Bellmont

Access Management & Multi-Modal Transportation Study

Final Report

October 2015

Prepared for:

ADOT

COCONINO COUNTY ARIZONA

Prepared by:

BURGESS & NIPLE

Bellemont Access Management & Multi-Modal Transportation Study

ADOT Task Assignment MPD 012-15

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AND

COCONINO
COUNTY ARIZONA

Prepared by:

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Introduction

The Bellemont Access Management & Multi-Modal Transportation Study was conducted by the Arizona Department of Transportation (ADOT) for Coconino County through the Planning Assistance for Rural Areas (PARA) program. Coconino County, with ADOT support, has reviewed the Bellemont area transportation system and determined priority needs for future improvements north of Interstate 40 (I-40), including access management recommendations. The Study Area is located immediately north of I-40, at the Bellemont Traffic Interchange (TI) (milepost 185.15), which is approximately 9 miles west of the City of Flagstaff. The Study Area is approximately three miles wide (east-west). Primary roads within the Study Area are I-40, Brannigan Park Road, and Shadow Mountain Drive.

Bellemont is a rural, unincorporated community with a population of approximately 1,000 residents in Coconino County that has become a suburb of Flagstaff, where residents commute to work. Prevailing development in the area is a combination of commercial/industrial/residential uses. There are approximately 250 acres of privately-owned developable land at this location, with current development including a truck stop with restaurants, hotel, and a phased platted subdivision of which two phases have been completed.

This Study was completed with support from a Technical Advisory Committee (TAC). The TAC provided data, reviewed documents, provided study guidance, and attended TAC meetings. The following agencies were represented:

- Arizona Department of Public Safety, Flagstaff District 2
- ADOT Northcentral District
- ADOT Multimodal Planning Division
- Coconino County Community Development
- Coconino County Public Works
- Coconino County Sheriff's Office
- Flagstaff Metropolitan Planning Organization
- Northern Arizona Intergovernmental Public Transportation Authority
- Ponderosa Fire Department

Two working papers were completed in conjunction with this Study: Working Paper 1 – Existing and Future Conditions, and Working Paper 2 – Recommended Improvements and Implementation Plan. Both working papers were reviewed by the TAC and presented to the public over the course of two open houses. Input from the TAC and public was considered and influenced the completion of this study. Two Public Open Houses were conducted in conjunction with this study and are documented in ***Appendix FR-12 and FR-13***. ADOT's Planning/Environmental Linkages Questionnaire was completed at the conclusion of the study and is included as ***Appendix FR-14***.

Current and Future Conditions

A summary of completed and ongoing plans and studies involving the Study Area is presented. Known existing and future conditions within the Study Area are outlined, including:

- Land ownership and jurisdiction;
- Land use;
- Zoning;
- Residential development;
- Activity/Employment Centers;
- Socioeconomic Conditions;
- Physical, Natural, and Cultural Environment;
- Utilities; and
- Transportation Network.

Existing and future traffic analyses were conducted to identify traffic operation issues. The existing conditions analysis indicated that all of the intersections that were evaluated will operate at an overall Level of Service (LOS) A. However, field observations indicate that private property site layout and access (driveways) within the functional area of the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive create traffic operational issues that are not normally considered with a traditional traffic capacity analysis. Limited truck storage space, or area for queuing, is available for the fueling station; when the fueling stations are all occupied, waiting trucks are stopped through the driveway and the intersection. This creates periodic blockage of the intersection, including the only available shared northbound right-through lane. The blockage raises concerns for safety and timely emergency response. Residential traffic to Shadow Mountain Drive has no alternative route and is forced to wait for the truck traffic to clear the intersection.

The 2025 and 2035 analysis indicates the intersections will generally operate at a very good LOS A or LOS B. However, the truck volume for the Pilot Travel Center will continue to rise over the next 20 years. This increase in truck traffic will cause more frequent congestion on the street network as well as increased queue lengths.

Recommended Improvements and Implementation Plan

Transportation needs and deficiencies were identified, which include addressing congestion and safety, access management, gaps in the bicycle and pedestrian network, and public transit. Physical improvements, as well as policy and guidance recommendations, were developed.

Evaluation criteria were developed with the TAC and Project Management Team (PMT). These criteria were used to evaluate potential projects. The evaluation criteria are the following:

- Mobility;
- Consistency with planned improvements;
- Safety impact;
- Property impacts;
- Environmental compatibility;
- Public input;
- Cost; and
- Funding availability.

Improvements were assigned to near-term (5-year), mid-term (10-year), and long-term (20-year) time frames based on technical analysis, potential funding availability, and recommendations from other studies. Recommended projects are shown in ***Figure E1*** and ***Figure E2***. This section also documents recommendations for implementation, including a summary of potential funding sources.

Near-term (5-Year)

- Construct roadway Hybrid Concept 2/3.
- Widen the shoulders on Shadow Mountain Drive.
- Develop access management guidelines.

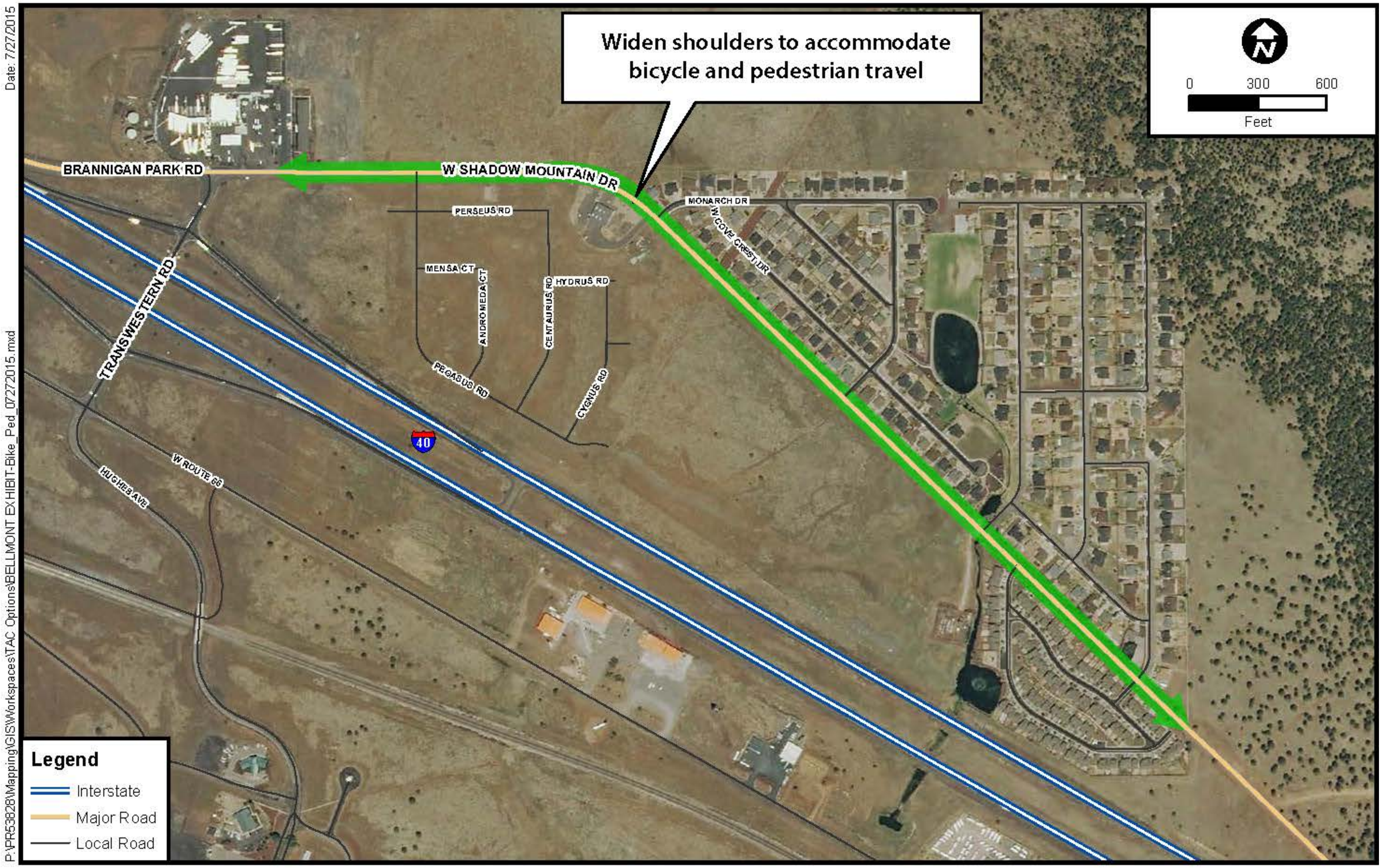
Mid-term (10-Year)

- Extend basic commuter service per the *Flagstaff Regional Five-Year and Long Range Transit Plan* (May 2013), depending on future transit studies and programming.
- Provide park-and-ride lot per *A Coordinated Transit Plan for ECoNA in Northern Arizona* (January 2014), depending on future transit studies and programming.

Long-term (20-Year)

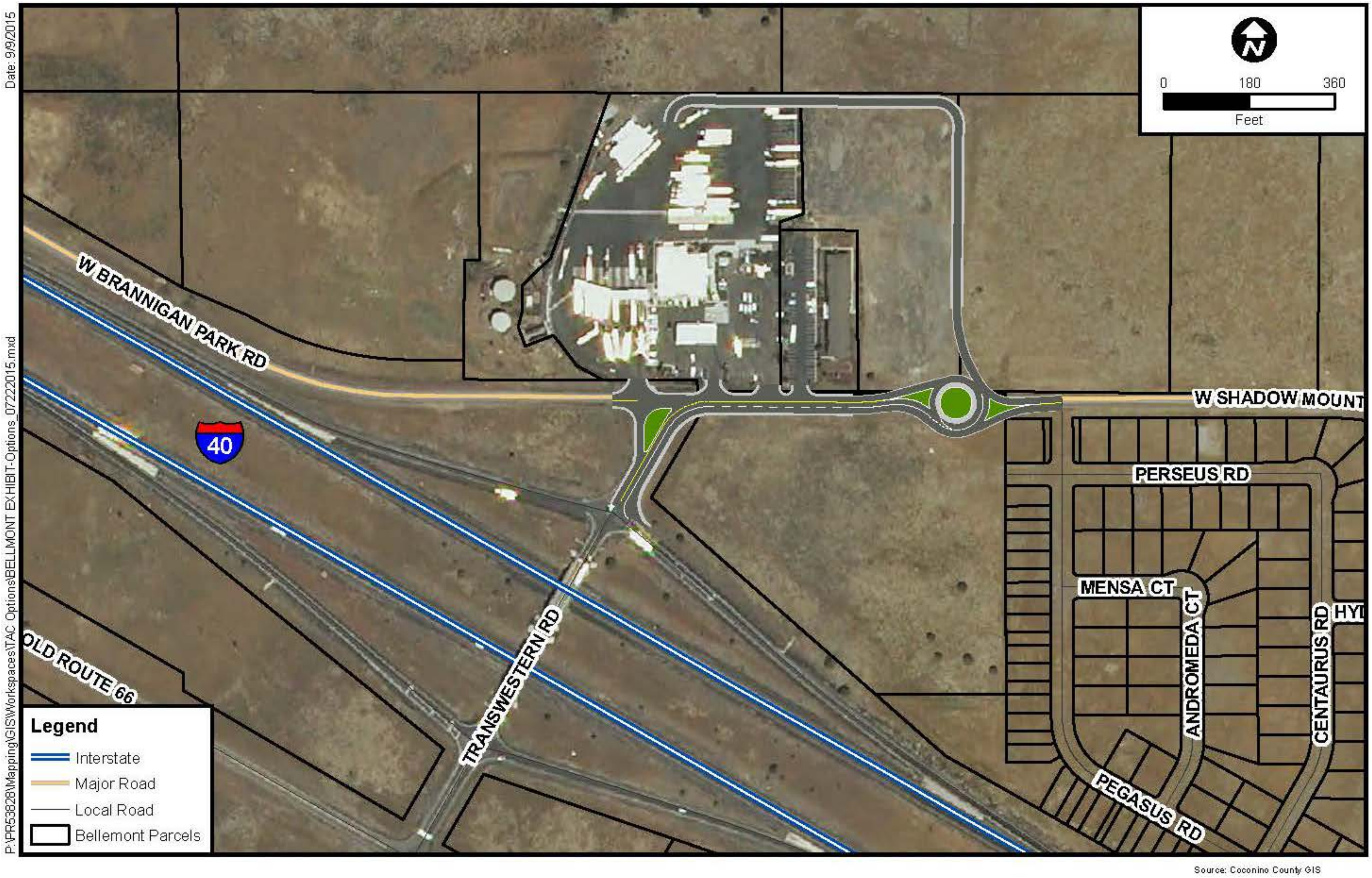
- Monitor commercial development in the Bellemont area and the Camp Navajo Industrial Park. Based on the traffic forecasts completed for this study and documented in Working Paper 1, the near-term roadway improvement recommendations (Hybrid Concept 2/3) should sufficiently manage Study Area future traffic demands and truck traffic. A primary need for Concept 1, which is the recommendation from the I-40 Bellemont to Winona Initial DCR, appears to have been based on anticipated substantial commercial development in the Camp Navajo Industrial Park; combined with other potential developments at the TI, the I-40 Bellemont to Winona Initial DCR attributed a potential increase of 26,600 vehicles per day by 2040 east and west of the Bellemont TI. The Camp Navajo Industrial park has been in the planning stage for nearly ten years but has not yet developed. Should the Camp Navajo Industrial Park develop in the future, the traffic forecasts and traffic capacity analysis performed as part of this study should be revisited prior to programming Concept 1.

Figure E1 - Wide Shoulders on Shadow Mountain Drive



Source: Coconino County GIS

Figure E2 – Hybrid Concept 2/3



1.0 Introduction

The Bellemont Access Management & Multi-Modal Transportation Study is being conducted by ADOT for Coconino County through the PARA program.

1.1. Study Overview

Bellemont is a rural, unincorporated community with a population of approximately 1,000 residents in Coconino County that has become a suburb of Flagstaff, where residents commute to work. Bellemont's transportation system is almost entirely automobile-oriented, with no public transit service and limited dedicated pedestrian and bicycle facilities.

Prevailing development in the area is a combination of commercial/industrial/residential uses. There are approximately 250 acres of privately-owned developable land at this location, with current development including a truck stop with restaurants, hotel, and a phased platted subdivision of which two phases have been completed. Additional phases of the subdivision are expected to be completed in the near future.

Three roads, I-40, Brannigan Park Road, and Shadow Mountain Drive are used to access virtually all the private land north of I-40 at this location. Frequent congestion from heavy truck volumes and subdivision traffic causes traffic delays and creates concern for safety and timely emergency response. The 2008 closure of the ADOT Parks Rest Area on I-40, just west of Bellemont, has also increased vehicular traffic accessing the truck stop and restaurants. Future build-out of the subdivision and potential commercial/industrial uses in the area are expected to continue to negatively affect the Brannigan Park Road and Shadow Mountain Drive intersection and the I-40 TI. ADOT recently prepared the *I-40 Bellemont to Winona Initial Design Concept Report (DCR)*, which recommended long-term improvements for the intersection and the TI.

