Initial Design Concept Report

Valencia Road: Wade Road to Ajo Highway (SR 86)

Pima County Project No. 4RTVWE

October 2016

Prepared for:

PIMA COUNTY

RTA
Regional Transportation Authority

Prepared by:

Kimley»Horn

Kimley»Horn

October 18, 2016

Paul Bennett, P.E.
Project Manager
Pima County Department of Transportation
201 N. Stone Ave, Tucson, AZ 85701
520-724-6408

RE: ***4RTVWE – Valencia Road, Wade Road to Ajo Hwy (SR86) – Initial Design Concept Report***

Dear Mr. Bennett:

We are pleased to submit the Initial Design Concept Report for Valencia Road, Wade Road to Ajo Hwy. This report addresses comments received from the Draft DCR dated August 2016. This revised report was prepared by Rick Solis and reviewed by Kevin Payne, PE.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Rick P. Solis, P.E.
Project Manager

Ray Montoya, P.E.
Quality Control Manager

Initial Design Concept Report

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Pima County Project No. 4RTVWE

October 2016

Prepared for:

PIMA COUNTY DEPARTMENT OF TRANSPORTATION
201 N. Stone Ave., 4th Floor
Tucson, AZ 85701

Prepared by:

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Approved: _____ _____

Priscilla S. Cornelio, P.E., Director *Date*
Pima County Department of Transportation

EXECUTIVE SUMMARY

This project involves the reconstruction of Valencia Road between Wade Road and Ajo Highway (SR86), specifically from 1/3 mile west of Wade Road to tie into the new roadway improvements at SR86 (Ajo Hwy) that are being constructed by the Arizona Department of Transportation (ADOT). This project will reconstruct the existing two and three lane roadway sections into a four-lane divided arterial street. The entire project is located in unincorporated Pima County. A location map is included as Figure 1 and a vicinity map is included as Figure 2. The project length is approximately 2.83 miles.

On May 16, 2006, the citizens of Pima County approved a $2.1 billion transportation plan to be funded by a one-half cent increase in the sales tax. Current project funding includes $10,057,000 from this sales tax revenue. Other funding includes $14,943,000 of Impact Fees, totaling $25,000,000 in project funding. It is estimated that this project will be advertised for bids in late 2017 / early 2018 and construction will be complete by early 2020.

The purpose of the project is to improve Valencia Road to provide capacity for future traffic demands, improve traffic safety, reduce congestion, improve operations and increase mobility. The widening is needed to accommodate the increased volumes of traffic projected in the year 2040. There are also several vertical deficiencies within the existing roadway profile, which limit stopping sight distances. Constructing this new arterial roadway to current standards will increase traffic capacity and user safety in all weather conditions. This section of Valencia Road is designated as a parkway in the Pima Association of Governments 2040 Regional Transportation Plan.

The design speed for this project is 50 miles per hour (mph). The posted speed limit for this corridor will be 45 mph (Pima County Ordinance 2014-003). The existing right-of-way width varies between 150 to 200 feet and is mostly sufficient for the four-lane roadway with some drainage and slope easements needed for the project. New right-of-way is in process at properties that are currently in the rezoning and development plan stage. Drainage improvements will include box and pipe culverts capable of conveying a 100-year storm. Channel work is anticipated.

Landscaping will be provided in the median and roadside areas. Artwork will also be included with this project.

Existing driveways that access Valencia Road will retain access. Median openings will be provided at all major side streets. Exclusive left-turns and right-turns will be added at intersections anticipated to be signalized in the future. Intersection lighting will be added at all existing side street intersections and around the Valencia Road curve approaching SR86.

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1 PROJECT OVERVIEW

1.1 Introduction

This project is located along Valencia Road between Ajo Highway (SR86) and terminating approximately 1/3 mile west of Wade Road. This segment of roadway is classified as Major Collector (Dated 8/19/2014 - FHWA Division Office). The Pima County Major Streets and Scenic Routes Plan (MSSR) and Ordinance establishes the entire Valencia Road project segment as Major Scenic Route and High Volume Arterial with 200-foot Right-of-Way. The official title of this project is "Valencia Road: Wade Road to Ajo Highway (SR 86)". The Project Number is 4RTVWE. This project involves the reconstruction of Valencia Road from an undivided two and three-lane roadway into a four-lane divided arterial road with raised median and pathway. The entire project is located in unincorporated Pima County. A location map is included as Figure 1 and a vicinity map is included as Figure 2.

1.2 Authorization

The Pima County Board of Supervisors approved the contract for the design of this project on February 2, 2016. The notice to proceed was issued on February 8, 2016. On May 16, 2006, the citizens of Pima County approved a $2.1 billion transportation plan to be funded by a one-half cent increase in the sales tax. This plan calls for upgrading Valencia Road to a four-lane "desert parkway". Current project funding includes $10,057,000 from this sales tax revenue. Other funding includes $14,943,000 of Impact Fees, totaling $25,000,000 in project funding.

1.3 Previous Work

The Valencia Road, Wade Road to Mark Road (4RTVMW) project was completed in March, 2016 and extends from approximately 1/3 mile west of Wade Road to Mark Road. ADOT is currently reconstructing SR86from Valencia Road to Kinney Road (Project No. 086-A(210)T H6806 01C). A portion of the Valencia Road curve approaching SR86 will be both reconstructed and widened with this project – "H6806".

1.4 Project Need

This section of Valencia Road is designated as a parkway within the Pima Association of Governments 2040 Regional Transportation Plan (RTP) dated, May 17, 2010. The roadway reconstruction and widening is needed to accommodate the increased volumes of traffic projected in the year 2040. There are also vertical deficiencies in the existing roadway profile, which limit stopping sight distances (SSD). Drainage is also a concern, with flooding problems that occur in the right-of-way. Drainage improvements include new drainage culverts and minor collector channels. Constructing this new parkway to current design standards will increase the traffic capacity and the overall safety will be improved during all weather conditions. This project will include the reconstruction of the Vahalla Road intersection to include turn lanes and tapers associated with this cross street.

Figure 1. Location Map

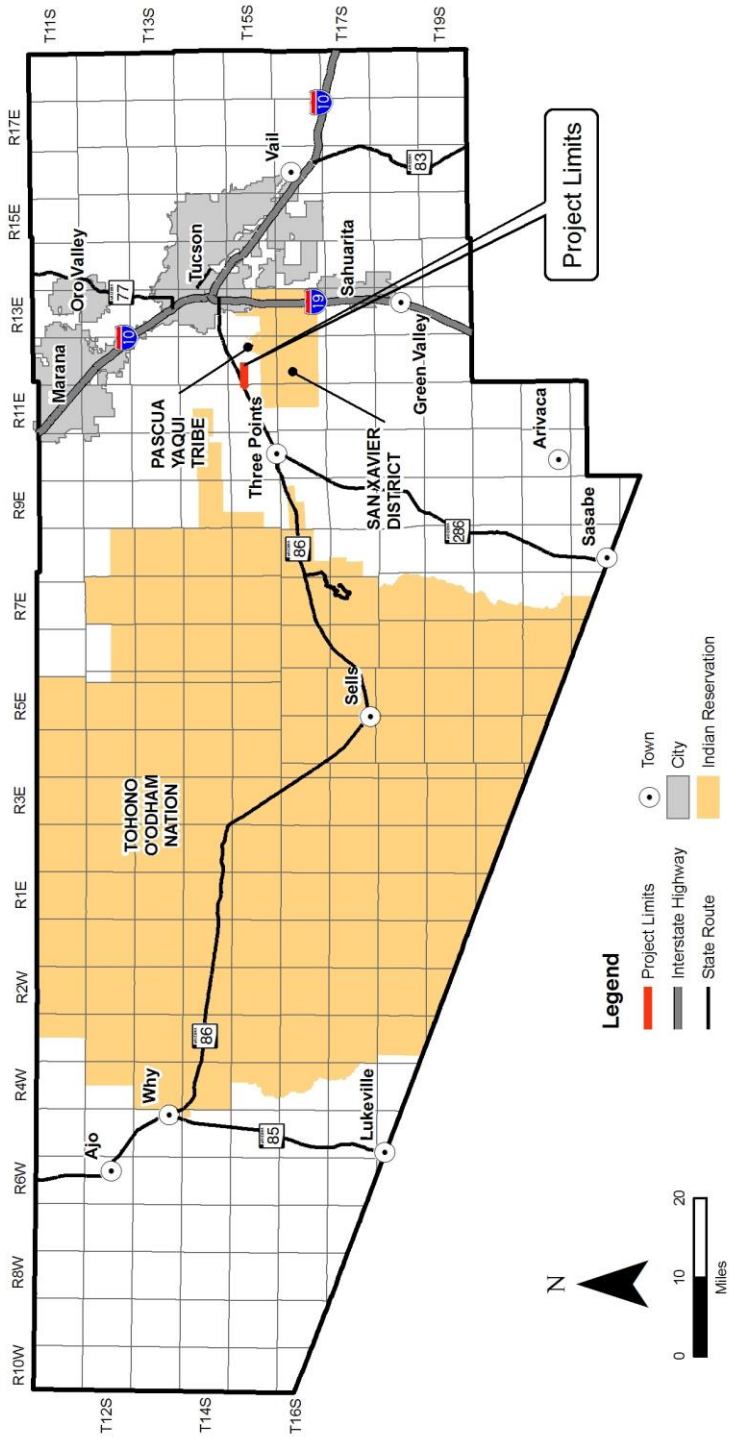


Figure 2. Vicinity Map

2 PROJECT DESCRIPTION

2.1 Project Type and Termini

This project involves the complete reconstruction of Valencia Road. The new roadway will contain four travel lanes, bike lanes (paved shoulders) in each direction, a raised and landscaped median, shared-use pathway, and sidewalk, including its connectivity to existing sidewalks at residential developments. The project will also include concrete box culverts and pipe culverts to convey the 100-yr storm under the roadway. Turn lanes will be added where warranted and to intersections that are anticipated to be signalized in the future. The total project length is 2.83 miles beginning a 1/3 mile west of Wade Road and ending at Ajo Hwy (SR86). Vahalla Road will be realigned to better align with the northern segment of Vahalla Road. The Vahalla realignment will total 0.3 mile in length.

2.2 Major Features

The design year for this project is 2040. The design speed is 50 miles per hour (mph). It will be posted at 45 mph. The existing right-of-way varies from 150 feet to 200 feet. As a minimum right-of-way width of 150 feet will accommodate the proposed four-lane divided section and embankment, the addition of turn lanes and drainage infrastructure will require new right-of-way at various locations. The typical roadway section is shown in Figure 3. Restorative landscape plantings will be provided in the median and roadside areas. An artist will be engaged by PCDOT to design artwork as part of the improvements.

The roadway centerline will be predominately centered on the section line with a shift to the north fronting the Arizona State Land Department (ASLD) parcel. This shift allows for more flexibility in the drainage design and the addition of turn lanes at Vahalla.

Drainage improvements along the corridor will include 25 new box and pipe culvert crossings designed to convey the 100-year storm beneath the roadway and replace existing storm drainage crossings, most of which are at-grade dip crossings. Roadside channels will be constructed at various locations to collect pavement drainage and offsite runoff draining toward the roadway. These channels will have various erosion control linings, e.g. vegetated earthen, rock riprap, wire-tied riprap, or concrete depending on the channel function and site specific needs within the project. Erosion/scour control measures will also be included at culvert inlets and outlets. Inlets of the cross drainage structures will generally be lowered and concrete lined. The existing concrete lined channels within the project limits will be kept.

Existing utilities are located throughout the project on both sides of the roadway centerline and along the abutting cross streets. Existing utilities include gas, electric, communications, potable water, and wastewater. Utility facilities primarily run parallel to Valencia Road and along all major cross streets. Utility relocation will be a significant element of this project. The relocation of electric, water (Metro Water), gas, telephone and cable lines will be performed prior to the road construction by the owning agency. Their design and construction will need to account for seasonal constraints for utility relocations. Noted below are utility relocation windows:

- Gas - April thru September
- Electric - September thru May
- Communication – if aerial, relocated following electric
- Water (Metro Water) – No seasonal constraint

Tucson Water and Pima County Regional Wastewater Reclamation Department facilities will be relocated and adjusted during roadway construction. The existing 42” Tucson Water line that runs parallel to the

section line shall be protected in place. This line is located approximately 67 to 69-feet south of the section line. Appurtenances associated with the 42" water line (Corrosion Test Stations, Rectifiers) have no seasonal constraints for relocation. Utility facilities are described in greater detail in Section 3.5.

Driveways will be provided to properties that currently access Valencia Road. This includes the Arizona G&T Coop electric substation. There are also several undeveloped properties which may require driveways at final design, depending upon status of their access. There will be raised medians to control access along the corridor. The proposed median opening locations will be generally located every 1,320 feet and at major existing or future traffic generating intersections.

There will be no intersection signalization constructed as part of this project, but rather conduit and pull boxes will be constructed at the intersections of Iberia Avenue and Vahalla Road in anticipation of future signalization. The existing traffic volumes and crash rates at these intersections do not currently warrant signalization for opening year conditions.

There will be new lighting at all cross street intersections with Valencia Road and along the approach curve to SR86.

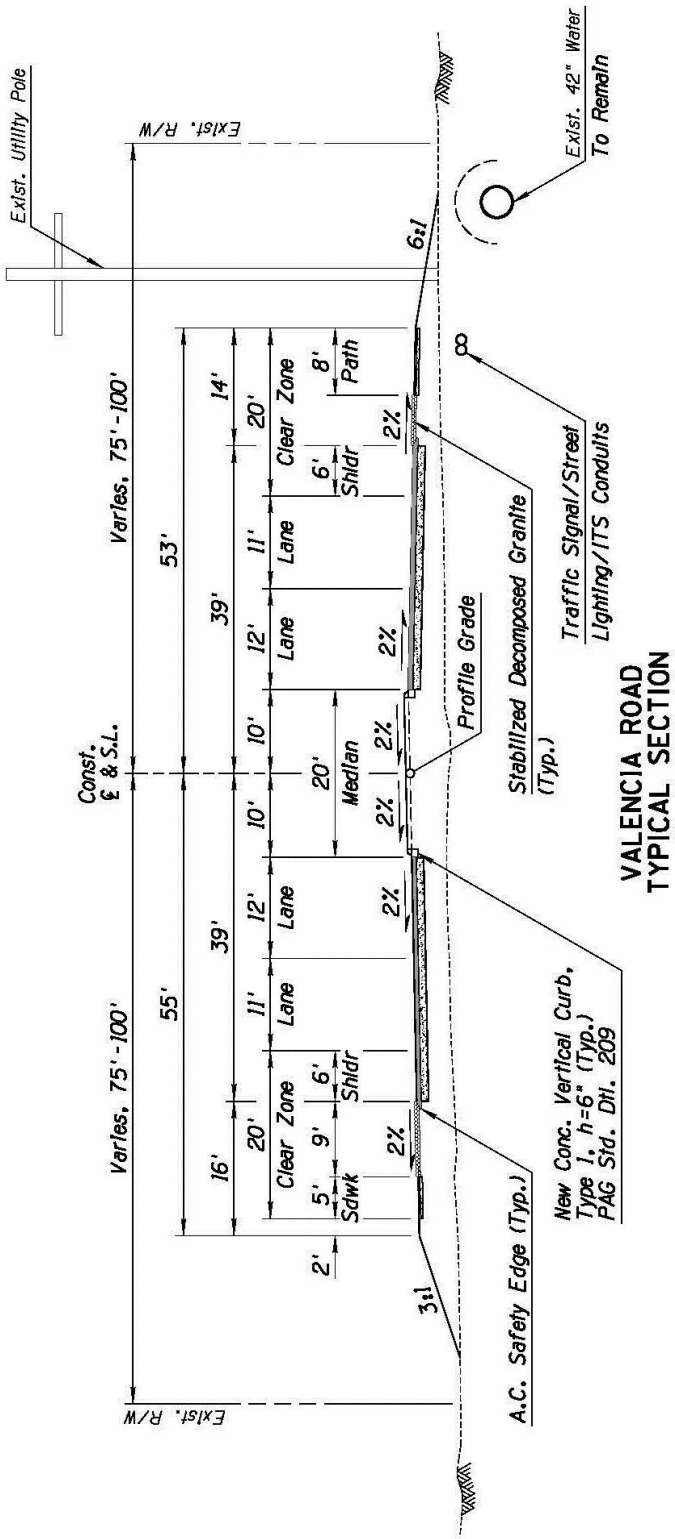
There are features included in the project to comply with the Americans with Disabilities Act (ADA). The features will ensure the project meets the guidelines set for accessibility. These include a multi-use pathway and sidewalk meeting the minimum width and maximum slope criteria. There will be curb ramps provided at intersections with a minimum running slope of 5% and maximum of 8.3% (not to exceed 15-ft in length). Within the turning space, the running slope will be 2% maximum and detectable warnings strips will be placed at the bottom of each ramp.

A minimum clear zone of 20 feet will be provided in order to restrict hazardous obstructions within the recommended horizontal offset from the travel lanes. The slopes within the clear zone will mostly be 2% with a maximum slope of 6:1 in areas restricted by right-of-way. All culvert headwalls and end sections will be located outside the clear zone. Metal handrail will be placed along warranted locations of pedestrian facilities and at culvert headwalls.

No guardrail is anticipated to be used on this project.

This project will restore vegetation to the medians and disturbed roadside areas in accordance with Appendix 4D of the Environmentally Sensitive Roadway Design Guidelines. Landscape restoration will take into account the extensive network of existing underground utilities in the project area, sight distance requirements, and clear zone. Storm water runoff will be directed to landscaped areas where feasible, supplementing irrigation.

Figure 3. Typical Roadway Cross Section



3 PROJECT AREA CHARACTERISTICS

3.1 Existing Topography and Terrain

In accordance with AASHTO topography classification, the roadway is classified as a having a level terrain. The existing terrain generally slopes in a gentle fashion to the northwest. Valencia Road generally slopes down to the west along the existing terrain. The cross slope along Valencia Road has no significant cut or fill slopes. Along the Bureau of Land Management (BLM) property, at the west end of the project, no major cut or fill slopes are evident. Minor drainage ditches parallel Valencia. Lined channels exist between Reed Bunting Drive and Mountain Eagle Drive, along the north right-of-way.

The average elevation for this project is 2,456.60 feet above sea level.

3.2 Existing Roadway

The existing roadway is uncurbed. Approximately half of the roadway is comprised of two twelve-foot travel lanes, with a twelve-foot continuous two-way left turn lane and paved shoulders that vary between 1 and 8-ft in width. The other half of the roadway has twelve-foot travel lanes and paved shoulders that vary between 6 inches and 1 foot in width. The existing roadway surface is asphaltic concrete.

The existing horizontal alignment of the roadway is straight with the centerline of the existing road located north and parallel to the section line. The existing vertical profile contains gentle grades varying from being flat to less than 1%, with the predominant downward slope to the west of 0.3%. There are several short dip sections for drainage throughout the corridor with only four existing pipe culvert crossings. The posted speed limit is 45 mph. Only one roadway curve exists on the project and it is at the approach to SR86. It currently is signed with a warning curve sign and a supplemental advisory speed plaque at 35 mph.

3.3 Existing Rights-of-Way

The existing Right-of-Way along the corridor is shown in the Record of Survey (ROS) plans (**Appendix C**). The existing right-of-way along Valencia Road is 200-foot wide (centered on the section line) with the following exceptions where ROW varies between 175 feet and 150 feet in width:

- From the end of the Valencia Curve (at the Section Corner & tie in with State Route 86) to just west of Reed Bunting Drive/Molino de Viento (at the Section Corner), the right-of-way consists of 75-foot half widths.
    - The North half width is on easement from the BLM. Pima County and the BLM are in process of renewing the easement. A summary of the BLM timeline follows later in this section.
    - The South half width is owned by Pima County. An additional 25-ft of right-of-way will be added as a rezoning condition, resulting in a 100-foot half width. This additional width extends along the south side within Sections 13 and 18, T15S, R11E. The additional right-of-way for Section 13 has been recorded, while Section 18 is in the Specific Plan development stage.
- On the south side, from Mountain Eagle Drive to Vahalla Road the right-of-way consists of a 75-foot half because it is undeveloped.
- On the north side just east of Vahalla Drive is an undeveloped parcel where the half right-of-way width is 75 feet.

- On the south side, from Vahalla Drive east to Victor Drive, there is an undeveloped parcel and an older subdivision with a 75-foot half right-of-way.

Timeline of Bureau of Land Management (BLM) Granted Right-of-Way and Renewal Requirements

May of 1959 - Valencia Road was initially established under proceeding #997 (#13 on list of conditions – second pdf), with an alignment straight into Ajo Highway.

On August 3, 1983, the Department of Interior granted right-of-way to PCDOT for the curve from Valencia onto SR86 and for the half width of the roadway right-of-way fronting federal lands for a 30-year term. A summary of each grant is noted below

- Roadway Grant: A-18432 having language: The right-of way is a road to be improved and maintained for public use. The road is known as West Valencia Road (County Road No 997) and crosses approximately 1.92 miles of public land at a width of 75 ft. from the south section line of the affected sections.
- Roadway Curve Grant: A-18241 having language: The right-of way is a road to be constructed and maintained for public use. The road will facilitate ingress and egress at the entrance to Ryan Field Airport from Tucson-Ajo Highway. The road dimensions are 666.02 ft. on the east side, 418.08 ft. on the west and 75 ft. on each side of the centerline with an additional width at intersections for an area of 1.63 acres.

In 1987 ADOT did an establishment for additional property along Ajo Hwy and Valencia Road via F-056-1-703 and took the curve into their system.

In 2015, ADOT added additional right-of-way as part of the current widening project H8606.

On July 28, 2016, the Bureau of Land Management (BLM) notified Pima County that grants A-18241 and A-18432 expired in August of 2013. Pima County is in the process of renewing the right-of-way grants. The BLM requested Pima County fill out the Application for Transportation and Utility Systems and Facilities On Federal Lands Standard Form SF-299 for each of the ROW's (AZA-018241 and AZA-018432) and apply for a renewal. Plan of Developments (POD), including the SF-299 were submitted to BLM on August 31, 2016. The POD outlines any changes to the original grant, such as the change in the number of lanes, the length, width and location of the ROW and included a Biological Evaluation and a Cultural Survey Report.

3.4 Existing Drainage

The project site is located within the lower reaches of several watersheds emanating from the Sierrita Mountains southwest of Tucson. These offsite watersheds are broad and unconfined with low topographic relief. Watershed boundaries are poorly defined and numerous upstream locations have been identified where breakout flows occur between watersheds. Contributing runoff drains from southeast to northwest, crosses Valencia Road and eventually drains to the Black Wash. Some residential development has occurred upstream of the roadway, including the Sonoran Ranch Estates I project in the western portion of the project limits and various other residential developments that line the upstream (south) side of the project's eastern half. Flows generated from the residential developments tend to be more concentrated in nature when they reach the roadway.

At approximate roadway station 208+80, the Diablo Channel crosses beneath Valencia Road in a multi barrel culvert. The Diablo Channel has a drainage area of approximately 12.5 square miles draining to Valencia Road. The channel was excavated as part of the Diablo Village Estates residential subdivision

improvements in the late 1970's and early 1980's. Upstream of its crossing with Valencia Road, the channel is a constructed trapezoidal channel with a 50-foot-wide earthen bottom and unlined banks. The existing culvert beneath Valencia Road consists of a 10-cell 60" X 36" corrugated metal arch pipes with concrete bank protection used for the inlet and outlets.

Overall, there are 24 points of flow concentration for existing drainage at Valencia Road within the project limits. The majority of these existing crossings occur within at-grade dip crossings. There are also 5 existing culvert crossings; one at the Diablo Channel culvert, three cross drainage pipes adjacent to the Sonoran Ranch Estates subdivision development, and the last crossing at Iberia Avenue. These pipes gather flow within the Right-of Way and convey it under and adjacent to Valencia Road, where it is discharged into downstream concrete lined channels. The existing drainage crossings are summarized in Table 1.

Table 1. Existing Drainage Crossings

Concentration Point	Roadway Station	Wash Name	Structure Description	100-Year Flow (cfs)
1A	91+05	Unnamed	At Grade Dip Section	47
1B	94+22	Unnamed	At Grade Dip Section	174
2	100+77	Unnamed	At Grade Dip Section	520
3A	114+48	Unnamed	At Grade Dip Section	335
3B	117+95	Unnamed	At Grade Dip Section	557
3C	122+70	Unnamed	At Grade Dip Section	193
4	131+80	Unnamed	At Grade Dip Section	122
5	134+20	Unnamed	At Grade Dip Section	746
6	142+86	Unnamed	At Grade Dip Section	422
7	155+48	Unnamed	1 – 24" CMP	160
8	162+13	Unnamed	1 – 24" CMP	57
9	166+10	Unnamed	At Grade Dip Section	245
10	171+06	Unnamed	1 – 24" CMP	523
11A	175+13	Unnamed	At Grade Dip Section	282
11B	177+98	Unnamed	At Grade Dip Section	228
12	180+35	Unnamed	At Grade Dip Section	200
13	188+28	Unnamed	At Grade Dip Section	666
14A	194+87	Unnamed	At Grade Dip Section	179
14B	198+40	Unnamed	At Grade Dip Section	77
15	200+85	Unnamed	At Grade Dip Section	97
16	208+80	Diablo Channel	10 – 60"x36" CMP Arch	1500
17A	219+96	Unnamed	At Grade Dip Section	134
17B	219+96	Unnamed	At Grade Dip Section	25
18	226+38	Unnamed	At Grade Dip Section	126

Pavement runoff is currently conveyed along roadside ditches and outlets to the west where it co-mingles with offsite drainage, crosses the road in various dip sections, before continuing to flow towards the northwest in existing washes. The ditches are typically quite shallow with minimal capacity.

The majority of the study area is located within Federal Emergency Management Agency (FEMA) designated flood zones, except in isolated locations where adjacent developed areas have been removed from the floodplain through Letters of Map Revisions (LOMRs). Depths of flow associated with the FEMA floodplains varies from one to three feet. The project also lies within the Black Wash critical hydrologic basin as defined by the Pima County Regional Flood Control District (RFCD).

3.5 Existing Utilities, Signals, and Lighting

Information pertaining to utility locations along Valencia Road from Wade Road to the Ajo Hwy was initially gathered through a Blue Stake Center design request. The utility companies provided information per Blue Stake regulations. Mapping records of existing facilities were also provided by various utility companies. The design team collected as-built records that were available to reflect both the horizontal and vertical alignment of some water facilities.

Field survey of existing above-ground water corrosion test stations (CTS) and regulator stations were performed by Pima County Survey Department. Prior to the completion of this DCR, Pima County Survey will survey all above ground appurtenances, including valves, valve boxes, meters, regulator stations, pull boxes, pedestals, risers, poles, anchors, guy wires, manholes, and cabinets as part of the field survey. Table 2 shows a list of the utilities within the corridor, along with the utility's representative name and contact information.

There are no existing traffic signals or lighting within the corridor.

Table 2. Utilities

Utility Agency	Contacts	Email	Phone Number
CenturyLink	Nate Hicks	Nate.Hicks@centurylink.com	520-838-3038
	Yadira Delgado	Yadra.Delgado1@centurylink.com	520-838-3029
	Kevin Wagner	kwanger@terratechllc.net	815-245-9640
Comcast	Mario Sanchez	Mario_Sanchez2@cable.comcast.com	520-744-5477
Metro Water	Tim Dinkel	tdinkel@metrowater.com	520-209-2817
PC Regional Waste Water Reclamation Dept. (PCRWWRD)	Rich Foitik	richard.foitik@pima.gov	520-724-3169
Arizona G&T Coop	Bill Wells	wwells@azgt.coop	520-586-5323
SW Gas	Chris Gin	Christopher.Gin@swgas.com	520-794-6265
Trico Electric	Frank Gonzales	fgonzales@trico.coop	520-744-2944 ext 1350
Tucson Electric Power	Jennifer Necas	jennifernecas@tep.com	520-918-8295
	David Smith	dsmith3@tep.com	520-396-2728
Tucson Water	Ed Lopez	Edward.Lopez@tucsonaz.gov	520-837-2125
	Bill Hunter	bill.hunter@tucsonaz.gov	520-837-2132
Level 3 Communications	Dominic East	dominic.east@level3.com	720-888-4398

3.6 Existing Biological Resources

The project area lies in the north Sonoran Desert biotic region and the south portion of the Basin and Range physiographic province. Despite the scarce and unreliable precipitation and the high summer

temperatures, this region supports a biologically diverse desert vegetative community.

The northerly flowing Santa Cruz River; a major ephemeral drainage, follows the eastern side of the Tucson Mountains within the Tucson Basin, then trends northwest, rounding the northern end of the range. Black Wash and other unnamed ephemeral drainages cross Valencia Road just east of or within the project limits converge to form the southeastern tributary to Brawley Wash, which joins the Santa Cruz River nearly 30 miles northwest of the project area.

Upland vegetation in the project area is velvet mesquite *(Prosopis velutina)* dominated Arizona Upland subdivision of Sonoran desertscrub (Brown 1994). Common shrubs and cacti in this community include triangleleaf bursage *(Ambrosia deltoidea)*, fourwing saltbush *(Atriplex canescens)*, longleaf jointfir *(Ephedra trifurca),* broom snakeweed *(Gutierrezia sarothrae),* burroweed (*Isocoma tenuisecta*), creosote bush *(Larrea tridentata)*, wolfberry *(Lycium* sp.), whitethorn acacia *(Vachellia [Acacia] constricta),* graythorn *(Ziziphus obtusifolia)*, Arizona pencil cholla *(Cylindropuntia arbuscula)*, jumping cholla *(Cylindropuntia fulgida* var. *fulgida)*, desert Christmas cactus *(Cylindropuntia leptocaulis)*, cane cholla *(Cylindropuntia spinosior),* pink flower hedgehog cactus *(Echinocereus fasciculatus),* candy barrelcactus *(Ferocactus wislizeni)*, and brown-spine pricklypear *(Opuntia phaeacantha)*. Foothill paloverde *(Parkinsonia [Cercidium] microphylla)* and saguaro *(Carnegiea gigantea)* are widely scattered and uncommon in the area. Also present are widely scattered individuals of the Pima pineapple cactus *(Coryphantha scheeri* var. *robustispina),* a federal endangered species.

Along ephemeral drainages, blue paloverde *(Parkinsonia [Cercidium] florida),* canyon ragweed *(Ambrosia ambrosioides)*, and fringed twinevine *(Sarcostemma cynanchoides)* are present.

For nearly a mile along Valencia Road at the western end of the project area, terrain adjacent to the roadway is undeveloped. To the east, much of the northern and southern ROW along Valencia Road has been disturbed adjacent to residential housing developments constructed in recent years or currently under construction. These include spacious setbacks of mostly barren terrain between the existing roadway and the artificial drainage channels and/or the landscape buffers bordering these developments.

The roadway prism of Valencia Road forms a slightly raised barrier to the flow of precipitation runoff surrounding the roadway resulting in increased density and abundance of native plant species. Regional and exotic invasive species are present adjacent to the roadway.. These include Mexican paloverde, Canadian horseweed *(Conyza canadensis)*, prickly lettuce *(Lactuca serriola)*, yellow sweetclover *(Melilotus officinalis)*, prickly Russian thistle *(Salsola tragus),* desert senna *(Senna covesii)*, Bermudagrass (*Cynodon dactylon*), stinkgrass *(Eragrostis cilianensis),* buffelgrass *(Pennisetum ciliare),* and Johnsongrass *(Sorghum halepense).*

Trees and vegetation that support nesting habitats for birds protected under the Migratory Bird Treaty Act (MBTA) will be affected by construction. As such, tree and vegetation removals will be completed during the non-breeding season (estimated as August 15 – December 31) which will avoid disturbance of migratory bird species. No nests were observed during the biological survey. Additional surveys may need to be completed prior to construction. No Burrowing Owls (BUOW) were observed, nor were any potential burrows observed during the biological survey. There are Regulated Riparian Habitat (RRH) areas that cross the project limits. Construction within these areas will be mitigated according to the Environmentally Sensitive Roadway Design Guidelines, Appendix 4D, Step 3.

3.7 Archaeological and Historic Resources

The project limits or Area of Potential Effect (APE) was surveyed for cultural resources on July 13, 2016. The survey area included; the existing roadway right-of-way, the proposed drainage easements, and TCE's. No other properties were evaluated for construction staging, lay down, or stockpiling uses as the contractor will be responsible for the identification of a staging yard and all associated environmental clearances. The cultural survey work was accomplished through EcoPlan permitting through the Arizona State Land Department (ASLD) and Bureau of Land Management (BLM). No cultural resource features other than a 1910 General Land Office Survey marker were discovered. Preparation of the Short Form Cultural Resources Survey report recommends "no historic properties affected" which allows BLM to utilize their abbreviated Section 106 Consultation process with Arizona State Historic Preservation Office.

3.8 Existing Visual Resources

Distant views within the project corridor consist of the Tucson Mountains to the north, Cat Mountain and the hills associated with the Drexel Heights area to the east, Black Mountains to the southwest, Sierrita Mountains to the south and the Roskruge Mountains to the west.

In the eastern section of the project, the middle-ground views are a mixture of walled medium-density residential developments and open space generally featuring native vegetation. From S. Reed Bunting Dr. to the project's end at Ajo Highway, the middle-ground views are of undeveloped open space with native vegetation. Power poles run parallel along the southern side of the roadway.

The foreground views of the residential area are of walled developments with minimal adjacent landscape, a 2-lane paved roadway with unpaved shoulders, numerous concrete drainage structures, and roadside areas with minimal vegetation. Interspersed areas of mesquite trees with non-native grass understory are present along the roadway. Along the western section of the project, dense stands of mesquite trees and native shrubs with an understory of non-native and native grasses, all within the right-of-way, dominate the foreground views.

3.9 Existing and Future Land Use

Land use in the project area consists of undeveloped parcels owned by private, State, and Federal agencies, residential single-family homes and an electric utility substation. Figure 4 represents current Land Use. The State Trust Land parcel is located on the south side of Valencia Road from Mountain Eagle Drive to Vahalla Road. The Federal parcel is owned by the Department of the Interior, Bureau of Land Management (BLM).

There are no tribal lands along this segment of Valencia Road.

3.10 Current Zoning

Existing zoning along Valencia Road is shown in Figure 5. It includes rural/suburban homestead/residential (SH, RH, and GR-1); single residences and multiple dwelling residences (CR-1, CR-3, CR-4 and CR-5); local business (CB-1); manufactured and mobile homes (CMH-1); transitional development (TR); and a Specific Plan (SP).

3.11 Proposed Developments

Along the corridor, there are five (5) active or proposed developments. Their name, status, and locations from west to east are as follows:

- Sendero Pass – Tentative plat stage. This development is generally located south of the Valencia curve at SR86 and within Sections 13 and 14, T15S, R11E.

- Pomegranate Farms – Revising their Specific plan. This development is generally located east of the Sendero Pass Development within Section 18, T15S, R12E.
- Sonoran Ranch Estates II – Ongoing construction of house pads and internal roadways. This development is generally located east of the BLM property along in Section 8, T15S, R12E.
- Vahalla Estates – Approved Construction Plans. This development is generally located at the southeast corner Valencia Road and Vahalla Road in Section 16, T15S, R12E.
- Tucson Mountain Ranch – Preliminary Development Plan. This development is generally located at the northwest corner Valencia Road and Vahalla Road in Section 9, T15S, R12E.

It is anticipated that the State Land property and the other vacant parcels will be developed at some time in the future. The entire corridor is included in the Pima County Southwest Infrastructure Plan.

3.12 Intergovernmental Agreements

The existing Intergovernmental Agreements (IGA) with Tucson Water and the Regional Transportation Authority (RTA) will be utilized on this project. Tucson Water and Pima County provide for a 50-50 cost sharing of expenses for any water lines that must be relocated due to the reconstruction of a road by Pima County. The RTA provides a portion of the design and construction funding for this project.

Figure 4. Land Use Map

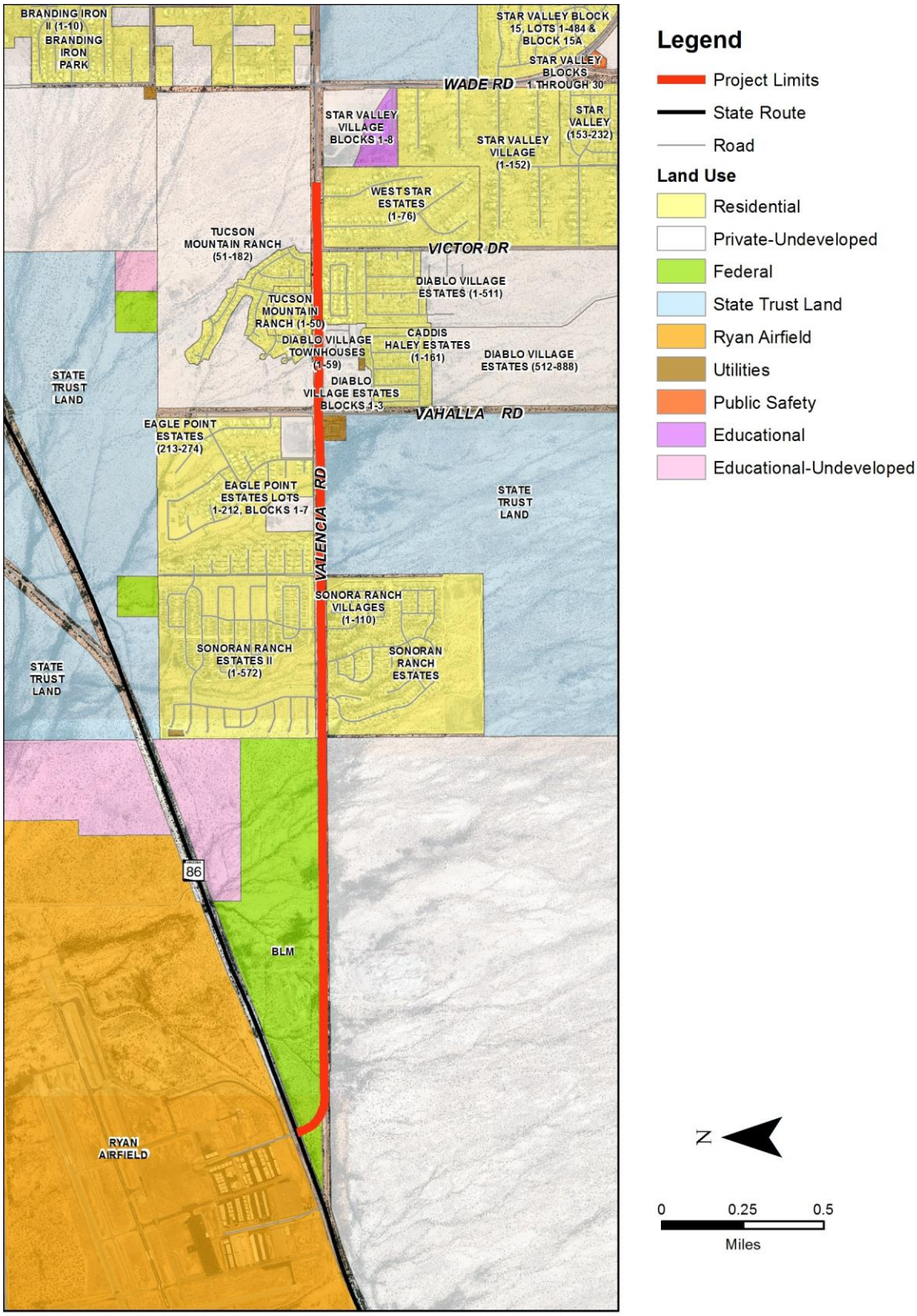
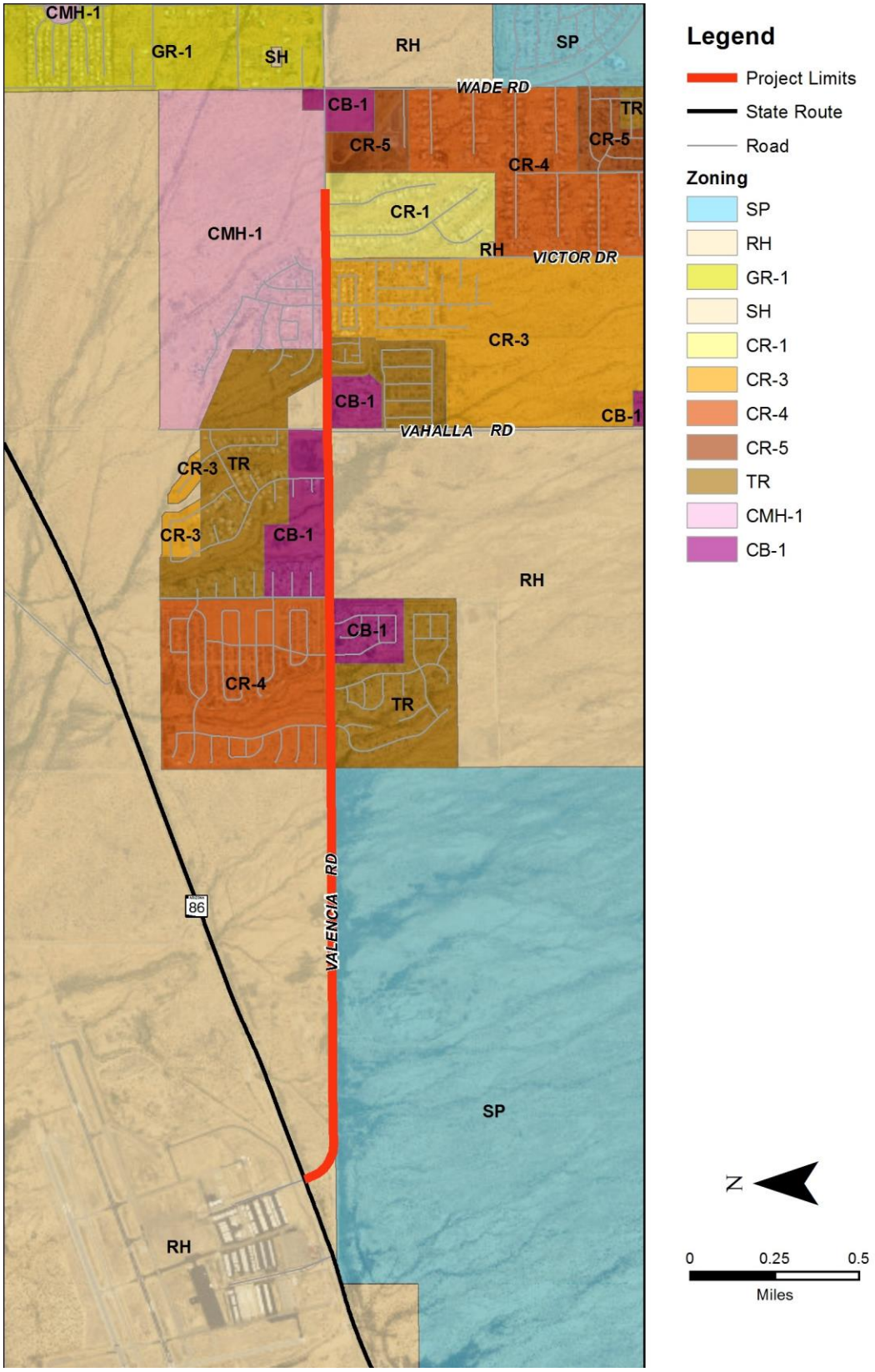


Figure 5. Zoning Map



4 TRAFFIC AND ACCIDENT DATA

4.1 Traffic

General. A traffic analysis memorandum was prepared for Pima County to document existing and Design Year 2040 traffic conditions; and to provide recommendations for number and length of turning lanes at intersections, location of median openings, and the need for traffic signals. The memorandum (**APPENDIX E**) serves as a supplement to the July 2011 *Traffic Engineering Study for Valencia Road, Mountain Eagle Drive to Mark Road (4RTVMW and 4RTVWE)*.

