240050	MISCELLANEOUS WORK (EFFLUENT BYPASS PUMPING OPERATIONS)	L.SUM	1	50,000.00	50,000
9240051	MISCELLANEOUS WORK (LANDSCAPE RESTORATION)	L.SUM	1	100,000.00	100,000
9240052	MISCELLANEOUS WORK (STRUCTURES)	L.SUM	1	100,000.00	100,000
9240119	MISCELLANEOUS WORK (RELOCATE RAMP METER)	EACH	6	12,400.00	74,400
9240121	MISCELLANEOUS WORK (ADD DETECTABLE WARNING STRIP)	EACH	69	500.00	34,500
9999910	LUMP SUM (RAMP S-E STRUCTURE OVER SOUTHERN AVENUE)	L.SUM	1	491,000.00	491,000
9999910	LUMP SUM (EB CD-2 STRUCTURE OVER SOUTHERN AVENUE)	L.SUM	1	571,000.00	571,000
9999910	LUMP SUM (EB CD-2 STRUCTURE OVER BASELINE ROAD EXIT RAMP)	L.SUM	1	456,000.00	456,000
9999910	LUMP SUM (EB TRANSFER STRUCTURE OVER BASELINE ROAD EXIT RAMP)	L.SUM	1	597,000.00	597,000
9999910	LUMP SUM (EB TRANSFER STRUCTURE OVER WESTERN CANAL)	L.SUM	1	311,000.00	311,000
9999910	LUMP SUM (WB CD-1 STRUCTURE OVER SOUTHERN AVENUE)	L.SUM	1	1,014,000.00	1,014,000
9999910	LUMP SUM (RAMP W-N STRUCTURE OVER WB CD-1)	L.SUM	1	1,039,000.00	1,039,000
9999910	LUMP SUM (RAMP N-E OVER WESTERN CANAL)	L.SUM	1	333,000.00	333,000
9999910	LUMP SUM (WESTERN CANAL EQUIPMENT PASS EXTENSION)	L.SUM	1	350,000.00	350,000
9999910	LUMP SUM (PRIEST DRIVE OVERPASS)	L.SUM	1	413,000.00	413,000
9999910	LUMP SUM (PEDESTRIAN BRIDGE) (ALAMEDA DRIVE)	L.SUM	1	2,959,000.00	2,959,000
9999910	LUMP SUM (PEDESTRIAN BRIDGE) (GUADALUPE ROAD)	L.SUM	1	1,421,100.00	1,421,100
9999910	LUMP SUM (PEDESTRIAN FENCE RETROFITS) (BROADWAY ROAD)	L.SUM	1	53,000.00	53,000

Table 39 – Order of Magnitude Total Project Cost Estimate (cont.)

Item	Description	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
9999910	LUMP SUM (PEDESTRIAN FENCE RETROFITS) (ELLIOT ROAD)	L.SUM	1	103,000.00	103,000
9999910	LUMP SUM (PEDESTRIAN FENCE RETROFITS) (WARNER ROAD)	L.SUM	1	93,000.00	93,000
9999910	LUMP SUM (8' x 1.5' RCBC EXTENSION) STA 8143+89	L.SUM	1	38,655.00	38,700
9999910	LUMP SUM (10' x 3' RCBC EXTENSION) STA 8281+00	L.SUM	1	30,341.00	30,400
9999910	LUMP SUM (8' x 2.5' RCBC EXTENSION) STA 8292+90	L.SUM	1	16,012.00	16,100
9999910	LUMP SUM (10' x 2' RCBC EXTENSION) STA 8306+20	L.SUM	1	60,863.00	60,900
9999910	LUMP SUM (BOX TOP REPLACEMENT) STA 8327+00	L.SUM	1	18,254.00	18,300
9999910	LUMP SUM (2-10' x 4' RCBC ADJUSTMENT) STA 8352+90	L.SUM	1	30,124.00	30,200
9999910	LUMP SUM (BOX TOP REPLACEMENT) STA 8363+00	L.SUM	1	21,790.00	21,800
				ITEM TOTAL	68,271,400
PROJECT WIDE					
	Maintenance and Protection of Traffic (8%)	COST		5,462,000.00	5,462,000
	Dust and Water Palliative (0.75%)	COST		513,000.00	513,000
	Quality Control (0.75%)	COST		513,000.00	513,000
	Construction Surveying (1.5%)	COST		1,025,000.00	1,025,000
	Erosion Control (0.3%)	COST		205,000.00	205,000
	Mobilization (8% of all construction items)	COST		8,070,000.00	8,070,000
				PROJECT WIDE SUBTOTAL	15,788,000
	Unidentified Items (20% of Item Total and Project Wide Subtotal)	COST		16,812,000.00	16,812,000
				PROJECT WIDE TOTAL	32,600,000
OTHER COST					
	Construction Engineering (9%)	COST		9,079,000.00	9,079,000
	Construction Contingencies (5%)	COST		5,044,000.00	5,044,000
	Environmental Mitigation (Unknown at this time)	COST		-	-
	PCCP Quality Incentive	SQ.YD.	172,431	1.50	258,700
	AR-ACFC Smoothness Incentive	L.MILE	99	11,000.00	1,089,200
	Engineering Design (Includes Surveying and Geotechnical) (8% of all items)	COST		8,070,000.00	8,070,000
	Right-of-Way	COST		9,225,600.00	9,225,600
	Utilities (Miscellaneous Relocation)			2,765,000.00	2,765,000
				OTHER COST TOTAL	35,531,500

SUMMARY

ITEM TOTAL:	**68,271,400**
PROJECT WIDE:	**32,600,000**
OTHER COST TOTAL:	**35,531,500**
SUBTOTAL PROJECT COST:	**136,402,900**
INDIRECT COST ALLOCATION (ICAP) (10.35%):	**14,118,000**
TOTAL PROJECT COST:	**150,520,900**

5.2 ESTIMATE OF FUTURE MAINTENANCE COSTS

Table 40 – Estimate of Future Maintenance Costs For Preferred Alternative

Annual Maintenance Cost Per Lane Mile Using PeCoS Latest FY Data[1]	
Category	**Metropolitan Phoenix**
1. Paved Surfaces & Shoulders	600
2. Roadside	3,070
3. Drainage & Environmental	300
4. Rest Areas	
5. Traffic Operations - Signal & Lighting; Signing & Striping - ITS	1,030
6. Landscaping	6,720
7. Winter Storms	
8. Emergency Response	130
9. Miscellaneous Maintenance[2]	2,400
10. Support and Other Operating Expenses	3,150
11. Other Specialty Items[3]	
MCL = Maintenance Cost per Lane Mile	**$17,400**
Annual Maintenance Cost of Project at PA/DCR Phase	**Metropolitan Phoenix[6]**
PW = Total Pavement Width[4]	12
NL = Number of Lane Miles	2
LP = Length of Project in Miles	20
PMC = Current Project Maintenance Cost	**$348,000**
Annual Maintenance Cost of Project at Beginning of Maintenance Phase	**Metropolitan Phoenix[6]**
IF = Inflation Factor[5]	1.058
N = Number of Years to Maintenance Phase	4
PMCI = Project Maintenance Cost including Inflation	**$436,036**

Notes: 1- Lane mile width is 12 ft, Total maintenance lane miles = 27,722 miles
Metropolitan Phoenix maintenance lane miles = 2,016 miles, Other Locations = 25,706 miles
2- Miscellaneous maintenance include building and yard maintenance, work for other divisions, training, material handling, vegetation control and contract administration for categories not considered in the maintenance cost breakdown
3- For Other Specialty Items, contact Central Maintenance.
4- Total pavement width includes the main line, ramps and shoulders.
5- Based on increase in maintenance costs of 76% over the last 10 years
6- Numbers for maintenance cost at PA/DCR Phase and Beginning of Maintenance Phase represent an Example Project, 24 feet wide, 2 miles long, going into the maintenance phase 3 years later.

Gray areas require manual entry
NL = PW / 12
PMC = MCL x NL x LP
PMCI = PMC x (IF^N)

6.0 IMPLEMENTATION PLAN

The Implementation Plan was developed to identify a menu of construction projects that could be used to implement the Preferred Alternative over time as funding becomes available. The individual projects would continue to allow the traveling public to use the facility yet minimize “throw-away” costs.

The funding identified in ADOT’s *Five-Year Transportation Facilities Construction Program (2017 - 2021)* includes a total project budget of $179,290,000 million. Funding for final design and right-of-way acquisition is budgeted in Fiscal Year (FY) 2016, and construction funding is currently included in FY 2019.

The total estimated design, construction and right-of-way costs for each of the individual projects are summarized in Table 41. The individual project estimates are included in Tables 42-46.

Table 41 – Estimated Design, Construction and Right-of-Way Costs by Location (Preferred Alternative)

Project	Estimated Design Cost	Estimated Construction Cost	Estimated Right-of-Way Cost	Estimated Total Project Cost
Broadway Road to Baseline Road (EB)	$2,370,300	$34,790,500	$5,665,600	$42,826,400
Broadway Road to Baseline Road (WB)	$3,268,600	$49,425,200	$4,349,300	$57,043,100
Baseline Road to Ray Road (EB)	$1,746,800	$25,251,700	N/A	$26,998,500
Baseline Road to Ray Road (WB)	$950,100	$13,840,600	N/A	$14,790,700
Alameda Drive and Guadalupe Road Crossings	$572,700	$8,146,900	165,500	$8,885,100
TOTAL	**$8,908,500**	**$131,454,900**	**$10,180,400**	**$150,543,800**

Note: Differences between the Total Project Estimate and the sum of the Implementation Plan estimates is due to rounding.