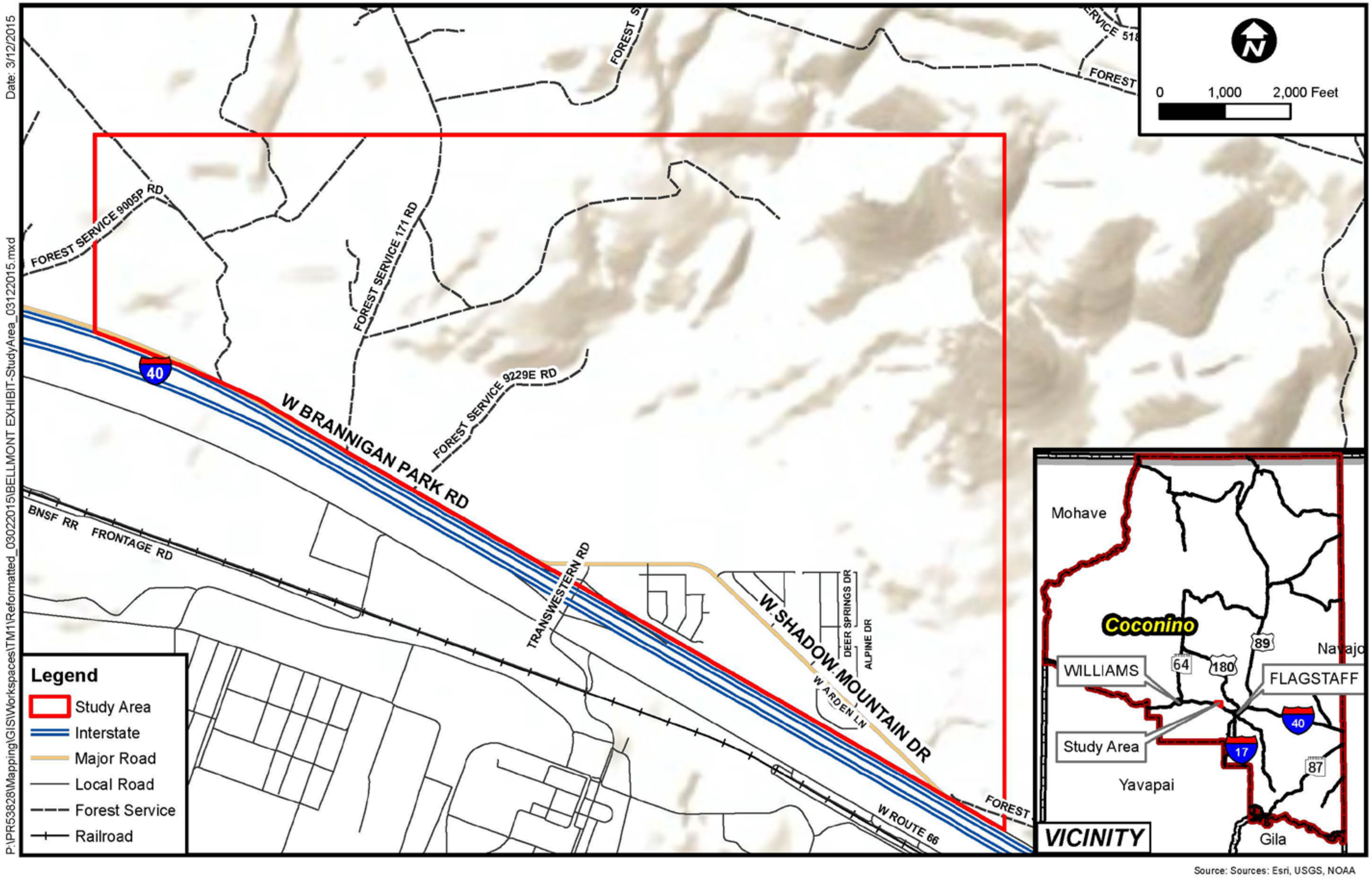
This access management and multi-modal transportation study provides a comprehensive review of the Bellemont area transportation system and provides guidance for determining priority needs for future improvements north of I-40, including:

- Alleviate congestion and improve/manage access; and
- Improve and evaluate multi-modal access to businesses from residential areas.

1.2. Study Area

The Study Area is located immediately north of I-40, at the Bellemont TI (milepost 185.15), which is approximately 9 miles west of the City of Flagstaff. The Study Area is approximately three miles wide (east-west). Primary roads within the Study Area are I-40, Brannigan Park Road, and Shadow Mountain Drive. A map of the Study Area is included as ***Figure 1.***

Figure 1 – Study Area



2.0 Relevant Plans and Studies

A review of completed and ongoing plans and studies involving the Study Area was performed and summarized below. Sources and reference information for these documents, along with other data included in this working paper, are cataloged in ***Appendix FR-1***.

2.1. I-40 Corridor Profile Study, In Progress

ADOT is conducting a corridor profile study for I-40, from the Arizona/California state line to the junction with I-17. The purpose of a corridor profile study is to strategically assess the health of key highway assets within the context of ADOT's Plan to Program (P2P) Link. The study will perform life cycle cost analyses and risk assessment to identify a range of cost-effective solutions for the I-40 corridor deficiencies and prioritize projects based on relative risks to operations, safety, and performance for the corridor.

2.2. Coconino County Roads Capital Improvement Plan

The Coconino County Roads Capital Improvements Plan (CIP) is an outline of planned improvement projects within Coconino County. The current CIP is for years 2015 to 2024. Coconino County also prepared a map that shows the project name, location, estimated cost, estimated work year, and estimated length of projects for the current CIP. The current Coconino County CIP identified a $3 million improvement in 2018 at the Bellemont TI, outside ADOT right of way, at the intersection of Brannigan Park Road and Shadow Mountain Drive. Specific details of the scope of the improvement were not included.

2.3. AASHTO U.S. Bicycle Route System, Working Paper 1, October 2014 (Draft)

The U.S. Bicycle Route (USBR) System is developing a national network of bicycle routes. Four routes are proposed in Arizona: USBR 66, 70, 79, and 90. This report evaluates potential route alternatives for each USBR and recommends a preferred route. Though not yet adopted, the preferred route of USBR 66 follows I-40 through Bellemont.

2.4. Coordinated Public Transit Human Services Transportation Plan, June 2014

The Coordinated Public Transit Human Services Transportation Plan was prepared by the Flagstaff Metropolitan Planning Organization (FMPO). It serves as a framework to improve coordination among transportation service providers and human service agencies in order to enhance transportation services for disadvantaged populations. It also serves as a federal requirement for a "locally developed, coordinated human services transportation plan." Goals and objectives to address unmet transportation needs and gaps in service were identified. A five-year transit plan to fill a gap in transit service from Bellemont and its surrounding areas to Flagstaff is stated in the report.

2.5. Flagstaff Regional Plan 2030, May 2014

The Flagstaff Regional Plan 2030 is a policy guide, which serves as a general plan for the City of Flagstaff and an amendment to the Coconino County Comprehensive Plan. It is an important planning tool that is used as a guide to navigate the future direction of the City and region. It applies to the 525-square-mile FMPO planning area that extends from Bellemont to Winona, and from Kachina Village and Mountainaire to north of the San Francisco Peaks. The plan directs future decision making and serves as a basis for policies and regulations to guide land use and physical and economic development. This comprehensive document consists of four parts: Introduction, Natural Environment, Built Environment, and Human Environment. The Flagstaff Regional Plan 2030 replaced the Regional Land Use and Transportation Plan 2001, which is no longer active.

2.6. A Coordinated Transit Plan for ECoNA in Northern Arizona, January 2014

This study reviewed existing and future transit services in northern Arizona and identified unmet needs and transportation issues. Various options were evaluated and the recommended transit service plan and funding options were identified. The transportation needs range from medical transportation to employment and tourism, including serving the Grand Canyon area and Northern Arizona University. Current and future demands were based on several models of estimation, such as Greatest Transit Needs, Rural Transit Demand Methodology, and Peer Comparison Analysis. The greatest transit need areas are primarily in Williams, followed by the Grand Canyon Village. In addition, this report outlines existing options as well as future needs for commuter traffic in Bellemont.

2.7. Flagstaff Regional Five-Year and Long Range Transit Plan, May 2013

The Flagstaff Regional Five-Year and Long Range Transit Plan proposes a long-term vision for Flagstaff's regional public transportation system. It identifies and establishes a short (1 to 5 years), mid (6 to 10) years, and long (11 to 20 years) range service plan, funding plan, and implementation plan. This plan takes steps to implement many of the policies outlined in the Flagstaff Regional Plan 2030. Currently, the Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA) operates Mountain Line and Mountain Link fixed route transit services, as well as Mountain Lift, a complimentary para-transit service, all within the City of Flagstaff. The regional vision is to extend basic commuter service to outlying areas, and based on funding availability, to provide service to Doney Park, Kachina Village, Bellemont, and other areas along I-40. Implementation steps for the short-term service plan outlined in this document were to begin in July 2013.

2.8. Mountain Mobility Business Plan 2015-2019, September 2013

This document provides NAIPTA guidance for the next five-year period and considers mobility in northern Arizona. It addresses gaps in available transportation programs for older adults, persons with disabilities, and persons of low-income. Its vision is "to build available, efficient mobility options within the Flagstaff area and the extended region of Coconino County." The working five-year budget includes two full-time positions to manage this new program, improvements to the taxi voucher program, van pool programs, and introduction of the mileage reimbursement program in rural areas. Bellemont residents are not specifically targeted in this plan.

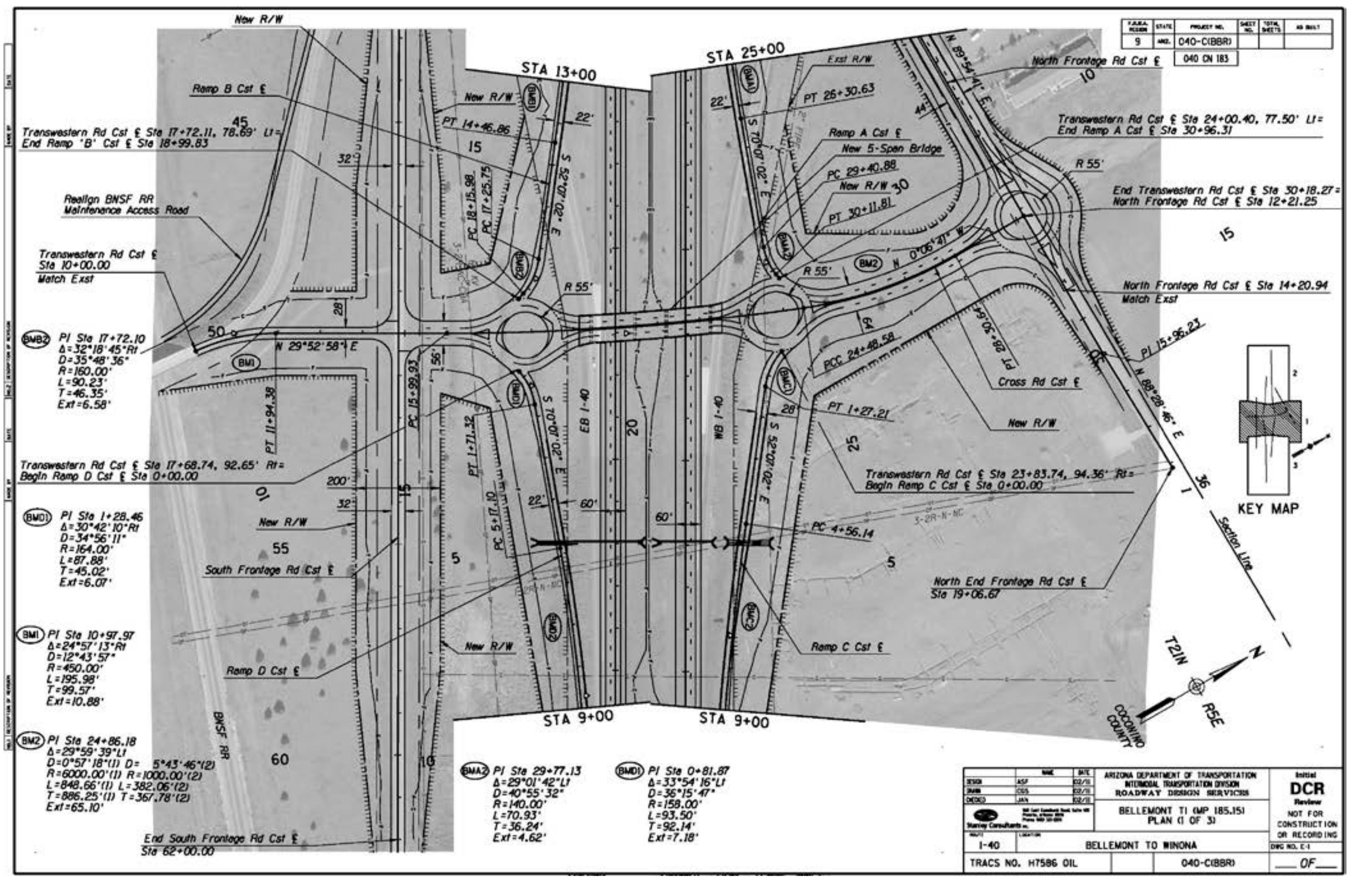
2.9. ADOT Statewide Bicycle and Pedestrian Plan Update, June 2013

This document is an update to the previous plan completed by ADOT in 2003. The update focuses on the critical planning needs for bicyclists and pedestrians on the State Highway System and also addresses the significant growth in Arizona in the last decade. The goals of the plan update are to double the walking and bicycling percentage statewide over the next 10 years, to reduce crashes involving pedestrians by 12 percent, and to improve bicycle and pedestrian infrastructure on state highways. Public input was reflected in the plan recommendations. Survey respondents specifically stated shoulder improvements were needed along I-40 to be suitable for bicycles.

2.10. Initial Design Concept Report, I-40 Bellemont to Winona, February 2011

The Initial Design Concept Report for I-40, from Bellemont to Winona, was performed by ADOT in partnership with Federal Highway Administration (FHWA). The purpose of the report was to evaluate additional capacity improvements to I-40 for the next 25 to 30 years. The recommended improvements for the Bellemont TI accounted for the development of a proposed Camp Navajo Industrial Park. This future project, located south of I-40 at the Bellemont TI, was planned to develop 600 to 800 acres. To accommodate the projected Camp Navajo expansion, the recommended improvements included the construction of a new TI east of the existing Bellemont TI. The new TI, which is shown in ***Figure 2***, includes three roundabouts and an additional lane in each direction of travel on Transwestern Road.