The current average daily traffic (ADT) volume were sampled at two locations along Valencia Road; between SR 86 and Via Molina De Viento - 2,899 vehicles per day, with an overall existing heavy vehicle percentage of 13.4 percent; and between Star Diamond Place and Wade Road - 9,700 vehicles per day were observed with an existing heavy vehicle percentage of 11.6 percent. No paved reliever roadways reside between the two ADT sample locations so the traffic volumes are representative of the traffic entering and exiting the study segment.

The forecast for the Design Year 2040 anticipates an increase of daily traffic volumes along Valencia Road to 25,000 vehicles per day between SR 86 and Via Molina De Viento, and 35,000 vehicles per day between Star Diamond Place and Wade Road. The 2040 design year traffic forecast is based on the comparison of growth rates derived from the Pima Association of Governments' (PAG) 2040 and 2045 Travel Demand Model and the planned Sendero Pass traffic study. The proposed divided four-lane roadway cross-section will have a capacity of approximately 39,800 vehicles per day and will satisfactorily handle these volumes of traffic with providing an acceptable Level of Service C or better.

The Traffic Memorandum analyzed future capacity at four intersections. The existing characteristics of each intersection are summarized below:

- SR86 / Valencia Road – is currently un-signalized with stop-control for northbound Valencia Road and southbound Ryan Airfield travel and free movements along SR86. This intersection is currently being reconstructed with ADOT's H6806 project. A new signal will be installed with ADOT's project.
- Valencia Road / Mountain Eagle Drive – This intersection is an un-signalized three-legged "T" intersection with Valencia Road. It has stop-control for the southbound approach and free movements along Valencia Road, including a two-way left turn lane for eastbound travel. No lighting exists at this intersection. Mountain Eagle Drive is a local roadway with a 25mph posted speed limit.
- Valencia Road / Iberia Road – This intersection is un-signalized with stop-control for both the northbound and southbound movements and free movements along Valencia Road, including a two-way left turn lane for eastbound and westbound travel. No lighting exists at this intersection. Iberia Road is a local roadway with a 25mph posted speed limit.
- Valencia Road / Vahalla Road – This intersection is un-signalized with stop-control for both the northbound and southbound movements. Along Vahalla, the northbound approach includes a dedicated right turn lane and a shared thru-left movement. Valencia Road has free movements through the intersection, which include a two-way left turn lane for eastbound travel and a dedicated left turn lane for westbound travel. No lighting exists at this intersection. Vahalla Road is a local roadway with a 25mph posted speed limit along the north leg and a 45mph posted speed along the south leg.

The existing conditions, existing traffic volumes, and proposed intersection configurations along the Valencia Road study area are presented in Figure 6 through Figure 9. Figure 9 also shows the existing signalized intersection at Wade Road and the committed traffic signal improvements by ADOT at Valencia Road and SR 86. Future anticipated traffic signal installation are also shown. At the remaining eight project intersections (not including Wade Road), the need for dedicated turn lanes and the need for safety improvements were evaluated. No capacity analysis was performed for these intersection.

There are currently no sidewalks along Valencia Road. There is existing sidewalk along the side streets into several of the adjacent subdivisions. A shared use 8-ft wide asphalt path will be constructed on the south side of Valencia Road beginning near the future driveway to Sendero Pass and terminating at the existing 8-ft wide path at Star Diamond, totaling 2.6 miles in length. New concrete sidewalk will be constructed on the north side of Valencia Road between Reed Bunting Drive and Victor Drive, totaling 1.4 miles in length. New concrete sidewalk will be constructed to connect the existing sidewalk along the side streets to the shared use path and new sidewalk along Valencia Road.

The six-foot paved shoulders to be built with this project will serve as bike lanes. “Bike Route” signs and pavement markings will also be provided.

4.2 Crash Data and Analysis

Crash data was obtained for the 4-year period from August, 2011 to August, 2015. During this period, there were 24 crashes on the roadway segment between SR 86 and Wade Road. The average crash rate for similar intersection types in Pima County (PCDOT 2013 Safety System Management Report) was 0.39 crashes per million entering vehicles. No intersection exceeded the average intersection crash rate.

Two intersections exceeded Pima County’s Average Severity Index for intersections with similar operating environments. This includes Valencia Road at Vahalla Road and Valencia Road at De Concini. For roadway segments, the average Pima County crash rate was 1.42 crashes per million mile and no segment exceeded the average crash rate.

The crash data for the intersections and segments are summarized in Table 3 and Table 4, respectively.

Figure 6. Existing Turning Movements

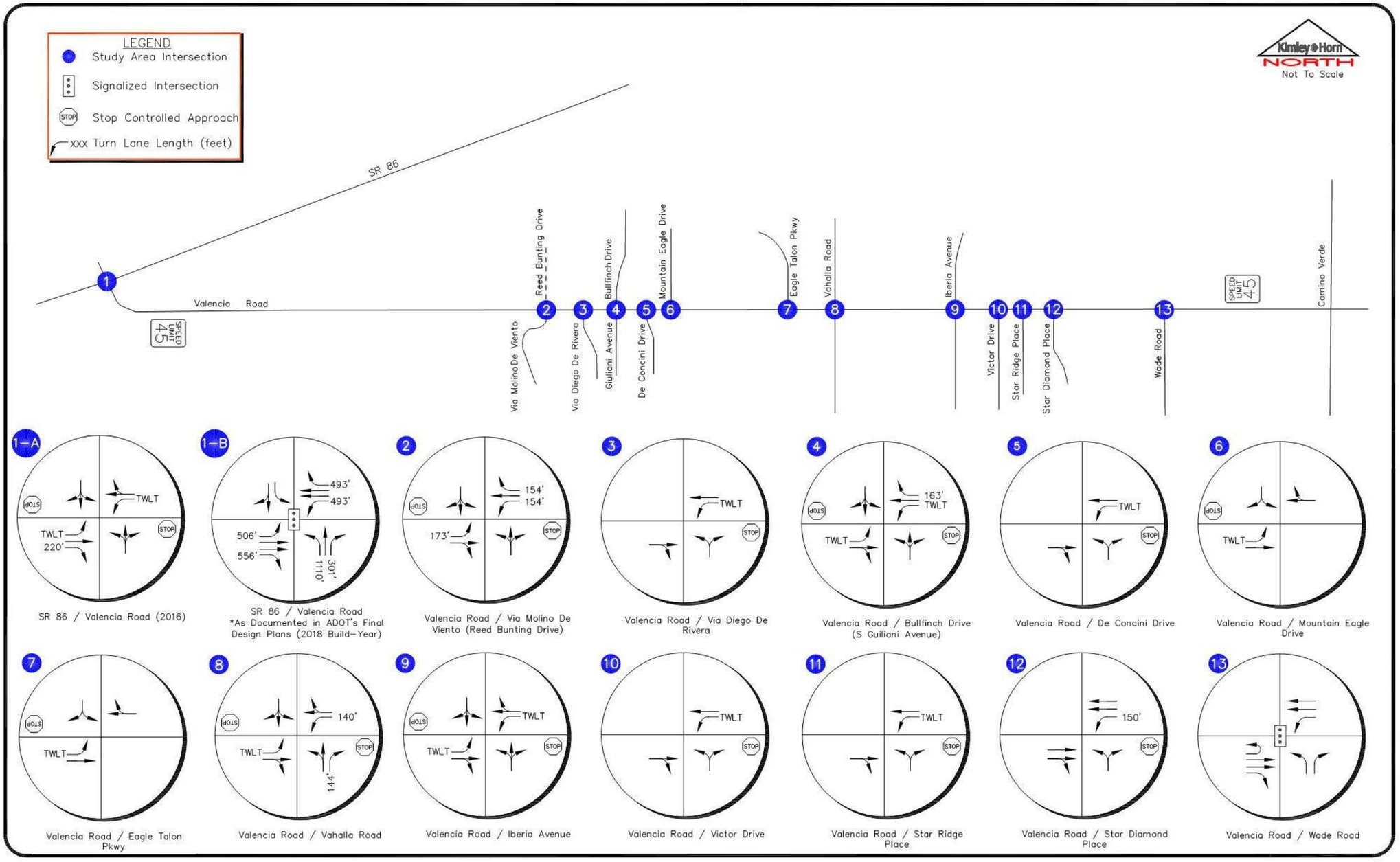


Figure 7. 2016 Traffic Volumes

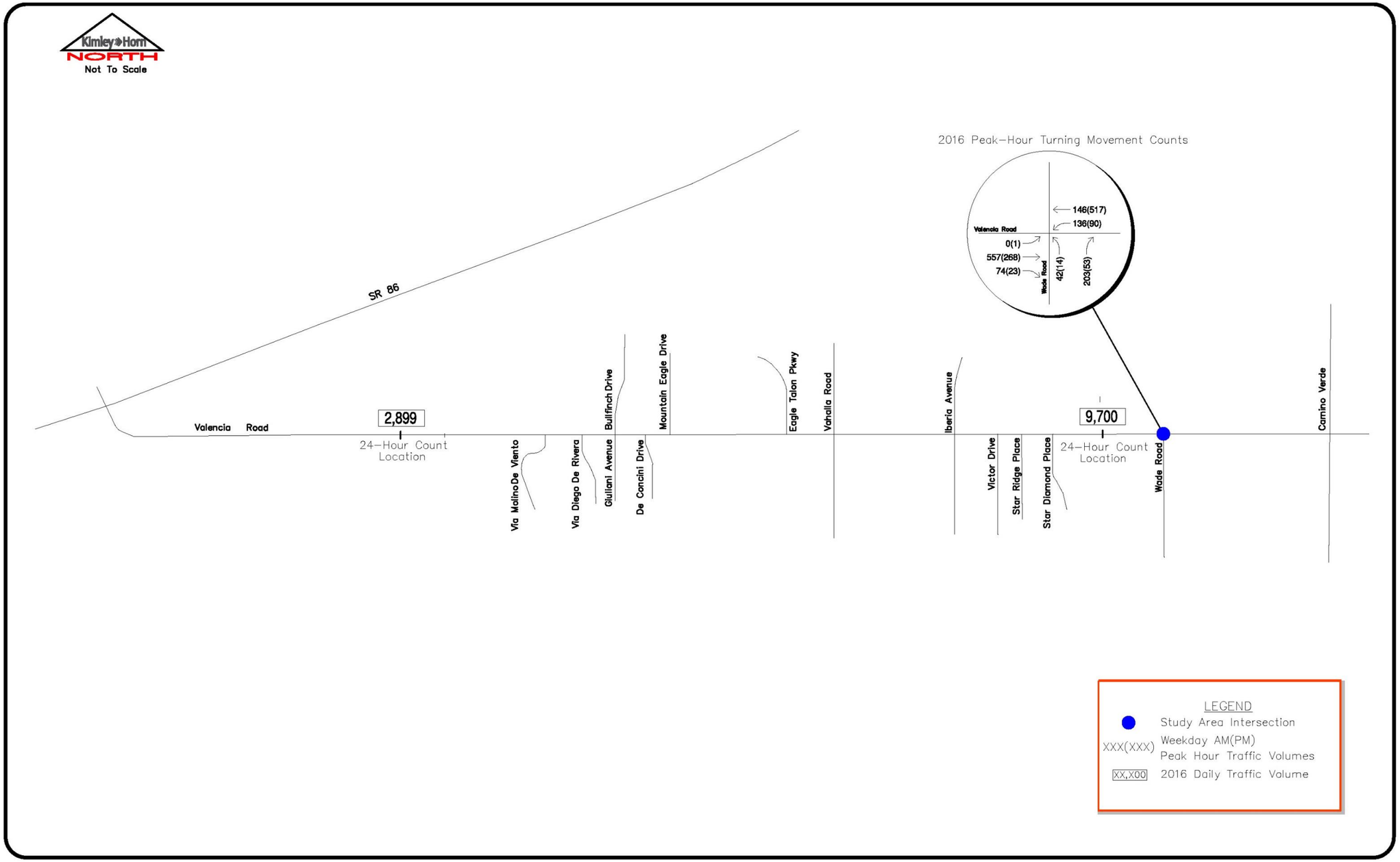


Figure 8. 2040 Forecasted Traffic Volumes

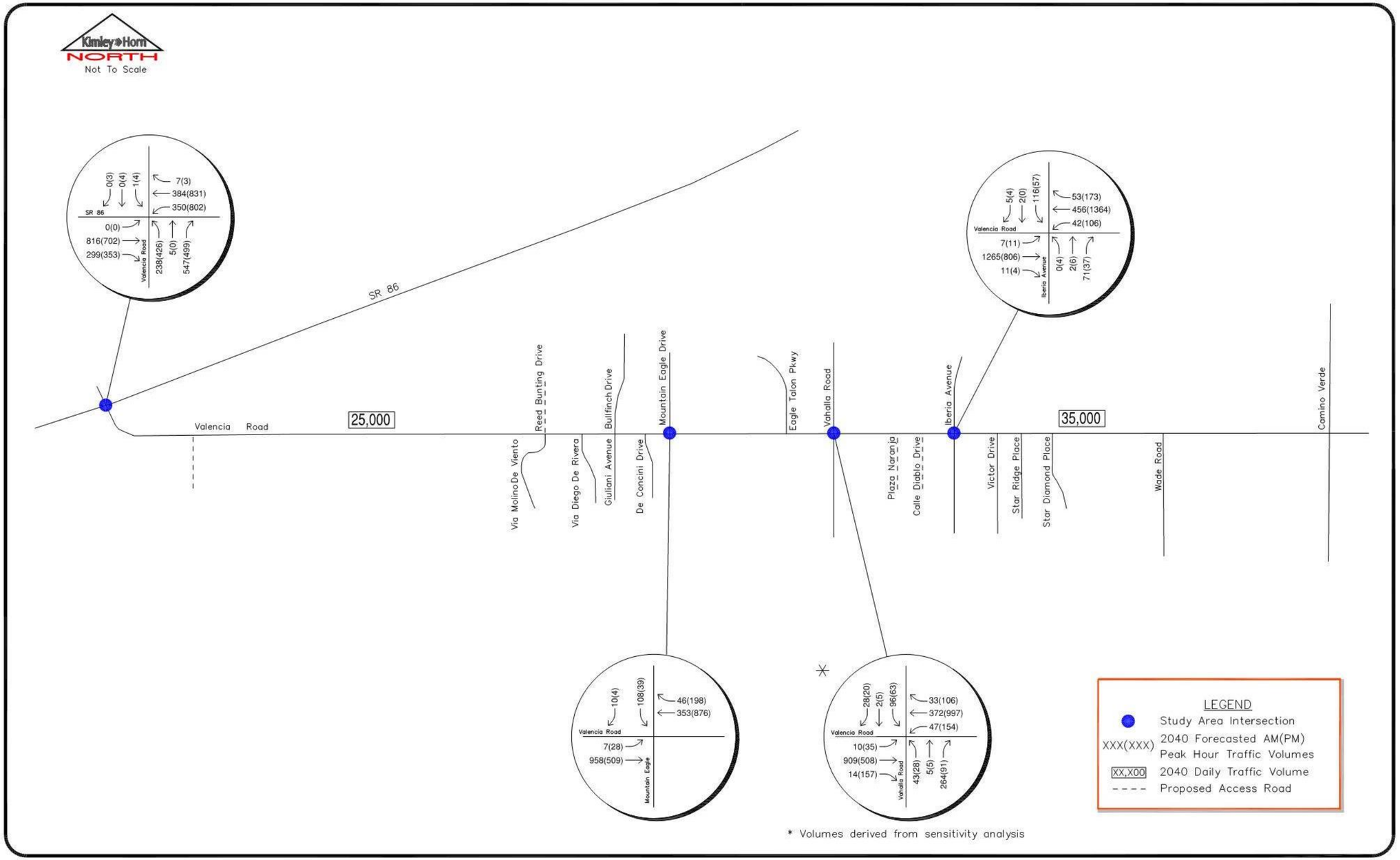


Figure 9. 2040 Proposed Intersection Configurations

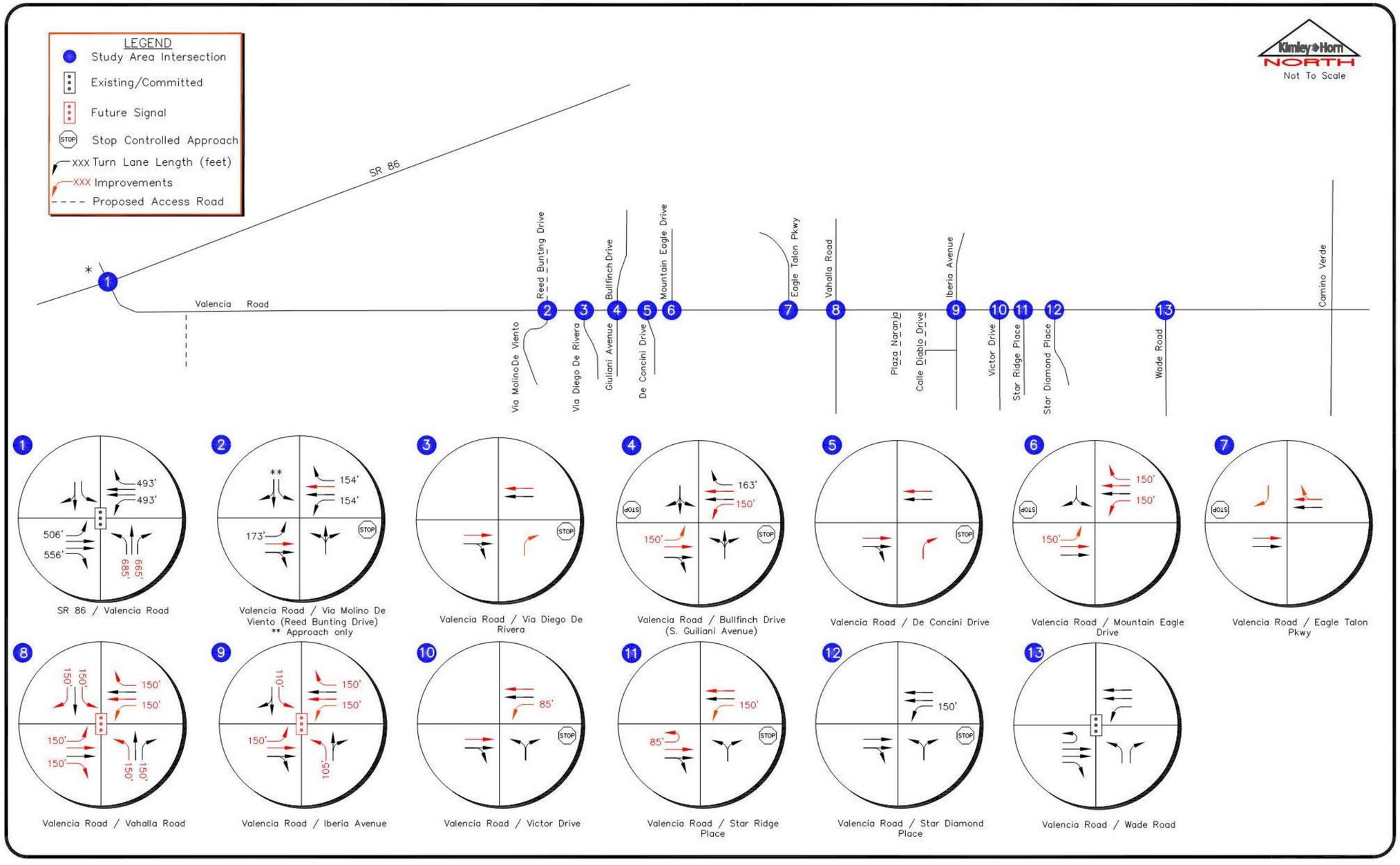


Table 3. Crash Data - Intersections

	Valencia Road at Victor Drive		Valencia Road at Iberia Avenue		Valencia Road at Vahalla Road		Valencia Road at Mountain Eagle Drive		Valencia Road at De Concini	
Severity	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**
Fatal	0	0%	0	0%	0	0%	0	0%	0	0%
Class 4 Injury	0	0%	0	0%	1	50%	0	0%	0	0%
Class 3 Injury	0	0%	1	25%	1	50%	0	0%	0	0%
Class 2 Injury	0	0%	0	0%	0	0%	0	0%	1	100%
Bodily Injury	0	0%	0	0%	0	0%	0	0%	0	0%
PDO	1	100%	3	75%	0	0%	1	100%	0	0%
Total Crashes	1	-	4	-	2	-	1	-	1	-
Severity Index	1.00	-	1.25	-	3.90	-	1.00	-	2.00	-
Average Severity Index	1.44	-	1.44	-	1.44	-	1.44	-	1.44	-
Class 3 Injury	0	0%	1	25%	1	50%	0	0%	0	0%
Class 2 Injury	0	0%	0	0%	0	0%	0	0%	1	100%
Bodily Injury	0	0%	0	0%	0	0%	0	0%	0	0%
PDO	1	100%	3	75%	0	0%	1	100%	0	0%
Total Crashes	1	-	4	-	2	-	1	-	1	-
Severity Index	1.00	-	1.25	-	3.90	-	1.00	-	2.00	-
Average Severity Index	1.44	-	1.44	-	1.44	-	1.44	-	1.44	-
Crash Type	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**
Turning	0	0%	1	25%	1	50%	0	0%	0	0%
Angle	0	0%	0	0%	1	50%	0	0%	0	0%
Rear-end	1	100%	1	25%	0	0%	1	100%	1	100%
Out of Control	0	0%	0	0%	0	0%	0	0%	0	0%
Sideswipe	0	0%	0	0%	0	0%	0	0%	0	0%
Fixed Object	0	0%	0	0%	0	0%	0	0%	0	0%
Backing	0	0%	0	0%	0	0%	0	0%	0	0%
Head on	0	0%	1	25%	0	0%	0	0%	0	0%
Pedestrian	0	0%	0	0%	0	0%	0	0%	0	0%
Animal	0	0%	0	0%	0	0%	0	0%	0	0%
Miscellaneous	0	0%	1	25%	0	0%	0	0%	0	0%
Total Crashes	1	-	4	-	2	-	1	-	1	-
Daily ADT	9,700	-	9,700	-	9,700	-	2,899	-	2,899	-
Crash Rate	0.06	-	0.23	-	0.11	-	0.19	-	0.19	-
Average Crash Rate	0.39	-	0.39	-	0.39	-	0.39	-	0.39	-

Table 4. Crash Data - Segments

	Valencia Road: Ajo Hwy to Mountain Eagle Dr (9600-8200)		Valencia Road: Mountain Eagle Dr to Iberia Ave (8200-7400)		Valencia Road: Iberia Ave to Wade Rd (7399-7000)	
Severity	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**
Fatal	0	0%	0	0%	0	0%
Class 4 Injury	0	0%	0	0%	0	0%
Class 3 Injury	1	17%	2	40%	2	50%
Class 2 Injury	2	33%	1	20%	0	0%
Bodily Injury	0	0%	0	0%	0	0%
PDO	3	50%	2	40%	2	50%
Total Crashes	6	-	5	-	4	-
Severity Index	1.50	-	1.60	-	1.50	-
Average Severity Index	1.60		1.60	-	1.60	-
Crash Type	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**
Turning	0	0%	0	0%	0	0%
Angle	0	0%	0	0%	0	0%
Rear-end	1	17%	2	40%	2	50%
Out of Control	0	0%	0	0%	0	0%
Sideswipe	0	0%	1	20%	2	50%
Fixed Object	2	33%	0	0%	0	0%
Backing	0	0%	0	0%	0	0%
Head on	1	17%	0	0%	0	0%
Pedestrian	0	0%	2	40%	0	0%
Animal	1	17%	0	0%	0	0%
Miscellaneous	1	17%	0	0%	0	0%
Total Crashes	6	-	5	-	4	-
Daily ADT	2,899	-	9,700	-	9,700	-
Crash Rate	1.13	-	0.28	-	0.23	-
Average Crash Rate	1.42	-	1.42	-	1.42	-

5 DESIGN STANDARDS AND CRITERIA

5.1 Geometric Standards

The roadway will be designed in accordance with AASHTO's A Policy on Geometric Design of Highways and Streets (Reference 2), the Pima County Roadway Design Manual (Reference 3) and AASHTO's Roadside Design Guide (Reference 4).

5.2 Design Standards

Design standards for this project include the Pima County Roadway Design Manual (Reference 3), the Standard Specifications and Details for Public Improvements for Public Improvements, Pima Association of Governments (Reference 5), AASHTO's Guide for the Development of Bicycle Facilities (Reference 6), and FHWA's Manual on Uniform Traffic Control Devices (Reference 7).

5.3 Slope Standards

The roadway slopes outside the roadway hinge and clear zone will be a maximum slope of 3H: 1V along the north roadway embankment and 6H: 1V along the south roadway embankment. It should be noted that a clear runout area exists at the bottom of these 3:1 slopes. Within clear zone, a maximum 6H: 1V slope will be used. All foreslopes used on the project are traversable. Along the shared-use path, the foreslopes will be a maximum 6H: 1V. This slope mitigates the use of vertical safety railing where the shoulder drop is 1-ft or more.

5.4 Pavement Structure

As of August 2016, no pavement design report has been prepared. Pavement design will be prepared in accordance with Sections 3.12 and 3.13 of the Pima County Roadway Design Manual (Reference 3) as updated June 2016.

5.5 Design Speed

The design speed for this project is 50 mph. It will be posted at 45 mph. The posted speed limit is consistent with Pima County Ordinance 2014-003.

5.6 Drainage Design

The drainage design criteria for this project follows the standards outlined in the Pima County 2013 Roadway Design Manual (RDM), the Pima County Floodplain Ordinance and in RFCD Technical Policies. These guidance documents establish the hydrologic design frequency for cross drainage structures to be the 100-year return period event.

Hydrology

The large variation in watershed sizes and drainage patterns warrants using different methods to compute discharge rates for differing watersheds. The watersheds are divided into regional and local watersheds. Per scoping meetings held with Pima County Regional Flood Control District (PCRFCD) early in the project, FLO-2D (Version 2009.06) was utilized to obtained 100-year peak discharge rates for regional watersheds and Pima County hydrology method (computer program PC-Hydro Version 5.4.3) was utilized for local watersheds.

Hydraulic Designs

Existing hydraulic conditions (inundation limits, flow depths, and velocities) for at-grade crossings in the predominantly sheet flow areas were based on floodplain mapping depths determined by 2-dimensional

FLO-2D hydraulic modeling. Headwater depths and ponding limits for all existing culverts were determined using FHWA HY-8 computer software. Proposed culverts were designed to convey 100-year flood flows beneath the roadway. Maximum headwater elevations were kept at or below roadway subgrade level. Cross culvert and collector channel alignments were designed to avoid the adjacent Tucson Water 42-inch water main. Where possible, drop inlets and collector channel erosion protection were designed to incorporate "natural" materials, e.g. grouted rock riprap, etc., and/or buried scour protection measures.

Onsite Drainage

The onsite or pavement drainage facilities consisted of roadside channels that also served to collect offsite runoff where needed. Roadside collector channels were designed to collect and convey the 100-year flood.

5.7 Access Control

This roadway will be access-controlled through the introduction of new median, therefore restricting turn movements to new median openings.

Median openings should be spaced one-quarter mile apart and no closer than 660 feet to a major intersection or another median opening and that the preferred spacing is ¼ mile. Signalized intersections should be spaced no closer than 0.5 mile.

Driveways shall not be located within the functional limits of an intersection, unless approved by Pima County. For this project, the functional limits are defined as the beginning and ending of tapers for right- and left-turn lanes. Per the RDM, new construction that encompasses existing roadways/driveways that do not meet the spacing requirements are subject to Pima County approval. A variance to these minimum requirements shall be requested in writing from the Department.

5.8 Cross Section Elements

In anticipation of development along the corridor, the roadway classification for the Valencia Road design is urban arterial. Cross section dimensional elements are listed in Table 5 below.

Table 5. Cross Sectional Elements

Cross Sectional Element	Width
Inside Traffic Lane	12 feet (includes 1 foot inside shoulder next to median curb
Outside Traffic Lane	11 feet
Paved Shoulder	6 feet
Right Turn Lane	13 feet
Left Turn Lane	14 feet (1 foot striped shoulder next to median curb)
Bike Lane	6 feet (5 feet next to right turn lanes)
Median	20 feet
Clear Zone	Clear Zone 20 feet from vehicle travel lane per AASHTO (Reference 4)
Shared-use Pathway	8 feet
Sidewalk	5 feet

Note: See Figure 3 for Valencia Road Typical Section.

Right turn lanes will be provided at Mountain Eagle Drive, Vahalla Road, Iberia Road, and Eagle Talon Parkway intersections as shown in **Figure 9**, this report.

5.9 Roadway Geometrics

Horizontal: Per the Pima County RDM, 4% is the maximum rate of super elevation for urban/suburban roadways. Per AASHTO, for a 50 mph design speed, the minimum radius at the specified maximum 4% super elevation rate is 926 feet. With a normal crown, the minimum radius would be 7,220 feet. The minimum horizontal curve length will be 500 feet. Angle breaks of 1°08' or less may be used in lieu of a horizontal curve.

Vertical: The maximum profile grade shall not exceed 3%. Since the outside edges of the new roadway will not be curbed, the RDM's minimum recommended profile grade of 0.5% does not apply.

5.10 Right-of-Way Width

The existing right-of-way varies from 150 feet to 200 feet. The half right-of-way width of 75 feet is sufficient for portions of the project with additional easements for drainage, slopes, and construction being required. Future residential and commercial development will dedicate an additional 25-ft of half right-of-way due to zoning requirements, thereby achieving the 100-foot half right-of-way, consistent with the Pima County Major Streets and Scenic Routes Plan (MSSR) and Ordinance which establishes a 200-foot Right-of-Way throughout the corridor. Valencia Road is a Scenic Route and is subject to the requirements of the designation (Section 18.77 of the Pima County Code).

6 MAJOR DESIGN FEATURES

6.1 Horizontal and Vertical Alignment

The majority (70%) of the Valencia Road construction centerline, which is also the roadway centerline, follows the section line with an adjustment to the north at the ASLD parcel by angle breaks. In addition, angle breaks are located at the section and quarter corners. The new roadway profile is generally located above the existing grade to accommodate the new culverts. A maximum 6% grade is used to tie into existing cross streets. Initial Design Stage construction plans are included in **APPENDIX C**.

6.2 Access Control

Two existing driveways that serve the Arizona G&T Coop electric substation near Vahalla Road will retain access to Valencia Road. It should be noted that these two driveways do not meet current Pima County RDM driveway spacing and location requirements. They are spaced at 128-ft from one another, less than the 230-ft standard. They are also located within the eastbound to southbound right-turn lane taper.

The existing intersections of Vahalla Road and Iberia Avenue are anticipated to meet signal warrants in the future. They currently do not meet warrants. They are spaced at 0.36 mile apart, less than the specified 0.5-mile Pima County RDM requirement.

6.3 Right-of-Way

Table 6 below includes the parcel numbers, type of right-of-way or property need, and area of need of affected properties.

Table 6. Right-of-Way Needs

Parcel Number	Type of Need	Area (acres)	Drainage Location
209-15-006N	Slope and Drainage*	1.12	CP-1A
210-40-023F	Drainage Channel*	1.04	CP-1B, CP-2
210-40-023E	Drainage Channel*	0.55	CP-3A, CP-3B,
210-40-022A	Drainage Channel*	1.52	CP-3C, 4, 5, 6
210-15-7470	Concrete Channel	0.001	CP7
210-15-6850	Concrete Channel	0.002	CP7
210-15-4150	Drainage	0.77	CP-11A, CP-11B, CP-12
210-15-4150	Drainage	0.23	CP-13
210-16-012B	Slope and Drainage	0.51	CP16
210-15-1940	Slope and Drainage	0.27	CP16
210-32-2860	Drainage Berm	0.034	Sta. 232+00

**Property need to be dedicated through the development process prior to construction.*

6.4 Drainage

An initial drainage report, prepared by CMG Drainage Engineering, Inc. for this project, addressed the existing and proposed conditions cross drainage hydrology and hydraulics. Drainage structures were located and sized first for the safe and efficient conveyance of offsite flows. In locations where drainage

crossed the existing roadway via at-grade dip crossings, new culverts were designed with drop inlets to maintain the roadway profile at a condition as low as possible and minimize the amount of fill needed. Drop inlets were designed with a goal of hydraulic efficiency to reduce disruptions to existing watercourse flow regimes. Proposed drainage crossings were located to maintain existing drainage patterns as much as possible. The proposed design included roadside channels to collect and direct offsite flows to 25 new culvert crossing locations. The locations and sizes of the cross drainage structures are presented in Table 7.

A pavement drainage system was also designed to keep a travel lane open in each direction during a 10-year storm. Since there are no outside curbs, this system consisted of properly sized roadside ditches.

Table 7. Proposed Culverts

Concentration Point	Roadway Station	Design Flow (cfs)	Structure Description
1A	91+05	47	3-24” SRP
1B	94+34	174	1-8’x4’ RCBC
2	100+77	520	3-10’x4’ RCBC
3A	114+48	335	3-8’x4’ RCBC
3B	117+95	557	4-49”x33” STEEL PIPE ARCH
3C	122+70	193	4-49”x33” STEEL PIPE ARCH
4	131+84	122	2-48” SRP
5	134+20	746	3-10’x4’ RCBC
6	142+85	422	3-10’x4’ RCBC
7	155+48	160	2-48” SRP
8A	161+09	29	2-30” SRP
8B	162+13	29	2-30” SRP
9	166+10	245	3-48” SRP
10	171+00	523	3-10’x4’ RCBC
11A	175+28	282	3-8’x4’ RCBC
11B	178+13	228	3-57”X38” STEEL PIPE ARCH
12	180+28	200	4-49”x33” STEEL PIPE ARCH
13	188+26	666	4-8’x4’ RCBC
14A	194+85	179	4-36” SRP
14B	198+40	77	2-36” SRP
15	200+70	97	3-42”x29” STEEL PIPE ARCH
16	208+80	1500	4-10’x5’ RCBC
17A	219+21	134	3-49”x33” STEEL PIPE ARCH
17B	220+01	25	2-24” SRP
18	226+38	137	3-49”x33” STEEL PIPE ARCH

6.5 Earthwork Considerations

The new profile was set to minimize embankment requirements while still providing clearance for the new cross drainage culverts and minimizing the need for additional right-of-way. In general, roadway embankment will be added to existing dip crossings to raise the grade in order to accommodate clearance of proposed drainage structures, while also keeping the pavement subgrade at or above the maximum headwater elevation.

The initial earthwork quantities are 31,037 cubic yards of excavation. Assuming 10% shrink, approximately 122,421 cubic yards of borrow is anticipated. These quantities include Drainage, Channel, and Rip Rap Excavation as well as Ground Compaction, Pipe and Trench Backfill, and Dikes and Berms.

6.6 Utilities

This roadway section contains a utility corridor that includes gas, electric, communications, potable water, and wastewater. Utility facilities primarily run parallel to Valencia Road and along all major cross streets.

The existing utilities have been summarized in Section 3.5. The Metro Water 8” and 12” water as well as the Tucson Water 12” water line will be impacted by the new cross drainage culverts. Metro Water lines will be relocated in advance of the project. Tucson Water lines will be relocated as part of the roadway construction project (4RTVWE). The relocation of the gas, telephone and cable lines will be performed prior to the road construction by the respective utility company.

The TEP overhead electric lines will also need to be relocated. This will be accomplished by TEP prior to the road work. The existing TEP line is 13.8kv distribution line, so the relocation will not have seasonal constraints. It should be noted that this corridor is subject to the Pima County Scenic Routes Ordinance.

Any work associated with the Southwest Gas regulator and high-pressure gas line must be performed between April and September.

Project design parameters identify that the 42” water line shall be protected in place. Appurtenances associate with the 42” water line (Corrosion Test Stations, Rectifiers) have no seasonal constraints for relocation.

No prior rights for the facilities located within the public right-of-way, owned by private utility companies, have been identified. Under an existing intergovernmental agreement, half of the water relocation costs by the project will be reimbursed by Tucson Water. Costs incurred by the project for relocation of Pima County Regional Wastewater Reclamation Department (PCRWRD) facilities will be reimbursed to the project by the PCRWRD by a memorandum of understanding (MOU).

The project team, with input from the utility companies, will identify the need for utility potholing to confirm horizontal location and verify vertical depth of facilities. All available and appropriate design options will be used to mitigate conflicts and relocation work to the extent possible. A utility conflict tracking table is included in **APPENDIX D**.

A summary of utility correspondence and the status of potential conflict is listed in Table 8 below. This table reflects feedback received as of August 2016.

Table 8. Utility Correspondence

Utility Agency	Items Received	Potential Conflict (Yes / No)
CenturyLink	Provided redlined plans and letter detailing potential conflicts. 4/20/2016	Yes
Comcast	Provided images of facilities throughout corridor limits. 2/22/2016	Yes
Level 3 Communications	Provided images of facilities throughout corridor limits. 7/26/2016	No
Metro Water	Provided PDF's of facilities throughout corridor limits. 9/21/2015	Yes
PC Regional Waste Water Reclamation Dept. (PCRWWRD)	Provided Review Comment Letter detailing potential conflicts, plan recommendations, and a request for Manhole Assessment Request Form to be completed. 3/30/2016	Yes
Arizona G&T Coop	Provided PDF's of facilities throughout corridor limits. 2/22/2016	Yes
	Received letter dated August 8, 2016 requesting the project consider reserving a spot along the north R/W line (within the roadway right-of-way) for placement of a new 115kv overhead line from Vahalla to the east 2.25 miles terminating near the Casino.	
SW Gas	Provided review of Preliminary Notification Plans. Included redlined plans recommendations, and a letter detailing potential conflicts. 5/20/2016	Yes
Trico Electric	Provided PDF's of facilities and cad file containing surveyed power pole locations. 5/11/2016	Yes
	Provided verbal comment that Trico is considering replacing existing power poles on south side of Valencia from Vahalla to the west. 6/16/2016	
Tucson Electric Power	Provided review of Preliminary Notification Plans. Included letter detailing conflicts. 4/15/2016	Yes
Tucson Water	Provided PDF's of valve maps and record drawings. 3-22-2016 to 7/18/2016	Yes

There are planned utility system upgrades which will be coordinated with the project team and other utility companies to eliminate design and construction conflicts and maximize the use of the limited right-of-way. Upgrades to date have been summarized in Table 9. It is noted that Pima County does not pay for upgrades to utility facilities including those for PCRWRD and Tucson Water.

Table 9. Current Utility Upgrades

Facility Type & Size	Facility Owner	Station (Begin)	Station (End)	Upgrade
25 kV	Trico	Sta 86+50,111' Rt	189+05, 69' Rt	Replacing existing poles
115kV	G&T Coop	Sta 82+90, 80' Lt	197+00, 83' Lt	Future overhead electric from substation at SWC of Valhalla and Valencia on north side of roadway
15" Sewer	PCRWRD	Sta 82+58, 75' Lt	129+60, 30' Rt	New sewer for proposed subdivision at Sendero Pass/ Pomegranate Farms

6.7 Structures

No walls or bridges are anticipated for this section of Valencia Road. The cross drainage culverts will be ADOT standard reinforced concrete box culverts. Special details for reinforced channel lining will be included in the final design phase.

6.8 Roadway Cross Section and Pavement Design

Based on Sections 3.12 and 3.13 of the Pima County Roadway Design Manual (Reference 3), a pavement design report will be prepared. The assumed pavement structures for the project are as follows:

- Valencia Road consists of 2 inches of terminal blend asphalt (Mix No. 2) over 4 inches of asphaltic concrete (Mix No. 1) over 11 inches of aggregate base.
- All driveways and minor side streets are assumed to consist of 2.5 inches of asphaltic concrete (Mix No. 2) over 4 inches of aggregate base.
- The more significant cross streets; Iberia Avenue and Vahalla Road are assumed to consist of 2 inches of terminal blend asphalt (Mix No. 2) over 4 inches of asphaltic concrete (Mix No. 1) over 6 inches of aggregate base.
- The multiuse path is assumed to consist of 2 inches of asphaltic concrete (Mix No. 3) over 4 inches of aggregate base.

6.9 Traffic

No traffic signals within the project corridor are anticipated to be warranted at the time of final design. To gain a better understating of when signals may be warranted at the intersections of Vahalla Road and Iberia Avenue, a planning level traffic signal warrant analysis was performed for the 5 and 10 year horizons beginning late year 2019 / early 2020 construction completion timeframe. The warrant analysis utilizes guidance provided in the 2009 edition of the MUTCD. The Traffic volume forecasts are based on the PAG 2045 Travel Demand Model and represent years 2025 (5-year) and 2030 (10-year).

IBERIA AVENUE - Signal Warrant Analysis		
5-Year	10-Year	2040 - Year
• 8-Hour: Not Satisfied	• 8-Hour (Condition B): Satisfied	• 8-Hour (Condition B): Satisfied
• 4-Hour: Not Satisfied	• 4-Hour: Satisfied	• 4-Hour: Satisfied
• Peak-Hour: Not Satisfied	• Peak-Hour: Satisfied	• Peak-Hour: Satisfied

VAHALLA ROAD - Signal Warrant Analysis		
The 10-Year was not met, so the 5-Year will not be met.	10-Year • 8-Hour: Not Satisfied • 4-Hour: Not Satisfied • Peak-Hour: Not Satisfied	2040 - Year • 8-Hour (Condition B): Satisfied • 4-Hour: Satisfied • Peak-Hour: Not Satisfied

The Iberia Avenue intersection may meet traffic signal warrants 10 years out from construction completion. The Vahalla Road intersection may not warrant a traffic signal until after 10 years from construction completion.

Conduit and pull boxes will be installed at Vahalla Road and Iberia Avenue.

Based on the 2012 *FHWA Lighting Handbook, Analysis for Lighting Needs*, lighting is required at all signalized intersections. Although no signals are anticipated to be constructed with this project, lighting will be installed.

For non-signalized intersections, since the crash data does not show significant night-time crashes, intersection lighting should be based on the major-street ADT. The ADT on Valencia Road (> 5,000 VPD) places lighting as a high priority. Therefore, it is recommended that street lighting be installed at each intersection. Roadway lighting is also recommended at the Valencia Road Curve based on engineering judgement and FHWA's Highway Safety Manual crash prediction analysis which indicated a reduction in a single crash over a one-year period utilizing 2040 traffic volumes. The roadway lighting around the curve will provide vehicles greater sight visibility. Light emitting diode (LED) type luminaire fixtures will be used on this project.

Conduit for future Intelligent Transportation Systems (ITS) (fiber optic communications) along one side of Valencia Road is included in the project.

The Vahalla Road intersection improvements include northbound/southbound dedicated left-turn and right-turn lanes with 150' storage lengths. The eastbound/westbound left-turn and right-turn lanes are recommended to have a minimum storage length of 150'. Vertical curb will be used at the curb returns to protect future traffic signal equipment and allow for the placement of wheelchair ramps.

At the Iberia Avenue intersection, the existing northbound/southbound approach configurations are recommended to include a dedicated left-turn lane with a shared thru/right-turn lane. The eastbound/westbound left-turn lanes are recommended to have a minimum storage length of 150'. Based on existing constraints, a 110' dedicated left-turn lane for the SB approach and 105' dedicated left-turn lane for the NB approach is recommended. A right-turn (150') lane is warranted for the westbound approach of the intersection. Vertical curb will be used at the curb returns to protect future traffic signal equipment and allow for the placement of wheelchair ramps.

6.10 Construction Issues

In general, the eastbound roadway prism (shoulder and lanes) can be constructed while keeping two lanes of traffic along Valencia Road in operation throughout construction. With this understanding, the following construction phasing scheme is anticipated:

1. Clearing and build eastbound roadway prism and drainage infrastructure. Build eastbound median curbing. Construct new eastbound lanes with 4" Mix No. 1 lift.