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Table 42 – Broadway Road to Baseline Road (Eastbound) Cost Estimate

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	7,169	5.00	35,900
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS, AND SLABS	SQ.FT.	7,450	5.00	37,300
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	7,654	10.00	76,600
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	10,178	10.00	101,800
2020034	REMOVAL OF SIGNS	L.SUM	1	16,400.00	16,400
2020036	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	6,074	$10.00	60,800
2020035	REMOVAL OF SIGN BRIDGES	L.SUM	1	90,000.00	90,000
2020041	REMOVAL OF PIPE	L.FT.	1,097	15.00	16,500
2020053	REMOVE (CONCRETE SIDEWALK RAMP)	EACH	12	500.00	6,000
2020071	REMOVE GUARDRAIL	L.FT.	209	3.00	700
2020081	REMOVE BITUMINOUS PAVEMENT (MILLING) (1")	SQ.YD.	156,686	1.00	156,700
2020155	REMOVE (CATCH BASIN)	EACH	18	500.00	9,000
2020201	SAW CUTTING	L.FT.	14,823	2.00	29,700
2030301	ROADWAY EXCAVATION	CU.YD.	33,585	10.00	335,900
2030401	DRAINAGE EXCAVATION	CU.YD.	5,600	10.00	56,000
2030901	BORROW	CU.YD.	88,602	10.00	886,100
4010010	PORTLAND CEMENT CONCRETE PAVEMENT (RAMPS)	SQ.YD.	2,701	35.00	94,600
4010013	PORTLAND CEMENT CONCRETE PAVEMENT (MAINLINE & CD ROADS)	SQ.YD.	40,497	40.00	1,619,900
4060023	ASPHALTIC CONCRETE (DIABLO WAY)	SQ.YD.	4,232	30.00	127,000
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (NEW PAVEMENT)	SQ.YD.	43,199	5.00	216,000
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (EXISTING PAVEMENT)	SQ.YD.	156,686	5.00	783,500
5010107	PIPE, CORRUGATED METAL, SLOTTED, 18"	L.FT.	86	65.00	5,600
5012524	STORM DRAIN PIPE, 24"	L.FT.	3,400	70.00	238,000
5012527	STORM DRAIN PIPE, 27"	L.FT.	1,500	85.00	127,500
5012530	STORM DRAIN PIPE, 30"	L.FT.	1,600	90.00	144,000
5012536	STORM DRAIN PIPE, 36"	L.FT.	3,100	110.00	341,000
5014024	FLARED END SECTION, 24" (C-13.20)	EACH	5	400.00	2,000
5030141	CONCRETE CATCH BASIN (MEDIAN)	EACH	11	3,000.00	33,000
5030604	CONCRETE CATCH BASIN (C-15.92)	EACH	43	3,500.00	150,500
5050001	MANHOLE (C-18.10) (NO. 1) (FOR PIPES 6" TO 36")	EACH	22	4,000.00	88,000
6060036	BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	2	125,000.00	250,000
6060048	BRIDGE SIGN STRUCTURE (SD9.20, TYPE 4F)	EACH	6	150,000.00	900,000
6060079	FOUNDATION FOR BRIDGE SIGN STRUCTURE (SD9.20, TYPE 4F)	EACH	9	10,000.00	90,000
6060080	FOUNDATION FOR BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	2	8,000.00	16,000
6060150	CANTILEVER SIGN STRUCTURE	EACH	1	30,000.00	30,000
6060240	FOUNDATION FOR CANTILEVER SIGN STRUCTURE	EACH	1	5,000.00	5,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	120	25.00	3,000
6070004	BREAKAWAY SIGN POST W6X12	L.FT.	152	25.00	3,800
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	8	300.00	2,400
6070024	FOUNDATION FOR BREAKAWAY SIGN POST W6X12	EACH	8	300.00	2,400
6070038	SLIP BASE (2 1/2 T)	EACH	40	150.00	6,000
6070057	SIGN POST (PERFORATED) 2 1/2 T)	L.FT.	584	8.00	4,700
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	40	175.00	7,000
6080005	WARNING, MARKER OR REGULATORY SIGN PANEL	SQ.FT.	574	20.00	11,500
6080018	EXTRUDED ALUMINUM SIGN PANEL	EACH	3,321	25.00	83,100
7030095	MILEPOST MARKER (S-10)	EACH	8	300.00	2,400
7040070	PAVEMENT MARKING (WHITE THERMOPLASTIC) (0.090")	L.FT.	44,615	0.25	11,200
7040071	PAVEMENT MARKING (YELLOW THERMOPLASTIC) (0.090")	L.FT.	37,215	0.25	9,400
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	66,726	1.00	66,800
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	14	110.00	1,600
7050047	PAVEMENT MARKING, PREFORMED, PATTERNED, WHITE STRIPE	L.FT.	70,868	3.00	212,700
7050048	PAVEMENT MARKING, PREFORMED, PATTERNED, YELLOW STRIPE	L.FT.	14,290	3.00	42,900
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	4,084	3.00	12,300
7080001	PERMANENT PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	74,227	0.10	7,500
7080011	PERMANENT PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	24,810	0.10	2,500
7080101	PERMANENT PAVEMENT MARKING (PAINTED SYMBOL)	EACH	14	100.00	1,400
7310090	POLE (TYPE H) (STANDARD BASE)	EACH	1	1,500.00	1,500
7310162	POLE (TYPE T) (50 FT.)	EACH	6	2,500.00	15,000
7310201	BREAKAWAY BASE FOR LIGHTING POLE (OVER 30')	EACH	9	500.00	4,500
7310270	POLE FOUNDATION (TYPE H)(STANDARD BASE)	EACH	3	2,500.00	7,500
7310341	POLE FOUNDATION (TYPE T) (40 FT. THRU 55 FT.)	EACH	6	3,000.00	18,000
7310832	RELOCATE EXISTING LIGHT POLES	EACH	12	1,000.00	12,000
7320050	ELECTRICAL CONDUIT (2")(PVC)	L.FT.	5,305	10.00	53,100
7320072	ELECTRICAL CONDUIT(3-3")(PVC)	L.FT.	9,510	20.00	190,200
7320073	ELECTRICAL CONDUIT(2-3")(PVC)	L.FT.	150	15.00	2,300
7320410	PULL BOX (NO. 5)	EACH	21	500.00	10,500
7320455	PULL BOX (NO. 9)	EACH	11	2,500.00	27,500
7320520	CONDUCTOR (NO. 8)	L.FT.	10,610	0.50	5,400
7320585	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	5,305	0.50	2,700
7320770	FIBER OPTIC CABLE (144 STRAND)	L.FT.	9,510	4.00	38,100
7330221	PEDESTRIAN PUSH BUTTON (MODIFY PUSH BUTTON HEIGHT)	EACH	2	500.00	1,000
7340105	CONTROL CABINET FOUNDATION	EACH	2	500.00	1,000
7340210	RELOCATE CONTROL CABINET	EACH	2	500.00	1,000
7350030	LOOP DETECTOR FOR TRAFFIC SURVEILLANCE (6'X6')	EACH	12	1,000.00	12,000
7360070	RELOCATE DMS	EACH	2	2,400.00	4,800

Table 42 – Broadway Road to Baseline Road (Eastbound) Cost Estimate (cont.)