Figure 2 – Proposed Bellemont TI



2.11. Flagstaff Pathways 2030 Regional Transportation Plan, December 2009

The Flagstaff Pathways 2030 Regional Transportation Plan (RTP) identifies and prioritizes future transportation investments in the Flagstaff region for driving, transit, walking, biking, and moving goods. As a federal and state requirement to receive transportation funding, the RTP evaluates the cost and effectiveness of projects for each major travel mode, as well as addresses the relationships between land use, transportation, the economy, and the environment. The RTP identified the Bellemont Pilot Travel Center as a rural activity center and included the reconstruction Bellemont TI.

2.12. Coconino County Comprehensive Plan, September 2003

The Coconino County Comprehensive Plan establishes future goals and policies to direct growth, solve problems, and improve the quality of life for Coconino County residents. The Comprehensive Plan's main objectives are to preserve and promote stable, safe, attractive, rural communities; safeguard the choices of its residents; coordinate strategies for economic development, transportation, and affordable housing; and to protect unique natural resources, ecosystems, and habitats. Additionally, it guides land use decisions and serves as a comprehensive reference for public and private-sector community programs. The Flagstaff Regional Plan 2030 serves as an amendment to this document.

2.13. Bellemont Area Plan, July 1985

The Bellemont Area Plan was developed by the County Community Development Department as an amendment to the Coconino County Comprehensive Plan. The purpose was to determine appropriate zoning and land uses for the Bellemont TI area of I-40 to facilitate development. The study recommended rezoning the Bellemont area to the Planned Community (PC) Zone. The plan added residential multi-family land use with a maximum density of 10 units per acre (RM-10A). Approved zoning includes mobile-home park, commercial-heavy use, and light industrial use.

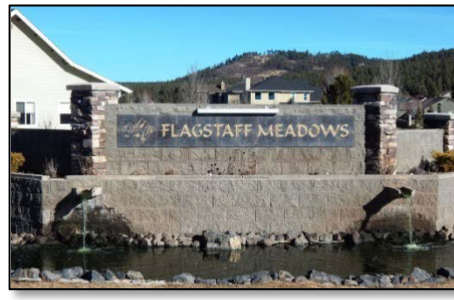
3.0 Existing Conditions

3.1. Land Ownership and Jurisdiction

Land within the Study Area is predominantly part of the Coconino National Forest. Private land is located along I-40. A portion of the Study Area is federal land as shown in ***Figure 3.*** Bellemont is an unincorporated area within Coconino County and is part of the FMPO planning area.

3.2. Land Use

Study Area land use is shown in ***Figure 3***. The majority of the land is undeveloped or open space, which includes portions of the Coconino National Forest. Developed lands are generally concentrated along Brannigan Park Road and Shadow Mountain Drive, near the Bellemont TI. This includes commercial land uses adjacent to the Bellemont TI. Existing residential development is located east of the Bellemont TI, including single family and multiple family residential developments that are further discussed in Section 3.4. Existing land use information is from the Coconino County Assessor and County zoning databases; it was verified using aerial imagery.



Flagstaff Meadows

The Ponderosa Fire District Station 82 is located to the east of the Bellemont TI where Brannigan Park Road ends and Shadow Mountain Drive begins. The first Baha'i school in Arizona has a special use permit for a church camp near the northwest part of the Study Area, along Forest Service Road 9005P.

3.3. Zoning

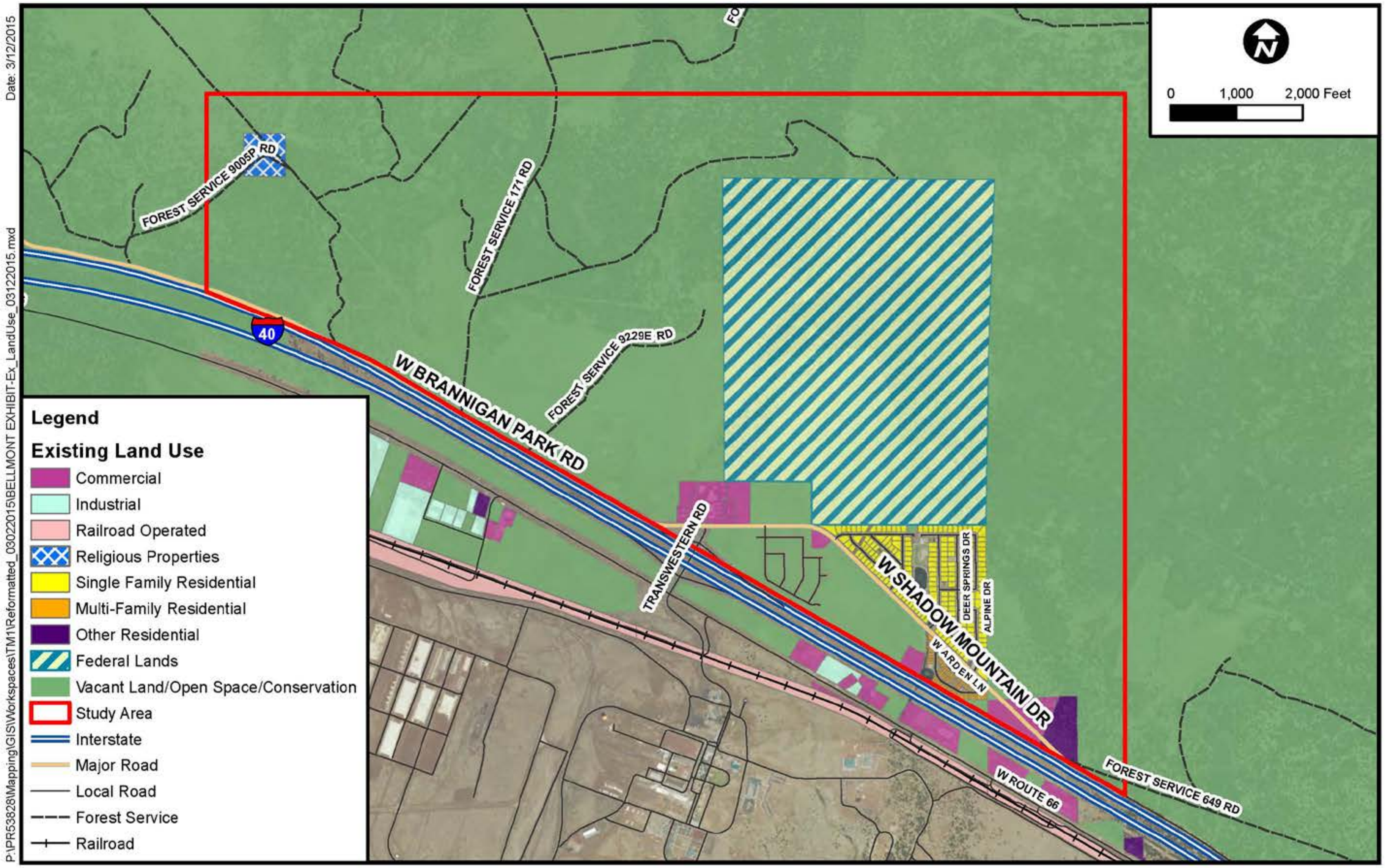
Study Area zoning is shown in ***Figure 4***, which includes residential (RS-6000), multi-unit residential (RM-10/A), manufactured home park (MHP), commercial heavy (CH-10,000), open space and conservation (OS), and General (G) with a conditional use permit for a church camp. The Bellemont Area Plan proposes a mixed-use zoning classification under the Planned Community (PC) Zone for the Study Area. The PC zone is designed to achieve the following purposes:

A. To provide for the classification and development of parcels of land as coordinated, comprehensive projects so as to take advantage of the superior environment which can result from large-scale community planning.
B. To allow diversification of land uses as they relate to each other in a physical and environmental arrangement, while ensuring substantial compliance with the provisions of this Ordinance.
C. To provide for a zone encompassing various types of land uses, such as single-family residential developments, multiple housing developments, professional and administrative office areas, commercial centers, industrial parks or any public or semi-public use or combination of uses through the adoption of a development plan and text materials which set forth land use relationships and development standards.

The western and southern borders of the undeveloped subdivision Flagstaff Meadows Unit 3 include multi-unit residential (RM-10/A), while the remainder of the subdivision is zoned for medium density residential (RS-6000). The Townhomes at Flagstaff Meadows are zoned for multi-unit residential (RM-10/A). Coconino County defines these zones as follows:

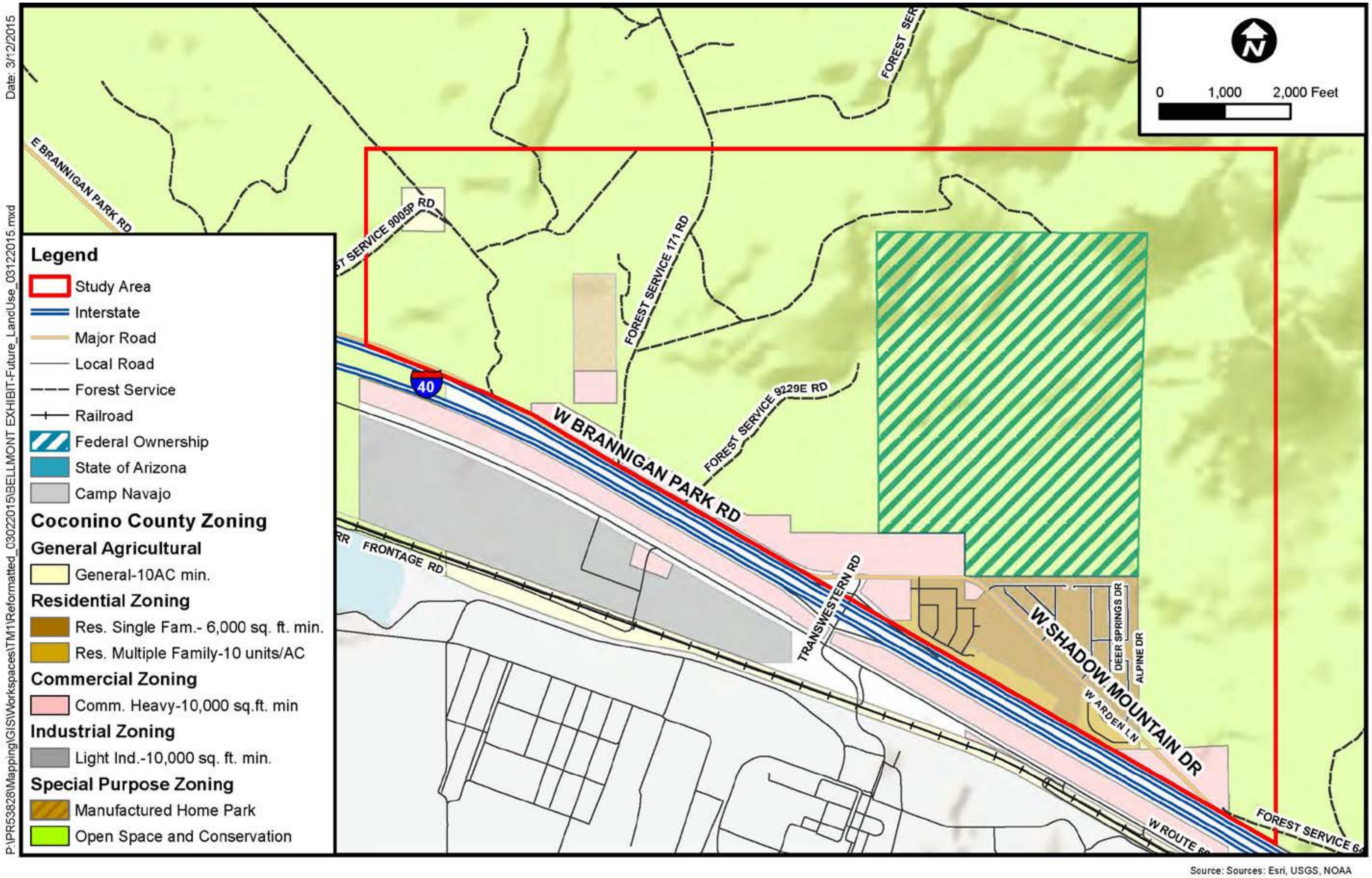
> RS-6000 – Residential Single Family Zone - This zone is intended for single family, urban residential development on minimum Lot sizes of 6,000 square feet and maximum densities of 6.0 Dwelling Units per acre. Only those additional uses are permitted that are complementary to, and can exist in harmony with, a residential neighborhood.
>
> RM-10/A – Multiple Family Residential Zone - This zone is intended for the development of medium density Apartments, Condominiums, Townhouses or other group Dwellings with provisions for adequate light, air, open space and landscaped areas at maximum densities of 10.0 Dwelling Units per acre. Only those additional uses are permitted that are complementary to, and can exist in harmony with, such residential developments.
>
> MHP – Manufactured Home Park - To provide for the exclusive development of Manufactured Home Parks. All Manufactured Home Parks hereinafter shall be developed in accordance with the provisions of this Section.
>
> CH-10,000 – Commercial Heavy Zone - This zone is intended to provide appropriately located areas for establishments catering primarily to highway travelers, visitors to the County or such businesses or uses where direct access to major arterial highways is essential or desirable for their operation.
>
> OS - Open Space and Conservation Zone - In addition to the objectives outlined in Section 1 (Purposes and Scope), the Open Space and Conservation Zone is included in the zoning regulations to achieve the following purposes:
>
> A. To reserve areas of the County where it is desirable and necessary to provide permanent open spaces when such are necessary to safeguard the public health, safety and general welfare and to provide for the location and preservation of scenic areas and recreation areas.
>
> B. This zone classification is intended to be applied primarily to lands held under public ownership.
>
> G – General Zone - This zone is a general rural land-use category intended for application to those unincorporated areas of the County not specifically designated in any other zone classification. Only those uses are permitted which are complementary and compatible with a rural environment.

Figure 3 – Land Use



Source: Coconino County GIS

Figure 4 – Zoning



3.3.1. Open Zoning Cases

There are two open zoning cases within the Study Area:

- PZ-CUP-15-001 – Conditional Use Permit for 11951 W Shadow Mountain Drive (existing fire station). This permit will renew the existing conditional use.
- PZ-CUP-15-007 – Conditional Use Permit for parcel 20347004H (west of existing truck stop). This permit will extend the existing conditional use for public water sales.