2. Move all traffic to eastbound lanes and shoulder and adjust water lines and build downstream drainage infrastructure along westbound. Build the westbound roadway prism and median curbing. Construct the new westbound lanes with 4" Mix No. 1 lift.
3. Move all traffic to westbound. Construct any remaining upstream drainage infrastructure (inlets / grading) along eastbound.
4. Add 2" terminal blend lift to eastbound of Valencia Road.
5. Move all traffic to eastbound. Add 2" terminal blend lift to westbound of Valencia Road.
6. Complete final striping and landscaping.

Special consideration should be given to access roads that do not provide a secondary access detour. These roads include: Vahalla Road south of Valencia, Iberia Avenue north of Valencia, Star Ridge Place, and Star Diamond Place.

It should be noted that the Valencia Road vertical curve ending near Star Diamond was designed to accommodate at least 200-ft of traffic control cross overs south of the existing raised median at Star Diamond while also accounting for the placement of a trench drain at Star Ridge place.

6.11 Design Exceptions

Introduction

The study team compared the geometric design elements of the proposed Valencia Road improvements and the recommendations contained in AASHTO's A Policy on Geometric Design of Highways and Streets (2011) and the Pima County Roadway Design Manual (RDM). Design exceptions will be discussed in each category. The FHWA classification for this roadway is Major Collector and the Pima County Major Streets and Scenic Routes Plan (MSSR) and Ordinance establishes the entire Valencia Road project segment as Major Scenic Route and High Volume Arterial with 200-foot Right-of-Way. Since this corridor is anticipated to experience an increase in development in the next 20 years, design criterion for urban settings will be assumed.

Lane, Shoulder and Median Widths

The proposed lane widths are 11 feet and 12 feet (inside lane and inclusive of 1 foot offset from median curb). AASHTO recommends 12 feet for a lane width but finds 11 feet acceptable for a constructed arterial. The RDM is consistent with the proposed lane width.

The outside paved shoulder width is six feet. AASHTO recommends six to eight feet for an outside shoulder. The RDM recommends six feet.

The inside paved shoulder width is one foot per the RDM. AASHTO does not recommend a minimum as long as the median curb is mountable as it will be on this project.

The RDM recommends a minimum median width of 20 feet which is used on this project. The median width fronting the Pomegranate Farms and Sendero Pass developments is 24 feet wide to accommodate dual left turns (2 x 11 feet) and a 2-foot median when those projects are constructed.

Vertical Alignment and Stopping Sight Distance

Valencia Road and Vahalla Road (south of Valencia) have 50-mph design speeds. AASHTO recommends a minimum stopping sight distance of 425 feet. For this design speed, this project is being designed using the Pima County requirement for stopping sight distance of no less than 425 feet. All new vertical curves for Valencia Road and Vahalla (south of Valencia) meet the criteria. Vahalla, north of Valencia is

designed with a 30-mph design speed, requiring a minimum 200 feet of SSD. The lengths of all vertical curves along Valencia Road are 200-ft minimum while the vertical curves along north and south Vahalla are 100-ft and 150-ft respectively.

Horizontal Alignment and Super elevation

The maximum angle point deflection of 1°08' specified by the RDM is achieved.

Only one roadway curve exists on the project and it is located at the approach to SR86. It is currently being reconstructed as part of ADOT's H6806 project with a 2% super elevation and a 520-ft centerline radius.

As specified in the RDM, the maximum super elevation rate for an urban/suburban roadway is 4%. Per the AASHTO super elevation table for high speed urban design at 4% maximum, using the design inputs of a 520-ft centerline radius and a 2% super elevation, the resulting speed is 15 mph.

As an alternative approach to establishing a safe operating speed at this curve, AASHTO's low speed urban design table includes super elevation rates and corresponding design radii and design speeds. Using the 520-ft centerline radius and the 2% super elevation, the resulting design speed would be between 35 mph and 40 mph, for 408-foot and 593-foot radii respectively. As such, the curve will be signed with a curve warning sign with an advisory speed sign for 30 mph for eastbound and westbound traffic. This combination is consistent with ADOT's signage on this curve.

The two design curves along Vahalla, south of Valencia Road, will have curve radii greater than or equal to 7,220-feet, the minimum curve radii for a normal crown roadway and 50 mph design speed. Speed reduction signage from 45 mph to a new permanent 35 mph posted speed limit is included along the northbound roadway due to new development along Vahalla that will add two new driveways (just south of Valencia) and due to the posted speed of 25-mph along Vahalla Road, north of Valencia Road.

Design Speed

For urban arterial roadways, AASHTO recommends a design speed of 30 to 60 mph. Pima County has specified a design speed of 50 mph for Valencia Road. Vahalla, north of Valencia, has a design speed of 30-mph, while south of Valencia, it has a 50-mph design speed.

Grades

The RDM specifies a maximum grade of 3%. Due to the absence of outside curbs, no minimum grade is required. AASHTO recommends a maximum grade of 6% for urban arterials in level terrain.

Cross Slopes

The AASHTO recommended cross slope range for travel lanes is 1.5% to 2.0%. The travel lanes on this project will have a cross slope of 2.0%.

Design Exceptions

No design exceptions from the AASHTO or Pima County controlling design criteria will be necessary.

6.12 Value Engineering

In December 2011, the Pima Association of Governments (PAG) performed a Value Analysis (VA) Study of the RTA's Valencia Road West (Mark Rd. to Mountain Eagle Rd.) project. This project 4RTVWE includes a portion of that study segment and will exercise the same accepted proposals and recommendations made by the decision making board with the exception of item P01-041 – elimination of fiber optic conduit (ITS). All accepted VA proposals that are applicable to this project along with their

specific application are summarized in Table 10.

Table 10. Value Analysis

Proposal No.	VA Proposal Description	Review Board Decisions	Specific Application to 4RTVWE
P01-015	Optimize the roadway profile to match the 100-year water surface elevation (no freeboard).	Accept with Modifications	See Note 1.
P01-008	Use smooth-lined metal pipe culverts rather than reinforced concrete pipe culverts.	Accept with Modifications	Used at all pipe crossings when possible.
P01-024	Change culvert drop-inlet structures from a 4:1 slope to a 2:1 slope.	Accept with Modifications	Used at all drop structure back slopes.
P01-001	Provide an 8-foot wide multi-purpose path instead of concrete sidewalk.	Accept with Modifications	An 8-ft wide multi-purpose pathway is being used on the project. Concrete sidewalk will be installed along the north edge of pavement fronting developed areas, at future signalized intersections and at side streets to connect to existing sidewalk.
P01-036	Reduce the shoulder width on Vahalla Road.	Accept	6-ft bike lanes are accommodated at the Valencia/Vahalla intersection. Shoulders transition to 2-ft from the intersection.
P03-003	Use alternative materials instead of concrete for constructing sidewalk.	Accept with Modifications	Asphalt is being used for the 8-ft pathway. Concrete is being used for the 5-ft wide sidewalk.
P01-040	Use terminal blend asphalt instead of crumb rubber in the Asphalt Rubber Asphalt Concrete (ARAC) mix.	Accept with Modifications	Asphalt (Mix No. 3) is being used for the 8-ft pathway.
P06-003	Pulverize in-place asphalt pavement materials and blend with new aggregate base.	Accept	Will review pavement cores for use as recycled AB. If no AB is present, the existing asphalt can be used as embankment.
P01-020	Reduce the amount of landscaping and irrigation.	Accept with Modifications	Mitigation requirements will be reviewed.
P01-043	Waive the Environmentally Sensitive Roadway (ESR) Ordinance and Riparian Habitat requirements with respect to the installation of high voltage electric lines underground.	Already in Plan	See Note 2.
P01-042	Seek RTA Board Approval of Administrative Code revisions to clarify the intent of the project scope and enable value proposals.	Accept	Achieved during project 4RTVMW
P01-041	Eliminate the fiber optic conduit (ITS) unless a user is identified and commits to providing the necessary funding.	**Declined with project 4RTVWE**	Pima County has indicted the need to provide conduit for future fiber between Ajo (SR86) and I-19. In keeping with this regional need, project 4RTVWE will install fiber optic conduit (SCH 40 PVC) for future use.

Note 1: The vertical profile design was set to accommodate a minimum 2-ft of vertical clearance between the top of cross culverts and the bottom of pavement subgrade, while also meeting SSD and curve length requirements. The vertical clearance extends the life of the pavement as aggregate base fissures are less likely to form over a uniform subbase rather than when placed directly atop a box culvert. Vertical clearance is required over metal pipes.

Note 2. Per the VE Analysis; TEP and TRICO currently have above-ground facilities along the corridor and Arizona G&T Coop electric substation has proposed facilities to be installed at a later date. The overhead lines would not be required to be placed underground. While this is not a direct project cost, there are additional costs associated with placement the utility underground which will be borne by ratepayers.

Along with the VA proposals, additional Value Engineering opportunities will be utilized within this project:

1. Begin the 2% crown break at the high side of the roadway median edge to both reduce embankment-borrow and the resulting footprint as the north foreslope daylights approximately 1-ft closer to the roadway than the symmetrical normal crown approach while still complying with ADA. This approach is especially critical along the BLM frontage as the embankment fill line is further from the property line.

   Savings: 11,000 CY borrow @ $8/CY = $88,000

2. To reduce the project footprint, 3:1 slopes foreslopes will be used in lieu of 4:1 slopes outside of clear zone and where runout areas at the bottom of the slope are present. These slopes will not be used adjacent to the shared use path. At a minimum, 2 feet of shoulder will be maintained between the sidewalk and the 3:1 embankment slopes. At an average fill height of 3.5-ft;

   Savings: 3,000 CY borrow @ $8/CY = $24,000

3. An opportunity to reduce the pavement structural section depth along the west stretch of Valencia Road between SR86 and Reed Bunting Drive/Via Molino De Viento is a possibility due to the anticipated ADT of 25,000 VPD in 2040. Assuming the project borrow is well graded and meets the project specification requirements, a planning level determination of the structural section yields a likely decrease of 2" of AB. As such, assuming a pavement section of 6" AC / 9" ABC would require an additional 2" of borrow within this segment to bring the reduced pavement section back to profile grade.

   Savings: Net total <u>($53,178) (See summary below)</u>

   2659 CY ABC @ $28/CY = ($74,449) (2" reduction)
   2,659 CY borrow @ $8/CY = $21,271 (2" increase)

7 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSIDERATIONS

7.1 Biological Resources

The project limits including proposed drainage easements, TCE's, and the dedicated right-of-way associated with the rezoning and the tentative plating of the Sendero Pass and Pomegranate Farms Developments were surveyed for biological resources on June 23 and on June 29th, 2016. A Biological Evaluation was prepared to address potential impacts to protected species. The analysis included plants and animals covered under the Endangered Species Act, BLM Sensitive Species List, and the Pima County Section 10 Permit (Multi-Species Conservation Plan), and Arizona Native Plants. The report concluded no impacts to Threatened or Endangered or Sensitive species would occur as a result of the project.

No Pima pineapple cacti were located within the project limits. One individual was noted about 80 feet outside the construction limits. Burrowing owls and suitable habitat for them have not been found within the project area. Tree and vegetation removal may affect nesting birds protected under the Migratory Bird Treaty Act (MBTA). Clearing and grubbing up to the ROW are expected on both sides of the roadway. Construction work completed during the non-breeding season (estimated August 15 – December 31) would avoid disturbance of migratory bird species.

The removal of native plants covered under the Arizona Native Plant Law will occur. Native plant species within the project area will be inventoried and mitigated according to Appendix 4D of the Environmentally Sensitive Roadway Design Guidelines.

Designated Important Riparian Areas cross the project area at Mountain Eagle Drive and west of Via Molino de Viento. Additionally, Regulated Riparian Habitats (as defined in Pima County Title 16, Floodplain Management Ordinance) cross the project area in multiple locations along Valencia Road. Impacts to riparian habitat will be mitigated according to the Environmentally Sensitive Roadway Design Guidelines, Appendix 4D, Step 3.

Noxious and/or invasive species have been identified in the project area and will be treated prior to ground disturbance, including utility relocations and/or adjustments.

No other properties were evaluated for construction staging, lay down, or stockpiling uses as the contractor will be responsible for the identification of a staging yard and all associated environmental clearances and permitting including SWPPP activities, in order to secure the selected site for use on the project.

7.2 Water Quality and Clean Water Act

This project will affect jurisdictional Waters of the United States (W.U.S). A preliminary jurisdictional delineation will be prepared during the preparation of this DCR and submitted to the U.S. Army Corps of Engineers for approval. The level of 404 permitting will be determined following feedback from the Corp. Preliminary drainage design indicates the work will qualify as a non-notifying Nationwide Permit #14, Linear Transportation Projects.

Washes within the project area feature Important Riparian Areas under the Conservation Land System. These areas are Pima County protected Regulated Riparian Habitat, as designated by the Pima County Board of Supervisors. Impacts to these areas will require coordination with the Pima County Regional Flood Control District to obtain a Regional Flood Control Permit. Mitigation for impacts to Regulated Riparian Habitat will include on-site mitigation included in the landscape plans and off-site mitigation in the form of an in-lieu fee.

7.3 Air Quality

The project is located in the Tucson Regional Carbon Monoxide Limited Maintenance Area. The Valencia Road widening from Wade Road to Ajo Highway is listed in the approved PAG 5-Year Regional Transportation Improvement Program, 2016-2020, and thus is in conformity with the State Implementation Plan for air quality.

7.4 Noise

Sensitive noise receivers are present in the project area including single and multi-family residences along Valencia Road and cross streets. Most residences have some type of existing privacy wall with various capacities to mitigate noise. The project will elevate the existing Valencia Road by an average of 3 feet and widen the roadway, which may impact some sensitive receivers. Although the project will result in an increase of traffic noise at adjacent residences, a recently completed noise analysis (Pima County, June 2016) determined that sensitive receivers would not be subjected to project-related noise exceeding noise abatement criteria described in Pima County Department of Transportation Noise Abatement Procedure (PCNAP, 2008).

The project will result in temporary noise impacts during project construction associated with the operation of heavy equipment. Mitigation measures are proposed to minimize short-term construction noise to the extent practicable.

7.5 Hazardous Materials

The presence and/or extent of hazardous materials in the project area have been identified. A Preliminary Initial Site Assessment (PISA), dated September 29, 2016, was completed as part of the project. The potential for hazardous materials issue was reported as low due to the adjacent land uses of residential and vacant/undeveloped lands. No asbestos testing is necessary due to the absence of load bearing structures on the project. The two RCP pipes crossing Iberia Avenue will be removed in whole and the four (4) CMP crossings along Valencia Road do not contain load bearing concrete. No painted structures requiring removal are present. Roadway paint stripe obliteration will only be performed on segments of roadway that were recently constructed with no lead base containing products. The safety data sheet (SDS) for the recently painted segment of Valencia were reviewed and contains no Lead. The project specifications shall state that construction activities should cease in the event potentially hazardous materials are encountered, an odor is identified, or significantly stained soil is visible during construction. Applicable regulations regarding discovery, response, and disposal of hazardous materials should be followed during construction.

7.6 Historical/Cultural Resources

The project right-of-way was surveyed for cultural resources on July 13, 2016. The survey work was accomplished through EcoPlan permits with Arizona State Land Department and Bureau of Land Management. No cultural resource features other than a 1910 General Land Office Survey marker were discovered. Preparation of the Short Form Cultural Resources Survey report will recommend “no historic properties affected” which allows BLM to utilize their abbreviated Section 106 Consultation process with Arizona State Historic Preservation Office.

7.7 Visual/Aesthetic Resources

The visual character of the project area will be altered by the increased paving, relocation of power poles, and enlargement of drainage features. The addition of future signalized intersections will also

change the visual character. Current traffic studies do not warrant signalized intersections for this project. However, they are anticipated to be added at a future date.

User groups located directly on or adjacent to the roadway will be affected by the addition of the proposed project improvements. User groups located a distance away from the roadway will not be affected be additional pavement or larger drainage features. However, they will be affected by the relocated power poles.

Visual Impact #1: Roadway Widening (expansion of paved surface)

Roadway widening (which includes bike lanes, a pedestrian pathway, and drainage structures) will have a moderate visual impact to user groups located on and adjacent to the roadway. Although the paved surface area will double in width from the existing condition, little existing vegetation will require removal adjacent to the residential areas (Wade Rd. to Reed Bunting Dr.). The majority of the existing unpaved right-of-way is currently cleared of vegetation. The western edge of the project is more rural (Reed Bunting Dr. to Ajo Highway) and will require removal of dense vegetation along the southern Valencia Rd. right–of–way.

The proposed raised median and buffer area at the edges of the roadway will aid to visually 'break up' the expanse of added pavement, pedestrian pathway and drainage structures. The relocation of the existing TEP poles to the opposite side of the road will not significantly impact the visual character of the project area.

Mitigation Strategy #1

To moderate project impacts, incorporate native plantings in the raised median and along roadside buffer areas using plant species typical of the surrounding biotic community. Avoid arranging plants in unnaturally straight lines and place trees so they screen undesirable views and frame more desirable views. Plant density and spacing should emulate the natural surroundings as much as possible. As described in the Ajo Corridor/Western Gateway Special Area Policy, a desert wildflower seed mix should be planted for an area of 40 feet on both sides of the right-of-way in areas to remain natural. Apply/combine native seed mix with rock mulch (matched to existing soil color) to blend with the existing landscape and reduce erosion in disturbed areas. Blend drainage structures into the landscape by selecting material colors and textures that mimic and blend with the natural surroundings. Locate new utilities/easements so as not to preclude tree planting.

Visual Impact #2: FUTURE Signalized Intersections

Future signalized intersections will affect the visual character of the area, attributable to the new poles, signals and associated electrical cabinets. These elements contrast with the low, relatively flat topography and vegetation existing in the project area and may obscure and clutter views to surrounding hills and mountains if not sensitively designed.

Mitigation Strategy #2

Current roadway design standards for signalized intersections limit the mitigation strategies for the placement, type and size of roadway signals used in the project. However, using pole diameters that are as small as structurally possible, limiting the number of poles needed by placing as many signals and signs as possible on a single pole and limiting or securing any loose or dangling wires needed for the signals can minimize the visual impact.

Mitigation Strategy #2a

Locate electrical cabinets either underground, in an area where they are less visible to the travelling

public (allow adequate distance for signal maintenance), or where plant materials can be used as screening. Select cabinet finishes that will have minimal contrast with surrounding, i.e. earth tones (tan or sage green) or stainless steel. White cabinets are in high contrast with the surroundings. Sensitive siting of cabinets so that they are not the most dominant visible feature at intersections is also desirable. Locate new utilities/easements so as not to preclude tree planting. Avoid locating utilities easements (water, sanitary, gas) directly adjacent to pedestrian paths, where tree plantings are desirable.

7.8 Neighborhood Impact

This project will not require the acquisition of residential properties, and will not displace existing residents. Vehicle access to residencies and cross streets will be maintained throughout construction. Project-related impacts to neighborhoods will include temporary construction activities that will produce dust, noise, and traffic delays within the project area. Standard measures to control dust and noise will be implemented during construction.

The project will result in permanent neighborhood impacts. The construction of raised medians and turning lanes will improve safety and operations but will also modify current access by controlling turning movements. The project will promote overall connectivity by improving pedestrian facilities, bicycle lanes. All weather access will improve connectivity for neighborhoods and for emergency responders (police, fire, and ambulance).

7.9 Community Resource Impact

Project activities will temporarily disrupt current use of the roadway right-of-way and shoulder as pedestrians and bicyclists may be detoured around construction activities. The project will improve pedestrian and bicycle connectivity by constructing new bicycle lanes on both sides of Valencia Road, new multiuse pathway along the south side of Valencia Road, and new sidewalk along the north side of Valencia Road with connections to existing sidewalks at residential developments.

8 PUBLIC INVOLVEMENT

8.1 Public Participation Plan

The Public Involvement Plan will be prepared by Pima County. The plan will feature public information meetings, a Community Advisory Committee, ongoing contact with affected parties, media relations and the development of informational materials. The goals of the plan are to educate the public about the project's purpose and need, solicit the public's comments on the project, review public comments and adjust the roadway design concept to address the public concerns to the greatest extent possible and within the constraints of the project, including safety and cost.

8.2 Community Advisory Committee

A total of four Community Advisory Committee (CAC) meetings are anticipated for this project. Two meetings have been held to date, August 25, 2016 and September 20, 2016. The first meeting introduced the project and responsibilities of the CAC. The second focused on finalizing the DCR and introduced the components of the EAMR. The October 2016 meeting will focus on remaining DCR comments and the Draft EAMR, and the November 2016 meeting will finalize the EAMR.

The CAC minutes are located in **APPENDIX B**.

The CAC will also meet as needed to provide input on the artwork, aesthetic treatments, and other items for which the committee is to have input.

8.3 Public Meetings

A total of three public open house meetings are anticipated to obtain community input on the project. The public meetings will be publicized through news releases distributed to the appropriate media and through display advertisements placed with *Daily Territorial* and *Arizona Daily Star* a minimum of 15 days prior to each meeting. Meeting announcements will be mailed to the project contact list comprised of impacted residents and businesses as well as elected officials. Corresponding information will be posted on the dedicated project Web site. Sign-in sheets will be provided to record attendance at the meetings, and attendees will be asked to submit comments on the forms provided at the meetings. Comments submitted during a two-week period following each meeting will be documented and summarized for the project team.

A public hearing will be held before a meeting of the Pima County Board of Supervisors upon completion of the EAMR.

9 AGENCY COORDINATION

9.1 Environmental Review

Environmental coordination is anticipated with the following agencies: U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), Bureau of Land Management, Arizona State Land Department, State Historic Preservation Office (SHPO), Arizona Game and Fish Department (AGFD), and the Arizona Department of Environmental Quality (ADEQ). Coordination with the SHPO will be initiated during the cultural resources section 106 consultation. Coordination with AGFD and USFWS through the use of their online Environmental Review Tool and Information Planning and Conservation System (IPaC) was initiated in July 2016. A list of species within three miles of the project vicinity was provided, as well as project related recommendations. Coordination with the USACE would occur through the submittal of a Preliminary Jurisdictional Delineation and subsequent Nationwide Permit as applicable. Coordination with BLM and ASLD would occur throughout the project as action relates to their Right-of-Way Easements and various technical reports.

9.2 Intergovernmental Agreements

Pima County and the RTA have an existing Intergovernmental Agreement (IGA) that currently covers design and construction activities for this project.

9.3 ADOT Permitting

This project will require a construction permit for construction activities or traffic control signage within ADOT Right-of-Way. Pima County will follow the ADOT encroachment permit requirements found at: https://azdot.gov/docs/default-source/business/encroachment-application-instructions.pdf?sfvrsn=4. Pima county held a meeting with ADOT Tucson District on July 26, 2016 to discuss the project impacts to the intersection of SR86 / Valencia Road.

10 ALTERNATIVES

10.1 Shared Use Path and Sidewalk Considerations

A memorandum was issued by John Bernal, Pima County Deputy County Administrator, addressing the use of sidewalks on county projects. It states "the placement of sidewalk without curb and gutter is acceptable where adequate separation from the roadway edge is incorporated in the project design."

Separation (Buffer)

According to the *Guide for the Development of Bicycle Facilities*, American Association of State Highway and Transportation Officials, 2012 Fourth Edition, the minimum recommended separation between a two-way shared use path and the outside edge of the paved shoulder is 5-ft. This separation buffer is assumed to be **stabilized surface such as compacted decomposed granite.**

- The separation of the shared use-path provided for this project is 6-ft, exceeding the minimum.
- The separation of the sidewalk provided for this project varies between 9-10 feet, except where sidewalk ties into intersections and at drainage crossings.

Width

This project includes an 8-ft wide paved shared-use path and 5-ft wide sidewalk, consistent with the recently constructed Valencia Road project – Mark Road to Wade Road 4RTVMW.

The shared use pathway width is adequate for the following reasons:

- Bike traffic is assumed to be low, as bicyclists will likely use the bike lanes provided along Valencia.
- Pedestrian use of the pathway is not expected to be more than occasional.
- The path will not be regularly subjected to maintenance vehicle loads that would cause pavement edge damage.

The sidewalk width is consistent with PAG Standard Detail 200.

Sidewalk Shoulder and Handrail Design Considerations

The proposed sidewalk configuration in relation to its surroundings does not require handrail for slope protection. Section 3.8 of the *2016 Pima County Subdivision and Development Street Standards* recommends handrail for protection of pedestrians whenever adjacent embankment slopes are steeper than 2:1 (H:V) and within 3 feet of the walkway or sidewalk and the embankment height is 3 feet or greater.

- This project maintains 2 feet of shoulder and 3:1 embankment slopes – Not requiring handrail.
- Where sidewalk is located against drainage crossings, handrail will be installed in accordance with PAG Standard Detail 105.

Path Shoulder and Handrail Design Considerations

The *Guide for the Development of Bicycle Facilities*, American Association of State Highway and Transportation Officials, 2012 Fourth Edition, provides guidance for shared use path design. The following are the shared use path design features that have been incorporated into the project:

- The railing height adjacent to the pathway is 42-in minimum.

- The railing lateral offset is at least 1-ft from the edge of path.
- The rail ends that remain within the 2-ft horizontal clearance area will be marked with object markers or other means such as reflective tape.
- A desirable graded shoulder of at least 3 to 5-ft wide with a maximum cross slope of 6:1 (H:V), which should be recoverable in all weather conditions, will be maintained on each side of the pathway. At a minimum, a 2-ft graded area with a maximum slope of 6:1 will be provided for clearance from lateral obstructions such as bushes, headwalls, and poles. This 2-ft clearance is also consistent with the MUTCD's sign panel edge offset guideline.
- The desirable minimum vertical clearance is 10-ft with a minimum of 8-ft in constrained areas. This clearance may be relevant at signalized intersections where pedestrian heads protrude out from poles.

11 CONCLUSIONS AND RECOMMENDATIONS

This project shall be designed as described in this report. The design standards and criteria to be used are listed in Section 5. A summary of major design recommendations includes:

- The two-way 8-ft wide asphalt shared use path shall be located a minimum of 6-ft offset from the outside edge of the new roadway paved shoulder.
- Include sidewalk along the north shoulder of Valencia Road from Victor Drive to Reed Bunting Drive.
- Traffic signals are not anticipated to be warranted opening year (2020) of the project. Pull boxes and conduit will be installed. This DCR includes the traffic signal layouts to verify pull box placement, pole clearances to proposed drainage structures and utilities (i.e. overhead power lines), and roadway embankment needs at intersection quadrants to ensure a level terrain for future pole placement.
- The use of terminal blend asphalt for the top course consistent with the PAG specifications.
- The use of LED light fixtures.
- The use of steel pipes when applicable.
- Include the previously accepted Value Engineering proposals in the recently constructed 4RTVMW project where possible.
- No noise walls are required for the project. Short term mitigation of construction noise is recommended.

12 COST ESTIMATE AND BUDGET CONSIDERATIONS

The project cost shown in Table 11 below is based on the preliminary design performed to date and will be refined as more detailed plans are prepared.

Table 11. Project Cost

Task	Cost
Right-of-way	$ 280,000
Design	$ 3,408,000
Construction *	$ 15,653,352
Construction Administration (15%)	$ 2,348,003
Utility Relocation / Oversite	$ 350,000
Art (1%)	$ 157,000
Contingency (10%)	$ 1,565,335
Subtotal	**$ 23,761,690**
Tucson Water Contribution **	$ (76,665)
Total	**$ 23,685,025**

* Includes full TW Relocation Costs
**Negative value shown to demonstrate contribution

For additional breakdown of the construction cost refer to **APPENDIX A**. The utility relocation costs assume one-half of the relocation costs being paid by Tucson Water and the full costs of manhole adjustments and reconstructs paid by Pima County Regional Wastewater Reclamation Department's (RWRD). No costs are included for TEP, Trico, Southwest Gas, or Metro Water relocations. No prior rights have been communicated to date.

Drainage easements and temporary construction easements will be needed as shown in Table 6. The cost of the drainage easements was based on a value of $4 per square foot (SF) paid at 90% of value, equaling $3.60/SF. Slope easements were based on the same value but paid at 75% of value, equaling $3.00/SF. An allowance for temporary construction easements was included at a value of $20,000.

Artwork is assumed to be 1% of the construction cost and construction administration is assumed to be 15% of the construction cost.

The total estimated cost to Pima County for this project is **$23,685,025**.

13 REFERENCES

1. "Draft Final Traffic Memorandum, 4RTVWE – Valencia Road (Wade Road to Ajo Highway)", Kimley-Horn, July 2016.
2. "A Policy on Geometric Design of Highways and Streets", American Association of State Highway and Transportation Officials, 2011, 6th Edition.
3. "Pima County Roadway Design Manual", Pima County Department of Transportation, Fourth Edition, 2013.
4. "Roadside Design Guide", American Association of State Highway and Transportation Officials, Fourth Edition, 2011.
5. "Standard Specifications and Details for Public Improvements for Public Improvements", Pima Association of Governments (PAG), 2015.
6. "Guide for the Development of Bicycle Facilities", American Association of State Highway and Transportation Officials, 2012 Fourth Edition.
7. "Manual on Uniform Traffic Control Devices", U.S. Department of Transportation, Federal Highway Administration, 2009 Edition.
8. "Drainage Report for Valencia Road, Wade Road to Ajo Highway, 4RTVWE", CMG Drainage Engineering Inc., August 2016.
9. "Preliminary Initial Site Assessment for Valencia Road, Wade Road to Ajo Highway", Ninyo and Moore, July 2016.

14 ABBREVIATIONS AND ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
APE	Area of Potential Effect
CAC	Community Advisory Committee
cfs	cubic feet per second
USACE	U.S. Army Corps of Engineers
County	Pima County
CMP	Corrugated Metal Pipe
CWA	Clean Water Act
dBA	A-weighted decibel
DCR	Design Concept Report
EAMR	Environmental Assessment and Mitigation Report
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
IGA	Intergovernmental Agreement
ISD	Intersection Sight Distance
kV	kilovolt
LOS	Level of Service
mph	miles per hour
MS&R	Pima County Major Streets and Routes Plan
NPDES	National Pollutant Discharge Elimination System
PAG	Pima Association of Governments
PCDOT	Pima County Department of Transportation
PCRFCD	Pima County Regional Flood Control District
PCRWRD	Pima County Regional Wastewater and Reclamation Department
PS&E	Plans, Specifications, and Estimate
R/W	Right-of-Way
RCBC	Reinforced Concrete Box Culvert

RDM	Pima County Department of Transportation Roadway Design Manual (2013)
ROE	Right of Entry
ROS	Record of Survey
RTA	Regional Transportation Authority
SHPO	State Historic Preservation Office
SRP	Spiral Rib Pipe
SSD	Stopping Sight Distance
SWG	Southwest Gas Corporation
TEP	Tucson Electric Power Company
USFWS	U.S. Fish and Wildlife Service

APPENDIX A CONSTRUCTION COST ESTIMATE & JUSTIFICATION

4RTVWE - VALENCIA: WADE TO AJO (SR86)
INITIAL DESIGN COST ESTIMATE

Kimley»Horn

Proj No. : **4RTVWE - Valencia West (Pre Design)**
KH Mngr : **Rick Solis, PE**
Date: **08/11/2016**

Project Location : **Valencia: Wade - Ajo (AZ86)**
Project Description : **Initial Design Phase Plans**
Bid Advertisement Date : **Nov 2017 to Jan 2018**

ITEM No.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1090010	Fuel Adjustment Allowance	USD	50,000	$1.00	$50,000.00
2010001	Clearing and Grubbing	L.S.	1	$44,500.00	$44,500.00
2010004	Preservation Fencing	L.F.	15,000	$3.00	$45,000.00
2010010	Clearing and Grubbing (Noxious and Invasive Species Control Allowance)	USD	1	$5,000.00	$5,000.00
2020001	Removal of Structures & Obstructions	L.S.	1	$125,000.00	$125,000.00
2020061	Relocate Mailbox	EACH	3	$250.00	$750.00
2030300	Roadway Excavation	C.Y.	9,163	$6.00	$54,978.00
2030401	Drainage Excavation	C.Y.	8,679	$7.00	$60,753.00
2030402	Channel Excavation	C.Y.	9,224	$7.00	$64,568.00
2030813	Dike	L.F.	102	$32.00	$3,264.00
2030901	Borrow	C.Y.	122,421	$8.00	$979,368.00
3030003	Aggregate Base	C.Y.	37,742	$28.00	$1,056,776.00
4040111	Tack Coat	TON	40	$800.00	$32,000.00
4060001	Asphaltic Concrete (No. 1)	TON	26,911	$60.00	$1,614,660.00
4060004	Asphaltic Concrete No. 2 (Terminal Mix)	TON	13,869	$80.00	$1,109,520.00
4060003	Asphaltic Concrete (No. 3)	TON	1,429	$65.00	$92,885.00
4060510	Bituminous Material Price Adjustment Allowance	USD	200,000	$1.00	$200,000.00
5010002	Pipe Sleeve	L.F.	1,750	$20.00	$35,000.00
5010324	Pipe, Spiral Rib Metal, 24"	L.F.	396	$75.00	$29,700.00
5010330	Pipe, Spiral Rib Metal, 30"	L.F.	484	$105.00	$50,820.00
5010336	Pipe, Spiral Rib Metal, 36"	L.F.	708	$125.00	$88,500.00
5010342	Pipe, Spiral Rib Metal, 42"	L.F.	488	$145.00	$70,760.00
5010348	Pipe, Spiral Rib Metal, 48"	L.F.	1,100	$160.00	$175,920.00
	42"x29" Steel Arch Pipe	L.F.	381	$135.00	$51,435.00
	49"x33" Steel Arch Pipe	L.F.	2,099	$155.00	$325,345.00
	57"x38" Steel Arch Pipe	L.F.	456	$175.00	$79,800.00
5030188	Drop Inlet	SF	66,200	$7.50	$496,500.00
5030211	Trench Drain	EACH	1	$15,500.00	$15,500.00
5090100	Sewer Manhole, Reconstruct	L.F.	23	$850.00	$19,550.00
5090110	Sewer Manhole, Adjustment	EACH	5	$500.00	$2,500.00
5109000	Potable Water, Miscellaneous Work	L.S.	1	$153,330.00	$153,330.00
5150005	Utility Potholing, Depth <12'	EACH	400	$350.00	$140,000.00
5150007	Utility Potholing, Depth ≥12'	EACH	75	$450.00	$33,750.00
5150101	Utility Impact Allowance	USD	100,000	$1.00	$100,000.00
6010161	Box Culvert 1B	L.S.	1	$110,000.00	$110,000.00
6010162	Box Culvert 2	L.S.	1	$265,000.00	$265,000.00
6010163	Box Culvert 3A	L.S.	1	$90,000.00	$90,000.00
6010164	Box Culvert 5	L.S.	1	$270,000.00	$270,000.00

4RTVWE - VALENCIA: WADE TO AJO (SR86)
INITIAL DESIGN COST ESTIMATE

ITEM No.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
6010165	Box Culvert 6	L.S.	1	$300,000.00	$300,000.00
6010166	Box Culvert 10	L.S.	1	$400,000.00	$400,000.00
6010167	Box Culvert 11A	L.S.	1	$100,000.00	$100,000.00
6010168	Box Culvert 13	L.S.	1	$105,000.00	$105,000.00
6010169	Box Culvert 16	L.S.	1	$252,000.00	$252,000.00
6016087	Pipe Culvert Headwall	EACH	5	$6,500.00	$32,500.00
6016088	Pipe Culvert Headwall w/Wingwalls	EACH	7	$12,000.00	$84,000.00
6070010	Sign Post (Perforated) (Single)	L.F.	1,400	$9.00	$12,600.00
6070110	Foundation for Sign Post (Perforated)	EACH	120	$200.00	$24,000.00
6080016	Sign Panel (Traffic Control) (Permanent) (Type IV)	S.F.	900	$20.00	$18,000.00
6080020	Sign Panel (Traffic Control) (Permanent) (Diamond Grade)	S.F.	10	$20.00	$200.00
7010001	Maintenance and Protection of Traffic	L.S.	1	$150,000.00	$150,000.00
7010007	Construction Area Elements (Predetermined Reimbursement Rate Allowance)	USD	100,000	$1.00	$100,000.00
7010010	Temporary Concrete Barrier (Installation and Removal)	L.F.	15,000	$13.00	$195,000.00
7010025	Flashing Arrow Panel	Ea/Day	3,800	$10.00	$38,000.00
7010027	Changeable Message Board	Ea/Day	1,100	$25.00	$27,500.00
7010030	Vertical Panel	Ea/Day	500,000	$0.10	$50,000.00
7010035	Barricade (Type II)	Ea/Day	165,000	$0.12	$19,800.00
7010038	Barricade (Type III)	Ea/Day	28,000	$0.20	$5,600.00
7010040	Flashing Warning Light (Type A)	Ea/Day	370,000	$0.10	$37,000.00
7010043	Flashing Warning Light (Type B)	Ea/Day	16,500	$0.45	$7,425.00
7010050	Steady-Burning Warning Light (Type C)	Ea/Day	450,000	$0.15	$67,500.00
7010055	Standard Intensity Reflective Sheeting (Less than 10 Sq. Ft.)	Ea/Day	135,000	$0.20	$27,000.00
7010060	Standard Intensity Reflective Sheeting (10 Sq. Ft. or Larger)	Ea/Day	16,500	$0.30	$4,950.00
7010063	Portable Sign Stand (Spring Type)	Ea/Day	11,500	$0.50	$5,750.00
7010065	Portable Sign Stand (Less than 10 Sq. Ft.)	Ea/Day	130,000	$0.20	$26,000.00
7010069	Portable Sign Stand (10 Sq. Ft. or larger)	Ea/Day	13,000	$0.35	$4,550.00
7010075	Flagging Services (Civilian)	HOUR	3,750	$25.00	$93,750.00
7010077	Flagging Services (Uniformed Officer) (Off Duty)	HOUR	750	$50.00	$37,500.00
7010079	Official Police Vehicle (Off Duty)	HOUR	750	$10.00	$7,500.00
7040010	Pavement Marking (White Hot-Sprayed Thermoplastic) (0.060")	L.F.	68,940	$0.40	$27,576.00
7040020	Pavement Marking (Yellow Hot-Sprayed Thermoplastic) (0.060")	L.F.	32,950	$0.40	$13,180.00
7040030	Pavement Marking (White Hot-Sprayed Thermoplastic) Sgl. Arrow (0.090")	EACH	37	$130.00	$4,810.00
7040050	Pavement Marking (White Hot-Sprayed Thermoplastic) Merge Arrow (0.090")	EACH	3	$130.00	$390.00
7040060	Pavement Legend (White Hot-Sprayed Thermoplastic) (ONLY) (0.090")	EACH	17	$130.00	$2,210.00
7040110	Pavement Marking (White Hot Sprayed Thermoplastic) Transverse) (0.09")	L.F.	5,020	$0.60	$3,012.00
7060020	Pavement Marker, Reflective, (Type C, Clear, Red)	EACH	956	$4.00	$3,824.00
7060025	Pavement Marker, Reflective, (Type D, Yellow, Two-Way)	EACH	65	$4.00	$260.00
7060035	Pavement Marker, Reflective, (Type H, Yellow, One-Way)	EACH	162	$4.00	$648.00
7080001	Painted Pavement Marking	L.F.	106,910	$0.10	$10,691.00
7080010	Painted Pavement Symbol or Legend	EACH	24	$70.00	$1,680.00
7310060	Pole (Type 2B Street Light)	EACH	44	$2,000.00	$88,000.00
7310240	Pole Foundation (Type 2A, 2B and 2C Street Light))	EACH	34	$1,500.00	$51,000.00

4RTVWE - VALENCIA: WADE TO AJO (SR86)
INITIAL DESIGN COST ESTIMATE

ITEM No.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
7310241	Pole Foundation (Type 2A, 2B and 2C Street Light) (Spread Foundation)	EACH	10	$1,800.00	$18,000.00
7310350	Control Cabinet Foundation	EACH	2	$800.00	$1,600.00
7310376	Service Pedestal and BBS Cabinet Foundation	EACH	4	$1,500.00	$6,000.00
7320010	Electrical Conduit (1") (PVC)	L.F.	350	$10.00	$3,500.00
7320015	Electrical Conduit (1 1/2") (PVC)	L.F.	1,850	$12.00	$22,200.00
7320020	Electrical Conduit (2") (PVC)	L.F.	4,950	$16.00	$79,200.00
7320040	Electrical Conduit (4") (PVC)	L.F.	13,700	$18.00	$246,600.00
7320041	Electrical Conduit (4") (PVC) (Second in Trench)	L.F.	900	$10.00	$9,000.00
7320062	Electrical Conduit (4") (PVC) (Concrete Encased)	L.F.	3,300	$50.00	$165,000.00
7320410	Pull Box (No. 5)	EACH	37	$500.00	$18,500.00
7320420	Pull Box (No. 7)	EACH	8	$550.00	$4,400.00
7320421	Pull Box (No. 7) (with Extension)	EACH	6	$600.00	$3,600.00
7320440	Pull Box (Fiber Optic)	EACH	7	$600.00	$4,200.00
7320459	Vault (Fiber Optic)	EACH	12	$2,500.00	$30,000.00
7320600	Conductors (Traffic Signals)	L.S.	1	$30,000.00	$30,000.00
7320609	Conductors (Street Lighting)	L.S.	1	$40,000.00	$40,000.00
7320800	Service Pedestal Cabinet	EACH	4	$10,000.00	$40,000.00
7320890	Electrical Service Installation	L.S.	1	$20,000.00	$20,000.00
7330000	Traffic Signals	EACH	2	$296,000.00	$592,000.00
7340200	Control Cabinet (Type IV) (Traffic Counter)	EACH	2	$20,000.00	$40,000.00
7350100	Loop Detector (6' x 6')	EACH	1	$900.00	$900.00
7360050	Luminaire (Horizontal Mount) (LED)	EACH	44	$600.00	$26,400.00
7360310	Load Center Cabinet (Type I)	EACH	4	$12,000.00	$48,000.00
8020011	Landscape Grading (DG and Plantings)	L.S.	1	$700,000.00	$700,000.00
8070001	Landscaping Establishment	L.S.	1	$40,000.00	$40,000.00
8080001	Landscape Irrigation System	L.S.	1	$300,000.00	$300,000.00
8100001	AZPDES/NPDES (Original)	L.S.	1	$80,000.00	$80,000.00
8100005	Sediment Log (Discretionary)	L.F.	1,500	$5.00	$7,500.00
8100006	Sediment Wattle (Discretionary)	L.F.	4,500	$3.00	$13,500.00
8100012	AZPDES/NPDES Allowance (Modified)	USD	70,000	$1.00	$70,000.00
9010001	Mobilization	L.S.	1	$700,000.00	$700,000.00
9080001	Concrete Curb (Std. Dtl. 209) (Type 1)	L.F.	29,106	$15.00	$436,590.00
9080051	Concrete Curb and Gutter (Std. Dtl. 209) (Type 1G)	L.F.	293	$25.00	$7,325.00
9080006	Concrete Wedge Curb (Std. Dtl. 209)	L.F.	77	$20.00	$1,540.00
9080090	Concrete Curb Terminal Section (Std. Dtl. 212)	EACH	8	$100.00	$800.00
9080105	Concrete Curb Transition	L.F.	72	$20.00	$1,440.00
9080201	Concrete Sidewalk	S.F.	44,211	$3.50	$154,738.50
9080203	Concrete Sidewalk (6")	S.F.	251	$5.00	$1,255.00
9080280	Curb Access Ramp, Std. Dtl. 207 (Type 1)	EACH	10	$1,500.00	$15,000.00
9080285	Median Refuge Area (Type 1)	EACH	2	$1,500.00	$3,000.00
9080292	Concrete Landing with Detectable Warning Strip (8')	EACH	17	$1,500.00	$25,500.00
9080292	Concrete Landing with Detectable Warning Strip (6')	EACH	18	$1,500.00	$27,000.00
9080402	Concrete Header	L.F.	1,535	$15.00	$23,025.00
9080504	Concrete Ford Wall (1' x 4')	L.F.	80	$50.00	$4,000.00
9090002	Survey Monument	EACH	13	$250.00	$3,250.00