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
7360078	LUMINAIRE (HIGH MAST)(LED)	EACH	254	800.00	203,200
7360104	LUMINAIRE (HORIZONTAL MOUNT)(LED)	EACH	31	600.00	18,600
7360105	LUMINAIRE (VERTICAL MOUNT)(LED)	EACH	30	600.00	18,000
800X002	LANDSCAPING (2 MILES @ $500,000/MI)	EACH	2	500,000.00	1,000,000
8080403	SEWER PIPE, VITRIFIED CLAY, 8"	L.FT.	750	96.00	72,000
8082112	WATER PIPE, DUCTILE IRON, 12"	L.FT.	1,450	120.00	174,000
9050026	GUARD RAIL TERMINAL (TANGENT TYPE)	EACH	3	2,500.00	7,500
9050401	GUARD RAIL TRANSITION, W-BEAM TO CONCRETE BARRIER	EACH	3	3,000.00	9,000
9080084	CONCRETE CURB AND GUTTER (C-05.10)	L.FT.	438	15.00	6,600
9080085	CONCRETE CURB AND GUTTER (MAG DET. 220)	L.FT.	1,320	15.00	19,800
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	3,525	3.00	10,600
9080296	CONCRETE SIDEWALK RAMP (NEW)	EACH	13	1,500.00	19,500
9080301	CONCRETE DRIVEWAY (C-05.20)	SQ.FT.	4,200	4.00	16,800
9100000	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (2.5' PAN)	L.FT.	22,060	60.00	1,323,600
9100008	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (2.5' PAN) (ADJ TO RW)	L.FT.	5,378	60.00	322,700
9100012	CONCRETE BARRIER (RETAINING HALF BARRIER)	L.FT.	1,662	75.00	124,700
9100201	CONCRETE MEDIAN BARRIER	L.FT.	1,591	65.00	103,500
9140153	RETAINING WALL (SD 7.01)	SQ.FT.	39,147	45.00	1,761,700
9140155	RETAINING WALL (SPECIALTY WALL 1)	SQ.FT.	15,016	55.00	825,900
9140156	RETAINING WALL (SPECIALTY WALL 3)	SQ.FT.	15,513	50.00	775,700
9140158	RETAINING WALL (SPECIALTY WALL 8)	SQ.FT.	11,458	55.00	630,200
9240050	MISCELLANEOUS WORK (EFFLUENT BYPASS PUMPING OPERATIONS)	L.SUM	1	50,000.00	50,000
9240051	MISCELLANEOUS WORK (LANDSCAPE RESTORATION)	L.SUM	1	50,000.00	50,000
9240052	MISCELLANEOUS WORK (STRUCTURES)	L.SUM	1	50,000.00	50,000
9240119	MISCELLANEOUS WORK (RELOCATE RAMP METER)	EACH	1	12,400.00	12,400
9240121	MISCELLANEOUS WORK (ADD DETECTABLE WARNING STRIP)	EACH	14	500.00	7,000
9999910	LUMP SUM (RAMP S-E STRUCTURE OVER SOUTHERN AVENUE)	L.SUM	1	491,000.00	491,000
9999910	LUMP SUM (EB CD-2 STRUCTURE OVER SOUTHERN AVENUE)	L.SUM	1	571,000.00	571,000
9999910	LUMP SUM (EB CD-2 STRUCTURE OVER EB T-4)	L.SUM	1	456,000.00	456,000
9999910	LUMP SUM (BASELINE RAMP 'F' STRUCTURE OVER EB T-4)	L.SUM	1	597,000.00	597,000
9999910	LUMP SUM (BASELINE RAMP 'F' STRUCTURE OVER WESTERN CANAL)	L.SUM	1	311,000.00	311,000
9999910	LUMP SUM (PEDESTRIAN FENCE RETROFITS) (BROADWAY ROAD)	L.SUM	1	53,000.00	53,000
				ITEM TOTAL	**18,171,700**
PROJECT WIDE					
	Maintenance and Protection of Traffic (8%)	COST		1,454,000.00	1,454,000
	Dust and Water Palliative (0.75%)	COST		137,000.00	137,000
	Quality Control (0.75%)	COST		137,000.00	137,000
	Construction Surveying (1.5%)	COST		273,000.00	273,000
	Erosion Control (0.3%)	COST		55,000.00	55,000
	Mobilization (8% of all construction items)	COST		2,145,000.00	2,145,000
				PROJECT WIDE SUBTOTAL	**4,201,000**
	Unidentified Items (20% of Item Total and Project Wide Subtotal)	COST		4,475,000.00	4,475,000
				PROJECT WIDE TOTAL	**8,676,000**
OTHER COST					
	Construction Engineering (9%)	COST		2,417,000.00	2,417,000
	Construction Contingencies (5%)	COST		1,343,000.00	1,343,000
	Environmental Mitigation (Unknown at this time)	COST		-	-
	PCCP Quality Incentive	SQ.YD.	43,199	1.50	64,800
	AR-ACFC Smoothness Incentive	L.MILE	22	11,000.00	239,700
	Engineering Design (Includes Surveying and Geotechnical) (8% of all items)	COST		2,148,000.00	2,148,000
	Right-of-Way	COST		5,134,200.00	5,134,200
	Utilities (Miscellaneous Relocation)	COST		615,000.00	615,000
				OTHER COST TOTAL	**11,961,700**

SUMMARY	
ITEM TOTAL:	**18,171,700**
PROJECT WIDE:	**8,676,000**
OTHER COST TOTAL:	**11,961,700**
SUBTOTAL PROJECT COST:	**38,809,400**
INDIRECT COST ALLOCATION (ICAP) (10.35%):	**4,017,000**
TOTAL PROJECT COST:	**42,826,400**

Table 43 – Broadway Road to Baseline Road (Westbound) Cost Estimate

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	13,576	5.00	67,900
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS, AND SLABS	SQ.FT.	6,900	5.00	34,500
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	12,407	10.00	124,100
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	45,262	10.00	452,700
2020034	REMOVAL OF SIGNS	L.SUM	1	16,400.00	16,400
2020035	REMOVAL OF SIGN BRIDGES	L.SUM	1	150,000.00	150,000
2020041	REMOVAL OF PIPE	L.FT.	363	15.00	5,500
2020053	REMOVE (CONCRETE SIDEWALK RAMP)	EACH	13	500.00	6,500
2020071	REMOVE GUARDRAIL	L.FT.	1,209	3.00	3,700
2020081	REMOVE BITUMINOUS PAVEMENT (MILLING) (1")	SQ.YD.	290,035	1.00	290,100
2020155	REMOVE (CATCH BASIN)	EACH	34	500.00	17,000
2020156	REMOVE (MANHOLE)	EACH	2	500.00	1,000
2020157	REMOVE (PIPE HEADWALL)	EACH	2	500.00	1,000
2020168	REMOVE (NOISE BARRIER WALL)	SQ.FT.	47,592	5.00	238,000
2020201	SAW CUTTING	L.FT.	25,983	2.00	52,000
2030301	ROADWAY EXCAVATION	CU.YD.	50,260	10.00	502,600
2030401	DRAINAGE EXCAVATION	CU.YD.	13,800	10.00	138,000
2030901	BORROW	CU.YD.	95,647	10.00	956,500
4010010	PORTLAND CEMENT CONCRETE PAVEMENT (RAMPS)	SQ.YD.	4,439	35.00	155,400
4010013	PORTLAND CEMENT CONCRETE PAVEMENT (MAINLINE & CD ROADS)	SQ.YD.	67,036	40.00	2,681,500
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (NEW PAVEMENT)	SQ.YD.	71,475	5.00	357,400
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (EXISTING PAVEMENT)	SQ.YD.	290.035	5.00	1,450,200
5010107	PIPE, CORRUGATED METAL, SLOTTED, 18"	L.FT.	128	65.00	8,400
5012524	STORM DRAIN PIPE, 24"	L.FT.	4,300	70.00	301,000
5012530	STORM DRAIN PIPE, 30"	L.FT.	52	90.00	4,700
5014024	FLARED END SECTION, 24" (C-13.20)	EACH	5	400.00	2,000
5030141	CONCRETE CATCH BASIN (MEDIAN)	EACH	14	3,000.00	42,000
5030604	CONCRETE CATCH BASIN (C-15.92)	EACH	64	3,500.00	224,000
5050001	MANHOLE (C-18.10) (NO. 1) (FOR PIPES 6" TO 36")	EACH	6	4,000.00	24,000
6060036	BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	1	125,000.00	125,000
6060048	BRIDGE SIGN STRUCTURE (SD9.20, TYPE 4F)	EACH	5	150,000.00	750,000
6060079	FOUNDATION FOR BRIDGE SIGN STRUCTURE (SD9.20, TYPE 4F)	EACH	5	10,000.00	50,000
6060080	FOUNDATION FOR BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	1	8,000.00	8,000
6060150	CANTILEVER SIGN STRUCTURE	EACH	5	30,000.00	150,000
6060240	FOUNDATION FOR CANTILEVER SIGN STRUCTURE	EACH	5	5,000.00	25,000
6061001	SIGN MOUNT ASSEMBLY (FOR BRIDGE FASCIA)	EACH	1	3,000.00	3,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	120	25.00	3,000
6070004	BREAKAWAY SIGN POST W6X12	L.FT.	152	25.00	3,800
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	8	300.00	2,400
6070024	FOUNDATION FOR BREAKAWAY SIGN POST W6X12	EACH	8	300.00	2,400
6070038	SLIP BASE (2 1/2 T)	EACH	40	150.00	6,000
6070057	SIGN POST (PERFORATED) 2 1/2 T)	L.FT.	584	8.00	4,700
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	40	175.00	7,000
6080005	WARNING, MARKER OR REGULATORY SIGN PANEL	SQ.FT.	574	20.00	11,500
6080018	EXTRUDED ALUMINUM SIGN PANEL	SQ.FT	5,525	25.00	138,200
6110201	METAL HANDRAIL	L.FT.	40	50.00	2,000
7030095	MILEPOST MARKER (S-10)	EACH	8	300.00	2,400
7040070	PAVEMENT MARKING (WHITE THERMOPLASTIC) (0.090")	L.FT.	44,490	0.25	11,200
7040071	PAVEMENT MARKING (YELLOW THERMOPLASTIC) (0.090")	L.FT.	55,530	0.25	13,900
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	75,756	1.00	75,800
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	24	110.00	2,700
7050047	PAVEMENT MARKING, PREFORMED, PATTERNED, WHITE STRIPE	L.FT.	84,428	3.00	253,300
7050048	PAVEMENT MARKING, PREFORMED, PATTERNED, YELLOW STRIPE	L.FT.	10,640	3.00	32,000
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	5,214	3.00	15,700
7080001	PERMANENT PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	80,164	0.10	8,100
7080011	PERMANENT PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	37,020	0.10	3,800
7080101	PERMANENT PAVEMENT MARKING (PAINTED SYMBOL)	EACH	24	100.00	2,400
7310162	POLE (TYPE T) (50 FT.)	EACH	16	2,500.00	40,000
7310190	POLE (RELOCATE HIGH MAST POLE AND ASSEMBLY)	EACH	1	20,000.00	20,000
7310201	BREAKAWAY BASE FOR LIGHTING POLE (OVER 30')	EACH	15	500.00	7,500
7310270	POLE FOUNDATION (TYPE H)(STANDARD BASE)	EACH	10	2,500.00	25,000
7310341	POLE FOUNDATION (TYPE T) (40 FT. THRU 55 FT.)	EACH	4	3,000.00	12,000
7310365	POLE FOUNDATION (FOR 150' HIGH MAST)	EACH	1	20,000.00	20,000
7310832	RELOCATE EXISTING LIGHT POLES	EACH	10	1,000.00	10,000
7320050	ELECTRICAL CONDUIT (2")(PVC)	L.FT.	8,800	10.00	88,000
7320072	ELECTRICAL CONDUIT(3-3")(PVC)	L.FT.	12,780	20.00	255,600
7320410	PULL BOX (NO. 5)	EACH	26	500.00	13,000
7320455	PULL BOX (NO. 9)	EACH	18	2,500.00	45,000
7320520	CONDUCTOR (NO. 8)	L.FT.	17,600	0.50	8,800
7320585	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	8,800	0.50	4,400
7320770	FIBER OPTIC CABLE (144 STRAND)	L.FT.	12,780	4.00	51,200
7330227	PEDESTRIAN PUSH BUTTON (MODIFY ISLAND CONCRETE)	EACH	1	500.00	500
7340105	CONTROL CABINET FOUNDATION	EACH	1	500.00	500
7340210	RELOCATE CONTROL CABINET	EACH	1	500.00	500
7360070	RELOCATE DMS	EACH	1	2,400.00	2,400

Table 43 – Broadway Road to Baseline Road (Westbound) Cost Estimate (cont.)