3.4. Residential Development

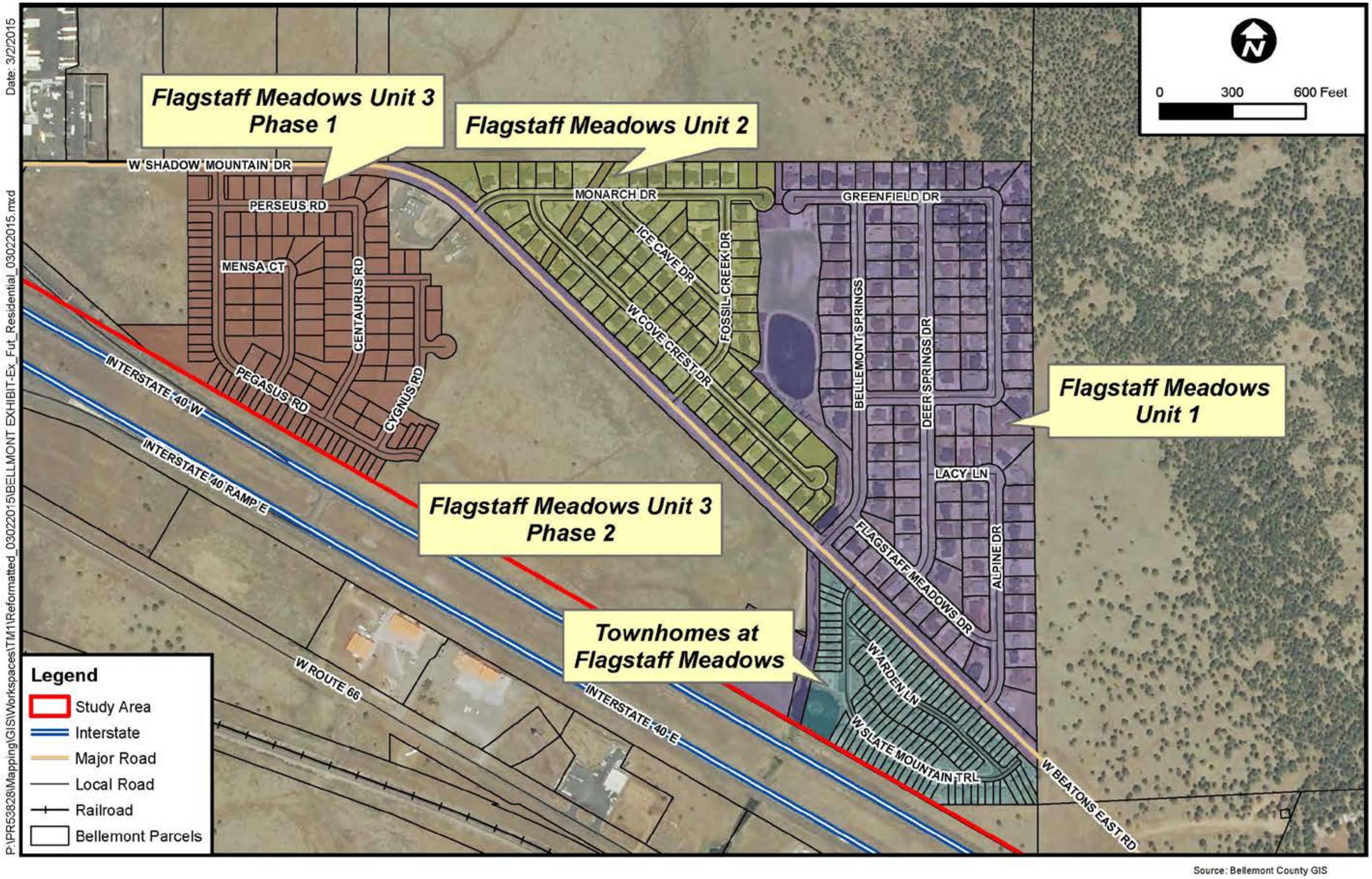
Study Area residential development is shown in ***Figure 5***, which includes Flagstaff Meadows Units 1 and 2 and the Townhomes at Flagstaff Village. Planned residential development includes Flagstaff Meadows Unit 3 Phase I and Phase II; Phase I is platted, Phase II is not. Phase II of Flagstaff Meadows Unit 3 is located between Flagstaff Meadows 2 Phase I and the Townhomes at Flagstaff Meadows. The mobile home park is currently vacant, but the Coconino County Comprehensive Plan includes 12 spaces. No development plans are underway for the undeveloped commercially-zoned areas along I-40.

After the completion of the Draft version of Working Paper 1, it was discovered that a manufactured home park is being planned within the Study Area along Brannigan Park Road, west of Transwestern Road. This development was included in subsequent traffic analysis as documented in Section 4.4.1.

3.5. Activity/Employment Centers

There are three primary employment/activity centers within the Study Area: Pilot Travel Center (truck stop) that includes a convenience store and two restaurants; Days Inn Hotel; and the Ponderosa Fire District Station 82. The Pilot Travel Center and the Days Inn are located at the intersection of Brannigan Park Road, Shadow Mountain Drive, and Transwestern Road, adjacent to the Bellemont TI; the Ponderosa Fire District Station 82 is located on the south side of Shadow Mountain Drive.

Figure 5 – Residential Development



3.6. Socioeconomic Conditions

3.6.1. Demographics

The populations within the State of Arizona and Coconino County have risen over the past ten years as illustrated in ***Table 1***. The population of the Bellemont area is difficult to quantify using Census data, as it is not a defined place, city, or town, nor does the area neatly align with a Zip Code Translation Area (ZCTA). Census divisions are shown in ***Figure 6***. ZCTA 86015 includes the majority of the residential development within the Study Area and extends south of I-40. Census Tract 22, Block Group 4 is bigger than the Study Area and extends to the north. Block Group 4 covers the entire Study Area, while the ZTCA will indicate if an area beyond the Study Area is skewing the results. Census data from the ZCTA and Block Group 4 will be assessed to provide information on general demographics.

Table 1 – Population

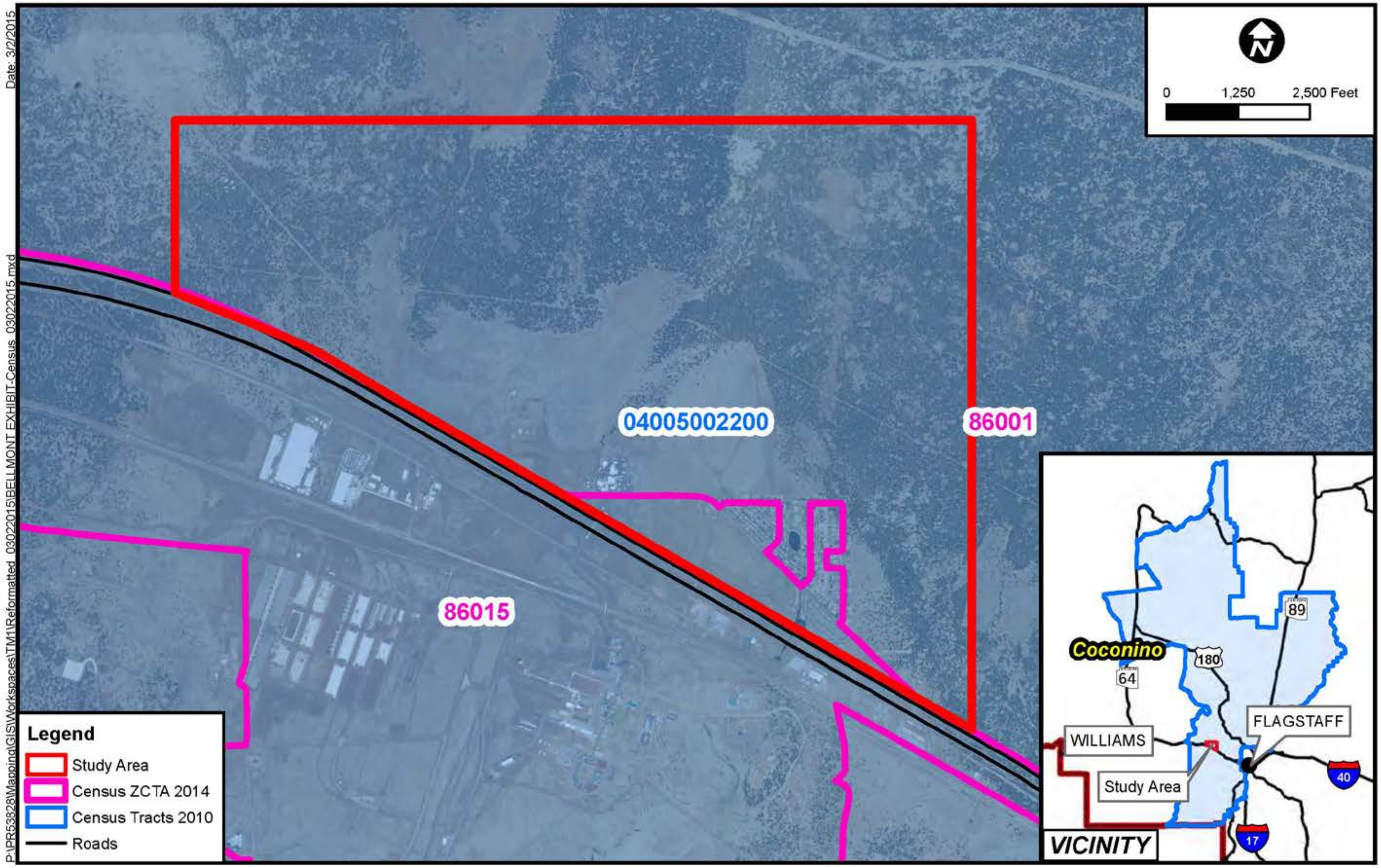
Place	Population		
	2000 Census	2010 Census	% Change
ZCTA 86015	231	385	+66.7%
Coconino County	116,320	134,437	+15.6%
State of Arizona	5,130,632	6,392,015	+24.6%
Source: 2000 and 2010 U.S. Census			

As part of the traffic forecasting processes outlined in Section 4.1, a population count was estimated based on the assumed number of residents per household and a rooftop count, which yielded a population of 731. To check the estimate, Census data for the applicable blocks was reviewed and is shown in **Table 2**. A review of ten of the blocks within Block Group 4 that more neatly align with the Study Area, yet still covers a larger extended area to the north, yields a population of 855. This is generally consistent with the estimate.

Table 2 – 2010 Population by Block and Block Group

Place	Population 2010 Census
Census Tract 22 – Block Group 4	2,003
Census Tract 22 – Block 4887	475
Census Tract 22 – Block 4888	19
Census Tract 22 – Block 4889	20
Census Tract 22 – Block 4890	58
Census Tract 22 – Block 4892	57
Census Tract 22 – Block 4893	76
Census Tract 22 – Block 4894	58
Census Tract 22 – Block 4895	21
Census Tract 22 – Block 4912	22
Census Tract 22 – Block 4914	49
Population Total	**855**

Figure 6 – Census Areas



Source: US Census,

3.6.2. Title VI of the Civil Rights Act of 1964 and Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, signed on February 11, 1994, reinforces the provisions set forth from Title VI of the Civil Rights Act of 1964 and provides additional guidance on identifying and addressing disproportionately high or adverse effects on minority and low-income populations, as well as disabled individuals, female head of household, and elderly populations. Specifically, those programs, policies, or benefits should ensure that they prevent discriminatory effects, including: discriminating against or excluding individuals or populations from participation, denying benefits of a proposed action/activity, or otherwise adversely affecting the human health or environment of these populations.

Relevant population characteristics were evaluated and are summarized below.

3.6.2.1. Minority Populations

A minority person can be defined as an individual who is racially classified as African American, Asian American, Native American or Alaskan Native, or anyone who classifies himself or herself as "other" race. Hispanics are also considered minorities, regardless of their racial affiliation. As shown in ***Table 3***, minority populations within the ZTCA and Block Group are below Coconino County and State levels.

Table 3 – Minority Population*

Place	Percent Minority	Percent Hispanic
ZTCA 86015	11.7%	12.2%
Tract 22 – Block Group 4	26.9%	21.0%
Coconino County	38.3%	13.5%
State of Arizona	27.0%	29.6%

*2010 Census Data.

3.6.2.2. Poverty Level Status

Low-income is defined as a person who is below the poverty level. Poverty thresholds are revised annually to allow for changes in the cost of living as reflected in the Consumer Price Index. The average poverty threshold for a family of four persons was just above $24,000 in 2014. As shown in ***Table 4***, the percentage of the population below the poverty level within the ZTCA is below Coconino County and State levels; however, the percentage in the Block Group is above Coconino County and State levels.

Table 4 – Poverty Level Status*

Place	Population for whom poverty status is determined	Below poverty level	
		Number	Percent
ZTCA 86015	156	0	0%
Tract 22 – Block Group 4	234	72	30.8%
Coconino County	113,076	20,609	18.2%
State of Arizona	5,021,238	698,669	13.9%

*2009-2013 American Community Survey 5-year Estimate.

3.6.2.3. Disabled Populations

Disabled individuals are persons older than 16 who are either work disabled, have self-care limitations, or have a mobility disability as enumerated in the 2010 Census. As shown in ***Table 5***, the percentage of disabled populations within the ZTCA and Block Group are below Coconino County and State levels.

Table 5 – Disability Status*			
Place	Population for whom poverty status is determined	Residents with a Disability	
		Number	Percent
ZTCA 86015	156	0	0%
Tract 22 – Block Group 4	546	0	0%
Coconino County	113,949	15,929	14.0%
State of Arizona	5,721,472	815,273	14.2%

*2009 – 2013 American Community Survey.

3.6.2.4. Female Head of Household

"Female head of household" is a family household in which there is a female with no male spouse present, regardless of whether she has any children less than 18 years of age. As shown in ***Table 6***, the percentage of female head of household populations within ZTCA is below Coconino County and State levels; however, the percentage in the Block Group percentage is above Coconino County and State levels.

Table 6 – Female Head of Household*			
Place	Number of Households for whom head of household is determined	Female Head of Household	
		Number	Percent
ZTCA 86015	52	0	0%
Tract 22 – Block Group 4	234	98	41.9%
Coconino County	29,450	9,244	31.4%
State of Arizona	1,573,888	377,280	24.0%

*2009 - 2013 American Community Survey.

3.6.2.5. Elderly Populations

Elderly refers to individuals who are older than 60 years of age. As shown in ***Table 7***, the percentage of elderly population within the ZTCA and Tract Block Group are lower than the Coconino County and State levels.

Table 7 – Age Distribution*						
	Below Age 15	**% Pop.**	**Age 16-64**	**% Pop.**	**Age 65 and over**	**% Pop.**
ZTCA 86015	122	31.7%	250	64.9%	13	3.4%
Tract 22 – Block Group 4	526	26.3%	1347	67.2%	130	6.5%
Coconino County	17,708	19.6%	96,190	71.5%	11,924	8.9%
State of Arizona	1,358,059	21.2%	4,152,127	65.0%	881,831	13.8%

*2010 Census Data.

3.7. Physical, Natural, and Cultural Environment

The physical, natural, and cultural environmental information summarized below is intended to provide a general overview of the Study Area. Additional research, analysis, coordination, and/or permitting will be required prior to any potential improvements. Conditions may change subsequent to the preparation of this study that may result in additional investigations or studies being required. This summary is not a formal National Environmental Policy Act analysis.