4RTVWE - VALENCIA: WADE TO AJO (SR86)
INITIAL DESIGN COST ESTIMATE

ITEM No.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
9130001	Riprap (Dumped)	C.Y.	7,445	$60.00	$446,700.00
9130004	Riprap (Slope Mattress)	C.Y.	1,235	$125.00	$154,430.56
9130101	Concrete Grouted Rip-Rap Channel Lining	S.Y.	2,961	$90.00	$266,500.00
9260001	Engineer's Field Office	L.S.	1	$50,000.00	$50,000.00
9280036	Ground-In Rumble Strip (8-inch)	L.F.	28,200	$0.20	$5,640.00
9330002	Handrail	L.F.	4,134	$20.00	$82,680.00

CONSTRUCTION COST (CON)	$15,653,352.06
Construction Contingency (CTG) 10%	$1,565,335.21
Construction Administration 15%	$2,348,002.81
Art 1%	$156,533.52

Notes:

1- 5% Contingency aplied to Asphaltic Concrete No. 1 & No. 2 (Terminal Mix)

2- 10% Contingency aplied Asphaltic Concrete (No. 3) - 8-ft Multiuse Path

Project No. 4RTVWE

Valencia Road – Wade Road to Ajo Way

Quantity Summary

August 11, 2016

Initial Design Phase Plans

Prepared For:

PIMA COUNTY

kimley-horn.com | 333 East Wetmore Road, Suite 280, Tucson, AZ 85705 | 520 615 9191

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Item 2020061 – Relocate Mailbox

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
2020061	Relocate Mailbox	BY VC	DATE 7/27/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Ref #	Quantity (EA)	Totals (EA)
Valencia Road	DM1	N/A	0	
	DM2	N/A	0	
	DM3	N/A	0	
	DM4	N/A	0	
	DM5	N/A	0	
	DM6	N/A	0	
	DM7	N/A	0	
	DM8	N/A	0	
	DM9	N/A	0	
	DM10	N/A	3	
	DM11	N/A	0	3
Vahalla Road	DM12	N/A	0	
	DM13	N/A	0	0
			Total	3 EA

Item 3030022 – Aggregate Base

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
3030003	Aggregate Base	BY ABG	DATE 8/10/2016	1
QUANTITIES		CKD BY RPS		

Location	Measured Area (SF)	Depth (FT)	AB (CY)	
Valencia Road Mainline	970738.8	0.917	32957.18	
Vahalla & Iberia Avenue	68309.4	0.500	1264.99	
Paved Driveways	31916.2	0.333	394.03	
Valencia Multi-Use Path	104883.5	0.333	1294.86	
Maintanence Driveways	2504.3	0.333	30.92	
Mailbox Pullout	240.0	0.333	2.96	
		Total	**35945**	**CY**
		Add 5%	**37742**	**CY**

Item 4040111 – Tack Coat

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY					PROJECT NO.	4RTVWE	SHT. NO.
4040111	Tack Coat					BY ABG	DATE 8/10/2016	1
QUANTITIES						CKD BY RPS		

Location	Measured Area (SY)	Lifts	Mult.	Tack (TON)	
Valencia Road Mainline	107839.9	1.000	0.000333	35.911	.000333 = (.08 GAL / SY) X (1 TON / 240 GAL)
Vahalla & Iberia Avenue	7589.9	1.000	0.000333	2.527	
Mailbox Pullout	20.0	1.000	0.000333	0.007	
		Total	38	TON	
		Add 5%	40	TON	

Item 4060001 – Asphaltic Concrete (No. 1)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY					PROJECT NO.	4RTVWE	SHT. NO.
4060001	Asphaltic Concrete (No. 1)					BY ABG	DATE 8/10/2016	1
QUANTITIES						CKD BY RPS		

Location	Measured Area (SY)	Depth (FT)	Mult.	AC (TON)	
Valencia Road Mainline	107859.9	0.333	0.666	23944.650	.666= (148 LB / CF) X (9 FT^2 / SY) X (1 TON / 2000 LB)
Vahalla & Iberia Avenue	7589.9	0.333	0.666	1684.964	
		Total	25630	TON	
		Contingency	5%		
		Total	26911	TON	

Item 4060004 – Asphaltic Concrete No. 2 (Terminal Mix)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY					PROJECT NO.	4RTVWE	SHT. NO.
4060004	Asphaltic Concrete No. 2 (Terminal Mix)					BY ABG	DATE 8/10/2016	1
QUANTITIES						CKD BY RPS		
	Location	**Measured Area (SY)**	**Depth (FT)**	**Mult.**	**AC (TON)**			
	Valencia Road Mainline	107859.9	0.1667	0.666	11972.445		.666= (148 LB / CF) X (9 FT^2 / SY) X (1 TON / 2000 LB)	
	Vahalla & Iberia Avenue	7589.9	0.1667	0.666	842.651			
	Paved Driveways	3546.2	0.1667	0.666	393.712			
			Total	**13209**	**TON**			
			Contingency	**5%**				
			Total	**13869**	**TON**			

Item 4060004 – Asphaltic Concrete No. 3

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY					PROJECT NO.	4RTVWE	SHT. NO.
4060003	Asphaltic Concrete (No. 3)					BY ABG	DATE 8/10/2016	1
QUANTITIES						CKD BY RPS		
	Location	**Measured Area (SY)**	**Depth (FT)**	**Mult.**	**AC (TON)**			
	Valencia South Pathway	11653.7	0.1667	0.666	1293.563		.666i= (148 LB / CF) X (9 FT^2 / SY) X (1 TON / 2000 LB)	
	Mailbox Pullout	26.7	0.3333	0.666	5.921			
			Total	**1299**	**TON**			
			Contingency	**10%**				
			Total	**1429**	**TON**			

Item 5109000 – Potable Water, Miscellaneous Work

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTWWE	SHT. NO.
5109000	Potable Water, Miscellaneous Work	BY ABG	DATE 8/10/2016	1
QUANTITIES		CKD BY RPS		

Item No.	Item Description	Unit	Quantity	Unit Price	Amount
5101112	POTABLE WATER PIPE, DI, 12" (CLASS 350)	LF	180	$140	$25,200
5101412	POTABLE WATER PIPE, PVC, 12" (305)	LF	642	$80	$51,360
5103101	POTABLE WATER, ADJUST VALVE BOX AND COVER	EA	10	$300	$3,000
5105012	POTABLE WATER, PIPE REMOVE & DISPOSE, 12" & LARGER	LF	822	$35	$28,770
5106012	POTABLE WATER, CONNECTIONS, 12"	EA	8	$1,500	$12,000
5107130	POTABLE WATER, CORROSION TEST STATION (CTS), RELOCATED, ABOVE GROUND	EA	6	$500	$3,000
5107350	RECTIFIER, RELOCATE	EA	2	$15,000	$30,000
				Total	$153,330

Item 7040010 – Pavement Marking (White Hot-Sprayed Thermoplastic) (0.060”)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
7040010	Pavement Marking (White Hot-Sprayed Thermoplastic) (0.060")	BY VC	DATE 7/27/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Ref #	Quantity (EA)	Totals (EA)
Valencia Road		Striping Quantities\Striping Quantities.xls		
	Total	68,940	L.F.	

Item 7040020 – Pavement Marking (Yellow Hot-Sprayed Thermoplastic) (0.060”)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
7040020	Pavement Marking (Yellow Hot-Sprayed Thermoplastic) (0.060")	BY VC	DATE 7/27/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Ref #	Quantity (EA)	Totals (EA)
Valencia Road		Striping Quantities\Striping Quantities.xls		
	Total	32,950	L.F.	

Item 7040030 – Pavement Marking (White Hot-Sprayed Thermoplastic) Sgl. Arrow (0.090”)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY					PROJECT NO.	4RTVWE	SHT. NO.
7040030	Pavement Marking (White Hot-Sprayed Thermoplastic) Sgl. Arrow (0.090")					BY VC	DATE 7/27/2016	1
QUANTITIES						CKD BY RPS		
	Location	**Plan #**	**Ref #**	**Quantity (EA)**	**Totals (EA)**			
	Valencia Road		Striping Quantities\Striping Quantities.xls					
		Total	**37**	**EA**				

Item 7040050 – Pavement Marking (White Hot-Sprayed Thermoplastic) Merge Arrow (0.090”)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY					PROJECT NO.	4RTVWE	SHT. NO.
7040050	Pavement Marking (White Hot-Sprayed Thermoplastic) Merge Arrow (0.090")					BY VC	DATE 7/27/2016	1
QUANTITIES						CKD BY RPS		
	Location	**Plan #**	**Ref #**	**Quantity (EA)**	**Totals (EA)**			
	Valencia Road		Striping Quantities\Striping Quantities.xls					
		Total	**3**	**EA**				

Item 7040060 – Pavement Legend (White Hot-Sprayed Thermoplastic) (ONLY) (0.090”)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY					PROJECT NO.	4RTVWE	SHT. NO.
7040060	Pavement Legend (White Hot-Sprayed Thermoplastic) (ONLY) (0.090")					BY VC	DATE 7/27/2016	1
QUANTITIES						CKD BY RPS		
	Location	**Plan #**	**Ref #**	**Quantity (EA)**	**Totals (EA)**			
	Valencia Road		Striping Quantities\Striping Quantities.xls					
		Total	**17**	**EA**				

Item 7040110 – Pavement Marking (White Hot-Sprayed Thermoplastic) (Transverse) (0.090”)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY					PROJECT NO.	4RTVWE	SHT. NO.
7040110	Pavement Marking (White Hot Sprayed Thermoplastic) Transverse) (0.09")					BY VC	DATE 7/27/2016	1
QUANTITIES						CKD BY RPS		
	Location	**Plan #**	**Ref #**	**Quantity (EA)**	**Totals (EA)**			
	Valencia Road		Striping Quantities\Striping Quantities.xls					
		Total	**5,020**	**L.F.**				

Item 7060020 – Pavement Marker, Reflective, (Type C, Clear, Red)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
7060020	Pavement Marker, Reflective, (Type C, Clear, Red)	BY VC	DATE 7/27/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Ref #	Quantity (EA)	Totals (EA)
Valencia Road		Striping Quantities\Striping Quantities.xls		
	Total	956	EA	

Item 7060025 – Pavement Marker, Reflective, (Type D, Yellow, Two-Way)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
7060025	Pavement Marker, Reflective, (Type D, Yellow, Two-Way)	BY VC	DATE 7/27/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Ref #	Quantity (EA)	Totals (EA)
Valencia Road		Striping Quantities\Striping Quantities.xls		
	Total	65	EA	

Item 7060035 – Pavement Marker, Reflective, (Type H, Yellow, One-Way)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
7060035	Pavement Marker, Reflective, (Type H, Yellow, One-Way)	BY VC	DATE 7/27/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Ref #	Quantity (EA)	Totals (EA)
Valencia Road		Striping Quantities\Striping Quantities.xls		
	Total	162	EA	

Item 7080001 – Painted Pavement Marking

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
7080001	Painted Pavement Marking	BY VC	DATE 7/27/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Ref #	Quantity (EA)	Totals (EA)
Valencia Road		Striping Quantities\Striping Quantities.xls		
	Total	106,910	L.F.	

Item 7080010 – Painted Pavement Symbol or Legend

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
7080010	Painted Pavement Symbol or Legend	BY VC	DATE 7/27/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Ref #	Quantity (EA)	Totals (EA)
Valencia Road		Striping Quantities\Striping Quantities.xls		
	Total	24	EA	

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY
7040010	Pavement Marking (White Hot-Sprayed Thermoplastic) (0.060")	L.F.	68,940
7040020	Pavement Marking (Yellow Hot-Sprayed Thermoplastic) (0.060")	L.F.	32,950
7040030	Pavement Marking (White Hot-Sprayed Thermoplastic) Sgl. Arrow (0.090")	EACH	37
7040050	Pavement Marking (White Hot-Sprayed Thermoplastic) Merge Arrow (0.090")	EACH	3
7040060	Pavement Legend (White Hot-Sprayed Thermoplastic) (ONLY) (0.090")	EACH	17
7040110	Pavement Marking (White Hot Sprayed Thermoplastic) Transverse) (0.09")	L.F.	5,020
7060020	Pavement Marker, Reflective, (Type C, Clear, Red)	EACH	956
7060025	Pavement Marker, Reflective, (Type D, Yellow, Two-Way)	EACH	65
7060035	Pavement Marker, Reflective, (Type H, Yellow, One-Way)	EACH	162
7080010	Painted Pavement Symbol or Legend	EACH	24
7080001	Painted Pavement Marking	L.F.	106,910

Drawing Name	Marking Width	Marking Code	RPM Type	RPM Spacing	# of Lanes	Total Line as measured in Microstation Length	End Station	Location/Description	Actual	Total Pavement Markings	# RPMs	Arrows	ONLY	Bike	Merge Arrow
PM3	6	6" White Guide			1	183			46	69					
PM3	8	8" White Guide			1	622			156	311					
PM3	8	8" Solid White	Type C Markers	20	1	824			824	1648	41				
PM3	4	4" Broken White	Type C Markers	40	1	1,599			400	400	40				
PM3	6	6" Solid White			1	2,449			2449	3674					
PM3	8	8" Solid White			1	0			0	0					
PM3	12	12" Solid White (Cross Walks)			1	108			108	324					
PM3	24	24" Solid White (Cross Walks)			1	0			0	0					
PM3	4	4" Solid Yellow			1	2,451			2451	2451					
PM3	12	12" Solid Yellow			1	0			0	0					
PM3	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM3	4	4" Solid Double Yellow	Type D Markers	40	1	236			472	472	6				
PM3	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM3		Arrow			1				0			5			
PM3		ONLY			1				0				0		
PM3		Bike			1				0					2	
PM3		Merge Arrow													3
PM3			Type D Markers								0				
PM3			Type F Markers								0				
PM3			Type H Markers								6				
PM4	6	6" White Guide			1	0			0	0					
PM4	8	8" White Guide			1	0			0	0					
PM4	8	8" Solid White	Type C Markers	20	1	300			300	600	15				
PM4	4	4" Broken White	Type C Markers	40	1	3,201			800	800	80				
PM4	6	6" Solid White			1	3,201			3201	4802					
PM4	8	8" Solid White			1	0			0	0					
PM4	12	12" Solid White (Cross Walks)			1	0			0	0					
PM4	24	24" Solid White (Cross Walks)			1	0			0	0					
PM4	4	4" Solid Yellow			1	3,030			3030	3030					
PM4	12	12" Solid Yellow			1	0			0	0					
PM4	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM4	4	4" Solid Double Yellow	Type D Markers	40	1	0			0	0	0				
PM4	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM4		Arrow			1				0			0			
PM4		ONLY			1				0				0		
PM4		Bike			1				0					2	
PM4		Merge Arrow													0
PM4			Type D Markers								0				
PM4			Type F Markers								0				
PM4			Type H Markers								12				

Drawing Name	Marking Width	Marking Code	RPM Type	RPM Spacing	# of Lanes	Total Line as measured in Microstation Length	End Station	Location/Description	Actual	Total Pavement Markings	# RPMs	Arrows	ONLY	Bike	Merge Arrow
PM5	6	6" White Guide			1	0			0	0					
PM5	8	8" White Guide			1	0			0	0					
PM5	8	8" Solid White	Type C Markers	20	1	298			298	596	15				
PM5	4	4" Broken White	Type C Markers	40	1	3,201			800	800	80				
PM5	6	6" Solid White			1	3,201			3201	4802					
PM5	8	8" Solid White			1	0			0	0					
PM5	12	12" Solid White (Cross Walks)			1	0			0	0					
PM5	24	24" Solid White (Cross Walks)			1	0			0	0					
PM5	4	4" Solid Yellow			1	3,029			3029	3029					
PM5	12	12" Solid Yellow			1	0			0	0					
PM5	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM5	4	4" Solid Double Yellow	Type D Markers	40	1	0			0	0	0				
PM5	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM5		Arrow			1				0			0			
PM5		ONLY			1				0				0		
PM5		Bike			1				0					2	
PM5		Merge Arrow													0
PM5			Type D Markers								0				
PM5			Type F Markers								0				
PM5			Type H Markers								12				
PM6	6	6" White Guide			1	0			0	0					
PM6	8	8" White Guide			1	0			0	0					
PM6	8	8" Solid White	Type C Markers	20	1	303			303	606	15				
PM6	4	4" Broken White	Type C Markers	40	1	3,200			800	800	80				
PM6	6	6" Solid White			1	3,200			3200	4800					
PM6	8	8" Solid White			1	0			0	0					
PM6	12	12" Solid White (Cross Walks)			1	0			0	0					
PM6	24	24" Solid White (Cross Walks)			1	0			0	0					
PM6	4	4" Solid Yellow			1	3,031			3031	3031					
PM6	12	12" Solid Yellow			1	0			0	0					
PM6	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM6	4	4" Solid Double Yellow	Type D Markers	40	1	0			0	0	0				
PM6	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM6		Arrow			1				0			0			
PM6		ONLY			1				0				0		
PM6		Bike			1				0					2	
PM6		Merge Arrow													0
PM6			Type D Markers								0				
PM6			Type F Markers								0				
PM6			Type H Markers								12				

Drawing Name	Marking Width	Marking Code	RPM Type	RPM Spacing	# of Lanes	Total Line as measured in Microstation Length	End Station	Location/Description	Actual	Total Pavement Markings	# RPMs	Arrows	ONLY	Bike	Merge Arrow
PM7	6	6" White Guide			1	280			70	105					
PM7	8	8" White Guide			1	180			45	90					
PM7	8	8" Solid White	Type C Markers	20	1	377			377	754	19				
PM7	4	4" Broken White	Type C Markers	40	1	2,886			722	722	72				
PM7	6	6" Solid White			1	2,800			2800	4200					
PM7	8	8" Solid White			1	154			154	308					
PM7	12	12" Solid White (Cross Walks)			1	36			36	108					
PM7	24	24" Solid White (Cross Walks)			1	0			0	0					
PM7	4	4" Solid Yellow			1	2,794			2794	2794					
PM7	12	12" Solid Yellow			1	0			0	0					
PM7	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM7	4	4" Solid Double Yellow	Type D Markers	40	1	50			100	100	1				
PM7	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM7		Arrow			1				0			2			
PM7		ONLY			1				0				1		
PM7		Bike			1				0					4	
PM7		Merge Arrow													0
PM7			Type D Markers								0				
PM7			Type F Markers								0				
PM7			Type H Markers								12				
PM8	6	6" White Guide			1	347			87	130					
PM8	8	8" White Guide			1	247			62	124					
PM8	8	8" Solid White	Type C Markers	20	1	600			600	1200	30				
PM8	4	4" Broken White	Type C Markers	40	1	3,031			758	758	76				
PM8	6	6" Solid White			1	3,040			3040	4560					
PM8	8	8" Solid White			1	313			313	626					
PM8	12	12" Solid White (Cross Walks)			1	0			0	0					
PM8	24	24" Solid White (Cross Walks)			1	0			0	0					
PM8	4	4" Solid Yellow			1	2,836			2836	2836					
PM8	12	12" Solid Yellow			1	0			0	0					
PM8	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM8	4	4" Solid Double Yellow	Type D Markers	40	1	0			0	0	0				
PM8	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM8		Arrow			1				0			4			
PM8		ONLY			1				0				2		
PM8		Bike			1				0					2	
PM8		Merge Arrow													0
PM8			Type D Markers								0				
PM8			Type F Markers								0				
PM8			Type H Markers								24				

Drawing Name	Marking Width	Marking Code	RPM Type	RPM Spacing	# of Lanes	Total Line as measured in Microstation Length	End Station	Location/Description	Actual	Total Pavement Markings	# RPMs	Arrows	ONLY	Bike	Merge Arrow
PM9	6	6" White Guide			1	129			32	48					
PM9	8	8" White Guide			1	129			32	65					
PM9	8	8" Solid White	Type C Markers	20	1	300			300	600	15				
PM9	4	4" Broken White	Type C Markers	40	1	2,800			700	700	70				
PM9	6	6" Solid White			1	2,672			2672	4008					
PM9	8	8" Solid White			1	0			0	0					
PM9	12	12" Solid White (Cross Walks)			1	0			0	0					
PM9	24	24" Solid White (Cross Walks)			1	0			0	0					
PM9	4	4" Solid Yellow			1	2,619			2619	2619					
PM9	12	12" Solid Yellow			1	0			0	0					
PM9	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM9	4	4" Solid Double Yellow	Type D Markers	40	1	0			0	0	0				
PM9	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM9		Arrow			1				0			0			
PM9		ONLY			1				0				0		
PM9		Bike			1				0					2	
PM9		Merge Arrow													0
PM9			Type D Markers								0				
PM9			Type F Markers								0				
PM9			Type H Markers								12				
PM10	6	6" White Guide			1	541			135	203					
PM10	8	8" White Guide			1	541			135	271					
PM10	8	8" Solid White	Type C Markers	20	1	300			300	600	15				
PM10	4	4" Broken White	Type C Markers	40	1	2,752			688	688	69				
PM10	6	6" Solid White			1	3,078			3078	4617					
PM10	8	8" Solid White			1	420			420	840					
PM10	12	12" Solid White (Cross Walks)			1	480			480	1440					
PM10	24	24" Solid White (Cross Walks)			1	0			0	0					
PM10	4	4" Solid Yellow			1	2,764			2764	2764					
PM10	12	12" Solid Yellow			1	0			0	0					
PM10	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM10	4	4" Solid Double Yellow	Type D Markers	40	1	0			0	0	0				
PM10	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM10		Arrow			1				0			10			
PM10		ONLY			1				0				5		
PM10		Bike			1				0					4	
PM10		Merge Arrow													0
PM10			Type D Markers								0				
PM10			Type F Markers								0				
PM10			Type H Markers								24				

Drawing Name	Marking Width	Marking Code	RPM Type	RPM Spacing	# of Lanes	Total Line as measured in Microstation Length	End Station	Location/Description	Actual	Total Pavement Markings	# RPMs	Arrows	ONLY	Bike	Merge Arrow
PM11	6	6" White Guide			1	50			13	19					
PM11	8	8" White Guide			1	0			0	0					
PM11	8	8" Solid White	Type C Markers	20	1	776			776	1552	39				
PM11	4	4" Broken White	Type C Markers	40	1	2,936			734	734	73				
PM11	6	6" Solid White			1	2,997			2997	4496					
PM11	8	8" Solid White			1	111			111	222					
PM11	12	12" Solid White (Cross Walks)			1	692			692	2076					
PM11	24	24" Solid White (Cross Walks)			1	0			0	0					
PM11	4	4" Solid Yellow			1	2,781			2781	2781					
PM11	12	12" Solid Yellow			1	0			0	0					
PM11	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM11	4	4" Solid Double Yellow	Type D Markers	40	1	220			440	440	6				
PM11	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM11		Arrow			1				0			6			
PM11		ONLY			1				0				3		
PM11		Bike			1				0					4	
PM11		Merge Arrow													0
PM11			Type D Markers								0				
PM11			Type F Markers								0				
PM11			Type H Markers								36				
PM12	6	6" White Guide			1	280			70	105					
PM12	8	8" White Guide			1	180			45	90					
PM12	8	8" Solid White	Type C Markers	20	1	340			340	680	17				
PM12	4	4" Broken White	Type C Markers	40	1	2,801			700	700	70				
PM12	6	6" Solid White			1	2,444			2444	3666					
PM12	8	8" Solid White			1	40			40	80					
PM12	12	12" Solid White (Cross Walks)			1	0			0	0					
PM12	24	24" Solid White (Cross Walks)			1	0			0	0					
PM12	4	4" Solid Yellow			1	2,450			2450	2450					
PM12	12	12" Solid Yellow			1	0			0	0					
PM12	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM12	4	4" Solid Double Yellow	Type D Markers	40	1	0			0	0	0				
PM12	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM12		Arrow			1				0			2			
PM12		ONLY			1				0				0		
PM12		Bike			1				0					0	
PM12		Merge Arrow													0
PM12			Type D Markers								0				
PM12			Type F Markers								0				
PM12			Type H Markers								12				

Drawing Name	Marking Width	Marking Code	RPM Type	RPM Spacing	# of Lanes	Total Line as measured in Microstation Length	End Station	Location/Description	Actual	Total Pavement Markings	# RPMs	Arrows	ONLY	Bike	Merge Arrow
PM13	6	6" White Guide			1	0			0	0					
PM13	8	8" White Guide			1	0			0	0					
PM13	8	8" Solid White	Type C Markers	20	1	0			0	0	0				
PM13	4	4" Broken White	Type C Markers	40	1	378			95	95	9				
PM13	6	6" Solid White			1	0			0	0					
PM13	8	8" Solid White			1	0			0	0					
PM13	12	12" Solid White (Cross Walks)			1	0			0	0					
PM13	24	24" Solid White (Cross Walks)			1	0			0	0					
PM13	4	4" Solid Yellow			1	0			0	0					
PM13	12	12" Solid Yellow			1	0			0	0					
PM13	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM13	4	4" Solid Double Yellow	Type D Markers	40	1	0			0	0	0				
PM13	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM13		Arrow			1				0			0			
PM13		ONLY			1				0				2		
PM13		Bike			1				0					0	
PM13		Merge Arrow													0
PM13			Type D Markers								0				
PM13			Type F Markers								0				
PM13			Type H Markers								0				
PM14	6	6" White Guide			1	185			46	69					
PM14	8	8" White Guide			1	186			47	93					
PM14	8	8" Solid White	Type C Markers	20	1	17			17	34	1				
PM14	4	4" Broken White	Type C Markers	40	1	0			0	0	0				
PM14	6	6" Solid White			1	1,879			1879	2819					
PM14	8	8" Solid White			1	17			17	34					
PM14	12	12" Solid White (Cross Walks)			1	0			0	0					
PM14	24	24" Solid White (Cross Walks)			1	0			0	0					
PM14	4	4" Solid Yellow			1	0			0	0					
PM14	12	12" Solid Yellow			1	0			0	0					
PM14	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM14	4	4" Solid Double Yellow	Type D Markers	40	1	1,567			3134	3134	39				
PM14	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM14		Arrow			1				0			2			
PM14		ONLY			1				0				0		
PM14		Bike			1				0					0	
PM14		Merge Arrow													0
PM14			Type D Markers								0				
PM14			Type F Markers								0				
PM14			Type H Markers								0				

Drawing Name	Marking Width	Marking Code	RPM Type	RPM Spacing	# of Lanes	Total Line as measured in Microstation Length	End Station	Location/Description	Actual	Total Pavement Markings	# RPMs	Arrows	ONLY	Bike	Merge Arrow
PM15	6	6" White Guide			1	180			45	68					
PM15	8	8" White Guide			1	150			38	75					
PM15	8	8" Solid White	Type C Markers	20	1	284			284	568	14				
PM15	4	4" Broken White	Type C Markers	40	1	0			0	0	0				
PM15	6	6" Solid White			1	830			830	1245					
PM15	8	8" Solid White			1	284			284	568					
PM15	12	12" Solid White (Cross Walks)			1	355			355	1065					
PM15	24	24" Solid White (Cross Walks)			1	0			0	0					
PM15	4	4" Solid Yellow			1	0			0	0					
PM15	12	12" Solid Yellow			1	0			0	0					
PM15	24	24" Solid Yellow (Cross Walks)			1	0			0	0					
PM15	4	4" Solid Double Yellow	Type D Markers	40	1	509			1018	1018	13				
PM15	4	4" Solid Broken Yellow	Type D Markers	40	1	0			0	0	0				
PM15		Arrow			1				0			6			
PM15		ONLY			1				0				4		
PM15		Bike			1				0					0	
PM15		Merge Arrow													0
PM15			Type D Markers								0				
PM15			Type F Markers								0				
PM15			Type H Markers								0				

Description	Total Pavement Markings	Actual Stripe Length
4" Solid Yellow	27,785	27,785
4" Solid Double Yellow	5,164	5,164
4" Solid Broken Yellow	0	0
6" Solid White	47,687	31,791
6" Solid Yellow	0	0
8" Solid White	12,116	6,058
6" Solid Double Yellow	0	0
12" Solid White	0	0
12" Solid White (Cross Walks)	5,013	1,671
24" Solid White (Cross Walks)	0	0
12" Solid Yellow	0	0
24" Solid Yellow (Cross Walks)	0	0
12" Solid White (Stop Bars)	0	0
18" Solid White (Stop Bars)	0	0
4" Broken White	7,196	7,196
6" Broken White	0	0
12" Broken White (Aux)	0	0
4" White Guide	0	0
6" White Guide	816	544
8" White Guide	1,118	559
Arrow	37	NA
ONLY	17	NA
Bike	24	NA
Merge Arrow	3	NA
Type C Markers	956	NA
Type D Markers	65	NA
Type E Markers	0	NA
Type F Markers	0	NA
Type G Markers	0	NA
Type H Markers	162	NA
Paint Bullnose Yellow	0	NA
Paint Bullnose White	0	NA
4" Solid White (Paint)	73,945	NA
4" Solid Yellow (Paint)	32,949	NA
Symbol (Paint)	57	NA
Delineators (M-25) - Single White or Single Yellow	0	NA
Delineators (M-25) - Double White or Double Yellow	0	NA
Delineators (Flexible) - Single White or Single Yellow		NA
6" Solid White Obliteration	0	NA
4" Solid Double Yellow Obliteration	0	NA
12" Solid White Obliteration	0	NA
Remove Marker	0	NA

Item 9080001 – Concrete Curb (Std. Dtl. 209)(Type 1)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTWWE	SHT. NO.
9080001	Concrete Curb (Std. Dtl. 209) (Type 1)	BY ABG	DATE 8/1/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (LF)	
Valencia Road	4RTWWE	29105.9	
	Total	29,106	L.F.

Item 9080006 – Concrete Wedge Curb (Std. Dtl. 209)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTWWE	SHT. NO.
9080006	Concrete Wedge Curb (Std. Dtl. 209)	BY ABG	DATE 8/10/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (LF)	
Valencia Road	4RTVWE	77	
	Total	77	L.F.

Item 9080090 – Concrete Curb Terminal Section (Std. Dtl. 212)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
9080090	Concrete Curb Terminal Section (Std. Dtl. 212)	BY ABG	DATE 8/10/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (EA)	
Valencia Road	4RTVWE	8	
	Total	8	EA

Item 9080105 – Concrete Curb Transition

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
9080105	Concrete Curb Transition	BY ABG	DATE 8/1/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (LF)	
Valencia Road	4RTVWE	72.00	
	Total	72	L.F.

Item 9080201 – Concrete Sidewalk

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
9080201	Concrete Sidewalk	BY ABG	DATE 8/10/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (SF)	
Valencia Road	4RTVWE	44211	
	Total	44,211	S.F.

Item 9080203 – Concrete Sidewalk (6”)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
9080203	Concrete Sidewalk (6")	BY ABG	DATE 8/1/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (SF)	
Valencia Road	4RTVWE	251.00	
	Total	251	S.F.

Item 9080280 – Curb Access Ramp, Std. Dtl. 207 (Type 1)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
9080280	Curb Access Ramp, Std. Dtl. 207 (Type 1)	BY ABG	DATE 8/10/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (EA)	
Valencia Road	4RTVWE	10	
	Total	10	EA

Item 9080285 – Median Refuge Area (Type 1)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
9080285	Median Refuge Area (Type 1)	BY ABG	DATE 8/1/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (EA)	
Valencia Road	4RTVWE	2.00	
	Total	2	EA

Item 9080402 – Concrete Header

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
9080402	Concrete Header	BY ABG	DATE 8/1/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (LF)	
Valencia Road	4RTVWE	1535.00	
	Total	1,535	L.F.

Item 9080504 – Concrete Ford Wall (1’ x 4’)

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY	PROJECT NO.	4RTVWE	SHT. NO.
9080504	Concrete Ford Wall (1' x 4')	BY ABG	DATE 8/10/2016	1
QUANTITIES		CKD BY RPS		

Location	Plan #	Quantity (LF)	
Valencia Road	4RTVWE	80	
	Total	80	L.F.

Item 9090002 – Survey Monument

PROJECT	VALENCIA ROAD - WADE ROAD TO AJO WAY					PROJECT NO.	4RTVWE	SHT. NO.
9090002	Survey Monument					BY ABG	DATE 8/1/2016	1
QUANTITIES						CKD BY RPS		
	Location	**Plan #**	**Quantity (EA)**					
	Valencia Road	4RTVWE	13.00					
		Total	**13**	**EA**				

APPENDIX B PUBLIC INVOLVEMENT INFORMATION

APPENDIX C INITIAL DESIGN PHASE - DESIGN CONCEPT PLANS & RECORD OF SURVEY (BOUND SEPARATELY)

APPENDIX D UTILITY CONFLICT TRACKING TABLE

4RTVWE: VALENCIA ROAD-WADE ROAD TO AJO WAY UTILITY CONFLICT TABLE			
FACILITY	STATION	OFFSET	CONFLICT
TEP	85+00 - 89+00	RT of rdwy CL	OHE and pole within new pavement
TEP	89+00 - 97+00	RT of rdwy CL	OHE and pole within new pavement
Tucson Water	90+72	68' RT	Drainage: Drop inlet, close proximity to TW non-disturbance requirements for 42" water main
Tucson Water	92+85	44' RT	Roadway: Pavement, adjust water rectifier
Tucson Water	95+77 - 96+43	63' RT	Drainage : 45"x29" HERCP, close proximity to TW non-
SW Gas	90+93 - 91+80	5' RT	Drainage: 24" CMP close proximity to high pressure 6" gas
SW Gas	93+12	34' RT	Roadway: Pavement, adjust gas valve
SW Gas	93+45	48' RT	Roadway: Pavement, adjust gas valve
SW Gas	95+70 - 96+10	48' RT	Drainage and Roadway: 45" x 29" HERCP close proximity
TEP	97+00 - 105+00	RT of rdway CL	OHE and pole within new pavement
Tucson Water	100+81	68' RT	Drainage, close proximity to corrosion test station
Tucson Water	99+97 - 101+75	65' RT	Drainage: close proximity to TW non-disturbance
SW GAS	100+60 - 101+08	42' RT	Drainage: 10' x 4' RCBC and pavement, close proximity to 4" gas main
TEP	105+00 - 113+00	RT of rdwy CL	OHE and pole within new pavement
Tucson Water	108+15	68' RT	Drainage, close proximity to corrosion test station
TEP	113+00 - 121+00	RT of rdwy CL	OHE and pole within new pavement
Tucson Water	115+59 - 115+36	68' RT	Drainage: Drop inlet close proximity to TW non-
Tucson Water	117+52 - 118+38	68' RT	Drainage: Drop inlet close proximity to TW non-disturbance
Tucson Water	116+73	68' RT	Drainage, close proximity to corrosion test station
TRICO-CenturyLink-Comcast	117+98	58' RT	Drainage: Exist Power pole in conflict with drop inlet.
SW GAS	114+29 - 114+67	43' RT	Drainage: 8' x 4' RCBC, close proximity to 4" gas main
SW GAS	117+80 - 118+10	43' RT	Drainage: 53" x 34" HERCP close proximity to 4" gas main
TEP	121+00 - 122+50	RT of rdwy CL	OHE and pole within new pavement
TRICO	121+00 - 129+00	58' RT	Roadway: Cut-Fill
Tucson Water	122+46 - 122+94	68' RT	Drainage: Drop inlet, close proximity to TW non-
Tucson Water	128+70	60' RT	Drainage, close proximity to corrosion test station
Tucson Water	128+71	61' RT	Drainage, close proximity water rectifier
SW GAS	122+53 - 122 +86	45' RT	Drainage: 53" x 34" HERCP, close proximity to 4" gas main
TRICO	134+00 - 137+00	58' RT	Roadway: Cut-Fill
Tucson Water	131+46 - 123+28	68' RT	Drainage: Drop inlet, close proximity to TW non-
Tucson Water	133+45 - 135+23	68' RT	Drainage: Drop inlet, close proximity to TW non-
Tucson Water	130+66	68' RT	Drainage, close proximity to corrosion test station
SW GAS	131+76 - 131+97	39' RT	Drainage: 48" CMP close proximity to 4" gas main
SW GAS	134+05 - 134+56	44' RT	Drainage: 10' x 4' RCBC , close proximity to 4" gas main
TRICO	137+00 - 145+00	58' RT	Roadway: Cut-Fill
TRICO-CenturyLink-Comcast	143+28	58' RT	Drainage: Exist Power pole in conflict with drop inlet.
Tucson Water	142+62 - 144+44	68' RT	Drainage: Drop inlet, close proximity to TW non-
Tucson Water	142+23	68' RT	Drainage, close proximity to corrosion test station
SW GAS	142+77 - 143+36	41' RT	Drainage and Roadway: 10' x 4' RCBC and pavement,
TRICO	152+00 - 160+00	58' RT	Roadway: Cut-Fill
Tucson Water	149+33	68' RT	Drainage, close proximity to corrosion test station
METRO WATER	153+41	94' RT	Roadway: Pavement, conflict with water valve, elevate to
TRICO	152+00 - 160+00	58' RT	Roadway: Cut-Fill
Tucson Water	155+28 - 155+78	68' RT	Drainage: Drop inlet, close proximity to TW non-

FACILITY	STATION	OFFSET	CONFLICT
PCRWWRD	153+59	84.5' RT	Roadway: Pavement, adjust manhole # 3862-06 rim
PCRWWRD	159+39	84' RT	Roadway: Adjust manhole # 3862-04 rim elevation to
SW GAS	155+43 - 155+58	37' RT	Drainage: 48" CMP, close proximity to 4" gas main
TRICO	160+00 - 163+00	58' RT	Roadway: Cut-Fill
Tucson Water	161+19 - 162+28	69' RT	Drainage: Drop inlet, close proximity to TW non-
Tucson Water	165+24 - 167+34	73' RT	Drainage: Drop inlet, close proximity to TW non-
SW GAS	161+84 - 162+12	39' RT	Drainage: 30" CMP, close proximity to 4" gas main
SW GAS	166+09 - 166+46	48' RT	Drainage: 48" CMP, close proximity to 4" gas main
CENTURY LINK	175+13	68' RT	Roadway: Fill, pedestal to grade
METRO WATER	173+80	35' LT	Roadway: Pavement, adjust three water valves to grade
METRO WATER	175+30 - 175+97	35' LT	Drainage: 8' x 4' RCBC, close proximity to water line
PCRWWRD	169+60	97' RT	Roadway: Adjust manhole # 3779-09 rim elevation to
PCRWWRD	173+20	45' LT	Roadway: Pavement, adjust manhole # 3863-17 rim
TRICO	174+87	7' RT	Drainage: 10' x 4' RCBC, close proximity to underground
SW GAS	170+94 - 171+50	51' RT	Drainage: 10' x 4' RCBC, close proximity to 4" gas main
SW GAS	174+05 - 175+12	52' RT	Drainage: 8' x 4' RCBC, close proximity to 4" gas main
METRO WATER	178+22 - 178+75	35' LT	Drainage: 60" x 38" HERCP, close proximity to water line
METRO WATER	179+89 - 180+34	35' LT	Drainage: 53" x 34" HERCP, close proximity to water line
SW GAS	176+95 - 178+23	58' RT	Drainage: 60" x 38" HERCP, close proximity to 4" gas main
SW GAS	179+99 - 181+07	58' RT	Drainage: 53" x 34" HERCP, close proximity to 4" gas main
METRO WATER	187+86 - 188+45	36' LT	Drainage: 8' x 4' RCBC, close proximity to water line
SW GAS	187+01 - 189+81	57' RT	Drainage: 8' x 4' RCBC, close proximity to 4" gas main
TRICO	189+52	72' RT	Drainage: Exist Power pole in conflict with drop inlet.
METRO WATER	192+35	38' LT	Roadway: Pavement, adjust three water valves to grade
METRO WATER	194+60 -194+95	39' LT	Drainage: 36" CMP, close proximity to water line
PCRWWRD	192+26	49' LT	Roadway: Pavement, adjust manhole # 3779-34 rim
TRICO	194+75	70' RT	Drainage: Exist Power pole in conflict with drop inlet.
SW GAS	194+62 - 195+26	54' RT	Drainage: 36" CMP, close proximity to 4" gas main
METRO WATER	200+46 - 200+80	75' LT	Drainage: 45" x 29" HERCP, close proximity to 12" water line
SW GAS	198+26 - 198+51	52' RT	Drainage: 36" CMP, close proximity to 4" gas main
SW GAS	200+61 - 200+95	48' RT	Drainage: 45" x 29" HERCP, close proximity to 4" gas main
TRICO	198+19 - 198+60	54' LT	Drainage: Outlet structure, close proximity to underground
TRICO	198+19 - 198+60	58' LT	Drainage: Outlet structure, close proximity to underground
TRICO	198+26 - 198+51	36' LT	Drainage: 36" CMP, close proximity to underground power
TRICO	200+63 - 201+56	65' RT	Drainage: Drop inlet floor close proximity to underground
Tucson Water	197+95 - 198+85	80' RT	Drainage: Drop inlet, close proximity to TW non-
Tucson Water	200+62 - 200+96	80' RT	Drainage: 45" x 29" HERCP, close proximity to water line
CenturyLink	200+50 - 201+52	64' RT	Drainage: Drop inlet floor close proximity to UGT
CenturyLink	200+03	92' RT	Roadway: Existing pedistal falls within roadway pavement
METRO WATER	208+48 - 209+11	44' LT	Drainage: 10' x 5' RCBC, close proximity to 8" water line
SW GAS	208+48 - 209+11	45' RT	Drainage: 10' x 5' RCBC, close proximity to 4" gas main
TRICO	208+45 - 209+12	61' RT to 56' RT	Drainage: 10' x 5' RCBC, close proximity to underground
TRICO	208+42 - 209+16	40' RT	Drainage: 10' x 5' RCBC, close proximity to underground
Tucson Water	208+48 - 209+11	49' RT to 47' RT	Drainage: 10' x 5' RCBC, close proximity to water line
PCRWWRD	212+57	40' RT	Roadway: Pavement, adjust manhole # 5458-01 rim
PCRWWRD	212+69	50' RT	Roadway: Pavement, adjust manhole # 5471-01 rim
CenuryLink	208+44 - 209+11	45' RT	Drainage: Drop Inlet close proximity to UGT
PCRWWRD	214+28	40' RT	Roadway: Pavement, adjust manhole # 5458-02 rim
PCRWWRD	214+35	45' RT	Roadway: Pavement, adjust manhole # 5471-02 rim
PCRWWRD	218+93	48' RT	Roadway: Pavement, adjust manhole # 5471-03 rim

FACILITY	STATION	OFFSET	CONFLICT
PCRWWRD	219+89 - 220+28	47' RT	Drainage: 42" CMP, close proximity to sewer line
SW GAS	219+08	78' LT - 92' LT	Drainage: new culvert pipes conflict with existing 4" gas
SW GAS	219+58 - 220+00	63' LT	Drainage: 42" CMP, close proximity to 4" gas main
TRICO	218+99	85' LT	Drainage: new culvert pipes conflict with two N-S existing
TRICO	219+52 - 220+68	56' RT	Drainage: Drop inlet, close proximity to underground
TRICO	219+52 - 220+69	58' RT	Drainage: Drop inlet, close proximity to underground
TRICO	219+90	57' RT	Drainage: Drop inlet, OHE and pole to be relocated
TRICO	220+25	59' RT	Drainage: Drop inlet, OHE and pole to be moved
TRICO	219+52 - 220+01	50' LT to 59' RT	Drainage: 42" CMP, Drop inlet, underground power lines
TRICO	219+63 - 220+01	48' LT to 58' RT	Drainage: 42" CMP, Drop inlet, underground power lines
Tucson Water	219+15	26' RT	Roadway: Adjust water valve elevation to grade
Tucson Water	219+52 - 220+68	68' RT	Drainage: Drop inlet, close proximity to TW non-
Tucson Water	219+84 - 220+23	28' RT	Drainage: 42" CMP, close proximity to water line
CenturyLink	219+85	85' LT	Drainage: new culvert pipes conflict with existing 3 N-S
CenturyLink	219+60 - 219+88	78' LT	Drainage: Outlet structure close proximity to UGT
Metro Water	219+33	88" LT - 102' LT	Drainage: New culvert pipes conflict with two N-S existing
PCRWWRD	222+72	47' RT	Roadway: Adjust manhole # 5471-04 rim elevation to
PCRWWRD	226+57	45' RT	Drainage: 53" x 34" HECRP, adjust manhole # 5471-05 rim
PCRWWRD	226+52 - 226+99	45' RT	Drainage: 53" x 34" HECRP, close proximity to 12" PVC
SW GAS	225+36 - 226+27	61' LT	Drainage: 53" x 34" HECRP, close proximity to 4" gas main
Tucson Water	226+06	35' RT	Roadway: Adjust water valve elevation to grade
Tucson Water	226+12	29' RT	Roadway: Adjust water valve elevation to grade
Tucson Water	226+35 - 227+35	68' RT	Drainage: Drop inlet, close proximity to TW non-disturbance requirements for 42" water main
Tucson Water	226+38 - 226+85	29' RT	Drainage: 53" x 34" HECRP, close proximity to water line
CentryLink	225+78	57' LT to 43' LT	Drainage: Outlet structure close proximity to UGT
PCRWWRD	230+08	45' RT	Roadway: Adjust manhole # 4075-01 rim elevation to
PCRWWRD	231+29	46' RT	Roadway: Adjust manhole # 5471-06 rim elevation to
Tucson Water	230+17	29' RT	Roadway: Adjust water valve elevation to grade

APPENDIX E DRAFT FINAL TRAFFIC MEMORANDUM

4RTVWE – Valencia Road (Wade Road to Ajo Way)

Draft Final Traffic Memorandum

October 17, 2016

Prepared for:
Pima County Department of Transportation

Prepared by:
Kimley-Horn and Associates, Inc.
333 E. Wetmore Road, Suite 280
Tucson, AZ 85705

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Draft Final Traffic Engineering Memorandum

4RTVWE - Valencia Road (Wade Road to Ajo Hwy)

INTRODUCTION

This memorandum serves as a supplement to the July 2011 *Traffic Engineering Study for Valencia Road, Mountain Eagle Drive to Mark Road (4RTVMW and 4RTVWE).* **This memorandum's focus corridor is Valencia Road between Wade Road and Ajo Hwy, located in southwest Tucson, Arizona within unincorporated Pima County – Project # 4RTVWE.** This project will reconstruct the current roadway section into a four-lane divided roadway. The roadway improvements will provide capacity for future traffic demands to reduce congestion and improve safety.