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
7360078	LUMINAIRE (HIGH MAST)(LED)	EACH	15	800.00	12,000
7360104	LUMINAIRE (HORIZONTAL MOUNT)(LED)	EACH	22	600.00	13,200
7360105	LUMINAIRE (VERTICAL MOUNT)(LED)	EACH	44	600.00	26,400
800X002	LANDSCAPING (2 MILES @ $500,000/MI)	EACH	2	500,000.00	1,000,000
8082106	WATER PIPE, DUCTILE IRON, 6"	L.FT.	200	60.00	12,000
8082112	WATER PIPE, DUCTILE IRON, 12"	L.FT.	200	120.00	24,000
9050026	GUARD RAIL TERMINAL (TANGENT TYPE)	EACH	9	2,500.00	22,500
9050401	GUARD RAIL TRANSITION, W-BEAM TO CONCRETE BARRIER	EACH	9	3,000.00	27,000
9080084	CONCRETE CURB AND GUTTER (C-05.10)	L.FT.	5,490	15.00	82,400
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	4,100	3.00	12,300
9080296	CONCRETE SIDEWALK RAMP (NEW)	EACH	14	1,500.00	21,000
9080301	CONCRETE DRIVEWAY (C-05.20)	SQ.FT.	4,200	4.00	16,800
9100000	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (2.5' PAN)	L.FT.	32,396	60.00	1,943,800
9100008	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (2.5' PAN) (ADJ TO RW)	L.FT.	9,013	60.00	540,800
9100009	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (4.5' PAN)	L.FT.	1,007	60.00	60,500
9140107	WALL (COMBINATION WALL) (SOUND WALL PORTION)	SQ.FT.	40,545	31.00	1,256,900
9140115	WALL (SOUND BARRIER WALL) (NON STANDARD ON BRIDGE)	SQ.FT.	1,992	75.00	149,400
9140136	SOUND BARRIER WALL (CONCRETE)	SQ.FT.	16,150	35.00	565,300
9140138	WALL (SOIL NAIL WALL)	SQ.FT.	4,755	75.00	356,700
9140153	RETAINING WALL (SD 7.01)	SQ.FT.	52,228	45.00	2,350,300
9140156	RETAINING WALL (SPECIALTY WALL 2)	SQ.FT.	1,281	100.00	128,100
9140158	RETAINING WALL (SPECIALTY WALL 4)	SQ.FT.	2,992	55.00	164,600
9140180	RETAINING WALL (SPECIALTY WALL 5)	SQ.FT.	5,712	100.00	571,200
9140181	RETAINING WALL (SPECIALTY WALL 6)	SQ.FT.	36,343	50.00	1,817,200
9240051	MISCELLANEOUS WORK (LANDSCAPE RESTORATION)	L.SUM	1	50,000.00	50,000
9240052	MISCELLANEOUS WORK (STRUCTURES)	L.SUM	1	50,000.00	50,000
9240121	MISCELLANEOUS WORK (ADD DETECTABLE WARNING STRIP)	EACH	21	500.00	10,500
9999910	LUMP SUM (WB CD-1 STRUCTURE OVER SOUTHERN AVENUE)	L.SUM	1	1,014,000.00	1,014,000
9999910	LUMP SUM (RAMP W-N STRUCTURE OVER WB CD-1)	L.SUM	1	1,039,000.00	1,039,000
9999910	LUMP SUM (RAMP N-E OVER WESTERN CANAL)	L.SUM	1	333,000.00	333,000
9999910	LUMP SUM (WESTERN CANAL EQUIPMENT PASS EXTENSION)	L.SUM	1	350,000.00	350,000
9999910	LUMP SUM (PRIEST DRIVE OVERPASS)	L.SUM	1	413,000.00	413,000
				ITEM TOTAL	**25,059,700**
PROJECT WIDE					
	Maintenance and Protection of Traffic (8%)	COST		2,005,000.00	2,005,000
	Dust and Water Palliative (0.75%)	COST		188,000.00	188,000
	Quality Control (0.75%)	COST		188,000.00	188,000
	Construction Surveying (1.5%)	COST		376,000.00	376,000
	Erosion Control (0.3%)	COST		76,000.00	76,000
	Mobilization (8% of all construction items)	COST		2,960,000.00	2,960,000
				PROJECT WIDE SUBTOTAL	**5,793,000**
	Unidentified Items (20% of Item Total and Project Wide Subtotal)	COST		6,171,000.00	6,171,000
				PROJECT WIDE TOTAL	**11,964,000**
OTHER COST					
	Construction Engineering (9%)	COST		3,333,000.00	3,333,000
	Construction Contingencies (5%)	COST		1,852,000.00	1,852,000
	Environmental Mitigation (Unknown at this time)	COST		-	-
	PCCP Quality Incentive	SQ.YD.	71,475	1.50	107,300
	AR-ACFC Smoothness Incentive	L.MILE	29	11,000.00	322,700
	Engineering Design (Includes Surveying and Geotechnical) (8% of all items)	COST		2,962,000.00	2,962,000
	Right-of-Way	COST		3,941,400.00	3,941,400
	Utilities (Miscellaneous Relocation)	COST		2,150,000.00	2,150,000
				OTHER COST TOTAL	**14,668,400**

SUMMARY

ITEM TOTAL:	**25,059,700**
PROJECT WIDE:	**11,964,000**
OTHER COST TOTAL:	**14,668,400**
SUBTOTAL PROJECT COST:	**51,692,100**
INDIRECT COST ALLOCATION (ICAP) (10.35%):	**5,351,000**
TOTAL PROJECT COST:	**57,043,100**

Table 44 – Baseline Road to Ray Road (Eastbound) Cost Estimate

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	2,293	5.00	11,500
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS, AND SLABS	SQ.FT.	2,300	5.00	11,500
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	1,451	10.00	14,600
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	12,392	10.00	124,000
2020034	REMOVAL OF SIGNS	L.SUM	1	24,400.00	24,400
2020041	REMOVAL OF PIPE	L.FT.	45	15.00	700
2020052	REMOVE (HANDRAIL)	L.FT.	890	20.00	17,800
2020053	REMOVE (CONCRETE SIDEWALK RAMP)	EACH	20	500.00	10,000
2020071	REMOVE GUARDRAIL	L.FT.	766	3.00	2,300
2020081	REMOVE BITUMINOUS PAVEMENT (MILLING) (1")	SQ.YD.	223,017	1.00	223,100
2020155	REMOVE (CATCH BASIN)	EACH	7	500.00	3,500
2020157	REMOVE (PIPE HEADWALL)	EACH	4	500.00	2,000
2020168	REMOVE (NOISE BARRIER WALL)	SQ.FT.	25,821	5.00	129,200
2020201	SAW CUTTING	L.FT.	3,744	2.00	7,500
2030301	ROADWAY EXCAVATION	CU.YD.	13,713	10.00	137,200
2030305	ROCK EXCAVATION	CU.YD.	2,500	200.00	500,000
2030401	DRAINAGE EXCAVATION	CU.YD.	3,230	10.00	32,300
4010010	PORTLAND CEMENT CONCRETE PAVEMENT (RAMPS)	SQ.YD.	9,422	35.00	329,800
4010013	PORTLAND CEMENT CONCRETE PAVEMENT (MAINLINE & CD ROADS)	SQ.YD.	24,966	40.00	998,700
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (NEW PAVEMENT)	SQ.YD.	34,388	5.00	172,000
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (EXISTING PAVEMENT)	SQ.YD.	223,017	5.00	1,115,100
5010107	PIPE, CORRUGATED METAL, SLOTTED, 18"	L.FT.	965	65.00	62,800
5012524	STORM DRAIN PIPE, 24"	L.FT.	2,100	70.00	147,000
5012924	PIPE CULVERT, 24"	L.FT.	4	85.00	400
5012930	PIPE CULVERT, 30"	L.FT.	2	95.00	200
5012936	PIPE CULVERT, 36"	L.FT.	33	110.00	3,700
5012942	PIPE CULVERT, 42"	L.FT.	17	130.00	2,300
5012948	PIPE CULVERT, 48"	L.FT.	4	140.00	600
5014024	FLARED END SECTION, 24" (C-13.20)	EACH	46	400.00	18,400
5030141	CONCRETE CATCH BASIN (MEDIAN)	EACH	3	3,000.00	9,000
5030604	CONCRETE CATCH BASIN (C-15.92)	EACH	58	3,500.00	203,000
6060036	BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	1	125,000.00	125,000
6060080	FOUNDATION FOR BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	1	8,000.00	8,000
6060150	CANTILEVER SIGN STRUCTURE	EACH	5	30,000.00	150,000
6060240	FOUNDATION FOR CANTILEVER SIGN STRUCTURE	EACH	5	5,000.00	25,000
6061001	SIGN MOUNT ASSEMBLY (FOR BRIDGE FASCIA)	EACH	2	3,000.00	6,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	120	25.00	3,000
6070004	BREAKAWAY SIGN POST W6X12	L.FT.	152	25.00	3,800
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	8	300.00	2,400
6070024	FOUNDATION FOR BREAKAWAY SIGN POST W6X12	EACH	8	300.00	2,400
6070038	SLIP BASE (2 1/2 T)	EACH	32	150.00	4,800
6070057	SIGN POST (PERFORATED) 2 1/2 T)	L.FT.	468	8.00	3,800
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	32	175.00	5,600
6080005	WARNING, MARKER, OR REGULATORY SIGN PANEL	SQ.FT.	590	20.00	11,800
6080018	EXTRUDED ALUMINUM SIGN PANEL	EACH	1,623	25.00	40,600
6110201	METAL HANDRAIL	L.FT.	965	50.00	48,300
7030095	MILEPOST MARKER (S-10)	EACH	8	300.00	2,400
7040070	PAVEMENT MARKING (WHITE THERMOPLASTIC) (0.090")	L.FT.	29,609	0.25	7,500
7040071	PAVEMENT MARKING (YELLOW THERMOPLASTIC) (0.090")	L.FT.	34,103	0.25	8,600
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	68,058	1.00	68,100
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	21	110.00	2,400
7050047	PAVEMENT MARKING, PREFORMED, PATTERNED, WHITE STRIPE	L.FT.	39,425	3.00	118,300
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	3,287	3.00	9,900
7080001	PERMANENT PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	65,111	0.10	6,600
7080011	PERMANENT PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	22,735	0.10	2,300
7080101	PERMANENT PAVEMENT MARKING (PAINTED SYMBOL)	EACH	21	100.00	2,100
7310201	BREAKAWAY BASE FOR LIGHTING POLE (OVER 30')	EACH	1	500.00	500
7310270	POLE FOUNDATION (TYPE H)(STANDARD BASE)	EACH	1	2,500.00	2,500
7310832	RELOCATE EXISTING LIGHT POLES	EACH	1	1,000.00	1,000
7320072	ELECTRICAL CONDUIT(3-3")(PVC)	L.FT.	3,040	20.00	60,800
7320073	ELECTRICAL CONDUIT(2-3")(PVC)	L.FT.	50	15.00	800
7320455	PULL BOX (NO. 9)	EACH	10	2,500.00	25,000
7320770	FIBER OPTIC CABLE (144 STRAND)	L.FT.	3,040	4.00	12,200
7330221	PEDESTRIAN PUSH BUTTON (MODIFY PUSH BUTTON HEIGHT)	EACH	1	500.00	500
7330222	PEDESTRIAN PUSH BUTTON (MODIFY ISLAND CONCRETE TO MEET REQ)	EACH	1	500.00	500
7340105	CONTROL CABINET FOUNDATION	EACH	1	500.00	500
7340210	RELOCATE CONTROL CABINET	EACH	1	500.00	500
7350030	LOOP DETECTOR FOR TRAFFIC SURVEILLANCE (6'X6')	EACH	20	1,000.00	20,000
7360070	RELOCATE DMS	EACH	1	2,400.00	2,400
7360078	LUMINAIRE (HIGH MAST)(LED)	EACH	112	800.00	89,600
800X002	LANDSCAPING (4 MILES @ $500,000/MI)	EACH	4	500,000.00	2,000,000
9050026	GUARD RAIL TERMINAL (TANGENT TYPE)	EACH	4	2,500.00	10,000
9050401	GUARD RAIL TRANSITION, W-BEAM TO CONCRETE BARRIER	EACH	4	3,000.00	12,000
9080084	CONCRETE CURB AND GUTTER (C-05.10)	L.FT.	3,920	15.00	58,800