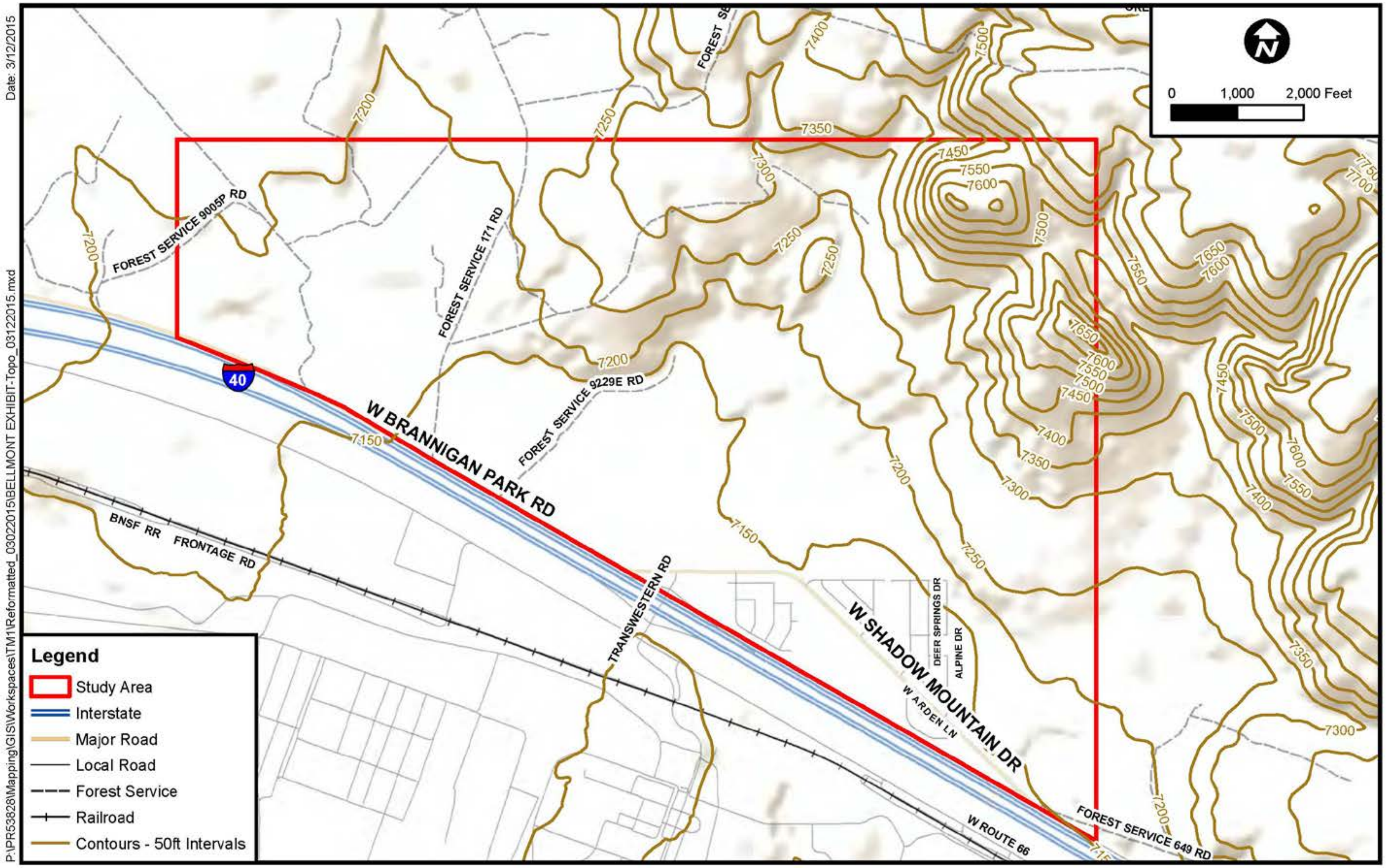
There are no Arizona State or Coconino County parks within the Study Area. In addition, there are no wilderness areas, national parks, national monuments, or national recreation areas. A large portion of the Study Area is the Coconino National Forest, generally shown as Open Space/Conservation Area in ***Figure 3***.

3.7.1. Topography and Drainage Features

Study Area topography is shown in ***Figure 7***. Wing Mountain is located outside, northeast of the Study Area; smaller foothills are within the Study Area, generally within Coconino National Forest lands and the area currently zoned as Open Space. Wing Mountain influences the Study Area topography as the ground generally slopes from northeast (high) to southwest (low). There are no major bodies of water within the Study Area.

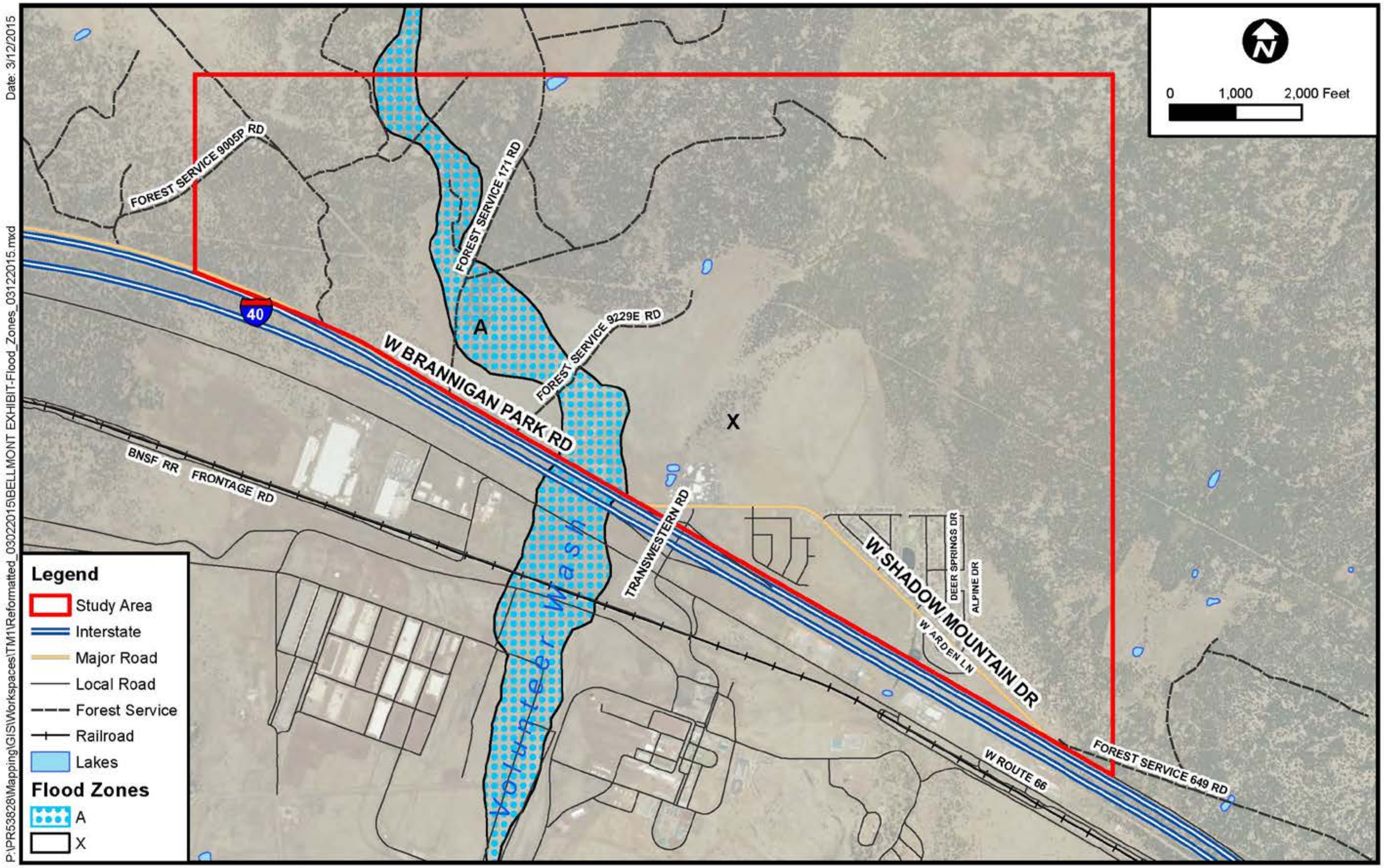
Key drainage features are shown in ***Figure 8.*** The National Flood Insurance Program develops Flood Insurance Rate Maps (FIRMs) to indicate the risk of flooding. Map number 04005C6800G, panel 6800G of 8475, effective September 3, 2010, and map number 04005C6425G, panel 6425G of 8475, effective September 3, 2010, cover the Study Area. Based upon these maps, the majority of the Study Area is located within flood Zone X, or areas determined to be outside the 0.2% annual chance floodplain. The area near Volunteer Wash is in flood Zone A, which is a special flood hazard area subject to inundation by the 1% annual chance flood. The base flood elevation is not determined. Large box culverts under I-40 and Brannigan Park Road accommodate Volunteer Wash flows.

Figure 7 – Topography



Source: Sources: Esri, USGS, NOAA

Figure 8 – Drainage Features



Source: Coconino County GIS, FEMA

3.7.2. Wildlife

The Coconino County Comprehensive Plan identifies Bellemont as a priority 3 wildlife planning area. The Arizona Game and Fish Department's Heritage Data Management System identifies ten special status species as potentially occurring within the Study Area, as shown in ***Table 8***.

Table 8 – Special Status Species Within the Study Area

Scientific Name	Common Name	U.S. Fish & Wildlife Service	U.S. Forest Service	Bureau of Land Management	State of Arizona
Accipiter gentilis	Northern Goshawk	SC	S	S	WSC
Aquilegia desertorum	Mogollon Columbine				SR
Clematis hirsutissima	Clustered Leather Flower		S		HS
Haliaeetus leucocephalus (wintering pop.)	Bald Eagle - Winter Population	SC	S	S	WSC
Microtus mexicanus navaho	Navajo Mexican Vole	SC	S		WSC
Myotis occultus	Arizona Myotis	SC		S	
Myotis thysanodes	Fringed Myotis	SC			
Myotis volans	Long-legged Myotis	SC			
Phacelia serrata	Cinder Phacelia	SC			
Strix occidentalis lucida	Mexican Spotted Owl	LT			WSC

SC = Species of Concern; C = Candidate Species; S = Sensitive Species; WSC = Wildlife of Special Concern; SR = Salvage Restricted; HS = Highly Safeguarded; LT = Listed Threatened

Source: Arizona Game and Fish Department (Heritage Data Management System)

The Arizona's Wildlife Linkage Assessment, prepared by the Arizona Wildlife Linkages Workgroup, identified Potential Linkage Zones (PLZs) throughout the State that are critical to wildlife for movement and dispersal. PLZ 14 and PLZ 15 are identified within or near the Study Area. During the design phase, features that accommodate wildlife movement should be considered.

The Arizona Game and Fish Department Online Environmental Review Tool was used to assess special areas within the Study Area. There are no critical habitat or important bird areas within the Study Area. The entire Study Area is within a classified "special area" – a 10J area for the California condor. The Peaks to Rim Linkage Design wildlife corridor crosses through the northern portion of the Study Area, within the Forest Service lands.

3.7.3. Cultural Resources

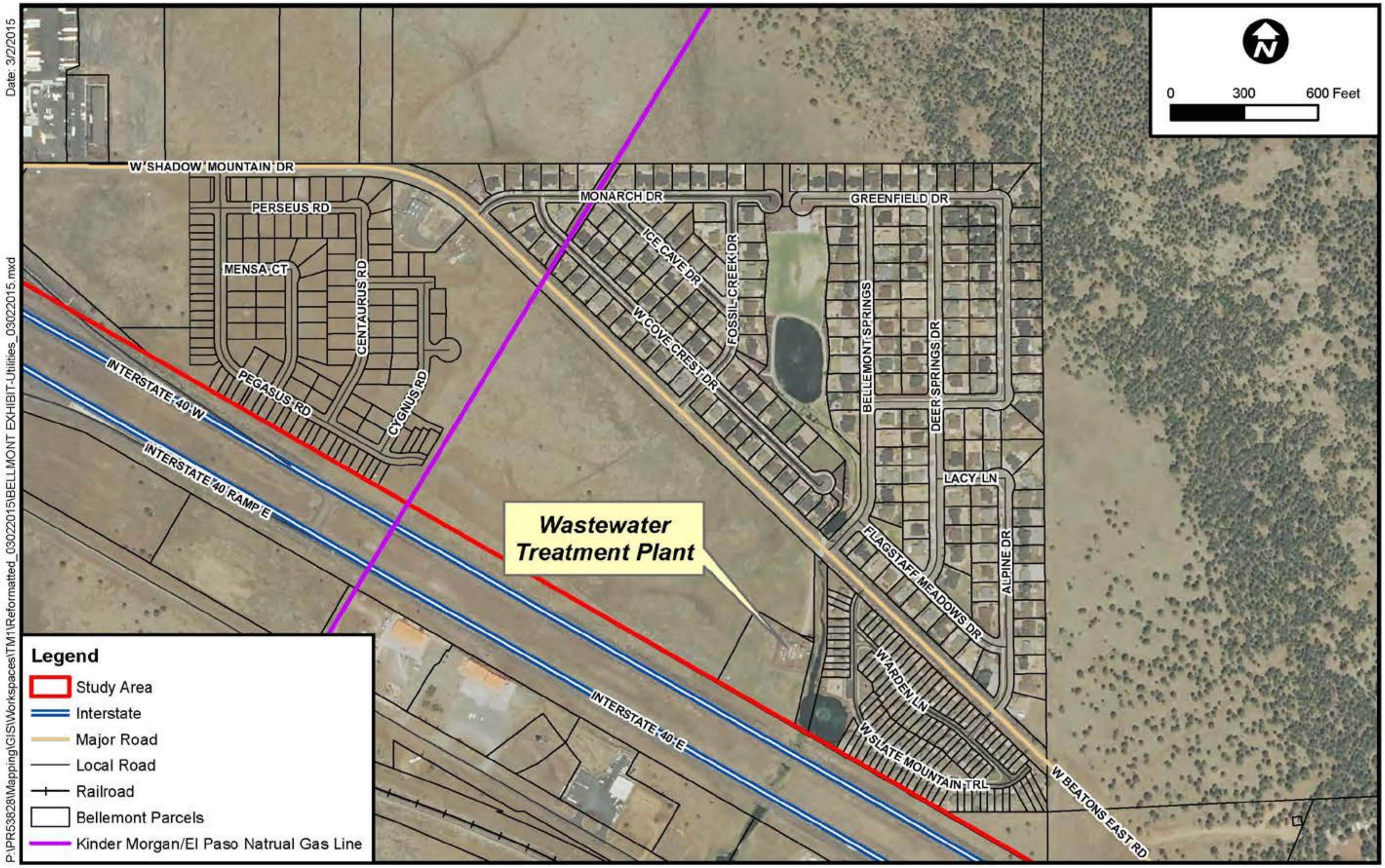
The Study Area was reviewed for known cultural resources. Existing records of cultural resource surveys and sites were reviewed, including site and project files in the AZSITE cultural resources database and the National Register of Historic Places (National Register). The AZSITE cultural resource database indicated that a small portion of the Study Area has been surveyed and that the available survey was conducted in the 1990's along I-40, west of the Bellemont TI. A search of the National Register of

Historic Places revealed no sites of importance within the Study Area. The General Land Office (GLO) maps, maintained by the Bureau of Land Management (BLM) identified one homestead within the Study Area, which appears to be bisected by I-40, and a few roads that generally run diagonally within the Study Area.