PURPOSE

The purpose of the memorandum is to update and document traffic laneage and storage recommendations found in the July 2011 *Traffic Engineering Study* based on 2016 traffic count data and other relevant and available traffic studies in the area. The development and documentation of the following design inputs are critical to the completion of this project, and are provided within this Traffic Engineering Memorandum:

- Intersection geometry
- Median opening requirements;
- Turn lane storage lengths, based on PCDOT Pavement Marking Standards (Sheet No. 4-6). At SR86, ADOT PGP 430 will be used to verify minimum left and right-turn storage requirements;
- Signalization nodes; and
- Design year & ADT / heavy vehicle %.

PREVIOUS TRAFFIC STUDIES / REPORTS:

The following traffic studies/reports reflect new public infrastructure projects and development in the vicinity of the study corridor:

- *State Route 86 Traffic Analysis Study: Kinney Road to Continental Road*; February 2007
- *State Route 86: Sandario Road to Kinney Road, Final Design Concept Report (DCR)*, April 2010
- *Traffic Engineering Study for Valencia Road, Mountain Eagle Drive to Mark Road (4RTVMW and 4RTVWE)*, July 2011
- *Sendero Pass Traffic Impact Analysis (16415-P)*; August 22, 2016
- *Southwest Infrastructure Report*, 2007 (1980)
- *Sonoran Ranch Estates II – Traffic Statement and Approved Construction Plans*

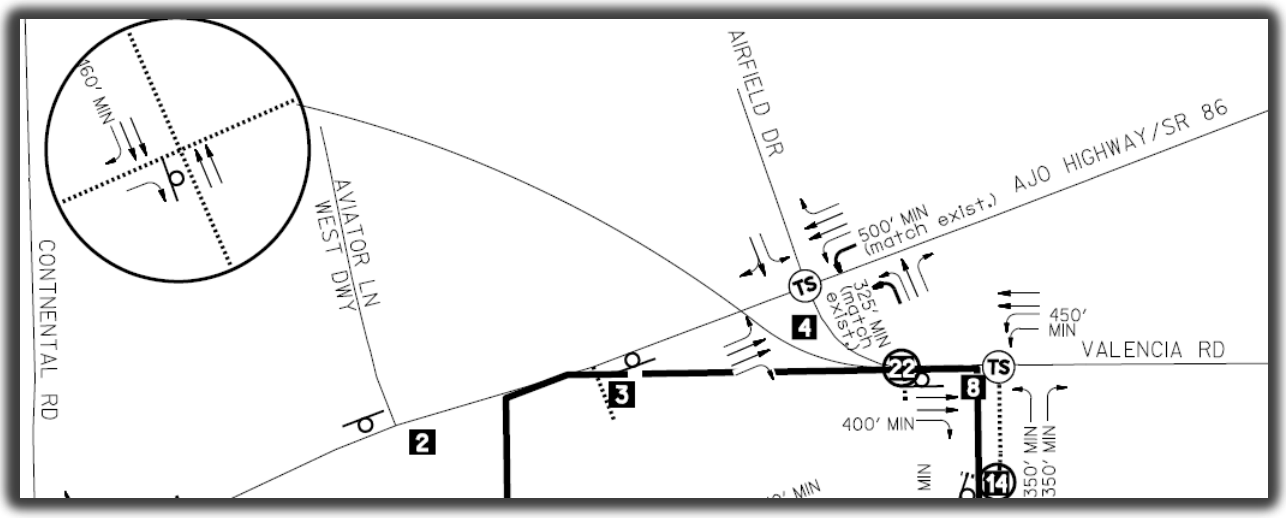
The State Route 86 Traffic Analysis Study evaluated the needs of SR 86 between Kinney Road and Continental Road for years 2007 and 2030. Year 2030 traffic was forecasted using Pima Association of

Governments (PAG) travel demand model. The study recommended a traffic signal at Valencia / SR86 for year 2007 conditions. For year 2030, Valencia Road is shown to be realigned approximately 1200-feet to the east along SR86, establishing a new “T” intersection with SR86. The configuration would also result in a “T” intersection with SR86 / Airfield Drive (at the existing intersection SR86 /Valencia-Airfield). **It should be noted that while this report included the intersection relocation, the actual design by ADOT (H6806, dated 2015) moved the intersection back to where it is today.** The current intersection location also corresponds with the Ryan Airfield Master Plan.

The State Route 86 DCR recommends a new traffic signal at the existing SR86 / Valencia Road intersection. The DCR states that this signalized intersection operates at **LOS B** for both the AM and PM periods in 2030 and **LOS A** for both the AM and PM periods in 2007 (opening year with signalization).

Traffic Engineering Study for Valencia Road, Mountain Eagle Drive to Mark Road (4RTVMW and 4RTVWE) was completed in 2011. The study recommended traffic signals at the intersection of Vahalla Road, Iberia Road and Wade Road (currently signalized) based on 2030 traffic volume forecasts. Dedicated right and left turn lanes were recommended to accommodate the signalized intersections.

The Sendero Pass Traffic Analysis evaluated the traffic impacts of the proposed development situated on 837 acres of land south of Ryan Airfield. The development would have a significant impact to Valencia Twin Mustang Trail and the driveway to Lots 32,33 (intersection #22 in the TIA) are shown in Exhibit 1 above. The ultimate year 2030 Valencia Road / Twin Mustang Trail intersection recommends dual



westbound to southbound left turn lanes (450-ft min), two westbound thru lanes, a dedicated eastbound to southbound right turn lane (400-ft min), and two eastbound thru lanes. In addition, Intersection # 22 shows right-in/ right-out access onto Valencia within the curve. The Sendero Pass traffic study recommends improvements to the newly constructed SR86/Valencia intersection for the 2030 horizon year. The improvements are the addition of a westbound to southbound left-turn lane, resulting in dual Lefts (500-ft min) – No additional improvements to the intersection were shown

Pima County project 4RTVWE will design the median opening locations fronting the Sendero Pass and Pomegranate Farms properties to match the Sendero Tentative Plat and the preliminary line work obtained from Pomegranate Farms. While project 4RTVWE will not construct the developments ultimate dual left turn and right turn lane configurations, the project will design the roadway width, median width, and drainage infrastructure at Twin Mustang Trail to accommodate these future laneage needs that will be constructed by the developer. Traffic signal conduit and pull boxes will also be installed with project 4RTVWE.

Southwest Infrastructure Report (SIR), updated 2007 – The SIR indicated that Pima County plans to improve Valencia Road to a four-lane divided roadway between Ajo Highway and Mark Road and that this project will be funded through the Regional Transportation Authority (RTA). The proposed improvements included: four travel lanes (two in each direction), six-foot paved shoulders, four-foot graded and landscaped shoulders and Americans with Disabilities Act (ADA) compliant pedestrian pathways.

The Sonoran Ranch Estates II traffic statement states that the original construction of offsite turn lanes associated with the original plat were still valid for this approved construction plan and are to receive no improvements. As such, project 4RTVWE will only construct the driveway and associated curb returns as well as the turn lanes accessing Reed Bunting to match existing conditions. The driveway will accommodate three lanes; 12-ft ingress, 12-ft left turn lane, and 12-ft egress. Pavement is 2.5 AC (Mix 2) / 4" AB.

Additional developments and studies that were not reviewed or made available include Pomegranate Farms and Sonoran Ranch Estates. The Pomegranate Farms development is to occur on the western portion of Valencia Road, adjacent to Sendero Pass.

EXISTING CONDITIONS

This segment of roadway is classified as Major Collector (Dated 8/19/2014 - FHWA Division Office). The Pima County Major Streets and Scenic Routes Plan (MSSR) and Ordinance establishes the entire Valencia Road project segment as Major Scenic Route and High Volume Arterial with 200-foot Right-of-Way. The posted speed limit is 45MPH.

Within the study area, Wade Road is the only signalized intersection and has recently been constructed based on the recommendations of the 2011 Traffic Study. All other intersections have the same configurations documented in the 2011 study. **Figure 1** illustrates the existing conditions at cross-streets along Valencia Road.

Traffic Count Data

Traffic count data was collected on Wednesday, April 6, 2016. The following data was collected:

- AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak period turning movement counts at the Valencia Road / Wade Road intersection.
- 24-Hour direction daily traffic volumes with vehicle classifications:
    - Valencia Road, west of Via Molino De Viento;
    - Valencia Road, between Star Diamond Place and Wade Road.

The collected 24-hour traffic tube counts (**Appendix A**, and depicted in Figure 2) revealed the following traffic patterns

- West of Via Molino De Viento, traffic volumes on Valencia Road reach 2,899 vehicles per day (VPD). This represents a 39% decrease as compared to the 2011 Traffic Study where 4,724 vpd was counted.
- Between Star Diamond Place and Wade Road, the current daily traffic volumes along Valencia reach 9,700 VPD, an increase of 7.6 percent when compared to the 2011 traffic study where 9015 vpd was counted.
- The 24-hour traffic counts indicate an approximate 9% K-Factor.

The turning movement count data collected at Wade Road is provided in **Appendix B**.

The AM/PM peak period turning movement volumes at Valencia Road and Wade Road illustrated the following traffic patterns, see **Figure 2**:

- The 2016 turning movement counts show that the total entering traffic volumes at the Valencia Road and Wade Road intersection during the AM peak period is 1,158 vehicles per hour. This is a negligible percent increase in traffic volumes (0.2%) as compared to the turning movement counts collected in 2011.
- For the PM peak period, the 2016 turning movement counts show that the total entering traffic volumes is 965 vehicles per hour. In 2011, the intersection had 1,452 vehicles per hour. Which

indicates a 33.5% reduction in traffic at the intersection. The recently constructed extension of Camino Verde to the south of Valencia Road has changed traffic patterns in the area.

- The direction split (D-factor) of the traffic for the 24-hour period is around 50% for both the EB and WB. For the AM peak period, the heavy direction of traffic is in the EB direction and the PM peak period shows the heavy direction of traffic in the WB direction.

Heavy Vehicle Percentage

Vehicle classification collected with the 24-hour traffic volume data collection on April 6, 2016. The Federal Highway Association (FHWA) defines heavy vehicles that fall within the categories of "2 Axle 6 Tire" through ">6 Axle Multi". The existing vehicle classifications are summarized in **Table 1**.

Table 1 - Vehicle Classification Data

Bikes	Cars & Trailers	2 Axle Long	Bus	2 Axle 6-Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	5 Axle Multi	6 Axle Multi	>6 Axle Multi
Valencia, West of Via Molino De Viento												
9	1866	622	10	375	4	1	10	2	0	0	0	0
0.3%	64.4%	21.5%	0.3%	12.9%	0.1%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%
Valencia Road, Between Star Diamond Place and Wade Road												
17	6628	1833	99	1047	30	6	24	3	5	7	1	0
0.2%	68.3%	18.9%	1.0%	10.8%	0.3%	0.1%	0.2%	0.0%	0.1%	0.1%	0.0%	0.0%

The vehicle classifications along Valencia Road, west of Via Molino De Viento, show that the heavy vehicle percentage for the eastbound direction is 6.6% and the westbound direction is 19.8%. A total of 13.4% of heavy vehicles were observed for both directions. Between Star Diamond Place and Wade Road, Valencia Road was observed to have 5.0% for the eastbound direction and 17.7% for the westbound direction. The total heavy vehicle percentage is 11.6%, which is lower than what was observed west of Via Molino since there is a higher volume of light-duty vehicles further east of the study area. The 24-hour count data with vehicle classifications are in **Appendix A.**

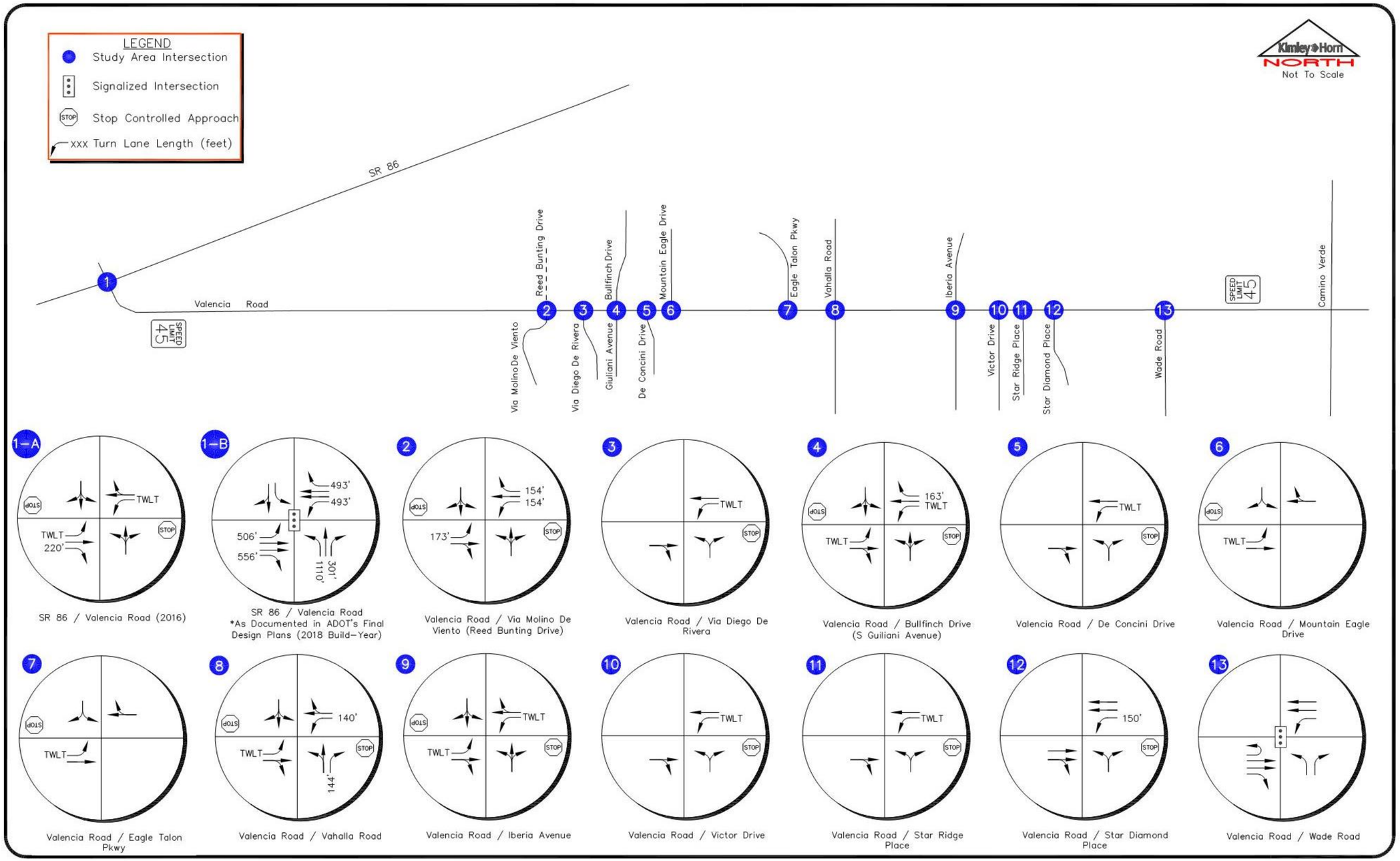


Figure 1 - Existing Conditions

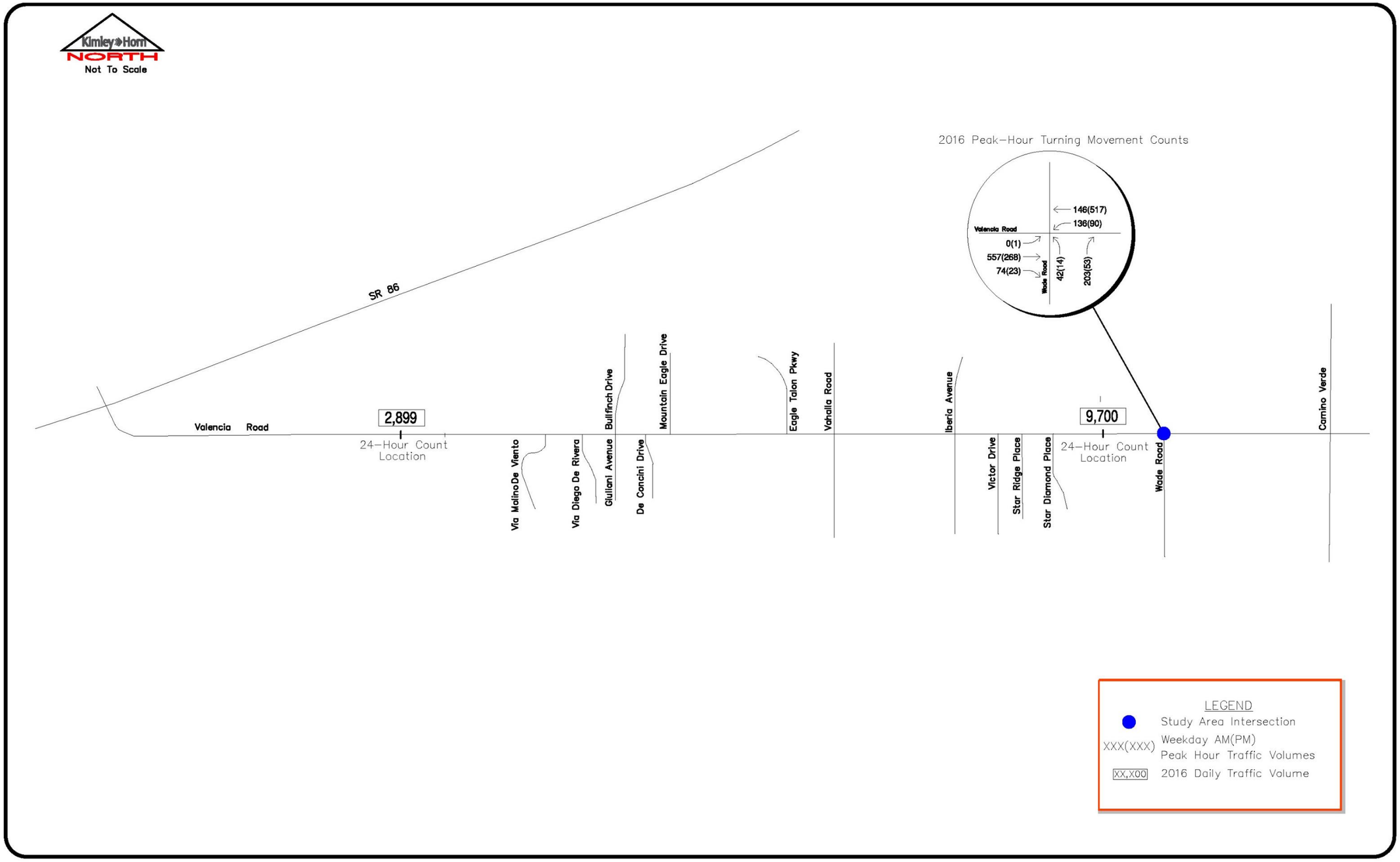


Figure 2 - 2016 Traffic Volumes

Crash Summary

A crash analysis was performed for study area intersections and segments. The historic crash data for intersections and segments along Valencia Road during the period of August 1, 2011 to August 31, 2015 was provided by PCDOT and is included in **Appendix C**. In total, 24 crashes occurred during the analysis period.

Intersection related crashes are summarized in **Table 2**, and segment related crashes are summarized in **Table 3**.

The crash rates are compared to the average crash rates documented in the PCDOT Safety System Management Report (2013). Study area intersections that are not listed indicate that no crashes occurred at them during the analysis period.

Table 2 - Intersection Crash Data Summary

	Valencia Road at Victor Drive		Valencia Road at Iberia Avenue		Valencia Road at Vahalla Road		Valencia Road at Mountain Eagle Drive		Valencia Road at De Concini	
Severity	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**
Fatal	0	0%	0	0%	0	0%	0	0%	0	0%
Class 4 Injury	0	0%	0	0%	1	50%	0	0%	0	0%
Class 3 Injury	0	0%	1	25%	1	50%	0	0%	0	0%
Class 2 Injury	0	0%	0	0%	0	0%	0	0%	1	100%
Bodily Injury	0	0%	0	0%	0	0%	0	0%	0	0%
PDO	1	100%	3	75%	0	0%	1	100%	0	0%
Total Crashes	1	-	4	-	2	-	1	-	1	-
Severity Index	1.00	-	1.25	-	3.90	-	1.00	-	2.00	-
Average Severity Index	1.44	-	1.44	-	1.44	-	1.44	-	1.44	-
Crash Type	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**
Turning	0	0%	1	25%	1	50%	0	0%	0	0%
Angle	0	0%	0	0%	1	50%	0	0%	0	0%
Rear-end	1	100%	1	25%	0	0%	1	100%	1	100%
Out of Control	0	0%	0	0%	0	0%	0	0%	0	0%
Sideswipe	0	0%	0	0%	0	0%	0	0%	0	0%
Fixed Object	0	0%	0	0%	0	0%	0	0%	0	0%
Backing	0	0%	0	0%	0	0%	0	0%	0	0%
Head on	0	0%	1	25%	0	0%	0	0%	0	0%
Pedestrian	0	0%	0	0%	0	0%	0	0%	0	0%
Animal	0	0%	0	0%	0	0%	0	0%	0	0%
Miscellaneous	0	0%	1	25%	0	0%	0	0%	0	0%
Total Crashes	1	-	4	-	2	-	1	-	1	-
Daily ADT	9,700	-	9,700	-	9,700	-	2,899	-	2,899	-
Crash Rate	0.06	-	0.23	-	0.11	-	0.19	-	0.19	-
Average Crash Rate	0.39	-	0.39	-	0.39	-	0.39	-	0.39	-

No study area intersections exhibited a crash rate higher than the PCDOT Safety Management System Management Report three-year average crash rate of 0.39 crashes per million entering vehicles (unsignalized intersections). The unsignalized intersections of Valencia Road / Vahalla Road and Valencia Road / De Concini exhibit a severity index higher than the average severity index for all unsignalized intersections within Pima County. Each intersection that experienced crashes is summarized below.

Valencia Road at Victor Drive Intersection

This unsignalized intersection had a crash rate of 0.06 crashes per million entering vehicles and a severity index of 1.00, a value lower than the Pima County severity index average of 1.44. Only 1 rear-end crash occurred at this intersection which resulted in Property Damage Only (PDO).

Valencia Road at Iberia Avenue Intersection

This unsignalized intersection had a crash rate of 0.23 crashes per million entering vehicles and a severity index of 1.25, a value lower than the Pima County severity index average of 1.44. A total of 4 crashes occurred at this intersection. The crash types include Turning, Head-On, and Rear-end collisions.

Valencia Road at Vahalla Road Intersection

This unsignalized intersection had a crash rate of 0.11 crashes per million entering vehicles and a severity index of 3.90, a value higher than the Pima County severity index average of 1.44. The crash types involved Turing and Angle related crashes with Class 4 Injury and Class 3 Injury severities.

Valencia Road at Mountain Eagle Drive Intersection

This unsignalized intersection had a crash rate of 0.19 crashes per million entering vehicles and a severity index of 1.00, a value lower than the Pima County severity index average of 1.44. One rear-end crash occurred that resulted in a PDO.

Valencia Road at De Concini Intersection

This unsignalized intersection had a crash rate of 0.19 crashes per million entering vehicles and a severity index of 2.00, a value higher than the Pima County severity index average of 1.44. One rear-end crash occurred that resulted in a Class 2 Injury.

Table 3 - Segment Crash Data Summary

	Valencia Road from Ajo Hwy to Mountain Eagle Drive (9600-8200)		Valencia Road from Mountain Eagle Drive to Iberia Avenue (8200-7400)		Valencia Road from Iberia Avenue to Wade Road (7399-7000)	
Severity	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**
Fatal	0	0%	0	0%	0	0%
Class 4 Injury	0	0%	0	0%	0	0%
Class 3 Injury	1	17%	2	40%	2	50%
Class 2 Injury	2	33%	1	20%	0	0%
Bodily Injury	0	0%	0	0%	0	0%
PDO	3	50%	2	40%	2	50%
Total Crashes	6	-	5	-	4	-
Severity Index	1.50	-	1.60	-	1.50	-
Average Severity Index	1.60		1.60	-	1.60	-
Crash Type	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**
Turning	0	0%	0	0%	0	0%
Angle	0	0%	0	0%	0	0%
Rear-end	1	17%	2	40%	2	50%
Out of Control	0	0%	0	0%	0	0%
Sideswipe	0	0%	1	20%	2	50%
Fixed Object	2	33%	0	0%	0	0%

	Valencia Road from Ajo Hwy to Mountain Eagle Drive (9600-8200)		Valencia Road from Mountain Eagle Drive to Iberia Avenue (8200-7400)		Valencia Road from Iberia Avenue to Wade Road (7399-7000)	
Severity	**Occurrence**	**%**	**Occurrence**	**%**	**Occurrence**	**%**
Backing	0	0%	0	0%	0	0%
Head on	1	17%	0	0%	0	0%
Pedestrian	0	0%	2	40%	0	0%
Animal	1	17%	0	0%	0	0%
Miscellaneous	1	17%	0	0%	0	0%
Total Crashes	6	-	5	-	4	-
Daily ADT	2,899	-	9,700	-	9,700	-
Crash Rate	1.13	-	0.28	-	0.23	-
Average Crash Rate	1.42	-	1.42	-	1.42	-

For roadway segments, the crash rates and Severity Indices are compared to the average crash rates and Severity Indices provided in the PCDOT Safety System Management Report (2013) based on roadway segments with ADTs < 10,000 VPD.

Each of the three Valencia Road segments had crash rates below the average crash rate of 1.42 crashes per million vehicle-miles. The Severity Index for each of the segments were below or equal to the Average Severity Index of 1.60.

Valencia Road from Ajo Hwy to Mountain Eagle Drive

This segment had a crash rate of 1.13 crashes per million vehicle-miles and a severity index of 1.50. Reported crash types include Sideswipes, Head On, Animal, and Rear-End. Crash severity included PDO, Class 3 Injury, and Class 2 Injury.

Valencia Road from Mountain Eagle Drive to Iberia Avenue

This segment had a crash rate of 0.28 crashes per million vehicle-miles and a severity index of 1.60. Two pedestrian related crashes were reported. Other reported crash types include Rear-end and Sideswipes. Crash severity included PDO, Class 3 Injury, and Class 2 Injury.

Valencia Road from Iberia Avenue to Wade Road

This segment had a crash rate of 0.23 crashes per million vehicle-miles and a severity index of 1.50. Reported crash types include Rear-end and Sideswipes. Crash severity included Class 3 Injuries and PDO crash severities.

FUTURE TRAFFIC CONDITIONS

This section documents the development of 2040 design hour volumes which serve as the foundation for recommended improvements.

Pima Association of Governments maintains and regularly updates the regional travel demand model (TDM). Population, land use, and development assumptions were recently updated in the travel demand model, in support of the PAG 2045 Regional Mobility and Accessibility Plan (RMAP). As the 2045 regional travel demand model represents the best information available, the 2045 model served as the basis for derivation of 2040 design hour volumes.

A comparison of 2040 PAG travel demand model (developed for the 2040 PAG Regional Transportation Plan), and the updated 2045 travel demand model demonstrated that the 2040 model included significantly more new development and population, than is now considered reasonable.

Illustrative of this differentiation, the 2045 PAG TDM forecasts Valencia Road to have 18,800 VPD west of Via Molin De Vento and 30,000 VPD to the east towards Wade Road. In contrast, the PAG 2040 model projected these segments to include 33,000 and 48,000 VPD, respectively. A summary of the traffic forecast is shown in **Table 4**. The 2040 design volumes are also summarized in the table.

Table 4 - Traffic Volume Forecast

Roadway	Segment	2016	PAG 2040 Forecast	Annual Growth Rate (%)	PAG 2045 Forecast	Annual Growth Rate (%)	2040 Design Volumes	Annual Growth Rate (%)
Valencia Road	Ajo Hwy to Via Molino de Viento	2,899	33,228	10.7	18,800	6.4	25,000	9.24
Valencia Road	Victor Drive to Wade Road	9,700	47,608	6.9	35,000	4.0	35,000	5.36

In terms of traffic volumes, there is a large disparity between various traffic forecast sources for the Valencia Road and SR 86 area. These include the Sendero Pass Traffic Impact Analysis with a 2030 horizon year, the Pima Association of Governments (PAG) 2040, and PAG 2045 forecasted volumes. **Figure 3** illustrates the forecasted volumes for the area. Note that the Sendero Pass study assumes a 2% growth in traffic volumes per year. The design team has agreed that this growth rate is reasonable to capture the potential traffic generated by the Pomegranate Farms development (currently under study) and any other background traffic. Details and justification of these design parameters are provided in Note to File memorandum submitted to Pima County (**Appendix D**).

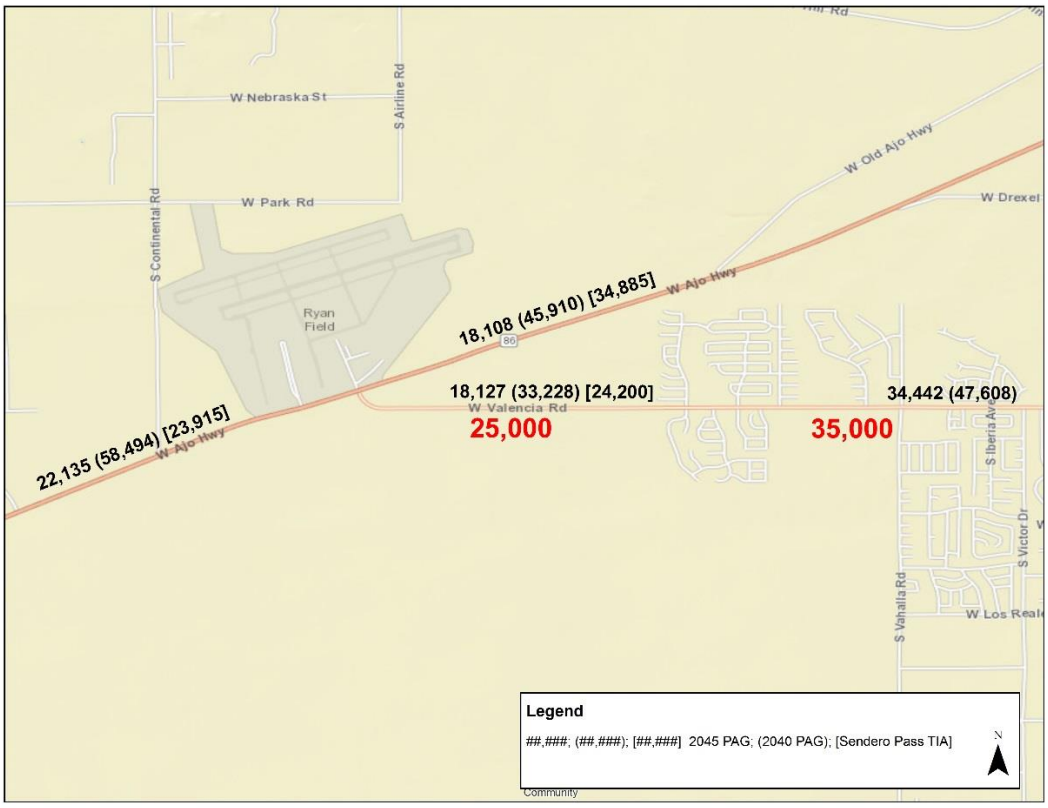


Figure 3 – Forecasted Average Daily Traffic Comparison

As such, considering the large disparity between various traffic forecast sources for the Valencia Road corridor, the following design year 2040 ADTs will be used for design:

- **25,000-VPD - SR86 to Via Molino De Viento**
- **35,000-VPD - Via Molino De Viento to Wade Rd**

Based on the 2012 Florida Department of Transportation (FDOT) published 2012 service volume tables, Valencia Road, when improved to a four-lane median divided, signalized arterial (with a capacity of 39,800 VPD), will perform at LOS C or better. Thus, the proposed 4-lane median divided cross-section will provide performance that exceeds county-required standards, as per Pima County Roadway Design Manual requirements (Section 3.15).

Forecasted traffic volumes at key intersections are shown in **Figure 4**. The traffic volumes were forecasted using the 2040 design year growth rates. A traffic capacity analysis was performed for the key intersections within the project limits. The results are shown in **Table 5**.

Table 5 – 2040 Future Capacity Analysis for Key Intersections

Intersections	EB			WB			NB			SB			Intersection LOS	Traffic Control
	L	T	R	L	T	R	L	T	R	L	T	R		
SR 86 / Valencia Road*														
AM Peak Hour	-	D	A	E	B	A	C	C	C	D	D		C	Signalized
PM Peak Hour	-	D	A	D	B	A	E	-	A	D	D		C	
Valencia Road / Mountain Eagle Drive														
AM Peak Hour	A	A	-	A	A	-	-	-	-	D	-	D	D	Stop-Sign Controlled
PM Peak Hour	A	A	-	A	A	-	-	-	-	E	-	E	E	
Valencia Road / Iberia Road														
AM Peak Hour	A	B	B	B	A	A	A	A	C	C	A	C	B	Signalized
PM Peak Hour	B	B	B	A	C	C	C	A	D	C	A	C	C	

**Assumes a dual left-turn lane per the Sendero Traffic Impact Analysis*

Traffic movement counts were not collected at Vahalla Road and the existing traffic volumes documented in the 2011 study did not appear to be reliable in representing the existing conditions. To confirm the design year geometry requirements for Vahalla Road, a sensitivity analysis was performed. The analysis estimated the number of single-family units (approximately 159 units south and 110 units north of Valencia Road) that would be expected to utilize Vahalla Road. The Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Edition) was used to determine the conservative number of trips. Based on the trip generation. The estimated AM and PM peak-hour turning movement volumes forecasted for design year 2040 are illustrated in **Figure 3**.

Table 6 - Vahalla Road Sensitivity Analysis

Intersections	EB			WB			NB			SB			Intersection LOS	Traffic Control
	L	T	R	L	T	R	L	T	R	L	T	R		
Vahalla Road / Valencia Road														
AM Peak Hour	B	C	B	B	A	C	B	B	C	C	B	B	B	Signalized
PM Peak Hour	C	C	A	B	B	A	B	B	A	C	C	A	B	

Table 6 represents the capacity analysis for 2040 design-year conditions. With the proposed signalization at Vahalla Road, adequate LOS is anticipated with conservative growth. Vehicle queueing at the turning lanes are anticipated to be below the Pima County minimum storage length requirements. The maximum 95th percentile queue that is achieved during the evaluation is 95' for the northbound right-turn movement.

Overall, the intersection evaluated for future design-year conditions demonstrate adequate performance. Based on the review of queue lengths that can be anticipated, minimum Pima County turn-lane storage length of 150' will provide adequate storage, with the exception of SR 86 / Valencia Road (discussed in the next section). Output files from the traffic analysis can be reviewed in **Appendix E**.

PROPOSED IMPROVEMENTS

The proposed improvements for Valencia Road are documented in this section. Intersection improvements were maintained from the 2011 Traffic Study except where the proposed ¼ mile (approximate) spacing median openings would restrict movements as recent traffic data collection demonstrated little change in terms of traffic volumes.

Design Speed

Valencia Road will maintain the existing 45 MPH posted speed limit. A design speed of 50 MPH is recommended.

Design Volumes

As described in the previous section, the 2040 design ADTs were developed for the Valencia Road project. These volumes are based on the growth rates derived from the PAG 2045 TDM forecast.

- 25,000 VPD, west of Via Molino De Viento/Reed Bunting Drive
- 35,000 VPD, west of Wade Road

Assuming a 9% K-factor derived from 24-hour traffic counts collected in 2016, the Design Hour Volumes (DHV) include:

- 2,250 VPH, west of Via Molino De Viento/Reed Bunting Drive
- 3,150 VPH, west of Wade Road

Median Openings

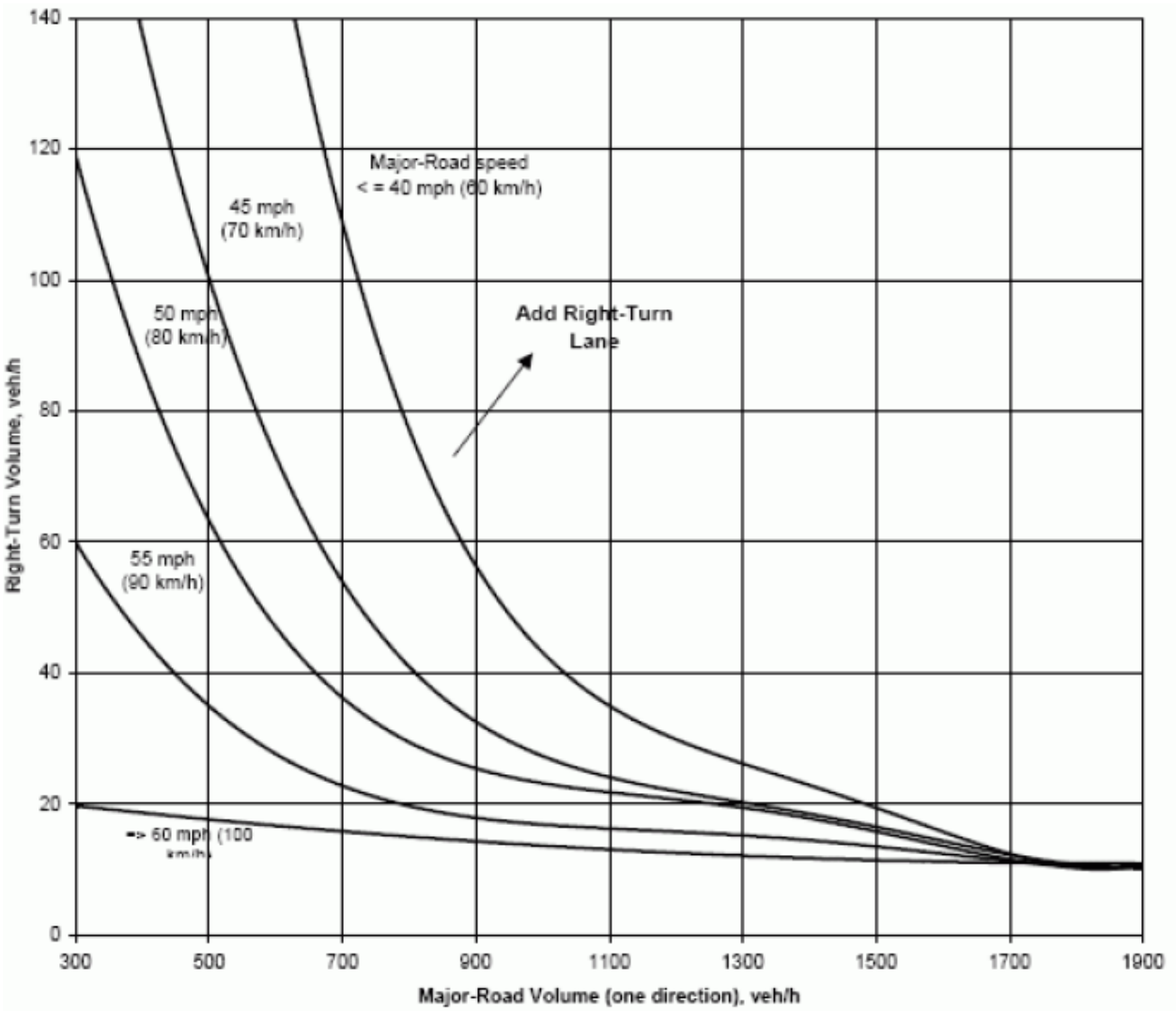
For existing cross-streets, full median openings will be provided at the following:

- Via Molino De Viento
- Bullfinch Drive
- Mountain Eagle Drive
- Vahalla Road
- Iberia Avenue
- Victor Drive (Left-turn out only)
- Star Ridge Place

Turn Lanes

Note that Pima County recommends that the signalized intersection approaches of Valencia Road / Vahalla Road and Valencia Road / Iberia Road be designed to include dedicated right-turn and left-turn lanes when geometrically feasible. The inclusion of right-turn lanes for the key non-signalized intersections will be based on Pima County Right-Turn Lane Warrants for multi-lane roads, **Table 7**.

Table 7 –Pima County Right-Turn Lane Warrant



The turn-lane analysis using the forecasted volumes in **Figure 3** and assumed trip generation shows that right-turn lanes are warranted at the following approaches:

- WB approach at Valencia Road / Mountain Eagle Drive
- WB approach at Valencia Road / Vahalla Road
- EB approach at Valencia Road / Vahalla Road
- WB approach at Valencia Road / Iberia Road
- WB approach at Valencia Road / Eagle Talon Parkway

Additional Design Considerations

The following intersection configurations will be impacted by the construction of the raised median. **Figure 4** contains an illustration of the proposed intersection configurations.

SR 86 / Valencia Road

The northbound Valencia Road approach was documented to have a single left-turn lane according to ADOT's final design plans. A sensitivity analysis was performed based on the 2013 traffic volumes at the intersection to confirm the adequacy of the single left-turn lane, capacity analysis summary provided in **Table 5** of the previous section.