Table 44 – Baseline Road to Ray Road (Eastbound) Cost Estimate (cont.)

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	8,200	3.00	24,600
9080296	CONCRETE SIDEWALK RAMP (NEW)	EACH	20	1,500.00	30,000
9080301	CONCRETE DRIVEWAY (C-05.20)	SQ.FT.	600	4.00	2,400
9100000	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (2.5' PAN)	L.FT.	5,714	60.00	342,900
9100008	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (2.5' PAN) (ADJ TO RW)	L.FT.	100	60.00	6,000
9100009	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (4.5' PAN)	L.FT.	3,865	60.00	231,900
9100012	CONCRETE BARRIER (RETAINING HALF BARRIER)	L.FT.	13,529	75.00	1,014,700
9140107	WALL (COMBINATION WALL) (SOUND WALL PORTION)	SQ.FT.	54,656	31.00	1,694,400
9140136	SOUND BARRIER WALL (CONCRETE)	SQ.FT.	33,787	35.00	1,182,600
9140153	RETAINING WALL (SD 7.01)	SQ.FT.	758	45.00	34,200
9140181	RETAINING WALL (SPECIALTY WALL 6)	SQ.FT.	18,348	50.00	917,400
91401XX	RETAINING WALL (SPECIALTY WALL 7)	SQ.FT.	336	75.00	25,200
91401XX	SOUND BARRIER WALL (CONCRETE NON-STANDARD)	SQ.FT.	3,822	40.00	152,900
9240119	MISCELLANEOUS WORK (RELOCATE RAMP METER)	EACH	2	12,400.00	24,800
9240121	MISCELLANEOUS WORK (ADD DETECTABLE WARNING STRIP)	EACH	20	500.00	10,000
9999910	LUMP SUM (PEDESTRIAN FENCE RETROFITS) (ELLIOT ROAD)	L.SUM	1	103,000.00	103,000
9999910	LUMP SUM (PEDESTRIAN FENCE RETROFITS) (WARNER ROAD)	L.SUM	1	93,000.00	93,000
9999910	LUMP SUM (8' x 1.5' RCBC EXTENSION) STA 8143+89	L.SUM	1	38,655.00	38,700
9999910	LUMP SUM (10' x 3' RCBC EXTENSION) STA 8281+00	L.SUM	1	30,341.00	30,400
9999910	LUMP SUM (8' x 2.5' RCBC EXTENSION) STA 8292+90	L.SUM	1	16,012.00	16,100
9999910	LUMP SUM (10' x 2' RCBC EXTENSION) STA 8306+20	L.SUM	1	60,863.00	60,900
9999910	LUMP SUM (BOX TOP REPLACEMENT) STA 8327+00	L.SUM	1	18,254.00	18,300
9999910	LUMP SUM (2-10' x 4' RCBC ADJUSTMENT) STA 8352+90	L.SUM	1	30,124.00	30,200
9999910	LUMP SUM (BOX TOP REPLACEMENT) STA 8363+00	L.SUM	1	21,790.00	21,800
				ITEM TOTAL	**13,387,300**
PROJECT WIDE					
	Maintenance and Protection of Traffic (8%)	COST		1,071,000.00	1,071,000
	Dust and Water Palliative (0.75%)	COST		101,000.00	101,000
	Quality Control (0.75%)	COST		101,000.00	101,000
	Construction Surveying (1.5%)	COST		201,000.00	201,000
	Erosion Control (0.3%)	COST		41,000.00	41,000
	Mobilization (8% of all construction items)	COST		1,580,000.00	1,580,000
				PROJECT WIDE SUBTOTAL	**3,095,000**
	Unidentified Items (20% of Item Total and Project Wide Subtotal)	COST		3,297,000.00	3,297,000
				PROJECT WIDE TOTAL	**6,392,000**
OTHER COST					
	Construction Engineering (9%)	COST		1,781,000.00	1,781,000
	Construction Contingencies (5%)	COST		989,000.00	989,000
	Environmental Mitigation (Unknown at this time)	COST		-	-
	PCCP Quality Incentive	SQ.YD.	34,388	1.50	51,600
	AR-ACFC Smoothness Incentive	L.MILE	26	11,000.00	281,600
	Engineering Design (Includes Surveying and Geotechnical) (8% of all items)	COST		1,583,000.00	1,583,000
	Right-of-Way	COST		-	-
				OTHER COST TOTAL	**4,686,200**

SUMMARY

ITEM TOTAL:	**13,387,300**
PROJECT WIDE:	**6,392,000**
OTHER COST TOTA:L	**4,686,200**
SUBTOTAL PROJECT COST:	**24,465,500**
INDIRECT COST ALLOCATION (ICAP) (10.35%):	**2,533,000**
TOTAL PROJECT COST:	**26,998,500**