3.8. Utilities

Study Area major existing utilities are shown in ***Figure 9***. An existing Kinder Morgan/El Paso Natural Gas Line passes through, generally transecting Flagstaff Meadows Unit 2, in an easement near the intersection of Shadow Mountain Drive and Monarch Drive. A wastewater treatment plant, owned and operated by Utility Source, LLC., is located north of I-40, near the western edge of the Townhomes at Flagstaff Meadows. Other minor utilities are present to serve local needs.

Figure 9 – Major Utilities



Source: Bellemont County GIS, El Paso Natural Gas

3.9. Transportation Network

3.9.1. Roadway Network

The Study Area existing roadway network is shown on ***Figure 1***, with key roadways summarized in ***Table 9***. All other roadways are considered local roads, which are owned and maintained by either Coconino County or the Forest Service.

Table 9 – Primary Road Summary

Roadway	Functional Classification*	Posted Speed	No. of Lanes**	Pavement Width	Own/ Maintain
I-40	Interstate	75 mph	4	N/A	ADOT
Transwestern Rd	Minor Arterial	Not Posted	2	28' – 38'	ADOT
Brannigan Park Rd	Minor Arterial	35 mph	2	20'-24'	Coconino Cnty
Shadow Mountain Dr	Local Road	35 mph	2	26' – 28'	Coconino Cnty

*ADOT Functional Classification System Database (as of 03/10/2015).
**Total includes both directions of travel.

I-40 is the major route passing east-west through the Study Area, extending from California to North Carolina. At a local level, I-40 connects the Study Area to the Cities of Williams and Flagstaff. Within the Study Area, I-40 is a four-lane divided facility that is governed by the ADOT Northcentral District. Brannigan Park Road (also Old Highway 66) and Shadow Mountain Drive are on the north side and parallel I-40. Brannigan Park Road serves the Study Area to the west, and Shadow Mountain Drive serves the Study Area to the east. Transwestern Road is oriented north-south and connects I-40 to Brannigan Park Road and Shadow Mountain Drive. The entire Study Area roadway network is rural in nature. Roadways are generally paved, except for the Forest Service roads.

3.9.1.1. Existing Access Control

I-40 and the Bellemont TI are limited access facilities, which are under the oversight of ADOT and FHWA. Changes in access to these facilities will require their approval. All other roadways in the Study Area will require Coconino County review and approval.

Access to the Study Area from I-40 is provided at the diamond-type Bellemont TI with Transwestern Road. Transwestern Road intersects Brannigan Park Road and Shadow Mountain Drive approximately 250 feet north of its intersection with the westbound I-40 ramps. The Transwestern Road intersections are stop-controlled. Stop-controlled access is also provided at intersections between the primary roadways listed in ***Table 9***, as well as their intersections with subdivision roadways. The remaining roadway intersections are uncontrolled.

Private property access is provided along Brannigan Park Road and Shadow Mountain Drive, with a concentration of six driveways adjacent to the intersection between Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive. These six commercial driveways all occur within a span of approximately 600 feet, centered at the intersection, providing uncontrolled left/right-turn access to the Pilot Travel Center and Days Inn.

3.9.1.2. Access Management Policies and Guidelines

Access management is the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a road. The purpose of access management is to provide access to land development in a manner that preserves the safety and efficiency of the transportation system. Access management provides a proactive and cost effective approach to improving road safety and reducing congestion. Failure to manage access creates adverse social, economic, and environmental impacts.

ADOT recently completed a draft Access Management Guidelines in November 2014. This document outlines policy to set forth uniform standards for managing access to and from ADOT roadways. It addresses a variety of topics, including types of access control, spacing requirements, treatment of access in the vicinity of an Interstate TI, and retrofitting existing roadways.

The Coconino County Engineering Design and Construction Manual provides limited guidance with respect to access management elements and leaves discretion to the Coconino County Public Works and Coconino County Engineer. The Coconino Comprehensive Plan outlines a need "to improve roadway capacity and safety by regulating vehicular access to public roadways from adjoining properties." The FMPO 2030 RTP describes a desire to design "Complete Streets," meaning that roadways are designed with all transportation users in consideration. Although access management guidelines and regulations are limited, access management is described as a priority for both Coconino County and the Flagstaff area.

3.9.2. Bicycle and Pedestrian Network

There are currently no bike lanes or bicycle paths within the Study Area. According to the 2012 AASHTO Guide for the Development of Bicycle Facilities, six-foot wide paved shoulders are acceptable on rural roadways, where shoulders are not adjacent to curb, guardrail, or other vertical obstructions. In the later scenario, five-foot wide shoulders are recommended to provide additional operating clearance to the vertical obstruction. Most of the marked and unmarked shoulders are too narrow.

Pedestrian accommodations are limited within the Study Area. There are no designated sidewalks or multi-use paths along Brannigan Park Road or Shadow Mountain Drive, providing no linkage to the Pilot Travel Center and associated restaurants and convenience store.

Slate Mountain Trail, Looking South

Sidewalks are sparingly located within the residential developments. Flagstaff Meadows has a detached sidewalk along Bellemont Springs Drive that ends at the signed neighborhood entrance. Detached sidewalks are typically found on one side of the street, except along Deer Springs Drive, which has an attached sidewalk. Flagstaff Meadows II has an attached sidewalk along Fossil Creek Drive, the signed neighborhood entrance, which ends at Cove Crest Drive. Attached sidewalks are typically found on the north or east side of the streets within the subdivision. The Townhomes at Flagstaff Meadows has attached ribbon curb/sidewalk on both sides of the streets.

3.9.3. Transit Network

There is no regular public transit service within or to/from the Study Area. NAIPTA operates the Mountain Line, Mountain Link, and Mountain Lift (para-transit), which provide public transit service only within the City of Flagstaff.

School bus transportation and curb-to-curb transportation for special needs students is provided for the residents of Bellemont.

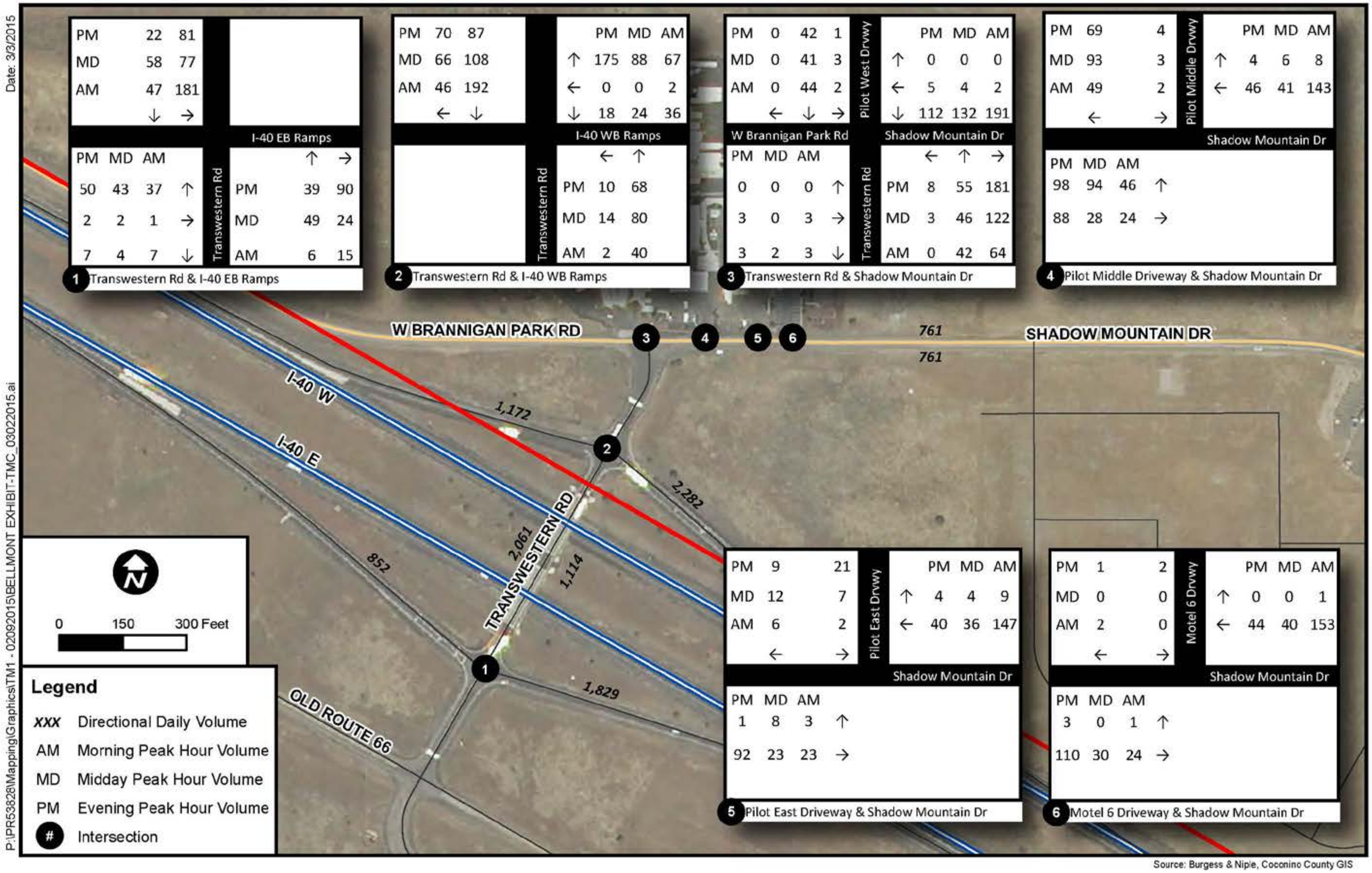
3.10. Traffic Analysis

3.10.1. Existing Traffic Volumes

Traffic counts were collected on February 12, 2015. Daily 24-hour counts and turning movement counts for the morning, mid-day, and evening peak hours were collected in the Study Area as shown on ***Figure 10***. More detailed traffic count data, including vehicle classification counts, is included in ***Appendix FR-2***.

Daily traffic volumes for the Study Area can be generally characterized as low. Daily traffic volumes on the Bellemont TI ramps range between 852 and 2,282 vehicles, Transwestern Road had 3,175 vehicles, and Shadow Mountain Road had 1,522 vehicles. The truck percentages varied from 15% on southbound Transwestern Road to as high as 51% on the eastbound off-ramp.

Figure 10 – Existing Traffic Volumes



3.10.2. Traffic Operational Analysis

Existing capacity analysis was conducted for the existing (2015) conditions at the six intersections identified in ***Figure 10***. *Synchro* software using the *Highway Capacity Manual* methodology was used for all intersections, except the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive. This intersection is stop-controlled on three of the four approaches, which is not supported in the HCM methodology. For this location, *SimTraffic* software was used for the evaluation. *Synchro* and *SimTraffic* results are included in ***Appendix FR-3.***

Table 10 summarizes the 2015 AM, Mid-Day, and PM peak hour capacity analysis results, which are presented in terms of LOS and delay. LOS is a qualitative value of how well a roadway or intersection operates. A grading system of A through F is assigned. LOS A represents free-flow traffic operations with little vehicle delay; LOS F represents substantial congestion and vehicle delay. Operations of LOS C and better are typically considered good and acceptable in rural areas; LOS D is often acceptable in urban areas. Operations of LOS E or F typically need attention.

Table 10 – 2015 Traffic Analysis

Intersection*	Approach	2015 AM Peak		2015 Mid-Day Peak		2015 PM Peak	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Intersection 1 Transwestern & EB I-40 Ramps	Eastbound	C	16.2	B	13.2	B	13.1
	Northbound	A	0.0	A	0.0	A	0.0
	Southbound	A	6.1	A	4.3	B	6.5
	Overall	**A**	**7.3**	**A**	**4.6**	**A**	**4.5**
Intersection 2 Transwestern & WB I-40 Ramps	Westbound	B	10.2	B	10.2	B	10.3
	Northbound	A	0.6	A	1.5	A	1.5
	Southbound	A	0.0	A	0.0	A	0.0
	Overall	**A**	**2.9**	**A**	**3.1**	**A**	**4.9**
Intersection 3 Transwestern & Brannigan Park & Shadow Mtn	Eastbound	A	4.8	A	3.1	A	5.0
	Westbound	A	4.5	A	4.3	A	4.4
	Northbound	A	0.5	A	0.6	A	0.7
	Southbound	A	5.9	A	5.6	A	3.6
	Overall	**A**	**3.5**	**A**	**2.6**	**A**	**2.4**
Intersection 4 Shadow Mtn & Middle Pilot Drive	Eastbound	A	5.2	A	5.7	A	3.6
	Westbound	A	0.0	A	0.0	A	0.0
	Southbound	B	10.0	A	9.2	A	9.6
	Overall	**A**	**3.5**	**A**	**5.9**	**A**	**4.5**
Intersection 5 Shadow Mtn & East Pilot Drive	Eastbound	A	0.8	A	1.9	A	0.2
	Westbound	A	0.0	A	0.0	A	0.0
	Southbound	A	9.8	A	9.1	A	9.5
	Overall	**A**	**0.6**	**A**	**2.8**	**A**	**1.7**
Intersection 6 Shadow Mtn & Days Inn Drive	Eastbound	A	0.8	A	0.0	A	0.4
	Westbound	A	0.0	A	0.0	A	0.0
	Southbound	A	10.0	A	0.0	A	9.5
	Overall	**A**	**0.5**	**A**	**0.0**	**A**	**0.8**

*Refer to ***Figure 10*** for intersection number.

The analysis indicates that the intersections operate with an overall LOS A. However, field observations indicate that private property site layout and access (driveways) within the functional area of the intersection create traffic operational issues that are not normally considered with a traditional traffic capacity analysis.

Several of the driveways serve a Pilot Travel Center (truck stop), which draws a high percentage of truck traffic (over 50 percent on the I-40 ramps). The site layout of the Pilot Travel Center includes a fueling station that is accessed by the driveway identified as Intersection 3 on ***Figure 10***. Limited truck storage space, or area for queuing, is available for the fueling station; when the fueling stations are all occupied, waiting trucks are stopped through the driveway and the intersection, as shown in ***Table 11***. This creates periodic blockage of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive, including the only available shared northbound right-through lane. Residential traffic to Shadow Mountain Drive has no alternative route and is forced to wait for the truck traffic to clear the intersection.