Because the Valencia Road approach is within the vicinity of an ADOT facility, ADOT's Traffic Engineering Guidelines and Processes (Section 400) for Turn Lane Design was used to determine the design storage length. According to the guidelines:

- Storage length = braking distance + queue length

The braking distance (Table 430-2 per the ADOT guidelines) is assumed to be based on the speed recommended for the curve approaching SR 86. ADOT's final design plans recommend a Curve Warning Sign and a 30 MPH warning speed plaque be posted.

- Assuming a 35 MPH curve design speed, the desirable ADOT breaking distance is 115'.
- Alternatively, the minimum breaking distance for 45 MPH is 85'.
- The maximum northbound left turn queue lengths occur in the PM (See Synchro reports) and was calculated between 503' (SimTraffic) and 556'. The maximum NB RT turn queue was 339 in the AM.
- Therefore, the maximum NB LT Storage Length Need = 115' + 556' = 671'.

Therefore, the provided storage lengths in the current design of 685' (NB LT) and 665' (NB RT) exceed the storage needs. The traffic analysis assumes that dual WB left-turns along SR86 are in-place in year 2040.

Valencia Road / Via Molino De Viento (Reed Bunting Drive)

This intersection will maintain the existing northbound stop controlled approach and have a full median opening. The storage lengths for the southbound approach turn-lanes will be determined based on the Sonoran Ranch Estates II development.

Valencia Road / Via Diego De Rivera

The raised median will restrict northbound left-turns and allow only right-turn in / right-turn out movements. The existing northbound stop controlled approach will be maintained.

Valencia Road / Bullfinch Drive (S. Guiliani Avenue)

This intersection will maintain the existing northbound/southbound stop controlled approach and have a full median opening. The eastbound/westbound left-turn lanes are recommended to have a minimum storage length of 150'.

Valencia Road / De Concini Drive

The raised median will restrict northbound left-turns and allow only right-turn in / right-turn out movements. The existing northbound stop controlled approach will be maintained.

It was noted that this intersection exceeds Pima County's severity index for intersection related crashes. As referenced in the FHWA Crash Modification Factor Clearinghouse, the presence of a median that would restrict movements may reduce all crash types by 22% and reduce the severity index.

Valencia Road / Mountain Eagle Drive

This intersection will maintain the existing southbound stop controlled approach and have a full median opening. The eastbound/westbound left-turn lanes are recommended to have a minimum storage length of 150'. A 150' westbound right-turn lane is also recommended.

Valencia Road / Eagle Talon Parkway

The raised median will restrict southbound left-turns and allow only right-turn in / right-turn out movements. The existing southbound stop controlled approach will be maintained. A 150' westbound right-turn lane is also recommended

Valencia Road / Vahalla Road

This intersection is recommended to have a traffic signal installed, consistent with the 2011 recommendation. Preliminary traffic signal warrants are not met for opening year, however this intersection should be monitored for traffic signal installation as development in the area occurs. The northbound/southbound approaches are recommended to have dedicated left-turn and right-turn lanes with 150' storage length. The eastbound/westbound left-turn and right-turn lanes are recommended to have a minimum storage length of 150'. The minimum lengths were confirmed to be adequate by performing a sensitivity analysis with reference to the Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Edition).

It was noted that this intersection exceeds Pima County's severity index for intersection related crashes. As referenced in the Highway Safety Manual (HSM), the installation of a traffic signal may reduce crashes of all severities by 44% and reduce the severity index

Valencia Road / Iberia Avenue

This intersection is recommended to have a traffic signal installed, consistent with the 2011 recommendation. Preliminary traffic signal warrants are not met for opening year, however this intersection should be monitored for traffic signal installation as development in the area occurs. The existing northbound/southbound approach configurations are recommended to include a dedicated left-turn lane with a shared thru/right-turn lane. The eastbound/westbound left-turn lanes are recommended to have a minimum storage length of 150. Based on drainage constraint, a 110' dedicated left-turn lane for the SB

approach and 105' dedicated left-turn lane for the NB approach is recommended. A right-turn (150') lane is warranted for the westbound approach of the intersection.

Valencia Road / Victor Drive

The raised median will allow westbound left-turns and northbound left-turns. Due to the vicinity of the Star Ridge Place median opening, a storage length of 85' and 122' bay taper would have to be implemented. Note that this is below Pima County requirements. The existing northbound stop controlled approach will be maintained.

Valencia Road / Star Ridge Place

This intersection will maintain the existing southbound stop controlled approach and have a full median opening. A westbound 150' left-turn lane into Star Ridge Place is recommended. Due to the vicinity of Victor Drive, a storage length of 85' and a 122' bay taper would have to be implemented. Note that this is below Pima County requirements. The existing northbound stop controlled approach will be maintained.

Valencia Road / Plaza Naranja (future development)

This intersection will provide access to the future Diablo Village development (see **Figure 4**). A full median opening is recommended to accommodate the future development.

Valencia Road / Calle Diablo Drive (future development)

This intersection provides additional access to the future Diablo Village development (see **Figure 4**). Based on the minimum distance (660') from the full median opening at Iberia Avenue, it is recommended to provide a right-in/right-out configuration since the distance between Iberia and Calle Diablo is less than 660'.

Lighting Recommendation

Based on the 2012 *FHWA Lighting Handbook, Analysis for Lighting Needs,* lighting is required at all signalized intersections. Thus, lighting is required at the intersection of Valencia Road / Vahalla Road and Valencia Road / Iberia Avenue.

For non-signalized intersections, the FHWA presents an example for prioritizing lighting needs shown in **Table 8**. Since the crash data doesn't show significant night-time crashes, intersection lighting should be based on the major-street ADT. The ADT on Valencia Road (> 5,000 VPD) places lighting as a high priority when comparing to the thresholds provided in the table. It is recommended that each intersection has lighting present.

Table 8 - Street Light Installation by Functional Class

Major Street Functional Classification				
	Principal Arterial (TH)	**Minor Arterial (TH or CSAH)**	**Collector (CSAH or CR)**	**Local (CR or TWN Rd)**
Priority	Major street volumes in vehicles per day (% of major street volume that is recommended on the minor street)			
Low	0-2000 (10%)	0-1000 (10%)	0-500 (10%)	0-250 (10%)
Moderate	2,000-5,000 (15%)	1,000-2,000 (15%)	500-1,000 (15%)	250-500 (15%)
High	>5,000	>2,000	>1,000	>500
	20%	20%	20%	20%

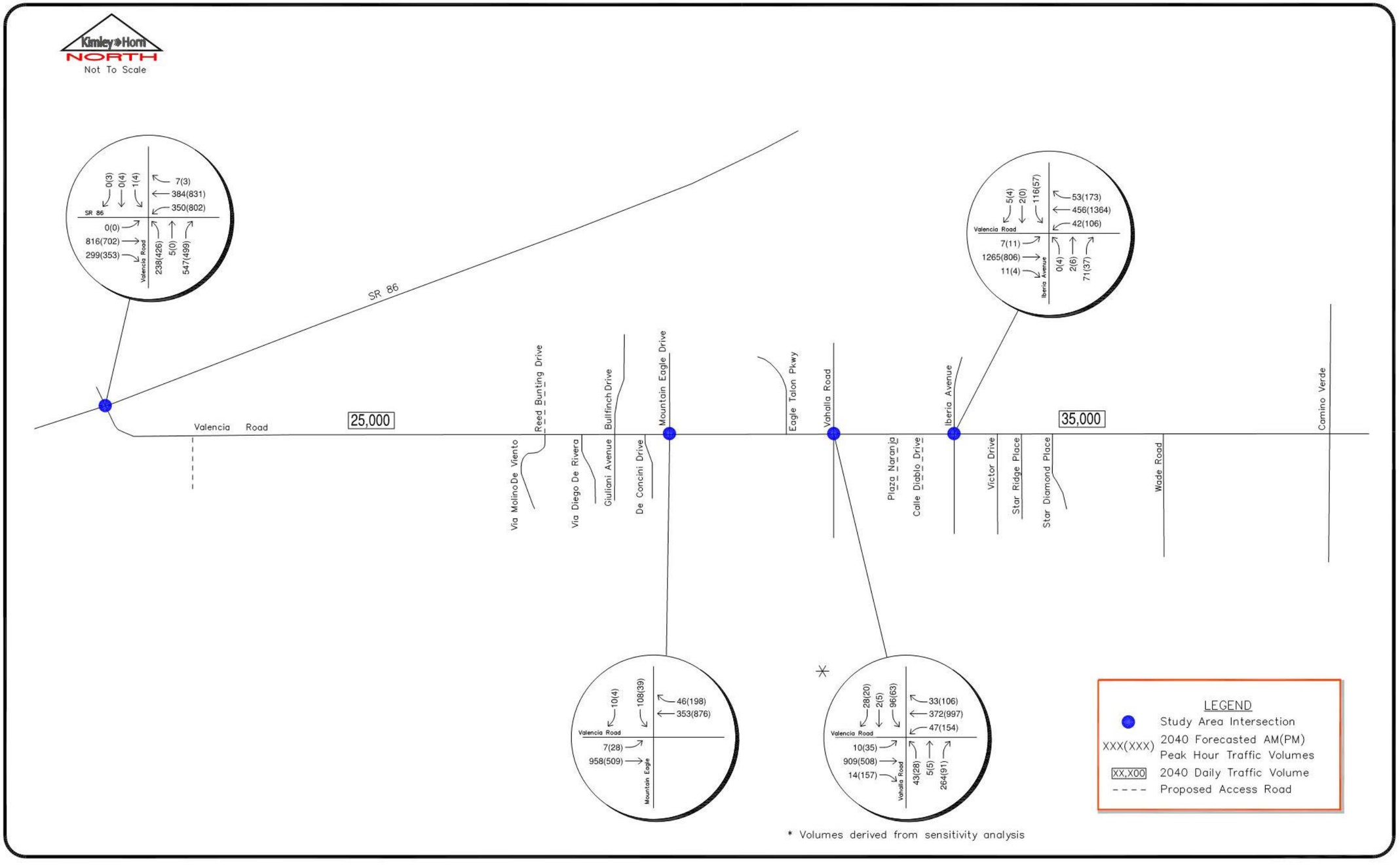


Figure 4 – 2040 Forecasted Traffic Volumes at Key Intersections

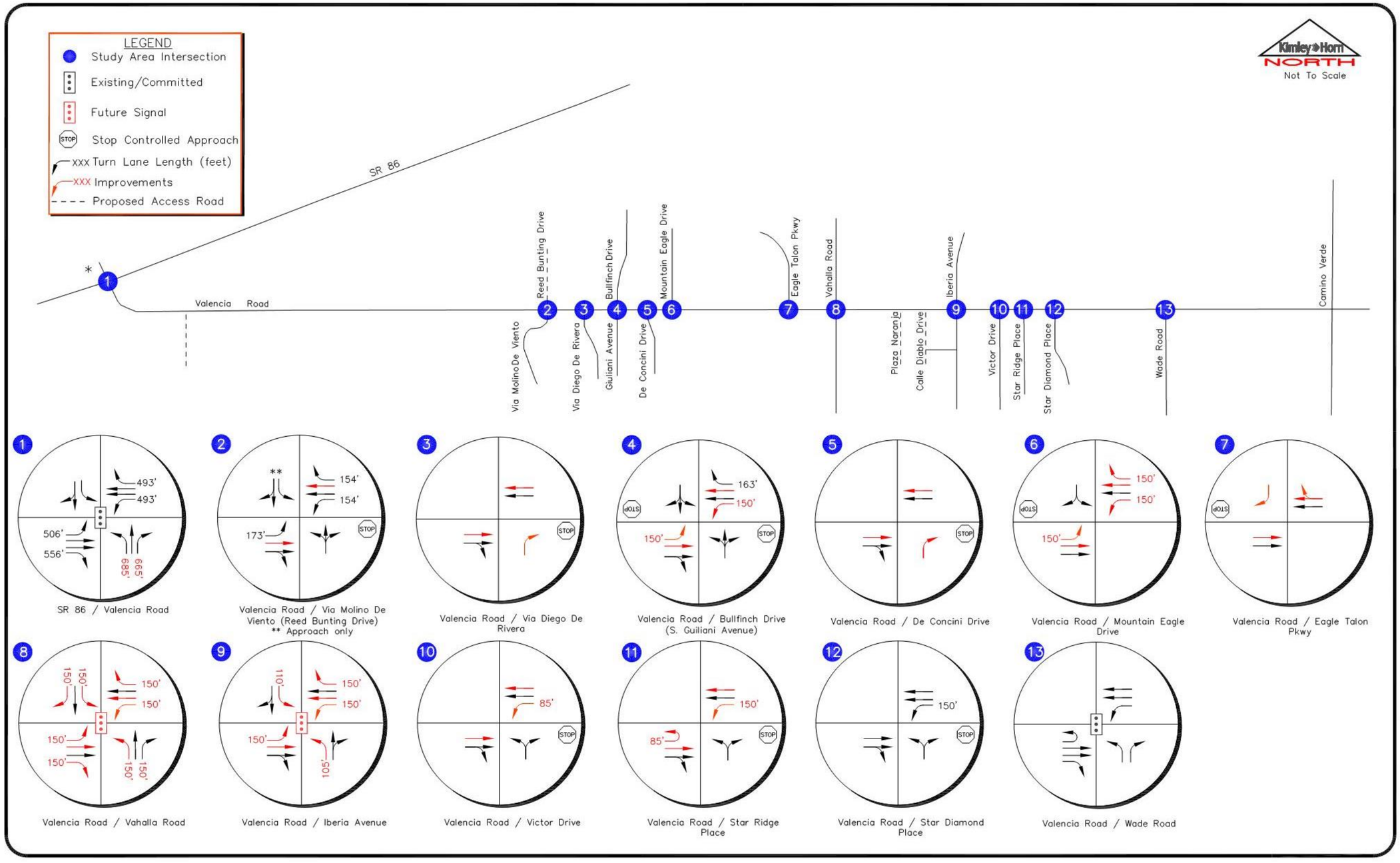


Figure 5 - Proposed Intersection Configurations

APPENDIX A – DAILY TRAFFIC COUNTS / VEHICLE CLASSIFICATION

Field Data Services of Arizona

21636 N. Dietz Dr.
Maricopa, AZ 85138
520.316.6745

Site Code: 16-1122-001
Station ID: Tues 04/06/2016
Valencia Rd. west of Via Molino De Viento 32.133351, -111.151065
Latitude: 0' 0.000 Undefined

Eastbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total
4/5/16	0	8	2	0	0	0	0	0	0	0	0	0	0	10
01:00	0	5	0	0	0	0	0	0	0	0	0	0	0	5
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	5	3	0	0	0	0	0	0	0	0	0	0	8
04:00	0	10	6	0	3	0	0	0	0	0	0	0	0	19
05:00	0	22	12	0	5	0	0	1	0	0	0	0	0	40
06:00	0	44	8	0	1	0	0	0	0	0	0	0	0	53
07:00	0	49	16	**2**	5	0	0	0	0	0	0	0	0	72
08:00	0	**63**	14	0	5	0	0	**2**	0	0	0	0	0	84
09:00	0	51	**21**	0	3	0	0	0	**1**	0	0	0	0	76
10:00	0	45	21	0	**7**	0	**1**	0	0	0	0	0	0	74
11:00	0	56	21	1	7	0	0	0	0	0	0	0	0	**85**
12 PM	0	48	22	0	4	0	0	**2**	0	0	0	0	0	76
13:00	0	42	18	0	6	**1**	0	0	0	0	0	0	0	67
14:00	0	49	15	0	5	0	0	1	0	0	0	0	0	70
15:00	0	60	17	0	6	0	0	0	0	0	0	0	0	83
16:00	0	**96**	23	**2**	**7**	0	0	0	0	0	0	0	0	128
17:00	0	95	**36**	2	4	0	0	0	0	0	0	0	0	**137**
18:00	**1**	72	18	0	5	0	0	0	0	0	0	0	0	96
19:00	0	46	15	0	3	0	0	0	0	0	0	0	0	64
20:00	0	33	5	0	2	0	0	0	0	0	0	0	0	40
21:00	0	30	3	0	1	0	0	0	0	0	0	0	0	34
22:00	0	23	10	0	1	0	0	0	0	0	0	0	0	34
23:00	1	10	1	0	1	0	0	0	0	0	0	0	0	13
Day Total	2	962	307	7	81	1	1	6	1	0	0	0	0	1368
Percent	0.1%	70.3%	22.4%	0.5%	5.9%	0.1%	0.1%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak		08:00	09:00	07:00	10:00		10:00	08:00	09:00					11:00
Vol.		63	21	2	7		1	2	1					85
PM Peak	18:00	16:00	17:00	16:00	16:00	13:00		12:00						17:00
Vol.	1	96	36	2	7	1		2						137
Grand Total	2	962	307	7	81	1	1	6	1	0	0	0	0	1368
Percent	0.1%	70.3%	22.4%	0.5%	5.9%	0.1%	0.1%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	

Field Data Services of Arizona

21636 N. Dietz Dr.
Maricopa, AZ 85138
520.316.6745

Site Code: 16-1122-001
Station ID: Tues 04/06/2016
Valencia Rd. west of Via Molino De Viento 32.133351, -111.151065
Latitude: 0' 0.000 Undefined

Westbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total
4/5/16	0	11	1	0	1	0	0	0	0	0	0	0	0	13
01:00	0	7	0	0	2	0	0	0	0	0	0	0	0	9
02:00	0	2	2	0	0	0	0	0	0	0	0	0	0	4
03:00	0	1	2	0	0	0	0	0	0	0	0	0	0	3
04:00	0	15	1	0	5	0	0	0	0	0	0	0	0	21
05:00	0	25	10	0	13	0	0	0	0	0	0	0	0	48
06:00	**1**	62	22	0	16	0	0	**2**	0	0	0	0	0	103
07:00	0	**68**	**25**	**1**	**19**	0	0	0	0	0	0	0	0	**113**
08:00	0	44	15	1	18	0	0	0	0	0	0	0	0	78
09:00	0	39	11	0	10	**1**	0	1	0	0	0	0	0	62
10:00	1	35	17	0	14	0	0	0	0	0	0	0	0	67
11:00	0	37	12	0	12	0	0	1	0	0	0	0	0	62
12 PM	0	58	16	0	10	0	0	0	0	0	0	0	0	84
13:00	0	53	19	0	19	0	0	0	0	0	0	0	0	91
14:00	0	47	24	0	21	0	0	0	0	0	0	0	0	92
15:00	1	51	23	0	23	**1**	0	0	**1**	0	0	0	0	100
16:00	**4**	58	22	0	21	1	0	0	0	0	0	0	0	106
17:00	0	**70**	**26**	**1**	**36**	0	0	0	0	0	0	0	0	**133**
18:00	0	59	24	0	16	0	0	0	0	0	0	0	0	99
19:00	0	46	19	0	6	0	0	0	0	0	0	0	0	71
20:00	0	35	9	0	13	0	0	0	0	0	0	0	0	57
21:00	0	29	6	0	8	0	0	0	0	0	0	0	0	43
22:00	0	26	5	0	8	0	0	0	0	0	0	0	0	39
23:00	0	26	4	0	3	0	0	0	0	0	0	0	0	33
Day Total	7	904	315	3	294	3	0	4	1	0	0	0	0	1531
Percent	0.5%	59.0%	20.6%	0.2%	19.2%	0.2%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	07:00	07:00	07:00	07:00	09:00		06:00						07:00
Vol.	1	68	25	1	19	1		2						113
PM Peak	16:00	17:00	17:00	17:00	17:00	15:00			15:00					17:00
Vol.	4	70	26	1	36	1			1					133
Grand Total	7	904	315	3	294	3	0	4	1	0	0	0	0	1531
Percent	0.5%	59.0%	20.6%	0.2%	19.2%	0.2%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	

Field Data Services of Arizona

21636 N. Dietz Dr.
Maricopa, AZ 85138
520.316.6745

Site Code: 16-1122-001
Station ID: Tues 04/06/2016
Valencia Rd. west of Via Molino De Viento 32.133351, -111.151065
Latitude: 0' 0.000 Undefined

Eastbound, Westbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total
4/5/16	0	19	3	0	1	0	0	0	0	0	0	0	0	23
01:00	0	12	0	0	2	0	0	0	0	0	0	0	0	14
02:00	0	2	2	0	0	0	0	0	0	0	0	0	0	4
03:00	0	6	5	0	0	0	0	0	0	0	0	0	0	11
04:00	0	25	7	0	8	0	0	0	0	0	0	0	0	40
05:00	0	47	22	0	18	0	0	1	0	0	0	0	0	88
06:00	**1**	106	30	0	17	0	0	**2**	0	0	0	0	0	156
07:00	0	**117**	**41**	**3**	**24**	0	0	0	0	0	0	0	0	**185**
08:00	0	107	29	1	23	0	0	2	0	0	0	0	0	162
09:00	0	90	32	0	13	**1**	0	1	**1**	0	0	0	0	138
10:00	1	80	38	0	21	0	**1**	0	0	0	0	0	0	141
11:00	0	93	33	1	19	0	0	1	0	0	0	0	0	147
12 PM	0	106	38	0	14	0	0	**2**	0	0	0	0	0	160
13:00	0	95	37	0	25	**1**	0	0	0	0	0	0	0	158
14:00	0	96	39	0	26	0	0	1	0	0	0	0	0	162
15:00	1	111	40	0	29	1	0	0	**1**	0	0	0	0	183
16:00	**4**	154	45	2	28	1	0	0	0	0	0	0	0	234
17:00	0	**165**	**62**	**3**	**40**	0	0	0	0	0	0	0	0	**270**
18:00	1	131	42	0	21	0	0	0	0	0	0	0	0	195
19:00	0	92	34	0	9	0	0	0	0	0	0	0	0	135
20:00	0	68	14	0	15	0	0	0	0	0	0	0	0	97
21:00	0	59	9	0	9	0	0	0	0	0	0	0	0	77
22:00	0	49	15	0	9	0	0	0	0	0	0	0	0	73
23:00	1	36	5	0	4	0	0	0	0	0	0	0	0	46
Day Total	9	1866	622	10	375	4	1	10	2	0	0	0	0	2899
Percent	0.3%	64.4%	21.5%	0.3%	12.9%	0.1%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	07:00	07:00	07:00	07:00	09:00	10:00	06:00	09:00					07:00
Vol.	1	117	41	3	24	1	1	2	1					185
PM Peak	16:00	17:00	17:00	17:00	17:00	13:00		12:00	15:00					17:00
Vol.	4	165	62	3	40	1		2	1					270
Grand Total	9	1866	622	10	375	4	1	10	2	0	0	0	0	2899
Percent	0.3%	64.4%	21.5%	0.3%	12.9%	0.1%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	

Field Data Services of Arizona

21636 N. Dietz Dr.
Maricopa, AZ 85138
520.316.6745

Site Code: 16-1122-002
Station ID: Tues 04/05/2016
Valencia Rd. btwn. Star Diamond Pl. &
Wade Rd. 32.133321, -111.118883
Latitude: 0' 0.000 Undefined

Eastbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total
4/5/16	0	15	1	0	0	1	0	0	0	0	0	0	0	17
01:00	0	15	2	0	0	0	0	0	0	0	0	0	0	17
02:00	0	13	1	0	0	0	0	0	0	0	0	0	0	14
03:00	0	25	10	0	1	0	0	0	0	0	0	0	0	36
04:00	0	78	22	0	7	0	0	1	0	0	0	0	0	108
05:00	0	162	66	0	13	1	0	0	0	0	0	0	0	242
06:00	0	334	71	8	13	1	0	1	0	0	0	0	0	428
07:00	**1**	**475**	**80**	4	**21**	0	**1**	1	0	0	**2**	0	0	**585**
08:00	0	281	58	**9**	19	**4**	0	**3**	0	0	0	0	0	374
09:00	0	193	51	0	17	0	1	1	0	0	0	0	0	263
10:00	0	169	48	1	12	2	0	2	0	0	1	0	0	235
11:00	0	184	54	2	11	3	0	0	0	0	0	0	0	254
12 PM	0	159	47	0	12	1	0	**2**	0	0	**1**	0	0	222
13:00	0	160	48	0	10	**2**	0	0	0	0	0	0	0	220
14:00	0	158	41	2	12	0	**1**	1	0	0	0	0	0	215
15:00	0	**202**	50	0	**15**	0	0	0	0	0	0	0	0	267
16:00	0	200	39	**13**	10	0	1	0	0	0	0	0	0	263
17:00	0	194	**62**	5	9	0	0	1	0	0	0	0	0	**271**
18:00	0	181	46	2	5	1	0	0	0	0	1	0	0	236
19:00	**1**	126	29	2	5	0	0	0	0	0	0	0	0	163
20:00	0	83	16	0	2	0	0	0	0	0	0	0	0	101
21:00	0	85	6	0	4	0	0	0	0	0	0	0	0	95
22:00	0	44	13	0	2	0	0	0	0	0	0	0	0	59
23:00	0	20	1	0	0	0	0	0	0	0	0	0	0	21
Day Total	2	3556	862	48	200	16	4	13	0	0	5	0	0	4706
Percent	0.0%	75.6%	18.3%	1.0%	4.2%	0.3%	0.1%	0.3%	0.0%	0.0%	0.1%	0.0%	0.0%	
AM Peak	07:00	07:00	07:00	08:00	07:00	08:00	07:00	08:00			07:00			07:00
Vol.	1	475	80	9	21	4	1	3			2			585
PM Peak	19:00	15:00	17:00	16:00	15:00	13:00	14:00	12:00			12:00			17:00
Vol.	1	202	62	13	15	2	1	2			1			271
Grand Total	2	3556	862	48	200	16	4	13	0	0	5	0	0	4706
Percent	0.0%	75.6%	18.3%	1.0%	4.2%	0.3%	0.1%	0.3%	0.0%	0.0%	0.1%	0.0%	0.0%	

Field Data Services of Arizona

21636 N. Dietz Dr.
Maricopa, AZ 85138
520.316.6745

Site Code: 16-1122-002
Station ID: Tues 04/05/2016
Valencia Rd. btwn. Star Diamond Pl. &
Wade Rd. 32.133321, -111.118883
Latitude: 0' 0.000 Undefined

Westbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total
4/5/16	0	40	7	0	5	0	0	0	0	0	0	0	0	52
01:00	0	24	5	0	3	0	0	0	0	0	0	0	0	32
02:00	0	8	0	0	1	0	0	0	0	0	0	0	0	9
03:00	0	9	2	0	1	0	0	0	0	0	0	0	0	12
04:00	0	21	2	0	2	0	0	0	0	0	0	0	0	25
05:00	0	26	14	2	10	1	0	0	0	**1**	0	0	0	54
06:00	**1**	74	19	**8**	28	1	0	0	**1**	0	0	0	0	132
07:00	1	96	47	8	37	**2**	0	0	0	0	0	**1**	0	192
08:00	0	108	30	5	34	0	**1**	0	1	0	0	0	0	179
09:00	0	**115**	37	3	36	1	0	**1**	0	1	0	0	0	**194**
10:00	0	94	38	0	**42**	1	0	1	0	0	0	0	0	176
11:00	0	96	**53**	1	29	1	0	1	0	0	0	0	0	181
12 PM	0	146	51	1	38	1	0	0	0	0	0	0	0	237
13:00	0	147	45	0	50	0	**1**	1	0	**1**	0	0	0	245
14:00	1	155	66	2	48	0	0	1	0	1	0	0	0	274
15:00	**4**	232	68	4	82	2	0	**2**	**1**	0	0	0	0	395
16:00	2	267	96	**11**	78	0	0	1	0	0	0	0	0	455
17:00	2	**315**	**103**	4	**101**	**3**	0	1	0	1	**1**	0	0	**531**
18:00	0	292	94	0	62	0	0	1	0	0	0	0	0	449
19:00	2	262	78	2	61	1	0	0	0	0	1	0	0	407
20:00	1	205	47	0	50	0	0	1	0	0	0	0	0	304
21:00	1	157	41	0	26	0	0	0	0	0	0	0	0	225
22:00	0	108	19	0	17	0	0	0	0	0	0	0	0	144
23:00	0	75	9	0	6	0	0	0	0	0	0	0	0	90
Day Total	15	3072	971	51	847	14	2	11	3	5	2	1	0	4994
Percent	0.3%	61.5%	19.4%	1.0%	17.0%	0.3%	0.0%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	
AM Peak	06:00	09:00	11:00	06:00	10:00	07:00	08:00	09:00	06:00	05:00		07:00		09:00
Vol.	1	115	53	8	42	2	1	1	1	1		1		194
PM Peak	15:00	17:00	17:00	16:00	17:00	17:00	13:00	15:00	15:00	13:00	17:00			17:00
Vol.	4	315	103	11	101	3	1	2	1	1	1			531
Grand Total	15	3072	971	51	847	14	2	11	3	5	2	1	0	4994
Percent	0.3%	61.5%	19.4%	1.0%	17.0%	0.3%	0.0%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	

Field Data Services of Arizona

21636 N. Dietz Dr.
Maricopa, AZ 85138
520.316.6745

Site Code: 16-1122-002
Station ID: Tues 04/05/2016
Valencia Rd. btwn. Star Diamond Pl. &
Wade Rd. 32.133321, -111.118883
Latitude: 0' 0.000 Undefined

Eastbound, Westbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total
4/5/16	0	55	8	0	5	1	0	0	0	0	0	0	0	69
01:00	0	39	7	0	3	0	0	0	0	0	0	0	0	49
02:00	0	21	1	0	1	0	0	0	0	0	0	0	0	23
03:00	0	34	12	0	2	0	0	0	0	0	0	0	0	48
04:00	0	99	24	0	9	0	0	1	0	0	0	0	0	133
05:00	0	188	80	2	23	2	0	0	0	**1**	0	0	0	296
06:00	1	408	90	**16**	41	2	0	1	**1**	0	0	0	0	560
07:00	**2**	**571**	**127**	12	**58**	2	**1**	1	0	0	**2**	**1**	0	**777**
08:00	0	389	88	14	53	**4**	1	**3**	1	0	0	0	0	553
09:00	0	308	88	3	53	1	1	2	0	1	0	0	0	457
10:00	0	263	86	1	54	3	0	3	0	0	1	0	0	411
11:00	0	280	107	3	40	4	0	1	0	0	0	0	0	435
12 PM	0	305	98	1	50	2	0	**2**	0	0	**1**	0	0	459
13:00	0	307	93	0	60	2	**1**	1	0	**1**	0	0	0	465
14:00	1	313	107	4	60	0	1	2	0	1	0	0	0	489
15:00	**4**	434	118	4	97	2	0	2	**1**	0	0	0	0	662
16:00	2	467	135	**24**	88	0	1	1	0	0	0	0	0	718
17:00	2	**509**	**165**	9	**110**	**3**	0	2	0	1	1	0	0	**802**
18:00	0	473	140	2	67	1	0	1	0	0	1	0	0	685
19:00	3	388	107	4	66	1	0	0	0	0	1	0	0	570
20:00	1	288	63	0	52	0	0	1	0	0	0	0	0	405
21:00	1	242	47	0	30	0	0	0	0	0	0	0	0	320
22:00	0	152	32	0	19	0	0	0	0	0	0	0	0	203
23:00	0	95	10	0	6	0	0	0	0	0	0	0	0	111
Day Total	17	6628	1833	99	1047	30	6	24	3	5	7	1	0	9700
Percent	0.2%	68.3%	18.9%	1.0%	10.8%	0.3%	0.1%	0.2%	0.0%	0.1%	0.1%	0.0%	0.0%	
AM Peak	07:00	07:00	07:00	06:00	07:00	08:00	07:00	08:00	06:00	05:00	07:00	07:00		07:00
Vol.	2	571	127	16	58	4	1	3	1	1	2	1		777
PM Peak	15:00	17:00	17:00	16:00	17:00	17:00	13:00	12:00	15:00	13:00	12:00			17:00
Vol.	4	509	165	24	110	3	1	2	1	1	1			802
Grand Total	17	6628	1833	99	1047	30	6	24	3	5	7	1	0	9700
Percent	0.2%	68.3%	18.9%	1.0%	10.8%	0.3%	0.1%	0.2%	0.0%	0.1%	0.1%	0.0%	0.0%	

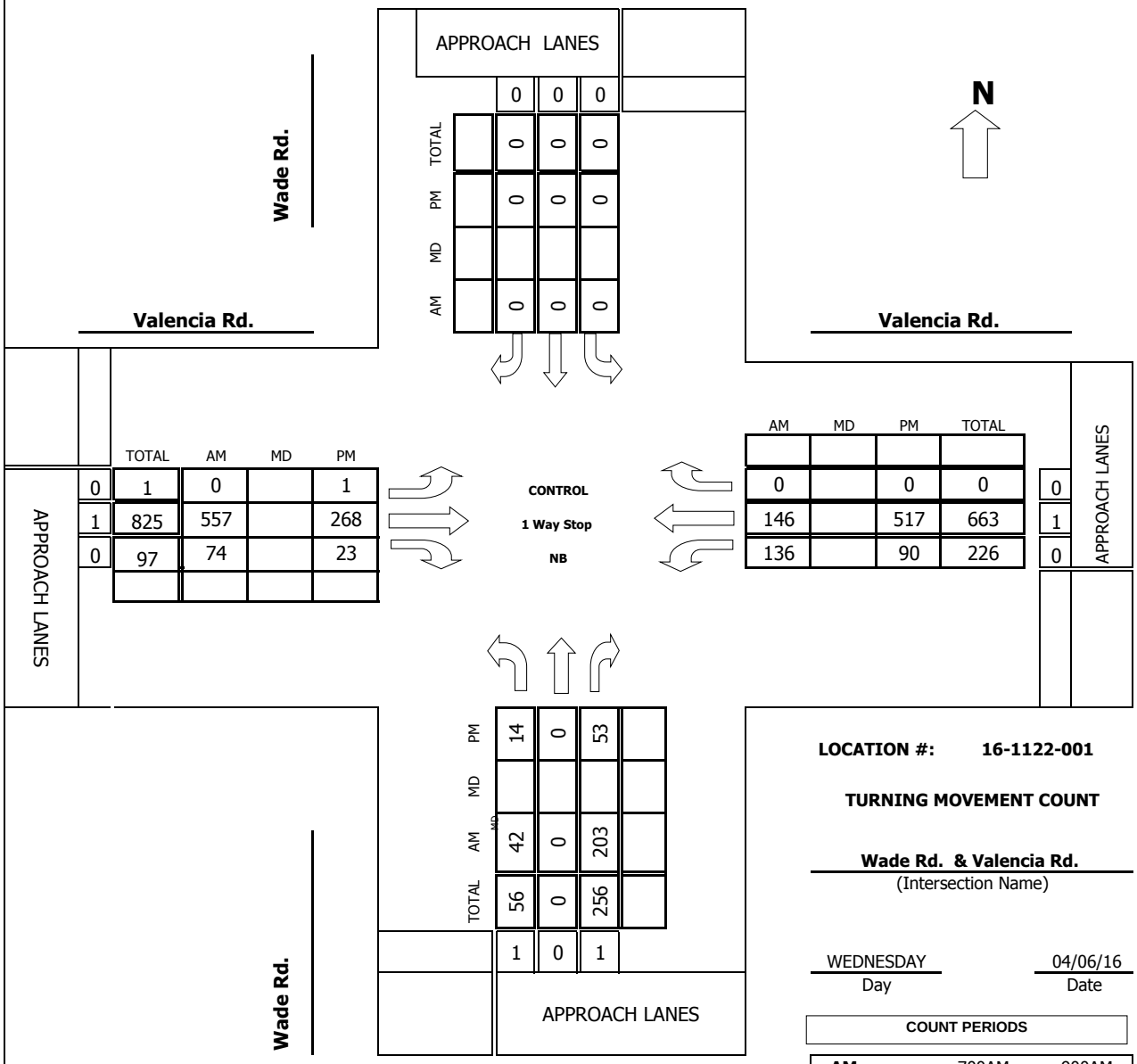
APPENDIX B – TURNING MOVEMENT VOLUMES

Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

Project #: 16-1122-001

TMC SUMMARY OF Wade Rd. & Valencia Rd.



LOCATION #: 16-1122-001

TURNING MOVEMENT COUNT

Wade Rd. & Valencia Rd.
(Intersection Name)

WEDNESDAY — Day
04/06/16 — Date

COUNT PERIODS

AM	700AM	-	900AM
NOON		-	
PM	400PM	-	600PM

AM PEAK HOUR: 700 AM

NOON PEAK HOUR:

PM PEAK HOUR: 500 PM

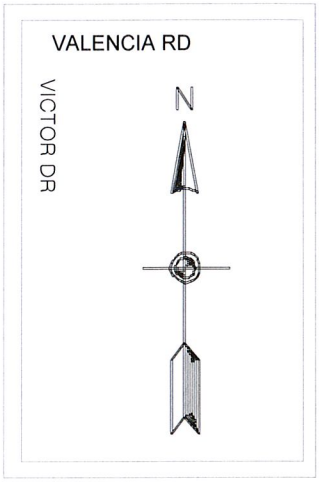
APPENDIX C – CRASH DATA

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

VALENCIA RD@VICTOR DR
8/1/2011 to 8/31/2015

LEGEND

- REAR END
- TURNING
- ANGLE
- OUT OF CONTROL
- MISC
- FIXED OBJ
- BACKING
- HEAD ON
- BODILY INJURY
- FATALITY



2

Print Date: 2/17/2016

CRASH AND INJURY SEVERITY SUMMARY

PROPERTY	1
INJURY	0
FATALITY	0
TOTAL	1

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

VALENCIA RD @ VICTOR DR

8/1/2011 to 8/31/2015

TYPE	DATE CASE #	TIME LIGHT	DAY	SEVERITY BLOCK #	DISTRACTED DRIVING	VIOLATIONS CITED	NARRATIVE
2	3/7/2014 140307278	17 : 13 Day	Fri	PROPERTY 7400 W	DR 1: UNKNOWN DISTRACTIONS	VEH 1: SPEED TOO FAST FOR CONDITIONS VEH 2: NONE	EB REAR-END

Date Printed 2/17/2016

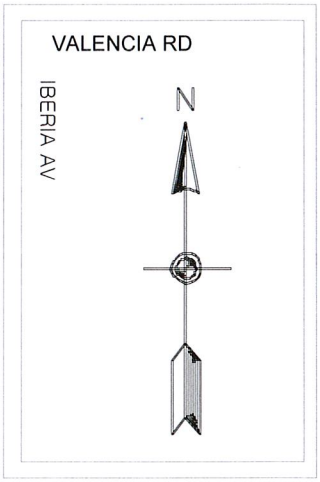
** Denotes Driver Impairment

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

IBERIA AV@VALENCIA RD
8/1/2011 to 8/31/2015

LEGEND

- REAR END
- TURNING
- ANGLE
- OUT OF CONTROL
- MISC
- FIXED OBJ
- BACKING
- HEAD ON
- BODILY INJURY
- FATALITY



CRASH AND INJURY SEVERITY SUMMARY

PROPERTY	3
INJURY	1
FATALITY	0
TOTAL	4

Print Date: 2/17/2016

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

IBERIA AV @ VALENCIA RD

8/1/2011 to 8/31/2015

TYPE	DATE CASE #	TIME LIGHT	DAY	SEVERITY BLOCK #	DISTRACTED DRIVING	VIOLATIONS CITED	NARRATIVE
31	1/29/2014 140129189	15:59 Day	Wed	INJURY - 3 7510 W		VEH 1: PASSED IN NO PASSING ZONE OTHER VEH 2: NONE	EB HIT WBLT HEAD-ON, LEFT RDWY & HIT BRICK WALL.
12	3/14/2013 130314362	19:45 Dark	Thu	PROPERTY 7500 W		VEH 1: SPEED TOO FAST FOR CONDITIONS FOLLOWED TOO CLOSELY VEH 2: NONE	WB REAR-ENDED A WB RT
15	2/5/2012 120205239	18:16 Dusk	Sun	PROPERTY 7500 W		VEH 1: MADE IMPROPER TURN VEH 2: OTHER UNSAFE PASSING	WB PASSING ON THE LEFT HIT A WB LT
11	11/16/2011 111116305	19:51 Dark	Wed	PROPERTY 7500 W		VEH 1: NONE VEH 2: OTHER	WB LT HIT AN EB

Date Printed 2/17/2016

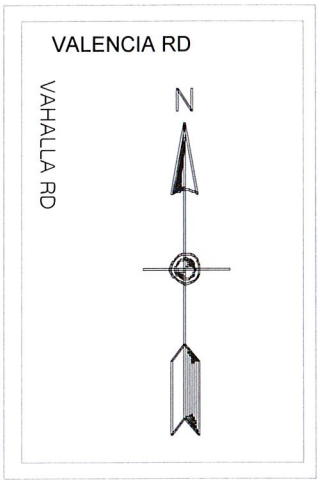
** Denotes Driver Impairment

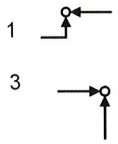
PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

VAHALLA RD@VALENCIA RD
8/1/2011 to 8/31/2015

LEGEND

- REAR END
- TURNING
- ANGLE
- OUT OF CONTROL
- MISC
- FIXED OBJ
- BACKING
- HEAD ON
- BODILY INJURY
- FATALITY





Print Date: 2/17/2016

CRASH AND INJURY SEVERITY SUMMARY

PROPERTY	0
INJURY	2
FATALITY	0
TOTAL	2

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

VAHALLA RD @ VALENCIA RD

8/1/2011 to 8/31/2015

TYPE	DATE CASE #	TIME LIGHT	DAY	SEVERITY BLOCK #	DISTRACTED DRIVING	VIOLATIONS CITED	NARRATIVE
3	1/17/2015 150117243	20:27 Dark	Sat	INJURY - 4 6500 S	DR 1: UNKNOWN DISTRACTIONS	VEH 1: RAN STOP SIGN VEH 2: NONE	NB RAN STOP SIGN & HIT EB (DELAYED FATAL)
1	8/11/2014 140811262	20:45 Dark	Mon	INJURY - 3 7800 W		VEH 1: UNKNOWN VEH 2: UNKNOWN	EB MOTORCYCLE TURNING LEFT HIT A WB HEAD-ON

Date Printed 2/17/2016

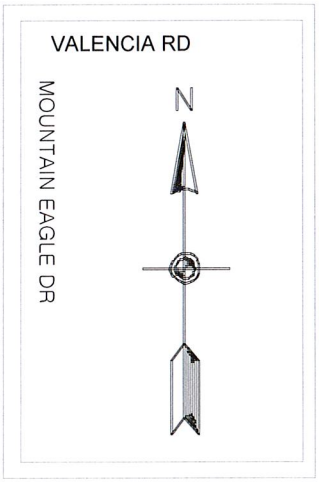
** Denotes Driver Impairment

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

MOUNTAIN EAGLE DR@VALENCIA RD
8/1/2011 to 8/31/2015

LEGEND

- REAR END
- TURNING
- ANGLE
- OUT OF CONTROL
- MISC
- FIXED OBJ
- BACKING
- HEAD ON
- BODILY INJURY
- FATALITY



17

CRASH AND INJURY SEVERITY SUMMARY

PROPERTY	1
INJURY	0
FATALITY	0
TOTAL	1

Print Date: 2/17/2016

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

MOUNTAIN EAGLE DR @ VALENCIA RD

8/1/2011 to 8/31/2015

TYPE	DATE CASE #	TIME LIGHT	DAY	SEVERITY BLOCK #	DISTRACTED DRIVING	VIOLATIONS CITED	NARRATIVE
17	3/27/2012 120327083	10 : 12 Dawn	Tue	PROPERTY 6500 S		VEH 1: NONE VEH 2: DISREGARD TRAFFIC SIGNAL	SB RE SB