Table 45 – Baseline Road to Ray Road (Westbound) Cost Estimate

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	947	5.00	4,800
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS, AND SLABS	SQ.FT.	2,450	5.00	12,300
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	523	10.00	5,300
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	14,697	10.00	147,000
2020034	REMOVAL OF SIGNS	L.SUM	1	24,400.00	24,400
2020041	REMOVAL OF PIPE	L.FT.	36	15.00	600
2020052	REMOVE (HANDRAIL)	L.FT.	156	20.00	3,200
2020053	REMOVE (CONCRETE SIDEWALK RAMP)	EACH	14	500.00	7,000
2020071	REMOVE GUARDRAIL	L.FT.	264	3.00	800
2020081	REMOVE BITUMINOUS PAVEMENT (MILLING) (1")	SQ.YD.	186,002	1.00	186,100
2020155	REMOVE (CATCH BASIN)	EACH	3	500.00	1,500
2020157	REMOVE (PIPE HEADWALL)	EACH	2	500.00	1,000
2020201	SAW CUTTING	L.FT.	1,470	2.00	3,000
2030301	ROADWAY EXCAVATION	CU.YD.	12,147	10.00	121,500
2030401	DRAINAGE EXCAVATION	CU.YD.	3,230	10.00	32,300
4010010	PORTLAND CEMENT CONCRETE PAVEMENT (RAMPS)	SQ.YD.	6,928	35.00	242,500
4010013	PORTLAND CEMENT CONCRETE PAVEMENT (MAINLINE & CD ROADS)	SQ.YD.	16,441	40.00	657,700
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (NEW PAVEMENT)	SQ.YD.	23,370	5.00	116,900
4070040	ASPHALTIC CONCRETE (AR-ACFC 1" OVERLAY) (EXISTING PAVEMENT)	SQ.YD.	186,002	5.00	930,100
5010107	PIPE, CORRUGATED METAL, SLOTTED, 18"	L.FT.	920	65.00	59,800
5012524	STORM DRAIN PIPE, 24"	L.FT.	1,950	70.00	136,500
5012930	PIPE CULVERT, 30"	L.FT.	8	95.00	800
5014024	FLARED END SECTION, 24" (C-13.20)	EACH	46	400.00	18,400
5030141	CONCRETE CATCH BASIN (MEDIAN)	EACH	2	3,000.00	6,000
5030604	CONCRETE CATCH BASIN (C-15.92)	EACH	53	3,500.00	185,500
6060036	BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	1	125,000.00	125,000
6060080	FOUNDATION FOR BRIDGE SIGN STRUCTURE (DMS SIGN)	EACH	1	8,000.00	8,000
6060150	CANTILEVER SIGN STRUCTURE	EACH	6	30,000.00	180,000
6060240	FOUNDATION FOR CANTILEVER SIGN STRUCTURE	EACH	6	5,000.00	30,000
6061001	SIGN MOUNT ASSEMBLY (FOR BRIDGE FASCIA)	EACH	4	3,000.00	12,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	120	25.00	3,000
6070004	BREAKAWAY SIGN POST W6X12	L.FT.	152	25.00	3,800
6070006	BREAKAWAY SIGN POST W8X18	L.FT.	84	25.00	2,100
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	8	300.00	2,400
6070024	FOUNDATION FOR BREAKAWAY SIGN POST W6X12	EACH	8	300.00	2,400
6070026	FOUNDATION FOR BREAKAWAY SIGN POST W8X18	EACH	6	300.00	1,800
6070038	SLIP BASE (2 1/2 T)	EACH	32	150.00	4,800
6070057	SIGN POST (PERFORATED) 2 1/2 T)	L.FT.	468	8.00	3,800
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	32	175.00	5,600
6080005	WARNING, MARKER, OR REGULATORY SIGN PANEL	SQ.FT.	590	20.00	11,800
6080018	EXTRUDED ALUMINUM SIGN PANEL	EACH	2,940	25.00	73,500
6110201	METAL HANDRAIL	L.FT.	216	50.00	10,800
7030095	MILEPOST MARKER (S-10)	EACH	8	300.00	2,400
7040070	PAVEMENT MARKING (WHITE THERMOPLASTIC) (0.090")	L.FT.	28,805	0.25	7,300
7040071	PAVEMENT MARKING (YELLOW THERMOPLASTIC) (0.090")	L.FT.	34,515	0.25	8,700
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	69,642	1.00	69,700
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	21	110.00	2,400
7050047	PAVEMENT MARKING, PREFORMED, PATTERNED, WHITE STRIPE	L.FT.	35,888	3.00	107,700
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	2,896	3.00	8,700
7080001	PERMANENT PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	65,631	0.10	6,600
7080011	PERMANENT PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	23,010	0.10	2,400
7080101	PERMANENT PAVEMENT MARKING (PAINTED SYMBOL)	EACH	21	100.00	2,100
7320073	ELECTRICAL CONDUIT(2-3")(PVC)	L.FT.	50	15.00	800
7330221	PEDESTRIAN PUSH BUTTON (MODIFY PUSH BUTTON HEIGHT)	EACH	1	500.00	500
7340105	CONTROL CABINET FOUNDATION	EACH	1	500.00	500
7340210	RELOCATE CONTROL CABINET	EACH	1	500.00	500
7350030	LOOP DETECTOR FOR TRAFFIC SURVEILLANCE (6'X6')	EACH	30	1,000.00	30,000
7360070	RELOCATE DMS	EACH	1	2,400.00	2,400
7360405	SIGN LIGHTING (85 WATT IF)	EACH	1	1,100.00	1,100
7360408	TRANSFORMER (FOR INDUCTIVE FLUORESCENT SIGN LIGHTING FIXTURE)	EACH	1	900.00	900
7360420	REMOVE AND SALVAGE EXISTING SIGN LIGHTING	L.SUM	1	500.00	500
800X002	LANDSCAPING (4 MILES @ $500,000/MI)	EACH	4	500,000.00	2,000,000
9050026	GUARD RAIL TERMINAL (TANGENT TYPE)	EACH	5	2,500.00	12,500
9050401	GUARD RAIL TRANSITION, W-BEAM TO CONCRETE BARRIER	EACH	5	3,000.00	15,000
9080084	CONCRETE CURB AND GUTTER (C-05.10)	L.FT.	4,112	15.00	61,700
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	2,450	3.00	7,400
9080296	CONCRETE SIDEWALK RAMP (NEW)	EACH	14	1,500.00	21,000
9100000	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (2.5' PAN)	L.FT.	4,401	60.00	264,100
9100009	CONCRETE BARRIER (SINGLE FACE WITH GUTTER) (4.5' PAN)	L.FT.	2,227	60.00	133,700
9100012	CONCRETE BARRIER (RETAINING HALF BARRIER)	L.FT.	14,356	75.00	1,076,700
9240119	MISCELLANEOUS WORK (RELOCATE RAMP METER)	EACH	3	12,400.00	37,200
9240121	MISCELLANEOUS WORK (ADD DETECTABLE WARNING STRIP)	EACH	14	500.00	7,000
				ITEM TOTAL	**7,277,300**

Table 45 – Baseline Road to Ray Road (Westbound) Cost Estimate (cont.)

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
PROJECT WIDE					
	Maintenance and Protection of Traffic (8%)	COST		583,000.00	583,000
	Dust and Water Palliative (0.75%)	COST		55,000.00	55,000
	Quality Control (0.75%)	COST		55,000.00	55,000
	Construction Surveying (1.5%)	COST		110,000.00	110,000
	Erosion Control (0.3%)	COST		22,000.00	22,000
	Mobilization (8% of all construction items)	COST		860,000.00	860,000
				PROJECT WIDE SUBTOTAL	**1,685,000**
	Unidentified Items (20% of Item Total and Project Wide Subtotal)	COST		1,793,000.00	1,793,000
				PROJECT WIDE TOTAL	**3,478,000**
OTHER COST					
	Construction Engineering (9%)	COST		968,000.00	968,000
	Construction Contingencies (5%)	COST		538,000.00	538,000
	Environmental Mitigation (Unknown at this time)	COST		-	-
	PCCP Quality Incentive	SQ.YD.	23,370	1.50	35,100
	AR-ACFC Smoothness Incentive	L.MILE	22	11,000.00	245,300
	Engineering Design (Includes Surveying and Geotechnical) (8% of all items)	COST		861,000.00	861,000
	Right-of-Way	COST		-	-
				OTHER COST TOTAL	**2,647,400**

SUMMARY

ITEM TOTAL:	**7,277,300**
PROJECT WIDE:	**3,478,000**
OTHER COST TOTAL:	**2,647,400**
SUBTOTAL PROJECT COST:	**13,402,700**
INDIRECT COST ALLOCATION (ICAP) (10.35%):	**1,388,000**
TOTAL PROJECT COST:	**14,790,700**

Table 46 – Alameda Drive and Guadalupe Road Cost Estimate

Item	Description	UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	16	5.00	100
2020022	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.FT.	51	2.00	200
2020025	REMOVAL OF CONCRETE SIDEWALK & CONCRETE DRIVEWAY	SQ.FT.	22	4.00	100
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	9	10.00	100
2020201	SAW CUTTING	L.FT.	107	2.00	300
2030201	EXCAVATION (FOR PATH)	CU.YD.	26	7.00	200
2030900	BORROW	CU.YD.	1,197	15.00	18,000
3030102	AGGREGATE BASE	CU.YD.	1	150.00	200
4060017	ASPHALTIC CONCRETE	TON	2	120.00	300
802000X	LANDSCAPING	L.SUM	1	88,063.00	88,100
8030104	DECOMPOSED GRANITE (4" STABILIZED)	SQ.YD.	1,424	15.00	21,400
9080084	CONCRETE CURB AND GUTTER	L.FT.	9	15.00	200
9080296	CONCRETE SIDEWALK RAMP (NEW)	EACH	2	1,500.00	3,000
9100008	CONCRETE BARRIER (32")	L.FT.	105	50.00	5,300
9140153	RETAINING WALL	SQ.FT.	7,842	45.00	352,900
9240050	MISCELLANEOUS WORK (PEDESTRIAN TRAFFIC SIGNAL MODIFICATIONS)	L.SUM	1	8,000.00	8,000
9240051	MISCELLANEOUS WORK (SRP POWER RELOCATION ALLOWANCE)	L.SUM	1	5,000.00	5,000
9240111	MISCELLANEOUS WORK (PAVEMENT STRIPING) (CROSSWALKS)	L.FT.	76	8.00	700
9240112	MISCELLANEOUS WORK (RELOCATE IRRIGATION LINE)	L.FT.	300	5.00	1,500
9240117	MISCELLANEOUS WORK (EXPANDED METAL SCREEN FENCE - WALLS)	SQ.FT.	8,375	25.00	209,400
9240118	MISCELLANEOUS WORK (EXPANDED METAL SCREEN FENCE - BRIDGE)	SQ.FT.	5,320	25.00	133,000
9240119	MISCELLANEOUS WORK (ADD DETECTABLE WARNING STRIP)	EACH	6	1,500.00	9,000
9999910	LUMP SUM (PEDESTRIAN OVERPASS STRUCTURE) (GUADALUPE ROAD)	L.SUM	1	564,100.00	564,100
9999910	LUMP SUM (PEDESTRIAN OVERPASS STRUCTURE) (ALAMEDA DRIVE)	L.SUM	1	2,959,000.00	2,959,000
				ITEM TOTAL	**4,380,100**
PROJECT WIDE					
	Maintenance and Protection of Traffic (8%)	COST		351,000.00	351,000
	Dust and Water Palliative (0.75%)	COST		33,000.00	33,000
	Quality Control (0.75%)	COST		33,000.00	33,000
	Construction Surveying (1.5%)	COST		66,000.00	66,000
	Erosion Control (0.3%)	COST		14,000.00	14,000
	Mobilization (8% of all construction items)	COST		518,000.00	518,000
				PROJECT WIDE SUBTOTAL	**1,015,000**
	Unidentified Items (20% of Item Total and Project Wide Subtotal)	COST		1,080,000.00	1,080,000
				PROJECT WIDE TOTAL	**2,095,000**
OTHER COST					
	Construction Engineering (9%)	COST		583,000.00	583,000
	Construction Contingencies (5%)	COST		324,000.00	324,000
	Environmental Mitigation (Unknown at this time)	COST		-	-
	Engineering Design (Includes Surveying and Geotechnical) (8% of all items)	COST		519,000.00	519,000
	Right-of-Way	COST		150,000.00	150,000
				OTHER COST TOTAL	**1,576,000**