Table 11 – Intersection 3 Access and Operational Issues	
Transwestern Road, looking north toward Pilot Travel Center. The fueling station is shown on the left with the large trucks entering and exiting the site.	
Pilot Travel Center fueling station truck storage space accommodates only one single or double trailer truck. When this storage space is occupied, a line of trucks and other vehicles often blocks the intersection.	
Traffic count video recording shows recurring truck usage of the intersection, with one truck stopped on Transwestern Road and another (red cab) pulling around to access the Pilot Travel Center fueling station.	
Traffic count video recording shows passenger vehicles incorrectly passing the queuing of trucks at the intersection, traveling in the opposite travel lane to either proceed into the truck stop or turn right onto Shadow Mountain Road, towards the residential areas.	

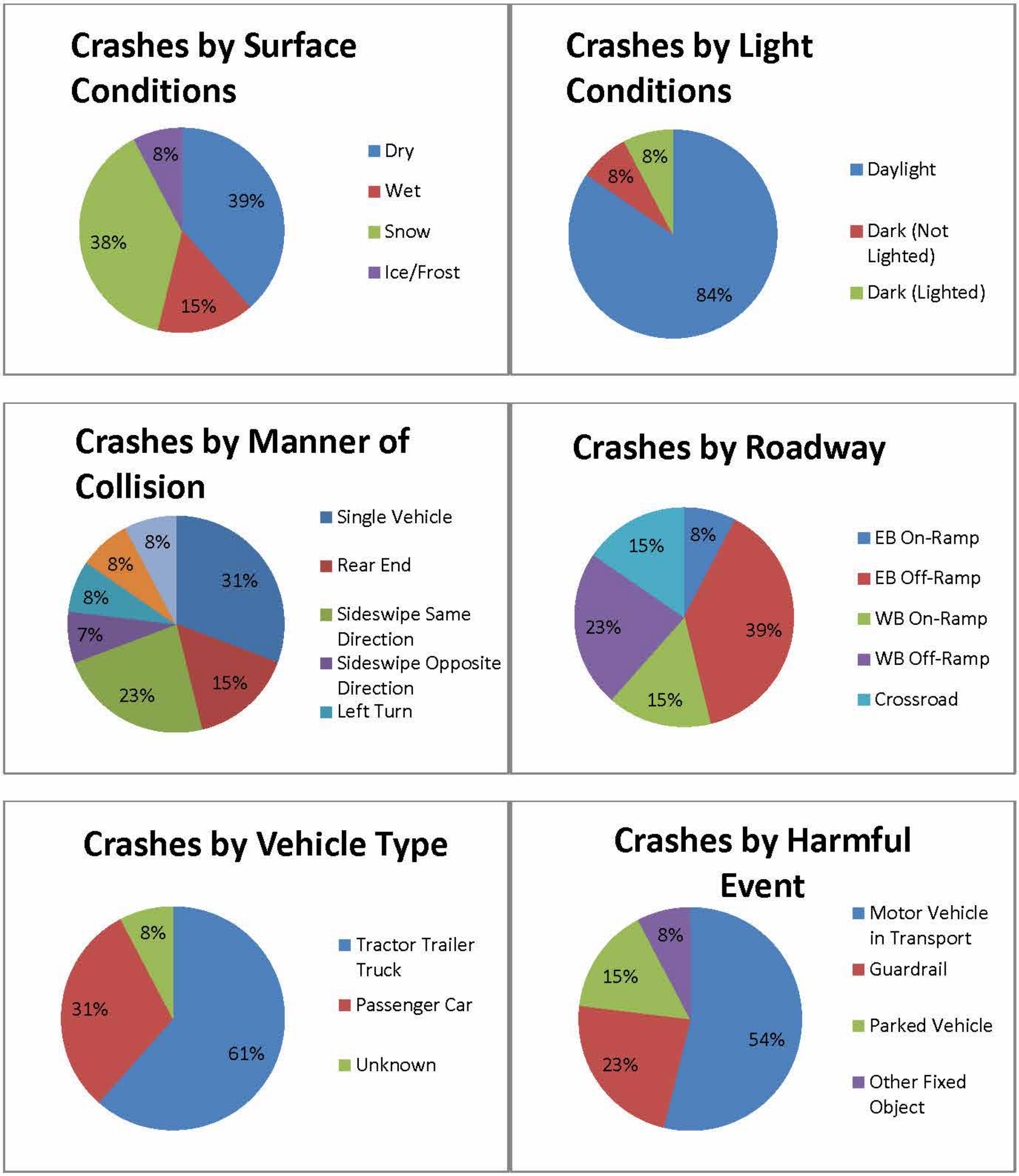
3.10.3. Existing Crash Analysis

Crash data for the Bellemont area was obtained from ADOT's Traffic Safety Section. The most recent five-year period (accessed February 23, 2015) was between September 1, 2009, and August 31, 2014. There were a total of 13 crashes reported on the ramps and the crossroad, Transwestern Road. Note that Transwestern Road is also recorded as Hughes Road and Navajo Army Depot Road in the crash reports. Additionally, Coconino County reported six crashes, including two non-injury crashes on Brannigan Park Road and four crashes involving two injuries on Shadow Mountain Road. Crash data is included in ***Appendix FR-4.***

Sixteen of the nineteen recorded crashes were minor and classified as "property damage only," two were "non-capacitating" injuries, and one was a "possible injury." Only one crash was reported in the last four months of 2009, four in each 2011 and 2013, and six in each 2010 and 2012. There were no reported crashes in the first eight months of 2014. As shown in ***Figure 11***, the majority of the crashes involved single vehicles, followed by sideswipes in the same direction, and then sideswipes in the opposite direction. Heavy trucks contributed to almost half of the crashes. Wet, snow, and icy surface conditions were factors in approximately half of the crashes. There were four crashes with guardrail or other fixed objects. The majority, six crashes, were reported on Brannigan Park Road and Shadow Mountain Drive.

Detailed police reports were requested for the reported crashes. Thirteen of the nineteen narratives were provided and evaluated. There were no apparent patterns, except for those noted above. Heavy truck traffic which exits I-40 at the Bellemont TI to use the Pilot Travel Center has been a factor in nine of the crashes, including backing into a stopped vehicle, making a sweeping right-turn and sideswiping a passenger car, and the inability to stop on ice/snow and striking guard rail or other vehicles. All of the crashes involving heavy trucks were minor, with no reported injuries.

Figure 11 – Vehicle Crash Analyses



4.0 Future Features

4.1. Travel Demand Model Land Use

The 2010 and 2035 land use for the current ADOT Statewide Travel Demand Model (AZTDM2) was reviewed to determine if it was appropriate for the Study Area, based on the existing development and known future development. It was determined that the 2010 land use was appropriate, but that a few changes were warranted for 2035 land use.

- Flagstaff Meadows Subdivision – This subdivision is located on Shadow Mountain Drive, east of Transwestern Road. The 2010 land use contains approximately 260 houses, which is likely close to what was there at the time. The 2035 land use contains approximately 320 houses. There are approximately 320 rooftops in this subdivision now, with the next phase already platted. To account for additional growth in this subdivision, the 2035 land use was increased by 100 houses to represent a full build-out of the next phase.
- Commercial Area and Camp Navajo Industrial Park (south of I-40) – A comparison of the land use showed little-to-no growth at the proposed Camp Navajo Industrial Park site, as well as the commercial area adjacent to the south side of I-40. The Camp Navajo Industrial Park has been under development for almost 10 years and currently does not have any businesses. It is uncertain when development at this site will occur. For the commercial area south of I-40, there is some existing development along the corridor, but nothing planned to occur in the near future. To account for some development in this area, the 2035 land use was adjusted to include a new commercial building of approximately 10,000 square feet. This adjusted 2035 employment to 25 employees, from 15 employees in 2010.

These adjustments to the 2035 land use were reviewed and approved by FMPO.

4.2. Utilities

Based upon available information, there are no planned major utility improvements within the Study Area.

4.3. Transportation Network

4.3.1. Roadway Network

Except for various improvements recommended in this study, key roadways within the Study Area are not expected to change within the 2035 planning horizon. Additional local roadways may be constructed to support future phases of the Flagstaff Meadows subdivision, but no new arterial or collector roadways are expected. There are planned improvements at the Bellemont TI; however, it is not programmed.

4.3.2. Bicycle and Pedestrian Network

Except for various improvements recommended in this study, the bicycle and pedestrian network is not anticipated to change within the 2035 planning horizon. Future multi-modal connectivity within the Study Area is dependent on development-level improvements. Future multi-modal connectivity outside the Study Area is dependent on multi-modal improvements to I-40, as it serves as the exclusive route connecting the Study Area to other destinations, including local towns, employment centers, and the City of Flagstaff. One of the goals of 2012 ADOT Statewide Bicycle and Pedestrian Plan Update is to improve bicycle and pedestrian infrastructure on state highways, as well as double the percentage of walking and bicycling statewide over the next 10 years. Public survey conducted as part of this update highlighted respondents' concerns associated with a need for shoulder improvements along I-40 to be suitable for bicyclists. However, no such improvements are planned at this time. The portion of I-40 that bisects Bellemont is currently recommended for inclusion in the future designation of USBR 66.

4.3.3. Transit Network

The existing transit network is not anticipated to change within the 2035 planning horizon. Long-term regional vision (11 to 20 years), outlined in *the Flagstaff Regional Five-year and Long Ranch Transit Plan*, is set to "maximize geographic coverage of the transit system, including extending basic commuter service to outlying areas of Bellemont, as well as areas along I-40 between Bellemont, Williams, the Twin Arrows Casino, and Winslow." Additionally, this document mentions the possibility of commuter service for Bellemont as soon as 6 to 10 years into the future, if adequate funding is in place.

Mountain Mobility Business Plan identifies additional five-year goals to address gaps in available transportation programs for older adults, persons with disabilities, and persons of low-income. No specific plans are identified for the Bellemont area's qualifying residents; however, its proposed introduction of the mileage reimbursement program for the rural area, as well as the enhanced taxi voucher program could benefit low-income, ADA eligible, and older persons living in Bellemont.

4.4. Traffic Analysis

4.4.1. Traffic Forecast and Annual Growth Factor Development

Using the revised land use discussed in Section 5.1, the AZTDM2 was run for the 2010 and 2035 scenarios. The assignments from these scenarios were reviewed for reasonableness. From this review, it was noticed that the Shadow Mountain Drive assignments were within 15% of the recently collected traffic count data. The rest of the Study Area was well below the traffic counts with assignments. The assignments for the I-40 ramps to and from the west are approximately 10% of the traffic counts. Upon review, it was determined that a majority of this under assignment is related to the Pilot Travel Center site. While this site is included in the land use as commercial, there is not a way to identify that it is a very high volume commercial site. The AZTDM2 has about 100 daily trips for the site, compared to the traffic counts that show over 3,600 daily trips. Because of the large difference, an annual growth factor was determined for the Study Area intersections to develop 10- and 20-year traffic forecasts.

The growth of the Bellemont TI and Shadow Mountain Drive is related directly to the amount of growth in the Flagstaff Meadows subdivision and the traffic generated by the Pilot Travel Center site. Annual growth for each of these sites was developed as follows:

- Flagstaff Meadows Subdivision – The 2010 AZTDM2 included 260 houses for this subdivision. This number increased to 420 for the year 2035. This represents an annual growth rate of 2.5%.
- Pilot Travel Center Site – The trips for the site are primarily pass-by trips from I-40. Therefore, it is reasonable to assume that the traffic for the site will increase at the same rate as I-40. From the ADOT 2013 AADT Report, this section of I-40 has an annual growth rate of 2.1%.

For this study, a global growth factor of 2.5% per year was selected. This will accommodate the growth for the subdivision and provide a slightly more conservative value for the Pilot Travel Center site. Existing 2015 traffic count data was increased by 2.5% per year, or 25%, to determine 10-year forecasts, and 50% to determine 20-year forecasts.

After the completion of the Draft version of this Working Paper 1, it was discovered that a manufactured home park is being planned within the Study Area along Brannigan Park Road, west of Transwestern Road. Based on coordination with development representatives, it is anticipated that it will consist of 225 manufactured homes. For analysis purposes, it is assumed that 75% of the development will be constructed in the 10-year horizon and 100% constructed in the 20-year horizon. As documented above, adding this development to the AZTDM2 model will not result in meaningful assignments for the Study Area. Therefore, the *ITE Trip Generation Manual* was used to determine the 10-year and 20-year trips associated with this development; Land Use 240, Mobile Home Park, was used. ***Table 12*** shows the AM, Mid-Day and PM peak trips associated with the development. It is assumed that these trips will be destined for Flagstaff; therefore, entering trips come from I-40 westbound and exiting trips are destined for I-40 eastbound. The trips in ***Table 12*** were added to the 10-year and 20-year intersection volumes after the 2.5% annual growth had been applied.

Table 12 – Manufactured Home Park Trip Generation

Design Year	Number of Units	AM Peak		Mid-Day Peak*		PM Peak	
		Entering	Exiting	Entering	Exiting	Entering	Exiting
2025	169	15	59	21	26	62	38
2035	225	20	79	26	35	82	51

*Mid-Day volumes were estimated.

4.4.2. Design Hour Volume Factor

Design hour forecasts typically represent the 30th highest hourly volume of the year. Since the 2015 traffic count data were assumed to be taken on an "average" day, a design hour volume factor was developed to convert the counted volume to design hour. From the ADOT 2013 AADT Report, the peak hour on I-40 in this area represents 8% of the AADT. From the 24-hour counts conducted on the I-40 ramps, the PM peak was 7.46% of the 24-hour volume. For this location, design hour volume factor is 8% / 7.46%, which is 1.072. To be a little more conservative, this factor was rounded to 1.1. The 2015 AM and PM turning movement counts were multiplied by 1.1 to convert them to the 30th highest hour design volumes for the traffic operational analysis.

4.4.3. Traffic Operational Analysis

Capacity analyses were conducted for the 2025 and 2035 no-build conditions at the six intersections identified in ***Figure 12***. *Synchro* software using the *HCM* methodology was used for all intersections, except the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive. This intersection is stop-controlled on three of the four approaches, which is not supported in the HCM methodology. For this location, *SimTraffic* software was used for the evaluation. *Synchro* and *SimTraffic* results are included in ***Appendix FR-3***. ***Table 13*** and ***Table 14*** summarize the 2025 and 2035 AM, Mid-Day, and PM peak hour capacity analysis results, respectively.