Date Printed 2/17/2016

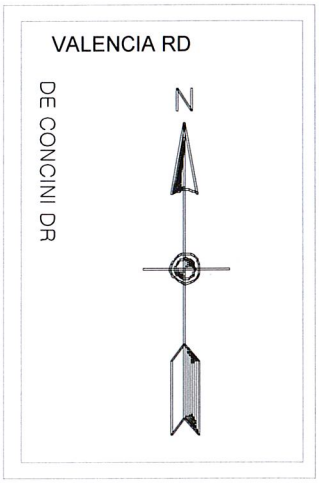
** Denotes Driver Impairment

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

DE CONCINI DR@VALENCIA RD
8/1/2011 to 8/31/2015

LEGEND

- REAR END
- TURNING
- ANGLE
- OUT OF CONTROL
- MISC
- FIXED OBJ
- BACKING
- HEAD ON
- BODILY INJURY
- FATALITY



12

CRASH AND INJURY SEVERITY SUMMARY

PROPERTY	0
INJURY	1
FATALITY	0
TOTAL	1

Print Date: 2/17/2016

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

DE CONCINI DR @ VALENCIA RD

8/1/2011 to 8/31/2015

TYPE	DATE CASE #	TIME LIGHT	DAY	SEVERITY BLOCK #	DISTRACTED DRIVING	VIOLATIONS CITED	NARRATIVE
12	3/28/2012 120328181	15 : 5 Day	Wed	INJURY - 2 8200 W	DR 1: UNKNOWN DISTRACTIONS	VEH 1: SPEED TOO FAST FOR CONDITIONS VEH 2: NONE	WB REAR-END

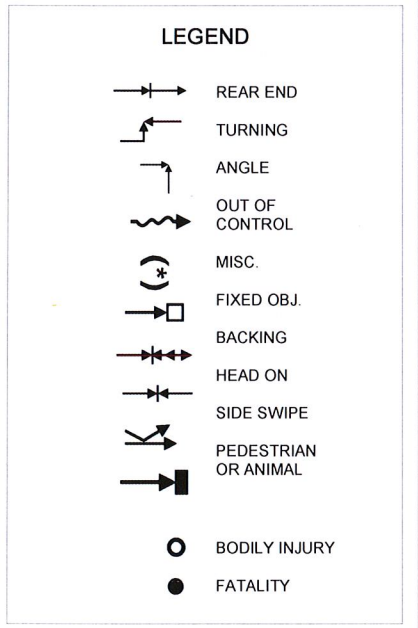
Date Printed 2/17/2016

** Denotes Driver Impairment

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

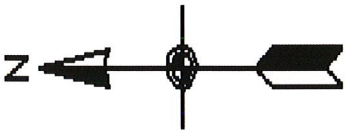
VALENCIA RD FROM 7000W TO 9600W

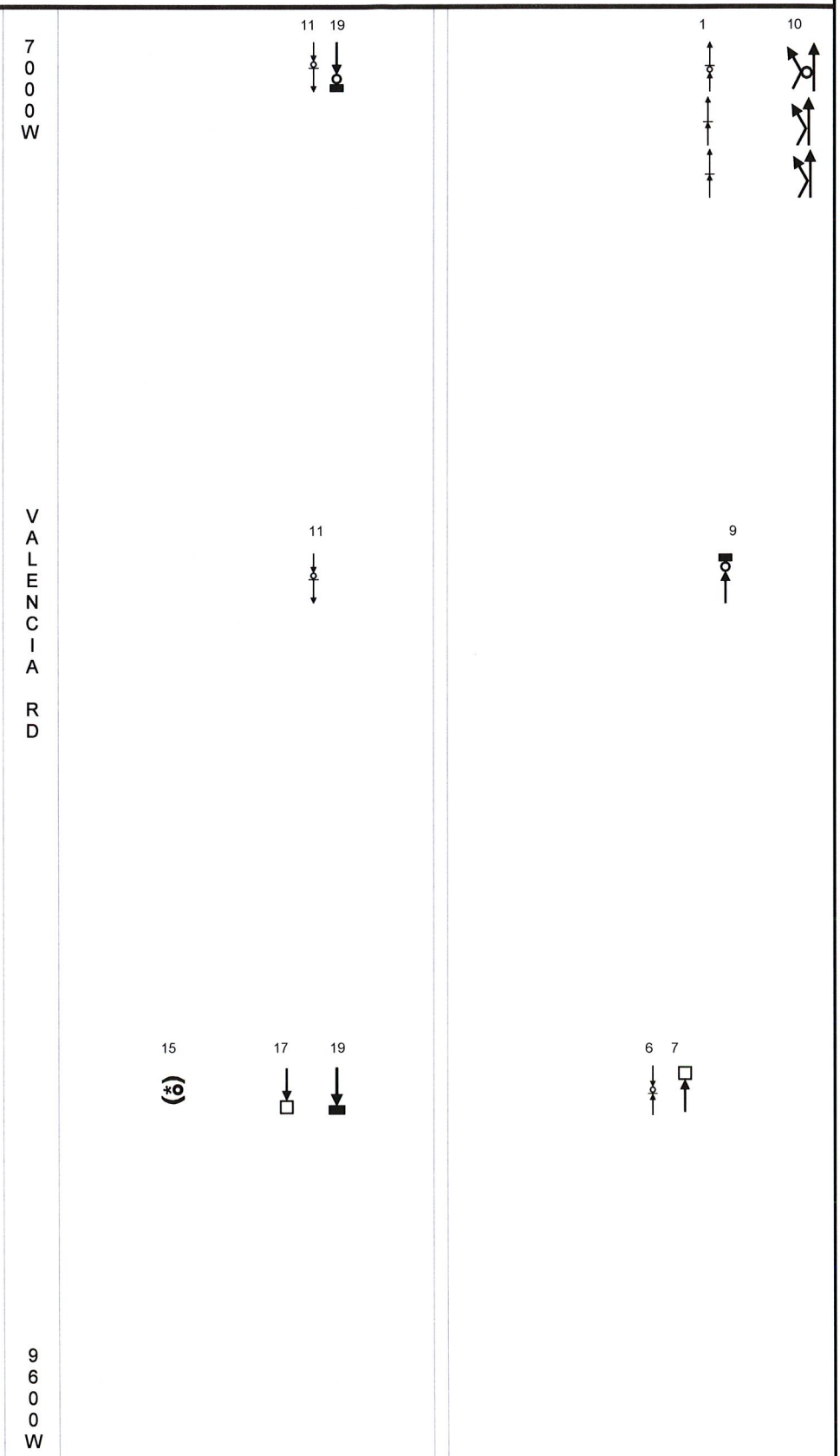
08/01/11 THROUGH 08/31/15



CRASH AND INJURY SEVERITY SUMMARY

PROPERTY	7
INJURY	8
FATALITY	0
TOTAL	15





Print Date: 2/17/2016

PIMA COUNTY
TRANSPORTATION
TRAFFIC ENGINEERING DIVISION

VALENCIA RD **: 7000 - 9600 W**

08/01/11 to 08/31/15

TYPE	DATE CASE #	TIME LIGHT	DAY	SEVERITY BLOCK #	DISTRACTED DRIVING	VIOLATIONS CITED	NARRATIVE
9	3/11/2015 150311022	6:53 Dawn	Wed	INJURY - 3 8170	DR 1: UNKNOWN DISTRACTIONS	VEH 1: UNKNOWN VEH 2: NONE	EB VEH HIT EB PEDESTRIAN
11	2/1/2015 150201042	4:30 Dark--lighted	Sun	INJURY - 2 8320	DR 1: UNKNOWN DISTRACTIONS	** VEH 1: SPEED TOO FAST FOR CONDITIONS VEH 2: OTHER	WB CHANGED LANES & RE A WB PARKED VEH. (ALCOHOL)
6	1/1/2015 150101204	13:27 Day	Thu	INJURY - 3 9500	DR 2: UNKNOWN DISTRACTIONS	** VEH 1: NONE VEH 2: DROVE/RODE IN OPPOSING LANE DISREGARDED PAVEMENT MARKINGS	WB HIT EB HEAD ON IN CURVE
19	10/26/2014 141026043	3:32 Dark	Sun	INJURY - 3 7580	DR 1: UNKNOWN DISTRACTIONS DR 2: UNKNOWN DISTRACTIONS	** VEH 1: SPEED TOO FAST FOR CONDITIONS VEH 2: DID NOT USE CROSSWALK	WB HIT A NB PEDESTRIAN (ALCOHOL)
7	2/4/2014 140204301	23:44 Dark	Tue	PROPERTY 9500		** VEH 1: SPEED TOO FAST FOR CONDITIONS	EB NEGO CURVE HIT A TRAFFIC SIGN (FELL ASLEEP)
19	1/2/2014 140102259	22:0 Dark	Thu	PROPERTY 9200		VEH 1: NONE	WB HIT AN ANIMAL IN THE RDWY (DEER)
17	9/13/2013 130913152	13:15 Day	Fri	PROPERTY 9200		VEH 1: OTHER	WB LOST CTRL, LEFT THE RDWY & HIT A FENCE (FAULTY BRAKES)
1	8/27/2013 130827040	07:43 Day	Tue	INJURY - 3 7200		VEH 1: SPEED TOO FAST FOR CONDITIONS VEH 2: NONE VEH 3: NONE VEH 4: NONE	EB REAR-END
10	1/4/2013 130104063	08:0 Day	Fri	PROPERTY 7450		VEH 1: UNKNOWN VEH 2: UNKNOWN	EB PASSING HIT EB
11	10/19/2012 121019063	08:19 Day	Fri	INJURY - 2 7670	DR 1: UNKNOWN DISTRACTIONS	VEH 1: FOLLOWED TOO CLOSELY VEH 2: NONE VEH 3: NONE	WB REAR-END
10	5/21/2012 120521382	21:58 Dark	Mon	PROPERTY 7010		VEH 1: NONE VEH 2: PASSED IN NO PASSING ZONE	WB PASSING SIDESWIPED AN EB
15	3/12/2012 120312171	13:29 Day	Mon	INJURY - 2 9480		VEH 1: SPEED TOO FAST FOR CONDITIONS	WB CROSSED CENTER LANE ROLLED & RAN OFF RD

Date Printed 2/17/2016

** Denotes Driver Impairment

TYPE	DATE CASE #	TIME LIGHT	DAY	SEVERITY BLOCK #	DISTRACTED DRIVING	VIOLATIONS CITED	NARRATIVE
10	11/9/2011 111109032	06 : 42 Day	Wed	INJURY - 3 7390	DR 1: UNKNOWN DISTRACTIONS	VEH 1: OTHER UNSAFE PASSING VEH 2: NONE	EB PASSING SIDESWIPED AN EB BICYCLE
1	10/15/2011 111015213	17 : 7 Day	Sat	PROPERTY 7570		** VEH 1: NONE VEH 2: SPEED TOO FAST FOR CONDITIONS	EB REAR-END (ALCOHOL)
	8/23/2011 110823057	08 : 25 Day	Tue	PROPERTY 7390	DR 1: UNKNOWN DISTRACTIONS	VEH 1: SPEED TOO FAST FOR CONDITIONS VEH 2: NONE	EB REAR-END (STOPPED FOR SCHOOL BUS)

Date Printed 2/17/2016

** Denotes Driver Impairment

APPENDIX D – SUBMITTED NOTE TO FILE

MEMORANDUM

To: Mr. Paul Bennett, PE

From: Rick Solis, PE

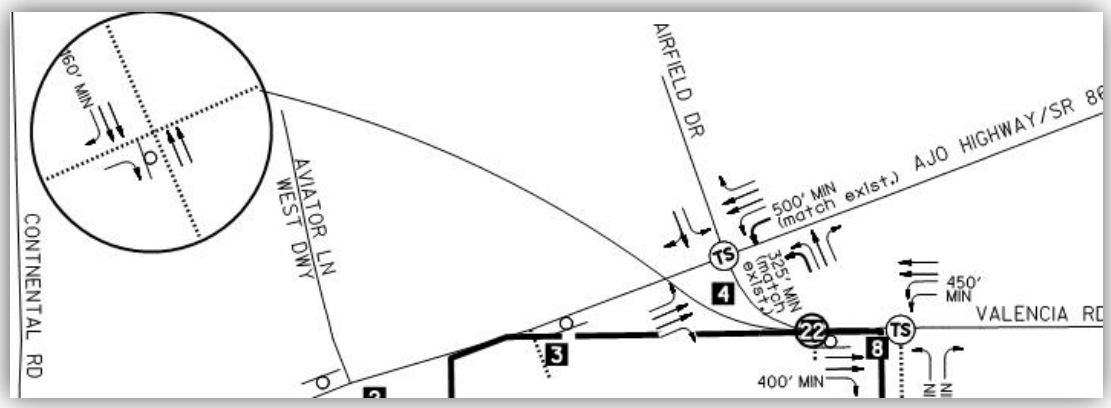
Kimley-Horn and Associates, Inc.

Date: 10/11/2016

Subject: 4RTVWE Valencia Road - Wade Rd to Ajo – SR86 Intersection and Valencia ADT Final Traffic Assumptions - **Note to File**

The Sendero Pass Traffic Analysis evaluated the traffic impacts of the proposed development situated on 837 acres of land south of Ryan Airfield. The development would have a significant impact to Valencia Road as the project proposes two access points along Valencia Road;

Exhibit 1. SR86 and Valencia Road Geometry (2030)



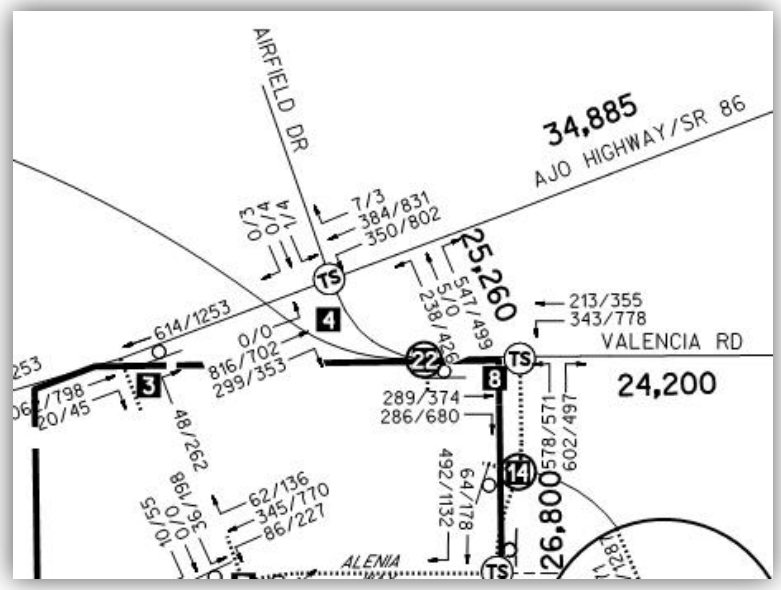
Source: Sendero Pass Traffic Impact Study

Twin Mustang Trail and the driveway to Lots 32,33 (intersection #22 in the TIA) are shown in Exhibit 1 above. The ultimate year 2030 Valencia Road / Twin Mustang Trail intersection recommends dual westbound to southbound left turn lanes (450-ft min), two westbound thru lanes, a dedicated eastbound to southbound right turn lane (400-ft min), and two eastbound thru lanes. In addition, Intersection # 22 shows right-in/ right-out access onto Valencia within the curve. The Sendero Pass traffic study recommends improvements to the newly constructed SR86/Valencia intersection for the

2030 horizon year. The improvements are the addition of a westbound to southbound left-turn lane, resulting in dual Lefts (500-ft min) – No additional improvements to the intersection were shown.

In terms of traffic volumes, there is a large disparity between various traffic forecast sources for the Valencia Road and SR 86 area. These include the Sendero Pass Traffic Impact Analysis with a 2030 horizon year (**Exhibit 2)**, the Pima Association of Governments (PAG) 2040, and PAG 2045 forecasted volumes. **Exhibit 3** (Page 3) illustrates the forecasted volumes for the area. Note that the Sendero Pass study assumes a 2% growth in traffic volumes per year. The design team has agreed that this growth rate is reasonable to capture the potential traffic generated by the Pomegranate Farms development (currently under study) and any other background traffic.

Exhibit 2. Sendero Pass 2030 Turning Movement Volumes



Conclusion

1. **Design Turning Movements for project 4RTVWE (SR 86 / Valencia Road)** - The 2030 forecasted traffic volumes from the Sendero Pass Traffic Impact Analysis (**Exhibit 2**) will be used as the 2040 design turning movement volumes to evaluate queuing for this project 4RTVWE. This is based on the review that the forecasted ADT volumes from the 2045 PAG Travel Demand Model are exceeded by the Sendero Pass study.

2. **Design ADT for Valencia Road** – To aid in the development of design ADT's, a pavement design sensitivity analysis was performed and found that ADTs ranging between 25k -35k ADT had negligible effect on the AC depth but exhibited some impact on the AB thickness. A cost comparison of Alternative AB scenarios was performed (See AB Calculations on page 5).

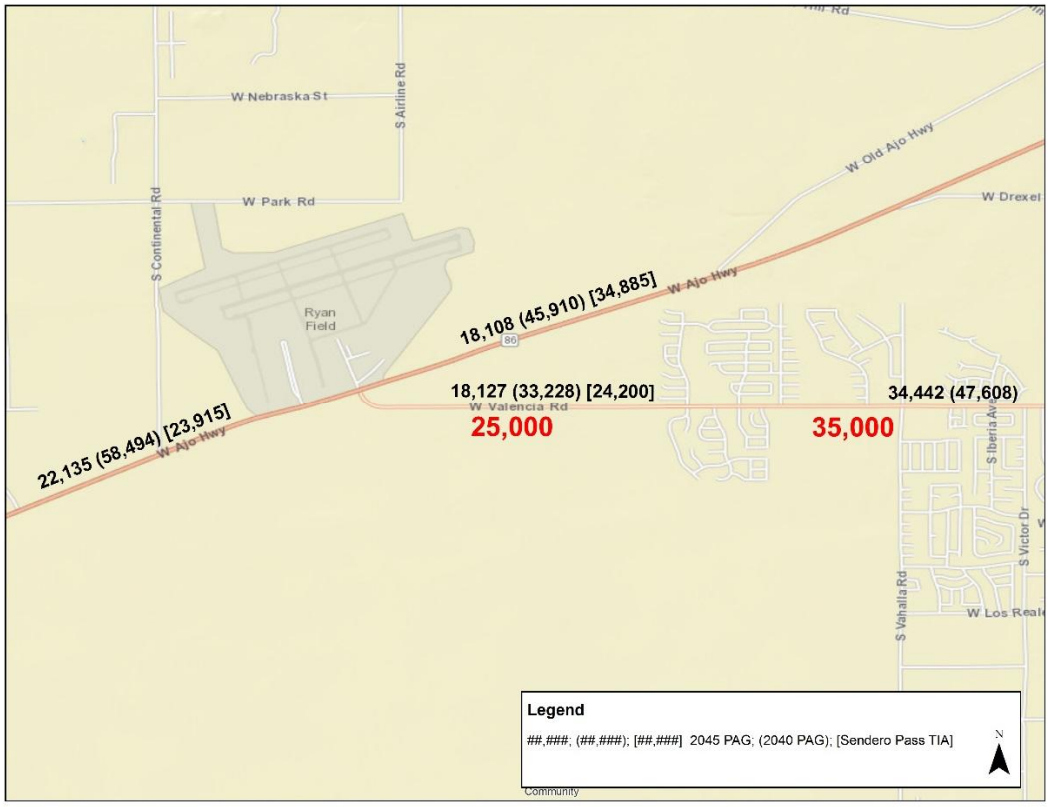
As such, considering the large disparity between various traffic forecast sources for the Valencia Road corridor, the following design year 2040 ADTs will be used for design:

- **25,000-VPD - SR86 to Via Molino De Viento**
- **35,000-VPD - Via Molino De Viento to Wade Rd**

Justification for these design parameters are as follows:

- **SR86 to Via Molino De Viento –** The 25,000 VPD value is in between the PAG 2045 ADT (18,127 VPD) and PAG 2040 ADT (33,228 VPD) and matches the Sendero Pass 2030 ADT's (25,260 VPD & 24,200 VPD).
- **Via Molino De Viento to Wade Rd –** The highest PAG 2045 (34,442) volume is in range of a 35,000 VPD.
- **Wade Rd to Camino Verde –** For comparison purposes, the 2030 ADT used for the recently constructed Wade to Camino Verde segment was 28,400 VPD. At a growth rate of 3.3%, this would equate to a 39,341 VPD in 2040.

Exhibit 3. – Average Daily Traffic Comparision



3. **Heavy Vehicle Percentages** - The Valencia Road pavement design will utilize the recorded 2016 heavy vehicle percentages (Table 1 from the project Traffic Memorandum) and the existing year 2016 ADT's; 2,899 VPD - SR86 to Via Molino De Viento and 9,700 VPD - Via Molino De Viento to Wade Rd.

Table 1 - Vehicle Classification Data

Bikes	Cars & Trailers	2 Axle Long	Bus	2 Axle 6-Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	5 Axle Multi	6 Axle Multi	>6 Axle Multi
Valencia, West of Via Molino De Viento												
9	1866	622	10	375	4	1	10	2	0	0	0	0
0.3%	64.4%	21.5%	0.3%	12.9%	0.1%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%
Valencia Road, Between Star Diamond Place and Wade Road												
17	6628	1833	99	1047	30	6	24	3	5	7	1	0
0.2%	68.3%	18.9%	1.0%	10.8%	0.3%	0.1%	0.2%	0.0%	0.1%	0.1%	0.0%	0.0%

4. **Turn Lane Storage Requirements at Valencia Approach to SR86** - Because the Valencia Road approach is within the vicinity of an ADOT facility, ADOT's Traffic Engineering Guidelines and Processes (Section 400) for Turn Lane Design was used to determine the design storage length. According to the guidelines:

   - Storage length = braking distance + queue length

   The braking distance (Table 430-2 per the ADOT guidelines) is assumed to be based on the speed recommended for the curve approaching SR 86. ADOT's final design plans recommend a Curve Warning Sign and a 30 MPH warning speed plaque be posted.

   - Assuming a 35 MPH curve design speed, the desirable ADOT breaking distance is 115'.
   - Alternatively, the minimum breaking distance for 45 MPH is 85'.
   - The maximum northbound left turn queue lengths occur in the PM (See Synchro reports) and was calculated between 503' (Sim Traffic) and 556'. The maximum NB RT turn queue was 339 in the AM.
   - Therefore, the maximum NB LT Storage Length Need = 115' + 556' = 671'.

   Therefore, the provided storage lengths in the current design of 685' (NB LT) and 665' (NB RT) exceed the storage needs. The traffic analysis assumes that dual WB left-turns along SR86 are in-place in year 2040. See the attached AM/PM traffic outputs.

AB Calculations:

Segment 1, Area: Valencia Road - SR86 to Via Molino De Viento = 47,860 SY
Segment 2, Area: Valencia Road - Via Molino De Viento to Wade Rd = 59,999 SY

Preliminary pavement design results include the following:

Alt 1 - 25,000 ADT, 6 AC / 9 AB on 8-in lime-treated subgrade
Alt 2 - 28,000 ADT, 6 AC / 11 AB on 8-in lime-treated subgrade
Alt 3 - 35,000 ADT, 6 AC / 12 AB on 8-in lime-treated subgrade

Segment 1 & Alt 1 Combination Cost: (47,860 SY) x (9”/12”)’ x (1 Yd / 3’) = 11,965 CY
Segment 1 & Alt 2 Combination Cost: (47,860 SY) x (12”/12”)’ x (1 Yd / 3’) = 14,623 CY

Sub-Total Dollar Difference (Cost Range $28/CY - $45/CY) = ($74,449) to ($119,650)

Segment 2 & Alt 2 Combination Cost: (59,999 SY) x (11”/12”)’ x (1 Yd / 3’) = 18,333 CY
Segment 2 & Alt 3 Combination Cost: (59,999 SY) x (12”/12”)’ x (1 Yd / 3’) = 19,999 CY

Sub-Total Dollar Difference (Cost Range $28/CY - $45/CY) = $46,665 to $74,999

Total Dollar Difference AB Cost [(1)(2)] (Cost Range $28/CY - $45/CY) = (**$27,783) to ($44,651)**

(1) Negative values reflect savings from the assumed pavement section 6” AC / 11” AB used throughout Valencia Road in the Draft DCR’s base cost estimate.
(2) Costs do not include 8-in lime-treated subgrade. Only the variable AB quantity was compared.

APPENDIX E – SYNCHRO OUTPUT SHEETS

Lanes and Geometrics
3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	495		532	493		493	685		666	362		125
Storage Lanes	1		1	2		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850			0.850			0.850		0.936	
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	1863	3362	1583	3433	3539	1583	1770	1863	1583	1770	1744	0
Flt Permitted				0.950			0.471			0.754		
Satd. Flow (perm)	1863	3362	1583	3433	3539	1583	877	1863	1583	1405	1744	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			325			113			372		3	
Link Speed (mph)		55			55			35			35	
Link Distance (ft)		731			847			966			535	
Travel Time (s)		9.1			10.5			18.8			10.4	

Intersection Summary	
Area Type:	Other

3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	816	299	350	384	7	238	5	547	1	4	3
Future Volume (vph)	0	816	299	350	384	7	238	5	547	1	4	3
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0										
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	887	325	380	417	8	259	5	595	1	4	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	887	325	380	417	8	259	5	595	1	7	0

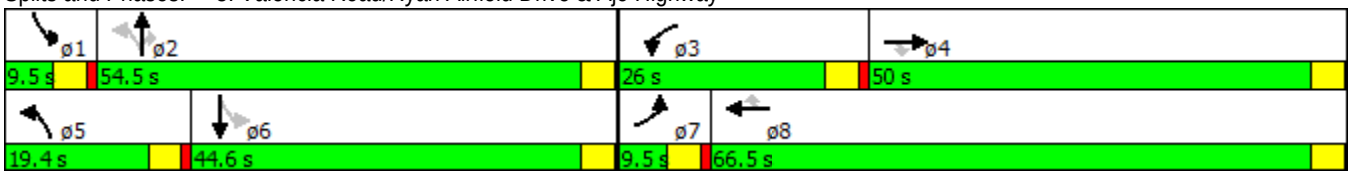
Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø7
Lane Configurations											
Traffic Volume (vph)	816	299	350	384	7	238	5	547	1	4	
Future Volume (vph)	816	299	350	384	7	238	5	547	1	4	
Turn Type	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	4		3	8		5	2		1	6	7
Permitted Phases		4			8	2		2	6		
Detector Phase	4	4	3	8	8	5	2	2	1	6	
Switch Phase											
Minimum Initial (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0
Minimum Split (s)	20.0	20.0	9.5	20.0	20.0	9.5	20.0	20.0	9.5	20.0	9.5
Total Split (s)	50.0	50.0	26.0	66.5	66.5	19.4	54.5	54.5	9.5	44.6	9.5
Total Split (%)	35.7%	35.7%	18.6%	47.5%	47.5%	13.9%	38.9%	38.9%	6.8%	31.9%	7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	1.0	0.5	0.5	1.0	0.5	0.5	1.0	0.5	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.5	4.0	4.0	4.5	4.0	4.0	4.5	4.0	
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?						Yes				Yes	
Recall Mode	None	None	None	None	None	None	Max	Max	None	None	None
Act Effct Green (s)	38.8	38.8	18.2	61.5	61.5	52.2	51.0	51.0	12.1	11.9	
Actuated g/C Ratio	0.32	0.32	0.15	0.50	0.50	0.43	0.42	0.42	0.10	0.10	
v/c Ratio	0.83	0.45	0.74	0.23	0.01	0.37	0.01	0.68	0.01	0.04	
Control Delay	46.9	5.4	60.5	17.4	0.0	27.3	26.4	16.0	38.0	36.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	46.9	5.4	60.5	17.4	0.0	27.3	26.4	16.0	38.0	36.5	
LOS	D	A	E	B	A	C	C	B	D	D	
Approach Delay	35.8			37.5			19.5			36.7	
Approach LOS	D			D			B			D	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 122.3
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 31.4 Intersection LOS: C
Intersection Capacity Utilization 69.8% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Valencia Road/Ryan Airfield Drive & Ajo Highway



Phasings
3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø7
Protected Phases	4		3	8		5	2		1	6	7
Permitted Phases		4			8	2		2	6		
Minimum Initial (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0
Minimum Split (s)	20.0	20.0	9.5	20.0	20.0	9.5	20.0	20.0	9.5	20.0	9.5
Total Split (s)	50.0	50.0	26.0	66.5	66.5	19.4	54.5	54.5	9.5	44.6	9.5
Total Split (%)	35.7%	35.7%	18.6%	47.5%	47.5%	13.9%	38.9%	38.9%	6.8%	31.9%	7%
Maximum Green (s)	46.0	46.0	21.5	62.5	62.5	14.9	50.5	50.5	5.0	40.6	5.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	1.0	0.5	0.5	1.0	0.5	0.5	1.0	0.5	1.0
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?						Yes				Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	None	None	None	None	None	Max	Max	None	None	None
Walk Time (s)											
Flash Dont Walk (s)											
Pedestrian Calls (#/hr)											
90th %ile Green (s)	46.0	46.0	21.5	72.0	72.0	14.9	50.5	50.5	5.0	40.6	0.0
90th %ile Term Code	Max	Max	Max	Hold	Hold	Max	MaxR	MaxR	Max	Hold	Skip
70th %ile Green (s)	45.5	45.5	21.5	71.5	71.5	50.0	50.5	50.5	0.0	0.0	0.0
70th %ile Term Code	Gap	Gap	Max	Hold	Hold	Hold	MaxR	MaxR	Skip	Skip	Skip
50th %ile Green (s)	40.3	40.3	19.1	63.9	63.9	50.0	50.5	50.5	0.0	0.0	0.0
50th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Hold	MaxR	MaxR	Skip	Skip	Skip
30th %ile Green (s)	34.9	34.9	16.5	55.9	55.9	50.0	50.5	50.5	0.0	0.0	0.0
30th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Hold	MaxR	MaxR	Skip	Skip	Skip
10th %ile Green (s)	28.4	28.4	13.2	46.1	46.1	50.0	50.5	50.5	0.0	0.0	0.0
10th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Hold	MaxR	MaxR	Skip	Skip	Skip

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 122.3
Control Type: Semi Act-Uncoord
90th %ile Actuated Cycle: 140
70th %ile Actuated Cycle: 130
50th %ile Actuated Cycle: 122.4
30th %ile Actuated Cycle: 114.4
10th %ile Actuated Cycle: 104.6

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	887	325	380	417	8	259	5	595	1	7
v/c Ratio	0.83	0.45	0.74	0.23	0.01	0.37	0.01	0.68	0.01	0.04
Control Delay	46.9	5.4	60.5	17.4	0.0	27.3	26.4	16.0	38.0	36.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.9	5.4	60.5	17.4	0.0	27.3	26.4	16.0	38.0	36.5
Queue Length 50th (ft)	335	0	148	90	0	140	2	139	1	3
Queue Length 95th (ft)	472	68	229	141	0	229	13	339	4	15
Internal Link Dist (ft)	651			767			886			455
Turn Bay Length (ft)		532	493		493	685		666	362	
Base Capacity (vph)	1277	803	609	1932	915	698	777	877	153	586
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.40	0.62	0.22	0.01	0.37	0.01	0.68	0.01	0.01

Intersection Summary

Lanes and Geometrics

3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	495		532	493		685	685		666	362		125
Storage Lanes	1		1	2		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850			0.850			0.850		0.936	
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	1863	3539	1583	3433	3539	1583	1770	1863	1583	1770	1744	0
Flt Permitted				0.950			0.702					
Satd. Flow (perm)	1863	3539	1583	3433	3539	1583	1308	1863	1583	1863	1744	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			384			117			597		3	
Link Speed (mph)		55			55			35			35	
Link Distance (ft)		731			847			1101			535	
Travel Time (s)		9.1			10.5			21.4			10.4	

Intersection Summary

Area Type: Other

Volume

3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

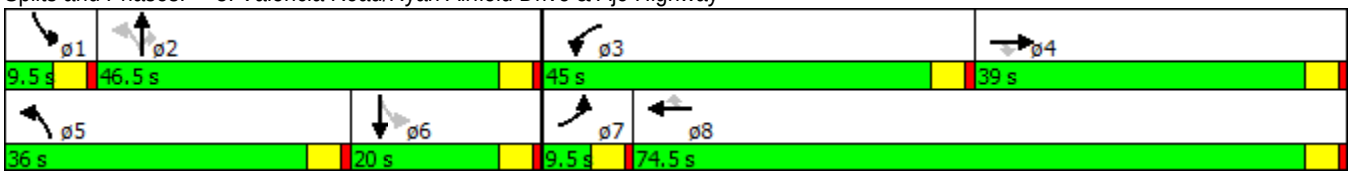
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	702	353	802	831	3	426	0	499	4	4	3
Future Volume (vph)	0	702	353	802	831	3	426	0	499	4	4	3
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	763	384	872	903	3	463	0	542	4	4	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	763	384	872	903	3	463	0	542	4	7	0

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBT	ø7
Lane Configurations										
Traffic Volume (vph)	702	353	802	831	3	426	499	4	4	
Future Volume (vph)	702	353	802	831	3	426	499	4	4	
Turn Type	NA	Perm	Prot	NA	Perm	pm+pt	Perm	pm+pt	NA	
Protected Phases	4		3	8		5		1	6	7
Permitted Phases		4			8	2	2	6		
Detector Phase	4	4	3	8	8	5	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0	4.0	5.0
Minimum Split (s)	20.0	20.0	9.5	20.0	20.0	9.5	20.0	9.5	20.0	9.5
Total Split (s)	39.0	39.0	45.0	74.5	74.5	36.0	46.5	9.5	20.0	9.5
Total Split (%)	27.9%	27.9%	32.1%	53.2%	53.2%	25.7%	33.2%	6.8%	14.3%	7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	Min	None	None	None
Act Effct Green (s)	31.1	31.1	34.0	69.7	69.7	32.1	30.5	6.3	6.0	
Actuated g/C Ratio	0.28	0.28	0.31	0.63	0.63	0.29	0.27	0.06	0.05	
v/c Ratio	0.77	0.53	0.83	0.41	0.00	0.92	0.62	0.04	0.07	
Control Delay	44.0	6.6	44.5	11.3	0.0	64.1	5.1	43.5	47.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	44.0	6.6	44.5	11.3	0.0	64.1	5.1	43.5	47.3	
LOS	D	A	D	B	A	E	A	D	D	
Approach Delay	31.5			27.6					45.9	
Approach LOS	C			C					D	

Intersection Summary	
Cycle Length: 140	
Actuated Cycle Length: 111	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 30.0	Intersection LOS: C
Intersection Capacity Utilization 83.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 3: Valencia Road/Ryan Airfield Drive & Ajo Highway



Phasings
3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBT	ø7
Protected Phases	4		3	8		5		1	6	7
Permitted Phases		4			8	2	2	6		
Minimum Initial (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0	4.0	5.0
Minimum Split (s)	20.0	20.0	9.5	20.0	20.0	9.5	20.0	9.5	20.0	9.5
Total Split (s)	39.0	39.0	45.0	74.5	74.5	36.0	46.5	9.5	20.0	9.5
Total Split (%)	27.9%	27.9%	32.1%	53.2%	53.2%	25.7%	33.2%	6.8%	14.3%	7%
Maximum Green (s)	34.5	34.5	40.5	70.0	70.0	31.5	42.0	5.0	15.5	5.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	None	None	None	None	None	Min	None	None	None
Walk Time (s)										
Flash Dont Walk (s)										
Pedestrian Calls (#/hr)										
90th %ile Green (s)	34.5	34.5	40.5	79.5	79.5	31.5	33.5	5.0	7.0	0.0
90th %ile Term Code	Max	Max	Max	Hold	Hold	Max	Hold	Max	Gap	Skip
70th %ile Green (s)	34.5	34.5	38.9	77.9	77.9	31.5	31.5	0.0	0.0	0.0
70th %ile Term Code	Max	Max	Gap	Hold	Hold	Max	Hold	Skip	Skip	Skip
50th %ile Green (s)	33.5	33.5	35.3	73.3	73.3	31.5	31.5	0.0	0.0	0.0
50th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Max	Hold	Skip	Skip	Skip
30th %ile Green (s)	30.0	30.0	32.0	66.5	66.5	31.5	31.5	0.0	0.0	0.0
30th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Max	Hold	Skip	Skip	Skip
10th %ile Green (s)	22.9	22.9	24.1	51.5	51.5	23.9	23.9	0.0	0.0	0.0
10th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Gap	Hold	Skip	Skip	Skip

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 111
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 131.5
70th %ile Actuated Cycle: 118.4
50th %ile Actuated Cycle: 113.8
30th %ile Actuated Cycle: 107
10th %ile Actuated Cycle: 84.4

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBT
Lane Group Flow (vph)	763	384	872	903	3	463	542	4	7
v/c Ratio	0.77	0.53	0.83	0.41	0.00	0.92	0.62	0.04	0.07
Control Delay	44.0	6.6	44.5	11.3	0.0	64.1	5.1	43.5	47.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.0	6.6	44.5	11.3	0.0	64.1	5.1	43.5	47.3
Queue Length 50th (ft)	264	0	303	153	0	332	0	3	3
Queue Length 95th (ft)	402	82	437	250	0	#556	48	11	20
Internal Link Dist (ft)	651			767					455
Turn Bay Length (ft)		532	493		685	685	666	362	
Base Capacity (vph)	1124	764	1280	2399	1111	536	978	101	251
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.50	0.68	0.38	0.00	0.86	0.55	0.04	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	909	14	47	372	33	43	5	264	96	2	28
Future Volume (veh/h)	10	909	14	47	372	33	43	5	264	96	2	28
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1696	1696	1652	1652	1652	1583	1583	1583	1863	1863	1863
Adj Flow Rate, veh/h	11	988	15	51	404	36	47	5	287	104	2	30
Adj No. of Lanes	1	2	1	1	2	1	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	12	12	15	15	15	20	20	20	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	478	1291	578	237	1592	712	486	605	514	400	517	439
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.40	0.40	0.40	0.04	0.51	0.51	0.04	0.38	0.38	0.28	0.28	0.28
Ln Grp Delay, s/veh	13.1	20.7	13.1	14.3	10.1	9.0	16.0	13.9	21.9	21.2	18.9	19.3
Ln Grp LOS	B	C	B	B	B	A	B	B	C	C	B	B
Approach Vol, veh/h		1014			491			339			136	
Approach Delay, s/veh		20.5			10.5			20.9			20.7	
Approach LOS		C			B			C			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4	5	6		8
Case No		3.0	1.2	5.0	1.2	5.0		3.0
Phs Duration (G+Y+Rc), s		31.6	7.7	32.9	7.6	24.0		40.6
Change Period (Y+Rc), s		4.0	4.5	4.0	4.5	4.0		4.0
Max Green (Gmax), s		27.6	5.9	34.0	5.1	18.0		44.4
Max Allow Headway (MAH), s		4.2	3.9	5.2	3.9	4.2		5.2
Max Q Clear (g_c+l1), s		14.1	3.3	21.1	3.5	7.5		7.3
Green Ext Time (g_e), s		1.4	0.0	7.8	0.0	1.2		13.8
Prob of Phs Call (p_c)		1.00	0.64	1.00	0.61	1.00		1.00
Prob of Max Out (p_x)		0.00	1.00	0.61	1.00	0.07		0.13

Left-Turn Movement Data								
Assigned Mvmt			3	7	5	1		
Mvmt Sat Flow, veh/h			1573	945	1508	1083		

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		1583		3223		1863		3139

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1346		1442		1583		1404

Left Lane Group Data								
Assigned Mvmt	0	0	3	7	5	1	0	0
Lane Assignment			(Pr/Pm)		(Pr/Pm)			

Lanes in Grp	0	0	1	1	1	1	0	0
Grp Vol (v), veh/h	0	0	51	11	47	104	0	0
Grp Sat Flow (s), veh/h/ln	0	0	1573	945	1508	1083	0	0
Q Serve Time (g_s), s	0.0	0.0	1.3	0.5	1.5	5.5	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	0.0	1.3	0.5	1.5	5.5	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	496	945	1166	1083	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	30.9	28.9	22.0	20.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	9.8	28.9	20.0	20.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	2.4	0.5	0.1	5.5	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	0	237	478	486	400	0	0
V/C Ratio (X)	0.00	0.00	0.22	0.02	0.10	0.26	0.00	0.00
Avail Cap (c_a), veh/h	0	0	295	545	529	400	0	0
Upstream Filter (I)	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	0.0	13.8	13.1	15.9	20.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.5	0.0	0.1	0.3	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	14.3	13.1	16.0	21.2	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.0	0.5	0.1	0.6	1.6	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	0.0	0.6	0.1	0.6	1.7	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.00	0.11	0.02	0.12	0.29	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T		T		T		T
Lanes in Grp	0	1	0	2	0	1	0	2
Grp Vol (v), veh/h	0	5	0	988	0	2	0	404
Grp Sat Flow (s), veh/h/ln	0	1583	0	1612	0	1863	0	1570
Q Serve Time (g_s), s	0.0	0.1	0.0	19.1	0.0	0.1	0.0	5.3
Cycle Q Clear Time (g_c), s	0.0	0.1	0.0	19.1	0.0	0.1	0.0	5.3
Lane Grp Cap (c), veh/h	0	605	0	1291	0	517	0	1592
V/C Ratio (X)	0.00	0.01	0.00	0.77	0.00	0.00	0.00	0.25
Avail Cap (c_a), veh/h	0	605	0	1517	0	517	0	1929
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	13.8	0.0	18.7	0.0	18.9	0.0	10.1
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.1
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	13.9	0.0	20.7	0.0	18.9	0.0	10.1
1st-Term Q (Q1), veh/ln	0.0	0.1	0.0	8.5	0.0	0.0	0.0	2.2

2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.1	0.0	8.9	0.0	0.0	0.0	2.3
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.08
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R		R		R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	287	0	15	0	30	0	36
Grp Sat Flow (s), veh/h/ln	0	1346	0	1442	0	1583	0	1404
Q Serve Time (g_s), s	0.0	12.1	0.0	0.5	0.0	1.0	0.0	0.9
Cycle Q Clear Time (g_c), s	0.0	12.1	0.0	0.5	0.0	1.0	0.0	0.9
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Lane Grp Cap (c), veh/h	0	514	0	578	0	439	0	712
V/C Ratio (X)	0.00	0.56	0.00	0.03	0.00	0.07	0.00	0.05
Avail Cap (c_a), veh/h	0	514	0	679	0	439	0	863
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	17.5	0.0	13.1	0.0	19.2	0.0	9.0
Incr Delay (d2), s/veh	0.0	4.3	0.0	0.0	0.0	0.1	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	21.9	0.0	13.1	0.0	19.3	0.0	9.0
1st-Term Q (Q1), veh/ln	0.0	4.4	0.0	0.2	0.0	0.4	0.0	0.4
2nd-Term Q (Q2), veh/ln	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	5.1	0.0	0.2	0.0	0.4	0.0	0.4
%ile Storage Ratio (RQ%)	0.00	0.98	0.00	0.03	0.00	0.08	0.00	0.07
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		18.1						
HCM 2010 LOS		B						