SUMMARY

ITEM TOTAL:	**4,380,100**
PROJECT WIDE:	**2,095,000**
OTHER COST TOTAL:	**1,576,000**
SUBTOTAL PROJECT COST:	**8,051,100**
INDIRECT COST ALLOCATION (ICAP) (10.35%):	**834,000**
TOTAL PROJECT COST:	**8,885,100**

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7.0 AASHTO CONTROLLING DESIGN CRITERIA

American Association of State Highway and Transportation Officials (AASHTO) Controlling Design Criteria have been reviewed for the existing roadways that will remain as a part of the proposed improvements. Existing and proposed features for each of the alternatives that do not meet current AASHTO (2004 Green Book) recommended guidelines are indicated below.

The Arizona Department of Transportation (ADOT) Design Criteria has also been reviewed for the new roadways that are part of the proposed improvements. Existing and proposed features for each alternative that do not meet current *ADOT Roadway Design Guidelines* (RDG) are also indicated below.

7.1 AASHTO NON-CONFORMING GEOMETRIC DESIGN ELEMENTS

Non-conforming AASHTO design elements that would not be upgraded as part of this project include the following:

I-10 MAINLINE (WB)

The proposed general-purpose and HOV lane widths are less than the AASHTO recommended 12’ minimum at the following location:

a. MP 151.88 to MP 153.70 (Station 7995+83 to Station 8087+49): Varies 0’ to 1’ less than recommended.

The proposed median shoulder width is less than the AASHTO recommend 10’ minimum (assuming a 4’ wide bridge pier) at the following locations:

a. 40th Street TI UP (MP 152.39 to MP 152.43): 1.5’ less than recommended.
b. 48th Street UP (MP 153.43 to MP 153.48): 1.0’ less than recommended.

I-10 C-D ROAD (EB)

The vertical curve stopping sight distance is less than the AASHTO recommended minimum distance at the following location:

a. MP 153.37 to MP 155.45 (Station 8177+00.00 to Station 8181+50.00; VPI Station 8179+25): 95’ less than the recommended 520’ (sag)

The horizontal stopping sight distance is less than the AASHTO recommended minimum distances due to roadway curvature and the placement of concrete barrier adjacent to the inside and outside shoulders at the following location:

a. MP 155.32 to MP 155.45 (Station 8173+90.23 to 8181+43.11; HPI Station 8177+72.50): 44’ less than the recommended 520’ (outside shoulder)

I-10 C-D ROAD (WB)

The proposed left shoulder width is less than the AASHTO recommended 6’ minimum (assuming a 4’ width bridge pier) at the following location:

a. Broadway Road TI UP (MP 153.82 to MP 153.87): Varies 0’ to 2.0’ less than recommended

The proposed right shoulder width is less than the AASHTO recommended 10’ minimum at the following location:

a. Broadway Road TI UP (MP 153.81 to MP 153.89): Varies 0’ to 4.0’ less than recommended

The horizontal stopping sight distance is less than the AASHTO recommended minimum distances due to roadway curvature and the placement of concrete barrier adjacent to the inside and outside shoulders at the following locations:

a. MP 155.23 to MP 155.37 (Station 8169+43.94 to Station 8177+01.25; HPI Station 8173+34.17): 173’ less than the recommended 522’ (inside shoulder)
b. MP 155.24 to MP 155.34 (WB CD Ramp ‘T-2’ Station 25+24.87 to Station 33+19.62; HPI Station 29+51.55): 106’ less than the recommended 441’ (outside shoulder)

I-10/US60 TI DIRECTIONAL RAMPS

The vertical curve stopping sight distance is less than the AASHTO recommended minimum distances at the following location:

a. Ramp ‘W-N’ MP 155.12 to MP 155.23 (Station 193+75.00 to Station 200+25.00; VPI Station 197+00): 52’ less than the recommended 541’ (sag)

The horizontal stopping sight distance is less than the AASHTO recommended minimum distances due to roadway curvature and the placement of concrete barrier adjacent to the inside and outside shoulders at the following locations:

a. Ramp ‘W-N’ MP 155.20 to MP 155.35 (Station 198+36.10 to Station 210+83.42; HPI Station 205+17.94): 119’ less than the recommended 522’ (outside shoulder)
b. Ramp ‘N-E’ MP 155.38 to MP 155.48 (Station 36+73.98 to 45+28.52; HPI Station 41+40.18): 74’ less than the recommended 405’ (outside shoulder)

BASELINE ROAD TI

The horizontal stopping sight distance is less than the AASHTO recommended minimum distances due to roadway curvature and the placement of concrete barrier adjacent to the inside and outside shoulders at the following locations:

a. Ramp 'F' MP 155.25 to MP 155.32 (Station 15+28.06 to Station 18+94.69; HPI Station 14+62.48): 81' less than the recommended 419' (inside shoulder)
b. Ramp 'F' MP 155.35 to MP 155.45 (Station 21+26.27 to Station 26+67.81; HPI Station 24+00.31): 5' less than the recommended 434' (outside shoulder)

7.2 REQUEST FOR AASHTO DESIGN EXCEPTIONS

AASHTO design exceptions were requested for the non-conforming design elements listed above. The design exception approval is include in Appendix C.

7.3 ADOT NON-CONFORMING GEOMETRIC DESIGN ELEMENTS

Non-conforming ADOT RDG design elements that would not be upgraded as part of this project include the following:

I-10 MAINLINE (WB)

The proposed general-purpose and HOV lane widths are less than the AASHTO recommended 12' minimum at the following location:

a. MP 151.88 to MP 153.70 (Station 7995+83 to Station 8087+49): Varies 0' to 1' less than recommended.

The proposed median shoulder width is less than the AASHTO recommend 10' minimum (assuming a 4' wide bridge pier) at the following locations:

a. 40th Street TI UP (MP 152.39 to MP 152.43): 1.5' less than recommended.
b. 48th Street UP (MP 153.43 to MP 153.48): 1.0' less than recommended.

I-10 C-D ROAD (EB)

The vertical curve stopping sight distance is less than the AASHTO recommended minimum distance at the following location:

a. MP 155.37 to MP 155.45 (Station 8177+00.00 to Station 8181+50.00; VPI Station 8179+25): 95' less than the recommended 520' (sag)

The horizontal stopping sight distance is less than the AASHTO recommended minimum distances due to roadway curvature and the placement of concrete barrier adjacent to the inside and outside shoulders at the following locations:

a. MP 155.32 to MP 155.45 (Station 8173+90.23 to Station 8181+43.11; HPI Station 8177+72.50): 44' less than the recommended 520' (outside shoulder)

I-10 C-D ROAD (WB)

The proposed left shoulder width is less than the AASHTO recommended 6' minimum (assuming a 4' width bridge pier) at the following location:

a. Broadway Road TI UP (MP 153.82 to MP 153.87): Varies 0' to 2.0' less than recommended

The proposed right shoulder width is less than the AASHTO recommended 10' minimum at the following location:

a. Broadway Road TI UP (MP 153.81 to MP 153.89): Varies 0' to 4.0' less than recommended

The horizontal stopping sight distance is less than the AASHTO recommended minimum distances due to roadway curvature and the placement of concrete barrier adjacent to the inside and outside shoulders at the following locations:

a. MP 155.23 to MP 155.37 (Station 8169+43.94 to Station 8177+01.25; HPI Station 8173+34.17): 173' less than the recommended 522' (inside shoulder)
b. WB CD Ramp 'T-2' MP 155.24 to MP 155.34 (Station 25+24.87 to Station 33+19.62; HPI Station 29+51.55): 106' less than the recommended 441' (outside shoulder)

I-10/US60 TI DIRECTIONAL RAMPS

The vertical curve stopping sight distance is less than the AASHTO recommended minimum distances at the following location:

b. Ramp 'W-N' MP 155.12 to MP 155.23 (Station 193+75.00 to Station 200+25.00; VPI Station 197+00): 52' less than the recommended 541' (sag)

The horizontal stopping sight distance is less than the AASHTO recommended minimum distances due to roadway curvature and the placement of concrete barrier adjacent to the inside and outside shoulders at the following locations:

a. Ramp 'W-N' MP 155.20 to MP 155.35 (Station 198+36.10 to Station 210+83.42; HPI Station 205+14.94): 119' less than the recommended 522' (outside shoulder)
b. Ramp 'N-E' MP 155.38 to MP 155.48 (Station 36+73.98 to Station 45+28.52; HPI Station 41+40.18): 74' less than the recommended 405' (outside shoulder)

BASELINE ROAD TI

The horizontal stopping sight distance is less than the AASHTO recommended minimum distances due to roadway curvature and the placement of concrete barrier adjacent to the inside and outside shoulders at the following location:

a. Ramp 'F' MP 155.25 to MP 155.32 (Station 15+28.06 to Station 18+94.69; HPI Station 14+62.48): 81' less than the recommended 419' (inside shoulder)

b. Ramp ‘F’ MP 155.35 to MP 155.45 (Station 21+26.27 to Station 26+67.81; HPI Station 24+00.31): 5’ less than the recommended 434’ (outside shoulder)

7.4 REQUEST FOR ADOT DESIGN EXCEPTIONS

ADOT design exceptions were requested for the non-conforming design elements listed above. The design exception approval is included in Appendix C.

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8.0 SOCIAL, ECONOMIC AND ENVIRONMENTAL CONCERNS

8.1 ENVIRONMENTAL DOCUMENT

A Categorical Exclusion (CE) is being prepared as part of this project. The approval date for the CD is anticipated to be ______Date_________.

8.2 MITIGATION MEASURES

Design Responsibility

- All disturbed soils not paved that will not be landscaped or otherwise permanently stabilized by construction will be seeded using species native to the project vicinity.
- The Maricopa County Flood Control District and the floodplain managers for the cities of Phoenix, Tempe, and Chandler will be provided an opportunity to review and comment on the design plans.
- Arizona Department of Transportation Project Manager will coordinate with the Arizona Department of Transportation Environmental Planning Historic Preservation Team, (602.712.8636 or 602.712.7767) before and throughout the final design to determine if the final design will result in adverse effects on historic properties. If it is determined that the project would result in an adverse effect, the Federal Highway Administration and Arizona Department of Transportation would implement the provisions set forth in Attachment 6 (Standard Measures for Resolving Adverse Effects) of the Programmatic Agreement Pursuant to Section 106 of the National Historic Preservation Act Regarding the Implementation of Federal-Aid Transportation Projects in the State of Arizona (December 16, 2015).
- The Arizona Department of Transportation project manager will contact the Arizona Department of Transportation Environmental Planning hazardous materials coordinator (602.920.3882 or 602.712.7767) 30 (thirty) days prior to bid advertisement to determine the need for additional site assessment and confirm that the asbestos report is still valid.
- During final design, the project manager will contact the Arizona Department of Transportation Environmental Planning noise coordinator (602.712.8246 or 602.712.7767) to arrange for qualified personnel to review and update the noise analysis.

District Responsibility:

- If any active bird nests cannot be avoided by vegetation clearing or construction activities, the Engineer will contact the Environmental Planning biologist (602.712.6819 or 602.712.7767) to evaluate the situation.
- All disturbed soils not paved that will not be landscaped or otherwise permanently stabilized by construction will be seeded using species native to the project vicinity.
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- Arizona Department of Transportation Project Manager will coordinate with the Arizona Department of Transportation Environmental Planning Historic Preservation Team, (602.712.8636 or 602.712.7767) before and throughout the final design to determine if the final design will result in adverse effects on historic properties. If it is determined that the project would result in an adverse effect, the Federal Highway Administration and Arizona Department of Transportation would implement the provisions set forth in Attachment 6 (Standard Measures for Resolving Adverse Effects) of the Programmatic Agreement Pursuant to Section 106 of the National Historic Preservation Act Regarding the Implementation of Federal-Aid Transportation Projects in the State of Arizona (December 16, 2015).
- If previously unidentified cultural resources are encountered during activity related to the construction of the project, the contractor shall stop work immediately at that location, notify the Engineer and shall take all reasonable steps to secure the preservation of those resources. The Engineer will contact the Arizona Department of Transportation Environmental Planning Historic Preservation Team, (602.712.8636 or 602.712.7767) immediately, and make arrangements for proper treatment of those resources.
- Access to adjacent businesses and residences will be maintained throughout construction.
- No milling activities or pavement marking obliteration will occur until the Lead-Based Paint Removal and Abatement Plan is approved and implemented.
- The Engineer will ensure a stormwater pollution prevention plan is prepared to meet the requirements of the construction general permit, including sampling and analysis plan, as necessary.
- The Engineer will prepare and submit a notice of intent for the project to the Arizona Department of Environmental Quality.
- The Engineer will prepare and submit a notice of termination upon achieving final stabilization for the project to the Arizona Department of Environmental Quality.
- The Engineer shall submit a copy of the authorization to discharge letter to any regulated municipal separate storm sewer system operator.

Contractor Responsibilities:

- Prior to construction, all personnel who will be on-site, including, but not limited to, contractors, contractors' employees, supervisors, inspectors, and subcontractors shall review the attached Arizona Department of Transportation Environmental Planning "Western Burrowing Owl Awareness" flyer.
- If any burrowing owls or active burrows are identified the contractor shall notify the Engineer immediately. No construction shall take place within 100 feet of any active burrow.
- If the engineer in cooperation with the Environmental Planning biologist determines burrowing owls cannot be avoided, the contractor shall employ a qualified biologist holding a permit from the U.S. Fish and Wildlife Service to relocate burrowing owls from the project area, as appropriate.
- If vegetation clearing will occur during the migratory bird breeding season (March 1- August 31), the contractor shall avoid any active bird nests. If the active nests cannot be avoided, the contractor shall notify the Engineer to evaluate the situation. During the non-breeding season (September 1- February 28) vegetation removal is not subject to this restriction.
- All disturbed soils not paved that will not be landscaped or otherwise permanently stabilized by construction will be seeded using species native to the project vicinity.
- To prevent invasive species seeds from leaving the site, the contractor shall inspect all construction equipment and remove all attached plant/vegetation and soil/mud debris prior to leaving the construction site.

- To prevent the introduction of invasive species seeds, the contractor shall inspect all earthmoving and hauling equipment at the equipment storage facility and the equipment shall be washed prior to entering the construction site.
- If previously unidentified cultural resources are encountered during activity related to the construction of the project, the contractor shall stop work immediately at that location notify the Engineer and shall take all reasonable steps to secure the preservation of those resources. The Engineer will contact the Arizona Department of Transportation Environmental Planning, Historic Preservation Team, (602.712.8636 or 602.712.7767) immediately, and make arrangements for proper treatment of those resources.
- Access to adjacent businesses and residences shall be maintained throughout construction.
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- The contractor after coordination with the Engineer will notify the public a minimum of 48 (forty-eight) hours in advance of any road closures.
- At least 14 (fourteen) calendar days prior to construction, the contractor shall place advance warning signs at locations designated by the District to notify motorists, pedestrians and bicyclists of construction-related delays.
- An approved contractor shall develop and implement a Lead-Based Paint Removal and Abatement Plan for the removal of the lead-based paint, Toxicity Characteristic Leaching Procedure testing of the generated waste stream, and proper disposal of the waste stream derived from the removal of the yellow pavement striping within the project limits. The contractor shall select a lead abatement contractor that meets the qualification requirements specified within the special provisions and as approval by the Engineer. The contractor shall follow all applicable federal, state, and local codes and regulations, including Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (2008 Edition), related to the treatment and handling of lead-based paint.
- The contractor shall submit a Lead-Based Paint Removal and Abatement Plan for the removal of yellow pavement striping within the project limits to the Engineer and the Arizona Department of Transportation Environmental Planning hazardous materials coordinator (602.920.3882 or 602.712.7767) for review and approval at least 10 (ten) working days prior to milling activities or paint strip removal.
- No milling activities or pavement marking obliteration shall occur until the Lead-Based Paint Removal and Abatement Plan is approved by the Arizona Department of Transportation Environmental Planning hazardous materials coordinator and implemented.
- Visible fugitive dust emissions from paint removal shall be controlled through wet or dry (e.g., vacuum) means during the removal process. If the liquid waste stream generated by a water-blasting obliteration method passes the Toxicity Characteristic Leaching Process analysis, it may be used as a dust palliative or for compaction on the project. If the water is not used on the project, it shall be properly disposed of in accordance with all applicable federal, state, and local regulations.
- Lead Based-Paint was detected in yellow paint at the Warner Road TI underpass; therefore the contractor shall notify their employees prior to any disturbance where lead is present in the paint below the 0.5 percent US Department of Housing and Urban Development/US Environmental Protection Agency action levels, but above the US Department of Labor Occupational Safety and Health Administration detection level. As part of the notification, the contractor shall make the US Department of Labor Occupational Safety and Health Administrationpublication_number_3142-12R_2004_Lead_in_Construction (http://www.osha.gov/Publications/osha3142.pdf) available to workers.
- For milling activities, the roadway surface preceding the milling machine shall be kept sufficiently wet so as to prevent the generation of any visible fugitive dust particles, but not so wet as to cause excess runoff from the roadway surface onto the roadway shoulder.
- If suspected hazardous materials are encountered during construction, work shall cease at that location and the Engineer will be notified. The Engineer will contact the Arizona Department of Transportation Environmental Planning hazardous materials coordinator (602.920.3882 or 602.712.7767) immediately, and make arrangements for assessment, treatment and disposal of those materials.
- The contractor shall prepare and implement a stormwater pollution prevention plan that meets the requirements of the construction general permit, including sampling and analysis plan, as necessary.
- The contractor shall prepare and submit a notice of intent for the project, and shall provide the stormwater pollution prevention plan and sampling and analysis plan, as necessary, to the Arizona Department of Environmental Quality.
- The contractor shall prepare and submit a notice of termination upon approval from the Engineer for the project to the Arizona Department of Environmental Quality.
- The contractor shall submit a copy of the authorization to discharge letter to any regulated municipal separate storm sewer system operator.
- The contractor shall comply with all local air quality and dust control rules, regulations and ordinances which apply to any work performed pursuant to the contract.