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	909	14	47	372	33	43	5	264	96	2	28
Future Volume (veh/h)	10	909	14	47	372	33	43	5	264	96	2	28
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1696	1696	1652	1652	1652	1583	1583	1583	1863	1863	1863
Adj Flow Rate, veh/h	11	988	15	51	404	36	47	5	287	104	2	30
Adj No. of Lanes	1	2	1	1	2	1	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	12	12	15	15	15	20	20	20	2	2	2
Cap, veh/h	478	1291	578	237	1592	712	486	605	514	400	517	439
Arrive On Green	0.40	0.40	0.40	0.04	0.51	0.51	0.04	0.38	0.38	0.28	0.28	0.28
Sat Flow, veh/h	945	3223	1442	1573	3139	1404	1508	1583	1346	1083	1863	1583
Grp Volume(v), veh/h	11	988	15	51	404	36	47	5	287	104	2	30
Grp Sat Flow(s),veh/h/ln	945	1612	1442	1573	1570	1404	1508	1583	1346	1083	1863	1583
Q Serve(g_s), s	0.5	19.1	0.5	1.3	5.3	0.9	1.5	0.1	12.1	5.5	0.1	1.0
Cycle Q Clear(g_c), s	0.5	19.1	0.5	1.3	5.3	0.9	1.5	0.1	12.1	5.5	0.1	1.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	478	1291	578	237	1592	712	486	605	514	400	517	439
V/C Ratio(X)	0.02	0.77	0.03	0.22	0.25	0.05	0.10	0.01	0.56	0.26	0.00	0.07
Avail Cap(c_a), veh/h	545	1517	679	295	1929	863	529	605	514	400	517	439
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.1	18.7	13.1	13.8	10.1	9.0	15.9	13.8	17.5	20.9	18.9	19.2
Incr Delay (d2), s/veh	0.0	2.0	0.0	0.5	0.1	0.0	0.1	0.0	4.3	0.3	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	8.9	0.2	0.6	2.3	0.4	0.6	0.1	5.1	1.7	0.0	0.4
LnGrp Delay(d),s/veh	13.1	20.7	13.1	14.3	10.1	9.0	16.0	13.9	21.9	21.2	18.9	19.3
LnGrp LOS	B	C	B	B	B	A	B	B	C	C	B	B
Approach Vol, veh/h		1014			491			339			136	
Approach Delay, s/veh		20.5			10.5			20.9			20.7	
Approach LOS		C			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4	5	6		8
Phs Duration (G+Y+Rc), s		31.6	7.7	32.9	7.6	24.0		40.6
Change Period (Y+Rc), s		4.0	4.5	4.0	4.5	4.0		4.0
Max Green Setting (Gmax), s		27.6	5.9	34.0	5.1	18.0		44.4
Max Q Clear Time (g_c+I1), s		14.1	3.3	21.1	3.5	7.5		7.3
Green Ext Time (p_c), s		1.4	0.0	7.8	0.0	1.2		13.8

Intersection Summary	
HCM 2010 Ctrl Delay	18.1
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	508	77	76	997	52	14	5	45	31	5	10
Future Volume (veh/h)	17	508	77	76	997	52	14	5	45	31	5	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1696	1696	1652	1652	1652	1583	1583	1583	1863	1863	1863
Adj Flow Rate, veh/h	18	552	84	83	1084	57	15	5	49	34	5	11
Adj No. of Lanes	1	2	1	1	2	1	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	12	12	15	15	15	20	20	20	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	204	1177	526	353	1520	680	508	640	544	535	603	512
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.37	0.37	0.37	0.06	0.48	0.48	0.02	0.40	0.40	0.32	0.32	0.32
Ln Grp Delay, s/veh	23.3	17.7	15.5	12.9	15.6	10.0	14.5	12.8	13.5	16.9	16.5	16.5
Ln Grp LOS	C	B	B	B	B	A	B	B	B	B	B	B
Approach Vol, veh/h		654			1224			69			50	
Approach Delay, s/veh		17.6			15.1			13.7			16.8	
Approach LOS		B			B			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4	5	6		8
Case No		3.0	1.2	5.0	1.2	5.0		3.0
Phs Duration (G+Y+Rc), s		33.0	8.5	30.2	5.8	27.2		38.7
Change Period (Y+Rc), s		4.0	4.5	4.0	4.5	4.0		4.0
Max Green (Gmax), s		29.0	7.5	31.0	5.5	19.0		43.0
Max Allow Headway (MAH), s		4.1	3.9	5.2	3.9	4.1		5.2
Max Q Clear (g_c+l1), s		3.6	4.2	15.1	2.5	3.3		21.5
Green Ext Time (g_e), s		0.3	0.0	10.7	0.0	0.2		13.2
Prob of Phs Call (p_c)		1.00	0.81	1.00	0.26	0.87		1.00
Prob of Max Out (p_x)		0.00	1.00	0.64	1.00	0.00		0.51

Left-Turn Movement Data								
Assigned Mvmt			3	7	5	1		
Mvmt Sat Flow, veh/h			1573	491	1508	1345		

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		1583		3223		1863		3139

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1346		1442		1583		1404

Left Lane Group Data								
Assigned Mvmt	0	0	3	7	5	1	0	0
Lane Assignment			(Pr/Pm)		(Pr/Pm)			

Lanes in Grp	0	0	1	1	1	1	0	0
Grp Vol (v), veh/h	0	0	83	18	15	34	0	0
Grp Sat Flow (s), veh/h/ln	0	0	1573	491	1508	1345	0	0
Q Serve Time (g_s), s	0.0	0.0	2.2	2.2	0.5	1.3	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	0.0	2.2	13.1	0.5	1.3	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	699	491	1183	1345	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	28.2	26.2	25.2	23.2	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	16.8	15.2	23.1	23.2	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	1.5	2.2	0.0	1.3	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	0	353	204	508	535	0	0
V/C Ratio (X)	0.00	0.00	0.24	0.09	0.03	0.06	0.00	0.00
Avail Cap (c_a), veh/h	0	0	428	237	597	535	0	0
Upstream Filter (I)	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	0.0	12.5	23.1	14.4	16.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	12.9	23.3	14.5	16.9	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.0	0.9	0.3	0.2	0.5	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	0.0	1.0	0.3	0.2	0.5	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.00	0.18	0.05	0.04	0.08	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T		T		T		T
Lanes in Grp	0	1	0	2	0	1	0	2
Grp Vol (v), veh/h	0	5	0	552	0	5	0	1084
Grp Sat Flow (s), veh/h/ln	0	1583	0	1612	0	1863	0	1570
Q Serve Time (g_s), s	0.0	0.1	0.0	9.4	0.0	0.1	0.0	19.5
Cycle Q Clear Time (g_c), s	0.0	0.1	0.0	9.4	0.0	0.1	0.0	19.5
Lane Grp Cap (c), veh/h	0	640	0	1177	0	603	0	1520
V/C Ratio (X)	0.00	0.01	0.00	0.47	0.00	0.01	0.00	0.71
Avail Cap (c_a), veh/h	0	640	0	1393	0	603	0	1882
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	12.8	0.0	17.4	0.0	16.5	0.0	14.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.3	0.0	0.0	0.0	1.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	12.8	0.0	17.7	0.0	16.5	0.0	15.6
1st-Term Q (Q1), veh/ln	0.0	0.1	0.0	4.1	0.0	0.1	0.0	8.3

2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.1	0.0	4.2	0.0	0.1	0.0	8.5
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.30
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R		R		R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	49	0	84	0	11	0	57
Grp Sat Flow (s), veh/h/ln	0	1346	0	1442	0	1583	0	1404
Q Serve Time (g_s), s	0.0	1.6	0.0	2.8	0.0	0.3	0.0	1.6
Cycle Q Clear Time (g_c), s	0.0	1.6	0.0	2.8	0.0	0.3	0.0	1.6
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Lane Grp Cap (c), veh/h	0	544	0	526	0	512	0	680
V/C Ratio (X)	0.00	0.09	0.00	0.16	0.00	0.02	0.00	0.08
Avail Cap (c_a), veh/h	0	544	0	623	0	512	0	842
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	13.2	0.0	15.4	0.0	16.5	0.0	9.9
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.1	0.0	0.0	0.0	0.1
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	13.5	0.0	15.5	0.0	16.5	0.0	10.0
1st-Term Q (Q1), veh/ln	0.0	0.6	0.0	1.1	0.0	0.1	0.0	0.6
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.6	0.0	1.1	0.0	0.1	0.0	0.6
%ile Storage Ratio (RQ%)	0.00	0.12	0.00	0.21	0.00	0.03	0.00	0.11
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		15.9						
HCM 2010 LOS		B						

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	508	77	76	997	52	14	5	45	31	5	10
Future Volume (veh/h)	17	508	77	76	997	52	14	5	45	31	5	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1696	1696	1652	1652	1652	1583	1583	1583	1863	1863	1863
Adj Flow Rate, veh/h	18	552	84	83	1084	57	15	5	49	34	5	11
Adj No. of Lanes	1	2	1	1	2	1	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	12	12	15	15	15	20	20	20	2	2	2
Cap, veh/h	204	1177	526	353	1520	680	508	640	544	535	603	512
Arrive On Green	0.37	0.37	0.37	0.06	0.48	0.48	0.02	0.40	0.40	0.32	0.32	0.32
Sat Flow, veh/h	491	3223	1442	1573	3139	1404	1508	1583	1346	1345	1863	1583
Grp Volume(v), veh/h	18	552	84	83	1084	57	15	5	49	34	5	11
Grp Sat Flow(s),veh/h/ln	491	1612	1442	1573	1570	1404	1508	1583	1346	1345	1863	1583
Q Serve(g_s), s	2.2	9.4	2.8	2.2	19.5	1.6	0.5	0.1	1.6	1.3	0.1	0.3
Cycle Q Clear(g_c), s	13.1	9.4	2.8	2.2	19.5	1.6	0.5	0.1	1.6	1.3	0.1	0.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	204	1177	526	353	1520	680	508	640	544	535	603	512
V/C Ratio(X)	0.09	0.47	0.16	0.24	0.71	0.08	0.03	0.01	0.09	0.06	0.01	0.02
Avail Cap(c_a), veh/h	237	1393	623	428	1882	842	597	640	544	535	603	512
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.1	17.4	15.4	12.5	14.6	9.9	14.4	12.8	13.2	16.8	16.5	16.5
Incr Delay (d2), s/veh	0.2	0.3	0.1	0.3	1.0	0.1	0.0	0.0	0.3	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	4.2	1.1	1.0	8.5	0.6	0.2	0.1	0.6	0.5	0.1	0.1
LnGrp Delay(d),s/veh	23.3	17.7	15.5	12.9	15.6	10.0	14.5	12.8	13.5	16.9	16.5	16.5
LnGrp LOS	C	B	B	B	B	A	B	B	B	B	B	B
Approach Vol, veh/h		654			1224			69			50	
Approach Delay, s/veh		17.6			15.1			13.7			16.8	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4	5	6		8
Phs Duration (G+Y+Rc), s		33.0	8.5	30.2	5.8	27.2		38.7
Change Period (Y+Rc), s		4.0	4.5	4.0	4.5	4.0		4.0
Max Green Setting (Gmax), s		29.0	7.5	31.0	5.5	19.0		43.0
Max Q Clear Time (g_c+I1), s		3.6	4.2	15.1	2.5	3.3		21.5
Green Ext Time (p_c), s		0.3	0.0	10.7	0.0	0.2		13.2

Intersection Summary	
HCM 2010 Ctrl Delay	15.9
HCM 2010 LOS	B

Lanes and Geometrics

3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	495		532	493		685	685		666	362		125
Storage Lanes	1		1	2		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850			0.850			0.850		0.936	
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	1863	3539	1583	3433	3539	1583	1770	1863	1583	1770	1744	0
Flt Permitted				0.950			0.702					
Satd. Flow (perm)	1863	3539	1583	3433	3539	1583	1308	1863	1583	1863	1744	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			384			117			597		3	
Link Speed (mph)		55			55			35			35	
Link Distance (ft)		731			847			1101			535	
Travel Time (s)		9.1			10.5			21.4			10.4	

Intersection Summary

Area Type: Other

Volume

3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

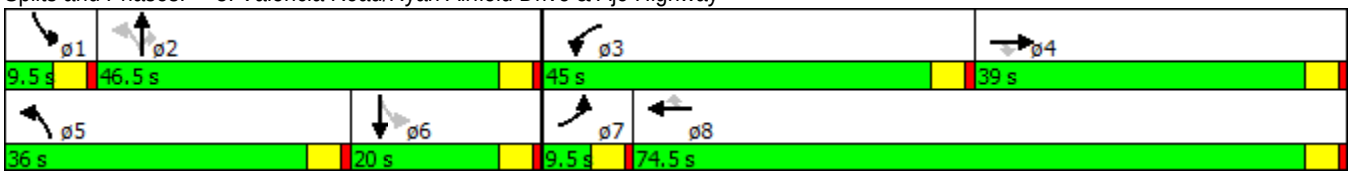
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	702	353	802	831	3	426	0	499	4	4	3
Future Volume (vph)	0	702	353	802	831	3	426	0	499	4	4	3
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	763	384	872	903	3	463	0	542	4	4	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	763	384	872	903	3	463	0	542	4	7	0

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBT	ø7
Lane Configurations										
Traffic Volume (vph)	702	353	802	831	3	426	499	4	4	
Future Volume (vph)	702	353	802	831	3	426	499	4	4	
Turn Type	NA	Perm	Prot	NA	Perm	pm+pt	Perm	pm+pt	NA	
Protected Phases	4		3	8		5		1	6	7
Permitted Phases		4			8	2	2	6		
Detector Phase	4	4	3	8	8	5	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0	4.0	5.0
Minimum Split (s)	20.0	20.0	9.5	20.0	20.0	9.5	20.0	9.5	20.0	9.5
Total Split (s)	39.0	39.0	45.0	74.5	74.5	36.0	46.5	9.5	20.0	9.5
Total Split (%)	27.9%	27.9%	32.1%	53.2%	53.2%	25.7%	33.2%	6.8%	14.3%	7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	Min	None	None	None
Act Effct Green (s)	31.1	31.1	34.0	69.7	69.7	32.1	30.5	6.3	6.0	
Actuated g/C Ratio	0.28	0.28	0.31	0.63	0.63	0.29	0.27	0.06	0.05	
v/c Ratio	0.77	0.53	0.83	0.41	0.00	0.92	0.62	0.04	0.07	
Control Delay	44.0	6.6	44.5	11.3	0.0	64.1	5.1	43.5	47.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	44.0	6.6	44.5	11.3	0.0	64.1	5.1	43.5	47.3	
LOS	D	A	D	B	A	E	A	D	D	
Approach Delay	31.5			27.6					45.9	
Approach LOS	C			C					D	

Intersection Summary	
Cycle Length: 140	
Actuated Cycle Length: 111	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 30.0	Intersection LOS: C
Intersection Capacity Utilization 83.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 3: Valencia Road/Ryan Airfield Drive & Ajo Highway



Phasings
3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBT	ø7
Protected Phases	4		3	8		5		1	6	7
Permitted Phases		4			8	2	2	6		
Minimum Initial (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0	4.0	5.0
Minimum Split (s)	20.0	20.0	9.5	20.0	20.0	9.5	20.0	9.5	20.0	9.5
Total Split (s)	39.0	39.0	45.0	74.5	74.5	36.0	46.5	9.5	20.0	9.5
Total Split (%)	27.9%	27.9%	32.1%	53.2%	53.2%	25.7%	33.2%	6.8%	14.3%	7%
Maximum Green (s)	34.5	34.5	40.5	70.0	70.0	31.5	42.0	5.0	15.5	5.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	None	None	None	None	None	Min	None	None	None
Walk Time (s)										
Flash Dont Walk (s)										
Pedestrian Calls (#/hr)										
90th %ile Green (s)	34.5	34.5	40.5	79.5	79.5	31.5	33.5	5.0	7.0	0.0
90th %ile Term Code	Max	Max	Max	Hold	Hold	Max	Hold	Max	Gap	Skip
70th %ile Green (s)	34.5	34.5	38.9	77.9	77.9	31.5	31.5	0.0	0.0	0.0
70th %ile Term Code	Max	Max	Gap	Hold	Hold	Max	Hold	Skip	Skip	Skip
50th %ile Green (s)	33.5	33.5	35.3	73.3	73.3	31.5	31.5	0.0	0.0	0.0
50th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Max	Hold	Skip	Skip	Skip
30th %ile Green (s)	30.0	30.0	32.0	66.5	66.5	31.5	31.5	0.0	0.0	0.0
30th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Max	Hold	Skip	Skip	Skip
10th %ile Green (s)	22.9	22.9	24.1	51.5	51.5	23.9	23.9	0.0	0.0	0.0
10th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Gap	Hold	Skip	Skip	Skip

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 111
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 131.5
70th %ile Actuated Cycle: 118.4
50th %ile Actuated Cycle: 113.8
30th %ile Actuated Cycle: 107
10th %ile Actuated Cycle: 84.4

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBT
Lane Group Flow (vph)	763	384	872	903	3	463	542	4	7
v/c Ratio	0.77	0.53	0.83	0.41	0.00	0.92	0.62	0.04	0.07
Control Delay	44.0	6.6	44.5	11.3	0.0	64.1	5.1	43.5	47.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.0	6.6	44.5	11.3	0.0	64.1	5.1	43.5	47.3
Queue Length 50th (ft)	264	0	303	153	0	332	0	3	3
Queue Length 95th (ft)	402	82	437	250	0	#556	48	11	20
Internal Link Dist (ft)	651			767					455
Turn Bay Length (ft)		532	493		685	685	666	362	
Base Capacity (vph)	1124	764	1280	2399	1111	536	978	101	251
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.50	0.68	0.38	0.00	0.86	0.55	0.04	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lanes and Geometrics
3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	495		532	493		493	685		666	362		125
Storage Lanes	1		1	2		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850			0.850			0.850		0.936	
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	1863	3362	1583	3433	3539	1583	1770	1863	1583	1770	1744	0
Flt Permitted				0.950			0.471			0.754		
Satd. Flow (perm)	1863	3362	1583	3433	3539	1583	877	1863	1583	1405	1744	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			325			113			372		3	
Link Speed (mph)		55			55			35			35	
Link Distance (ft)		731			847			966			535	
Travel Time (s)		9.1			10.5			18.8			10.4	

Intersection Summary	
Area Type:	Other

3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	816	299	350	384	7	238	5	547	1	4	3
Future Volume (vph)	0	816	299	350	384	7	238	5	547	1	4	3
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0										
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	887	325	380	417	8	259	5	595	1	4	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	887	325	380	417	8	259	5	595	1	7	0

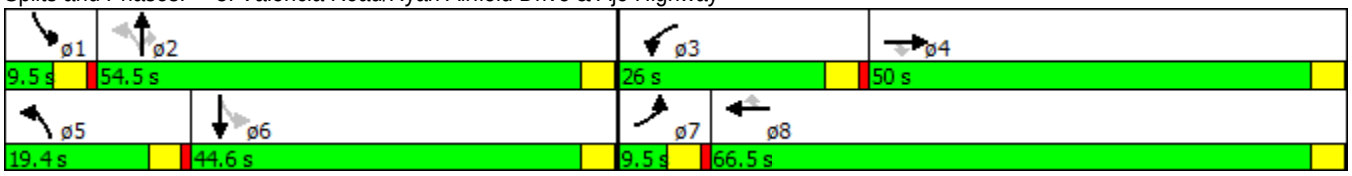
Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø7
Lane Configurations											
Traffic Volume (vph)	816	299	350	384	7	238	5	547	1	4	
Future Volume (vph)	816	299	350	384	7	238	5	547	1	4	
Turn Type	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	4		3	8		5	2		1	6	7
Permitted Phases		4			8	2		2	6		
Detector Phase	4	4	3	8	8	5	2	2	1	6	
Switch Phase											
Minimum Initial (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0
Minimum Split (s)	20.0	20.0	9.5	20.0	20.0	9.5	20.0	20.0	9.5	20.0	9.5
Total Split (s)	50.0	50.0	26.0	66.5	66.5	19.4	54.5	54.5	9.5	44.6	9.5
Total Split (%)	35.7%	35.7%	18.6%	47.5%	47.5%	13.9%	38.9%	38.9%	6.8%	31.9%	7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	1.0	0.5	0.5	1.0	0.5	0.5	1.0	0.5	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.5	4.0	4.0	4.5	4.0	4.0	4.5	4.0	
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?						Yes				Yes	
Recall Mode	None	None	None	None	None	None	Max	Max	None	None	None
Act Effct Green (s)	38.8	38.8	18.2	61.5	61.5	52.2	51.0	51.0	12.1	11.9	
Actuated g/C Ratio	0.32	0.32	0.15	0.50	0.50	0.43	0.42	0.42	0.10	0.10	
v/c Ratio	0.83	0.45	0.74	0.23	0.01	0.37	0.01	0.68	0.01	0.04	
Control Delay	46.9	5.4	60.5	17.4	0.0	27.3	26.4	16.0	38.0	36.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	46.9	5.4	60.5	17.4	0.0	27.3	26.4	16.0	38.0	36.5	
LOS	D	A	E	B	A	C	C	B	D	D	
Approach Delay	35.8			37.5			19.5			36.7	
Approach LOS	D			D			B			D	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 122.3
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 31.4 Intersection LOS: C
Intersection Capacity Utilization 69.8% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Valencia Road/Ryan Airfield Drive & Ajo Highway



Phasings
3: Valencia Road/Ryan Airfield Drive & Ajo Highway

10/11/2016

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø7
Protected Phases	4		3	8		5	2		1	6	7
Permitted Phases		4			8	2		2	6		
Minimum Initial (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0
Minimum Split (s)	20.0	20.0	9.5	20.0	20.0	9.5	20.0	20.0	9.5	20.0	9.5
Total Split (s)	50.0	50.0	26.0	66.5	66.5	19.4	54.5	54.5	9.5	44.6	9.5
Total Split (%)	35.7%	35.7%	18.6%	47.5%	47.5%	13.9%	38.9%	38.9%	6.8%	31.9%	7%
Maximum Green (s)	46.0	46.0	21.5	62.5	62.5	14.9	50.5	50.5	5.0	40.6	5.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	1.0	0.5	0.5	1.0	0.5	0.5	1.0	0.5	1.0
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?						Yes				Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	None	None	None	None	None	Max	Max	None	None	None
Walk Time (s)											
Flash Dont Walk (s)											
Pedestrian Calls (#/hr)											
90th %ile Green (s)	46.0	46.0	21.5	72.0	72.0	14.9	50.5	50.5	5.0	40.6	0.0
90th %ile Term Code	Max	Max	Max	Hold	Hold	Max	MaxR	MaxR	Max	Hold	Skip
70th %ile Green (s)	45.5	45.5	21.5	71.5	71.5	50.0	50.5	50.5	0.0	0.0	0.0
70th %ile Term Code	Gap	Gap	Max	Hold	Hold	Hold	MaxR	MaxR	Skip	Skip	Skip
50th %ile Green (s)	40.3	40.3	19.1	63.9	63.9	50.0	50.5	50.5	0.0	0.0	0.0
50th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Hold	MaxR	MaxR	Skip	Skip	Skip
30th %ile Green (s)	34.9	34.9	16.5	55.9	55.9	50.0	50.5	50.5	0.0	0.0	0.0
30th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Hold	MaxR	MaxR	Skip	Skip	Skip
10th %ile Green (s)	28.4	28.4	13.2	46.1	46.1	50.0	50.5	50.5	0.0	0.0	0.0
10th %ile Term Code	Gap	Gap	Gap	Hold	Hold	Hold	MaxR	MaxR	Skip	Skip	Skip

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 122.3
Control Type: Semi Act-Uncoord
90th %ile Actuated Cycle: 140
70th %ile Actuated Cycle: 130
50th %ile Actuated Cycle: 122.4
30th %ile Actuated Cycle: 114.4
10th %ile Actuated Cycle: 104.6

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	887	325	380	417	8	259	5	595	1	7
v/c Ratio	0.83	0.45	0.74	0.23	0.01	0.37	0.01	0.68	0.01	0.04
Control Delay	46.9	5.4	60.5	17.4	0.0	27.3	26.4	16.0	38.0	36.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.9	5.4	60.5	17.4	0.0	27.3	26.4	16.0	38.0	36.5
Queue Length 50th (ft)	335	0	148	90	0	140	2	139	1	3
Queue Length 95th (ft)	472	68	229	141	0	229	13	339	4	15
Internal Link Dist (ft)	651			767			886			455
Turn Bay Length (ft)		532	493		493	685		666	362	
Base Capacity (vph)	1277	803	609	1932	915	698	777	877	153	586
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.40	0.62	0.22	0.01	0.37	0.01	0.68	0.01	0.01

Intersection Summary

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	7	958	353	46	108	10
Future Vol, veh/h	7	958	353	46	108	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	12	15	15	2	2
Mvmt Flow	8	1041	384	50	117	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	434	0	-	0	945	217
Stage 1	-	-	-	-	409	-
Stage 2	-	-	-	-	536	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1122	-	-	-	260	787
Stage 1	-	-	-	-	639	-
Stage 2	-	-	-	-	551	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1122	-	-	-	258	787
Mov Cap-2 Maneuver	-	-	-	-	258	-
Stage 1	-	-	-	-	639	-
Stage 2	-	-	-	-	547	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	29.2
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1122	-	-	-	274
HCM Lane V/C Ratio	0.007	-	-	-	0.468
HCM Control Delay (s)	8.2	-	-	-	29.2
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	2.3

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	28	509	876	198	39	4
Future Vol, veh/h	28	509	876	198	39	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	12	15	15	2	2
Mvmt Flow	30	553	952	215	42	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1167	0	-	0	1398	584
Stage 1	-	-	-	-	1060	-
Stage 2	-	-	-	-	338	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	594	-	-	-	132	455
Stage 1	-	-	-	-	294	-
Stage 2	-	-	-	-	694	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	594	-	-	-	125	455
Mov Cap-2 Maneuver	-	-	-	-	125	-
Stage 1	-	-	-	-	294	-
Stage 2	-	-	-	-	659	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	45.6
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	594	-	-	-	134
HCM Lane V/C Ratio	0.051	-	-	-	0.349
HCM Control Delay (s)	11.4	-	-	-	45.6
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0.2	-	-	-	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	1265	11	42	456	53	0	2	71	5	2	96
Future Volume (veh/h)	7	1265	11	42	456	53	0	2	71	5	2	96
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1696	1900	1652	1652	1900	1583	1583	1900	1863	1863	1900
Adj Flow Rate, veh/h	8	1375	12	46	496	58	0	2	77	5	2	104
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	12	12	15	15	15	20	20	20	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	514	1799	16	218	1636	191	316	7	282	310	8	423
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.01	0.55	0.55	0.04	0.58	0.58	0.00	0.21	0.21	0.01	0.27	0.27
Ln Grp Delay, s/veh	8.8	17.9	17.8	13.7	9.8	9.8	0.0	0.0	31.4	25.7	0.0	25.5
Ln Grp LOS	A	B	B	B	A	A			C	C		C
Approach Vol, veh/h		1395			600			79			111	
Approach Delay, s/veh		17.8			10.1			31.4			25.5	
Approach LOS		B			B			C			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	1.1	4.0	1.1	4.0	1.1	4.0	1.1	4.0
Phs Duration (G+Y+Rc), s	5.1	23.0	7.9	52.7	0.0	28.1	5.4	55.2
Change Period (Y+Rc), s	4.5	4.0	4.5	4.0	4.5	4.0	4.5	4.0
Max Green (Gmax), s	5.1	19.0	6.9	62.0	5.0	19.1	5.5	63.4
Max Allow Headway (MAH), s	3.8	5.6	3.9	5.3	0.0	5.6	3.8	5.3
Max Q Clear (g_c+l1), s	2.2	6.3	3.1	30.9	0.0	6.6	2.2	10.0
Green Ext Time (g_e), s	0.0	0.8	0.0	17.8	0.0	0.8	0.0	23.0
Prob of Phs Call (p_c)	0.12	1.00	0.68	1.00	0.00	0.99	0.18	1.00
Prob of Max Out (p_x)	1.00	0.00	1.00	0.49	0.00	0.04	1.00	0.27

Left-Turn Movement Data				
Assigned Mvmt	1	3	5	7
Mvmt Sat Flow, veh/h	1774	1573	1508	1774

Through Movement Data				
Assigned Mvmt	2	4	6	8
Mvmt Sat Flow, veh/h	34	3274	30	2833

Right-Turn Movement Data				
Assigned Mvmt	12	14	16	18
Mvmt Sat Flow, veh/h	1317	29	1558	330

Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Pr/Pm)		(Pr/Pm)		(Pr/Pm)		(Pr/Pm)	

Lanes in Grp	1	0	1	0	1	0	1	0
Grp Vol (v), veh/h	5	0	46	0	0	0	8	0
Grp Sat Flow (s), veh/h/ln	1774	0	1573	0	1508	0	1774	0
Q Serve Time (g_s), s	0.2	0.0	1.1	0.0	0.0	0.0	0.2	0.0
Cycle Q Clear Time (g_c), s	0.2	0.0	1.1	0.0	0.0	0.0	0.2	0.0
Perm LT Sat Flow (s_l), veh/h/ln	1314	0	345	0	1090	0	851	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	21.0	0.0	48.7	0.0	19.0	0.0	48.7	0.0
Perm LT Serve Time (g_u), s	14.7	0.0	19.8	0.0	19.0	0.0	43.2	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	4.5	0.0	0.0	0.0	0.1	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	310	0	218	0	316	0	514	0
V/C Ratio (X)	0.02	0.00	0.21	0.00	0.00	0.00	0.02	0.00
Avail Cap (c_a), veh/h	401	0	280	0	400	0	606	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	25.7	0.0	13.2	0.0	0.0	0.0	8.8	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	25.7	0.0	13.7	0.0	0.0	0.0	8.8	0.0
1st-Term Q (Q1), veh/ln	0.1	0.0	0.5	0.0	0.0	0.0	0.1	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	0.1	0.0	0.5	0.0	0.0	0.0	0.1	0.0
%ile Storage Ratio (RQ%)	0.02	0.00	0.09	0.00	0.00	0.00	0.01	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment				T				T
Lanes in Grp	0	0	0	1	0	0	0	1
Grp Vol (v), veh/h	0	0	0	677	0	0	0	274
Grp Sat Flow (s), veh/h/ln	0	0	0	1612	0	0	0	1570
Q Serve Time (g_s), s	0.0	0.0	0.0	28.9	0.0	0.0	0.0	7.9
Cycle Q Clear Time (g_c), s	0.0	0.0	0.0	28.9	0.0	0.0	0.0	7.9
Lane Grp Cap (c), veh/h	0	0	0	885	0	0	0	906
V/C Ratio (X)	0.00	0.00	0.00	0.76	0.00	0.00	0.00	0.30
Avail Cap (c_a), veh/h	0	0	0	1127	0	0	0	1122
Upstream Filter (I)	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	0.0	0.0	15.5	0.0	0.0	0.0	9.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.2
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	17.9	0.0	0.0	0.0	9.8
1st-Term Q (Q1), veh/ln	0.0	0.0	0.0	12.8	0.0	0.0	0.0	3.4

2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.0	0.0	13.4	0.0	0.0	0.0	3.5
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.12
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		T+R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	79	0	710	0	106	0	280
Grp Sat Flow (s), veh/h/ln	0	1351	0	1691	0	1588	0	1594
Q Serve Time (g_s), s	0.0	4.3	0.0	28.9	0.0	4.6	0.0	8.0
Cycle Q Clear Time (g_c), s	0.0	4.3	0.0	28.9	0.0	4.6	0.0	8.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	0.97	0.00	0.02	0.00	0.98	0.00	0.21
Lane Grp Cap (c), veh/h	0	289	0	929	0	431	0	920
V/C Ratio (X)	0.00	0.27	0.00	0.76	0.00	0.25	0.00	0.30
Avail Cap (c_a), veh/h	0	289	0	1182	0	431	0	1139
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	29.1	0.0	15.5	0.0	25.2	0.0	9.6
Incr Delay (d2), s/veh	0.0	2.3	0.0	2.3	0.0	0.3	0.0	0.2
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	31.4	0.0	17.8	0.0	25.5	0.0	9.8
1st-Term Q (Q1), veh/ln	0.0	1.6	0.0	13.4	0.0	2.0	0.0	3.5
2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.6	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.8	0.0	14.0	0.0	2.1	0.0	3.5
%ile Storage Ratio (RQ%)	0.00	0.09	0.00	0.55	0.00	0.11	0.00	0.12
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		16.6						
HCM 2010 LOS		B						

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	1265	11	42	456	53	0	2	71	5	2	96
Future Volume (veh/h)	7	1265	11	42	456	53	0	2	71	5	2	96
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1696	1900	1652	1652	1900	1583	1583	1900	1863	1863	1900
Adj Flow Rate, veh/h	8	1375	12	46	496	58	0	2	77	5	2	104
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	12	12	15	15	15	20	20	20	2	2	2
Cap, veh/h	514	1799	16	218	1636	191	316	7	282	310	8	423
Arrive On Green	0.01	0.55	0.55	0.04	0.58	0.58	0.00	0.21	0.21	0.01	0.27	0.27
Sat Flow, veh/h	1774	3274	29	1573	2833	330	1508	34	1317	1774	30	1558
Grp Volume(v), veh/h	8	677	710	46	274	280	0	0	79	5	0	106
Grp Sat Flow(s),veh/h/ln	1774	1612	1691	1573	1570	1594	1508	0	1351	1774	0	1588
Q Serve(g_s), s	0.2	28.9	28.9	1.1	7.9	8.0	0.0	0.0	4.3	0.2	0.0	4.6
Cycle Q Clear(g_c), s	0.2	28.9	28.9	1.1	7.9	8.0	0.0	0.0	4.3	0.2	0.0	4.6
Prop In Lane	1.00		0.02	1.00		0.21	1.00		0.97	1.00		0.98
Lane Grp Cap(c), veh/h	514	885	929	218	906	920	316	0	289	310	0	431
V/C Ratio(X)	0.02	0.76	0.76	0.21	0.30	0.30	0.00	0.00	0.27	0.02	0.00	0.25
Avail Cap(c_a), veh/h	606	1127	1182	280	1122	1139	400	0	289	401	0	431
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.8	15.5	15.5	13.2	9.6	9.6	0.0	0.0	29.1	25.7	0.0	25.2
Incr Delay (d2), s/veh	0.0	2.4	2.3	0.5	0.2	0.2	0.0	0.0	2.3	0.0	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	13.4	14.0	0.5	3.5	3.5	0.0	0.0	1.8	0.1	0.0	2.1
LnGrp Delay(d),s/veh	8.8	17.9	17.8	13.7	9.8	9.8	0.0	0.0	31.4	25.7	0.0	25.5
LnGrp LOS	A	B	B	B	A	A			C	C		C
Approach Vol, veh/h		1395			600			79			111	
Approach Delay, s/veh		17.8			10.1			31.4			25.5	
Approach LOS		B			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.1	23.0	7.9	52.7	0.0	28.1	5.4	55.2
Change Period (Y+Rc), s	4.5	4.0	4.5	4.0	4.5	4.0	4.5	4.0
Max Green Setting (Gmax), s	5.1	19.0	6.9	62.0	5.0	19.1	5.5	63.4
Max Q Clear Time (g_c+I1), s	2.2	6.3	3.1	30.9	0.0	6.6	2.2	10.0
Green Ext Time (p_c), s	0.0	0.8	0.0	17.8	0.0	0.8	0.0	23.0

Intersection Summary	
HCM 2010 Ctrl Delay	16.6
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	806	4	106	1364	173	37	6	4	57	0	4
Future Volume (veh/h)	11	806	4	106	1364	173	37	6	4	57	0	4
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1696	1900	1652	1652	1900	1583	1583	1900	1863	1863	1900
Adj Flow Rate, veh/h	12	876	4	115	1483	188	40	7	4	62	0	4
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	12	12	15	15	15	20	20	20	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	143	1893	9	380	1709	214	325	162	93	373	0	283
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.01	0.58	0.58	0.05	0.61	0.61	0.03	0.17	0.17	0.04	0.00	0.18
Ln Grp Delay, s/veh	18.2	13.0	13.0	9.7	24.1	25.5	33.6	0.0	35.9	33.3	0.0	34.8
Ln Grp LOS	B	B	B	A	C	C	C		D	C		C
Approach Vol, veh/h		892			1786			51			66	
Approach Delay, s/veh		13.0			23.8			34.1			33.4	
Approach LOS		B			C			C			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	1.1	4.0	1.1	4.0	1.1	4.0	1.1	4.0
Phs Duration (G+Y+Rc), s	8.6	21.6	9.4	63.1	7.9	22.3	5.9	66.5
Change Period (Y+Rc), s	4.5	4.0	4.5	4.0	4.5	4.0	4.5	4.0
Max Green (Gmax), s	5.3	17.6	9.3	60.8	5.3	17.6	5.1	65.0
Max Allow Headway (MAH), s	3.8	5.5	3.9	5.3	3.9	5.5	3.8	5.3
Max Q Clear (g_c+l1), s	4.9	2.6	5.0	17.8	4.2	2.2	2.3	48.1
Green Ext Time (g_e), s	0.0	0.0	0.1	30.7	0.0	0.0	0.0	14.5
Prob of Phs Call (p_c)	0.83	1.00	0.96	1.00	0.68	0.89	0.29	1.00
Prob of Max Out (p_x)	1.00	0.00	0.64	0.67	1.00	0.00	1.00	0.89

Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1774		1573		1508		1774	

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		947		3290		0		2808

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		541		15		1583		352

Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Pr/Pm)		(Pr/Pm)		(Pr/Pm)		(Pr/Pm)	

Lanes in Grp	1	0	1	0	1	0	1	0
Grp Vol (v), veh/h	62	0	115	0	40	0	12	0
Grp Sat Flow (s), veh/h/ln	1774	0	1573	0	1508	0	1774	0
Q Serve Time (g_s), s	2.9	0.0	3.0	0.0	2.2	0.0	0.3	0.0
Cycle Q Clear Time (g_c), s	2.9	0.0	3.0	0.0	2.2	0.0	0.3	0.0
Perm LT Sat Flow (s_l), veh/h/ln	1398	0	557	0	1196	0	295	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	17.6	0.0	60.0	0.0	17.6	0.0	59.1	0.0
Perm LT Serve Time (g_u), s	17.0	0.0	43.3	0.0	17.6	0.0	16.5	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	4.4	0.0	0.0	0.0	1.8	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	373	0	380	0	325	0	143	0
V/C Ratio (X)	0.17	0.00	0.30	0.00	0.12	0.00	0.08	0.00
Avail Cap (c_a), veh/h	392	0	447	0	353	0	206	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	33.1	0.0	9.2	0.0	33.4	0.0	17.9	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.4	0.0	0.2	0.0	0.3	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	33.3	0.0	9.7	0.0	33.6	0.0	18.2	0.0
1st-Term Q (Q1), veh/ln	1.4	0.0	1.2	0.0	0.9	0.0	0.1	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	1.5	0.0	1.3	0.0	0.9	0.0	0.2	0.0
%ile Storage Ratio (RQ%)	0.25	0.00	0.24	0.00	0.18	0.00	0.03	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment				T				T
Lanes in Grp	0	0	0	1	0	0	0	1
Grp Vol (v), veh/h	0	0	0	429	0	0	0	822
Grp Sat Flow (s), veh/h/ln	0	0	0	1612	0	0	0	1570
Q Serve Time (g_s), s	0.0	0.0	0.0	15.8	0.0	0.0	0.0	44.2
Cycle Q Clear Time (g_c), s	0.0	0.0	0.0	15.8	0.0	0.0	0.0	44.2
Lane Grp Cap (c), veh/h	0	0	0	927	0	0	0	955
V/C Ratio (X)	0.00	0.00	0.00	0.46	0.00	0.00	0.00	0.86
Avail Cap (c_a), veh/h	0	0	0	954	0	0	0	993
Upstream Filter (I)	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	0.0	0.0	12.6	0.0	0.0	0.0	16.5
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.4	0.0	0.0	0.0	7.6
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	13.0	0.0	0.0	0.0	24.1
1st-Term Q (Q1), veh/ln	0.0	0.0	0.0	7.0	0.0	0.0	0.0	18.9

2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	2.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.0	0.0	7.1	0.0	0.0	0.0	21.0
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.72
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		T+R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	11	0	451	0	4	0	849
Grp Sat Flow (s), veh/h/ln	0	1488	0	1694	0	1583	0	1590
Q Serve Time (g_s), s	0.0	0.6	0.0	15.8	0.0	0.2	0.0	46.1
Cycle Q Clear Time (g_c), s	0.0	0.6	0.0	15.8	0.0	0.2	0.0	46.1
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	0.36	0.00	0.01	0.00	1.00	0.00	0.22
Lane Grp Cap (c), veh/h	0	255	0	974	0	283	0	968
V/C Ratio (X)	0.00	0.04	0.00	0.46	0.00	0.01	0.00	0.88
Avail Cap (c_a), veh/h	0	255	0	1002	0	283	0	1006
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	35.5	0.0	12.6	0.0	34.8	0.0	16.9
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.3	0.0	0.0	0.0	8.7
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	35.9	0.0	13.0	0.0	34.8	0.0	25.5
1st-Term Q (Q1), veh/ln	0.0	0.3	0.0	7.4	0.0	0.1	0.0	20.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	2.3
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.3	0.0	7.5	0.0	0.1	0.0	22.4
%ile Storage Ratio (RQ%)	0.00	0.01	0.00	0.29	0.00	0.00	0.00	0.77
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		20.8						
HCM 2010 LOS		C						

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	806	4	106	1364	173	37	6	4	57	0	4
Future Volume (veh/h)	11	806	4	106	1364	173	37	6	4	57	0	4
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1696	1900	1652	1652	1900	1583	1583	1900	1863	1863	1900
Adj Flow Rate, veh/h	12	876	4	115	1483	188	40	7	4	62	0	4
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	12	12	15	15	15	20	20	20	2	2	2
Cap, veh/h	143	1893	9	380	1709	214	325	162	93	373	0	283
Arrive On Green	0.01	0.58	0.58	0.05	0.61	0.61	0.03	0.17	0.17	0.04	0.00	0.18
Sat Flow, veh/h	1774	3290	15	1573	2808	352	1508	947	541	1774	0	1583
Grp Volume(v), veh/h	12	429	451	115	822	849	40	0	11	62	0	4
Grp Sat Flow(s),veh/h/ln	1774	1612	1694	1573	1570	1590	1508	0	1488	1774	0	1583
Q Serve(g_s), s	0.3	15.8	15.8	3.0	44.2	46.1	2.2	0.0	0.6	2.9	0.0	0.2
Cycle Q Clear(g_c), s	0.3	15.8	15.8	3.0	44.2	46.1	2.2	0.0	0.6	2.9	0.0	0.2
Prop In Lane	1.00		0.01	1.00		0.22	1.00		0.36	1.00		1.00
Lane Grp Cap(c), veh/h	143	927	974	380	955	968	325	0	255	373	0	283
V/C Ratio(X)	0.08	0.46	0.46	0.30	0.86	0.88	0.12	0.00	0.04	0.17	0.00	0.01
Avail Cap(c_a), veh/h	206	954	1002	447	993	1006	353	0	255	392	0	283
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.9	12.6	12.6	9.2	16.5	16.9	33.4	0.0	35.5	33.1	0.0	34.8
Incr Delay (d2), s/veh	0.3	0.4	0.3	0.4	7.6	8.7	0.2	0.0	0.3	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	7.1	7.5	1.3	21.0	22.4	0.9	0.0	0.3	1.5	0.0	0.1
LnGrp Delay(d),s/veh	18.2	13.0	13.0	9.7	24.1	25.5	33.6	0.0	35.9	33.3	0.0	34.8
LnGrp LOS	B	B	B	A	C	C	C		D	C		C
Approach Vol, veh/h		892			1786			51			66	
Approach Delay, s/veh		13.0			23.8			34.1			33.4	
Approach LOS		B			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.6	21.6	9.4	63.1	7.9	22.3	5.9	66.5
Change Period (Y+Rc), s	4.5	4.0	4.5	4.0	4.5	4.0	4.5	4.0
Max Green Setting (Gmax), s	5.3	17.6	9.3	60.8	5.3	17.6	5.1	65.0
Max Q Clear Time (g_c+I1), s	4.9	2.6	5.0	17.8	4.2	2.2	2.3	48.1
Green Ext Time (p_c), s	0.0	0.0	0.1	30.7	0.0	0.0	0.0	14.5

Intersection Summary	
HCM 2010 Ctrl Delay	20.8
HCM 2010 LOS	C