Table 13 – 2025 Traffic Analysis							
Intersection*	Approach	2025 AM Peak		2025 Mid-Day Peak		2025 PM Peak	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Intersection 1 Transwestern & EB I-40 Ramps	Eastbound	D	31.2	C	17.3	C	18.8
	Northbound	A	0.0	A	0.0	A	0.0
	Southbound	A	6.8	A	4.9	A	7.3
	Overall	**B**	**10.0**	**A**	**5.6**	**A**	**5.9**
Intersection 2 Transwestern & WB I-40 Ramps	Westbound	B	11.0	B	11.0	B	11.8
	Northbound	A	0.7	A	1.6	A	1.6
	Southbound	A	0.0	A	0.0	A	0.0
	Overall	**A**	**3.0**	**A**	**3.4**	**A**	**5.8**
Intersection 3 Transwestern & Brannigan Park & Shadow Mtn	Eastbound	A	4.5	A	4.4	A	3.4
	Westbound	A	6.2	A	5.6	A	6.3
	Northbound	A	0.5	A	0.7	A	0.9
	Southbound	A	7.6	A	7.2	A	7.9
	Overall	**A**	**4.5**	**A**	**3.4**	**A**	**3.0**
Intersection 4 Shadow Mtn & Middle Pilot Drive	Eastbound	A	5.4	A	5.8	A	3.7
	Westbound	A	0.0	A	0.0	A	0.0
	Southbound	B	10.6	A	9.6	B	10.2
	Overall	**A**	**3.7**	**A**	**6.1**	**A**	**4.7**
Intersection 5 Shadow Mtn & East Pilot Drive	Eastbound	A	0.8	A	1.9	A	0.2
	Westbound	A	0.0	A	0.0	A	0.0
	Southbound	B	10.2	A	9.2	A	9.9
	Overall	**A**	**0.6**	**A**	**2.8**	**A**	**1.8**
Intersection 6 Shadow Mtn & Days Inn Drive	Eastbound	A	0.8	A	0.0	A	0.4
	Westbound	A	0.0	A	0.0	A	0.0
	Southbound	B	10.4	A	0.0	A	9.9
	Overall	**A**	**0.5**	**A**	**0.0**	**A**	**0.8**

*Refer to ***Figure 12*** for intersection number.

Table 14 – 2035 Traffic Analysis							
Intersection*	Approach	2035 AM Peak		2035 Mid-Day Peak		2035 PM Peak	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Intersection 1 Transwestern & EB I-40 Ramps	Eastbound	F	69.7	C	23.1	D	28.0
	Northbound	A	0.0	A	0.0	A	0.0
	Southbound	A	7.1	A	5.1	A	7.8
	Overall	**C**	**15.8**	**A**	**6.7**	**A**	**7.6**
Intersection 2 Transwestern & WB I-40 Ramps	Westbound	B	12.1	B	11.9	B	13.6
	Northbound	A	0.7	A	1.7	A	1.6
	Southbound	A	0.0	A	0.0	A	0.0
	Overall	**A**	**3.3**	**A**	**3.6**	**A**	**6.6**
Intersection 3 Transwestern & Brannigan Park & Shadow Mtn	Eastbound	A	8.1	A	5.8	B	5.2
	Westbound	A	8.2	A	7.2	A	8.8
	Northbound	A	0.6	A	0.8	A	1.1
	Southbound	A	8.4	A	8.0	B	10.0
	Overall	**A**	**6.0**	**A**	**4.1**	**A**	**4.1**
Intersection 4 Shadow Mtn & Middle Pilot Drive	Eastbound	A	5.5	A	5.9	A	3.7
	Westbound	A	0.0	A	0.0	A	0.0
	Southbound	B	11.3	A	9.9	B	10.9
	Overall	**A**	**3.9**	**A**	**6.2**	**A**	**4.9**
Intersection 5 Shadow Mtn & East Pilot Drive	Eastbound	A	0.8	A	1.9	A	0.2
	Westbound	A	0.0	A	0.0	A	0.0
	Southbound	B	10.6	A	9.4	B	10.2
	Overall	**A**	**0.7**	**A**	**2.9**	**A**	**1.8**
Intersection 6 Shadow Mtn & Days Inn Drive	Eastbound	A	0.8	A	0.0	A	0.4
	Westbound	A	0.0	A	0.0	A	0.0
	Southbound	B	10.8	A	0.0	B	10.3
	Overall	**A**	**0.5**	**A**	**0.0**	**A**	**0.8**

*Refer to ***Figure 12*** for intersection number.

The analysis indicates the 2025 and 2035 intersections will operate at a very good LOS A or LOS B, except for the Transwestern Road and eastbound I-40 Ramps intersection that will operate at LOS C during 2035 AM peak hour. The truck volume for the Pilot Travel Center will continue to rise over the next 20 years, which will cause more frequent congestion on the street network as well as increased queue lengths. Driveways, or access points, to the public roadways from the Pilot Travel Center and/or truck storage on the Pilot Travel Center site will need to be addressed as part of any future year improvement.

5.0 Identified Needs Summary

Transportation needs and deficiencies were identified from a variety of technical sources, input from stakeholders and public, and field observations. The sections below summarize the roadway, bicycle and pedestrian, and transit network needs.

5.1. Roadway Network Needs

5.1.1. Congestion and Safety

There is a need to address congestion and safety at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive. The analysis in Section 3.10 and Section 4.4 indicated that these issues are caused by the presence and concentration of driveways within the functional area of the intersection. The location of the driveways and the Pilot Travel Center site conditions combine to adversely affect the traffic operations of these public roadways, including the Bellemont TI.

The site operations of the Pilot Travel Center, specifically the fueling station location and lack of large truck queuing space, complicate traffic operations and safety. As currently configured and utilized, the Pilot Travel Center site provides limited truck storage space, or area for queuing, for the fueling station when the fueling stations are occupied. Waiting trucks queue through the driveway and into the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive, including the only available shared northbound right-through lane. Residential traffic to Shadow Mountain Drive has no alternative route and is forced to wait for the truck traffic to clear the intersection.

5.1.2. Access Management

There is a need to provide guidance for the management of access, including driveways, to public roadways. ADOT is nearing the completion of its Access Management Guidelines that will apply to their roadway facilities; however, Coconino County guidance is limited. The FMPO is currently developing access management guidelines. A more comprehensive approach to access management, whether it is policy or guidelines, would serve as a tool for the County to preserve the safety and efficiency of its transportation system.

5.2. Bicycle and Pedestrian Network Needs

There is a need to address the gaps in the bicycle and pedestrian transportation networks. There are limited facilities available now; those that do exist do not serve as a network linking the different areas within the Study Area, nor the Study Area to the neighboring cities of Flagstaff and Williams.

5.3. Transit Network Needs

There is a need to address public transit for the Study Area. Previous studies and plans have identified this need and have developed plans for transit to serve the Study Area; however, none of the planned services have been implemented. Adequate funding sources for Study Area public transit have not been identified.

6.0 Potential Improvement Strategies

The potential improvement strategies development process included the exploration of a wide range of options. The process engaged the TAC and the public. Through a collaborative process, the potential improvement strategies were screened based upon a variety of factors, such as jurisdictional authority, feasibility, and cost. The potential improvement strategies outlined in the following subsections were approved by the TAC for evaluation. Strategies of interest to stakeholders and the public, but are either beyond the either beyond Coconino County's typical purview or the scope of this study, are listed in Section 7.6 for future consideration by others.

6.1. Potential Roadway Network Improvements

Potential improvements to the roadway network were generated to reduce congestion and improve safety concerns at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive, as outlined in Section 6.1.1. Based on input from the TAC, concepts were developed to address the presence of driveways within the functional area of the intersection and accommodate truck queuing from the Pilot Travel Center fueling station, where limited space is available onsite. Cost effective improvements were developed that would have a greater chance of being funded and implemented. Concepts were framed to be compatible with the recommendations in the *I-40 Bellemont to Winona Initial DCR*.

Five roadway concepts were developed and outlined below.

- ***Concept 1*** – Illustrated in ***Figure 14***, Concept 1 implements the Bellemont TI recommendations from the *I-40 Bellemont to Winona Initial DCR,* which is ADOT's long-term goal for the Bellemont TI. Concept 1 has been identified as a long-term solution primarily due to lack of identified funding, preventing it from being constructed at this time to resolve the congestion issues. The existing Bellemont TI would be reconstructed approximately 800 feet to the east. The new Bellemont TI intersections would be two-lane roundabouts. The new intersection with Shadow Mountain Drive would be a two-lane roundabout.

  Concept 1 improves the congestion and safety need at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive by relocating the intersection to the east, away from the Pilot Travel Center and other nearby driveways. Trucks queuing for the Pilot Travel Center fueling station would have limited storage on Shadow Mountain Drive.

- ***Concept 2*** – Illustrated in ***Figure 15***, Concept 2 realigns Transwestern Road to the east on the north side of I-40. A new one-lane roundabout is constructed on Shadow Mountain Drive at the approximate location of the roundabout proposed in *the I-40 Bellemont to Winona Initial DCR*. A new one-lane, one-way local access road is provided along the parcel boundary on the north side of the new roundabout.

  Concept 2 addresses the congestion and safety need at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive by relocating the intersection to the east, away from the Pilot Travel Center and other nearby driveways. The new local access road would provide truck access to the rear of the Pilot Travel Center site. Trucks queuing for the Pilot

Travel Center fueling station would be stored on onsite, or perhaps the new local access road, freeing Shadow Mountain Drive from truck storage.

- ***Concept 3*** – Illustrated in ***Figure 16***, Concept 3 widens Transwestern Road by one northbound lane, creating a dual-lane right-turn to eastbound Shadow Mountain Drive. A new raindrop, or teardrop, roundabout is constructed on Shadow Mountain Drive at the approximate location of the roundabout proposed in the *I-40 Bellemont to Winona Initial DCR*. A median "pork chop" island at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive relocates the Transwestern Road northbound to westbound left-turn traffic movement to the raindrop roundabout (U-turn). A new one-lane, one-way local access road is provided along the parcel boundary on the north side of the new raindrop roundabout.

  Concept 3 addresses the congestion and safety need at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive by relocating the intersection to the east, away from the Pilot Travel Center and other nearby driveways. The new local access road would provide truck access to the rear of the Pilot Travel Center site. Trucks queuing for the Pilot Travel Center fueling station would be stored on onsite, or perhaps the new local access road, freeing Shadow Mountain Drive from truck storage.

- ***Concept 4*** – Illustrated in ***Figure 17***, Concept 4 realigns Transwestern Road to the east and constructs a two-lane roundabout on Shadow Mountain Drive at the approximate location of the roundabout proposed in the *I-40 Bellemont to Winona Initial DCR*. Two dedicated right-turn lanes on westbound Shadow Mountain Drive are provided: one to accommodate truck traffic to the Pilot Travel Center fuel station and one for passenger cars. A third westbound lane is provided for through traffic.

  Concept 4 addresses the congestion and safety need at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive by relocating the intersection to the east, away from the Pilot Travel Center and other nearby driveways. Trucks queuing for the Pilot Travel Center fueling station would have limited storage on Shadow Mountain Drive.

- ***Concept 5*** – Illustrated in ***Figure 18,*** Concept 5 widens eastbound Shadow Mountain Drive by one lane. A new raindrop roundabout is constructed on Shadow Mountain Drive at the approximate location of the roundabout proposed in the *I-40 Bellemont to Winona Initial DCR*. A median "pork chop" island at intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive relocates the Transwestern Road northbound to westbound left-turn traffic movement to the raindrop roundabout (U-turn). Two dedicated right-turn lanes on westbound Shadow Mountain Drive are provided; one to provide limited truck storage accessing to the Pilot Travel Center fuel station and one for passenger cars. A third westbound lane is provided for through traffic.

  Concept 5 addresses the congestion and safety need at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive by relocating the intersection to the east, away from the Pilot Travel Center and other nearby driveways. Trucks queuing for the Pilot Travel Center fueling station would have limited storage on Shadow Mountain Drive.

Figure 12 – Concept 1

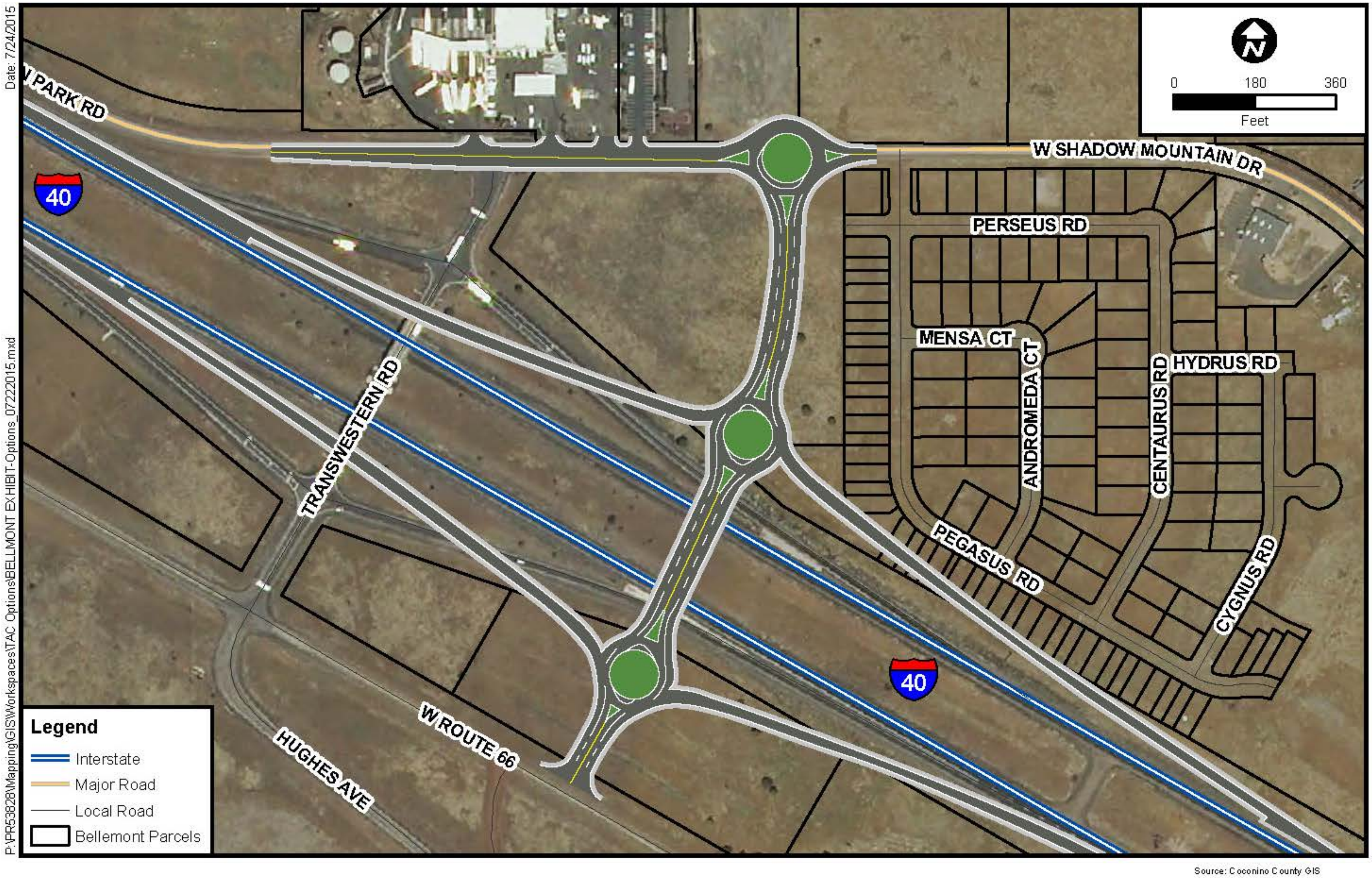
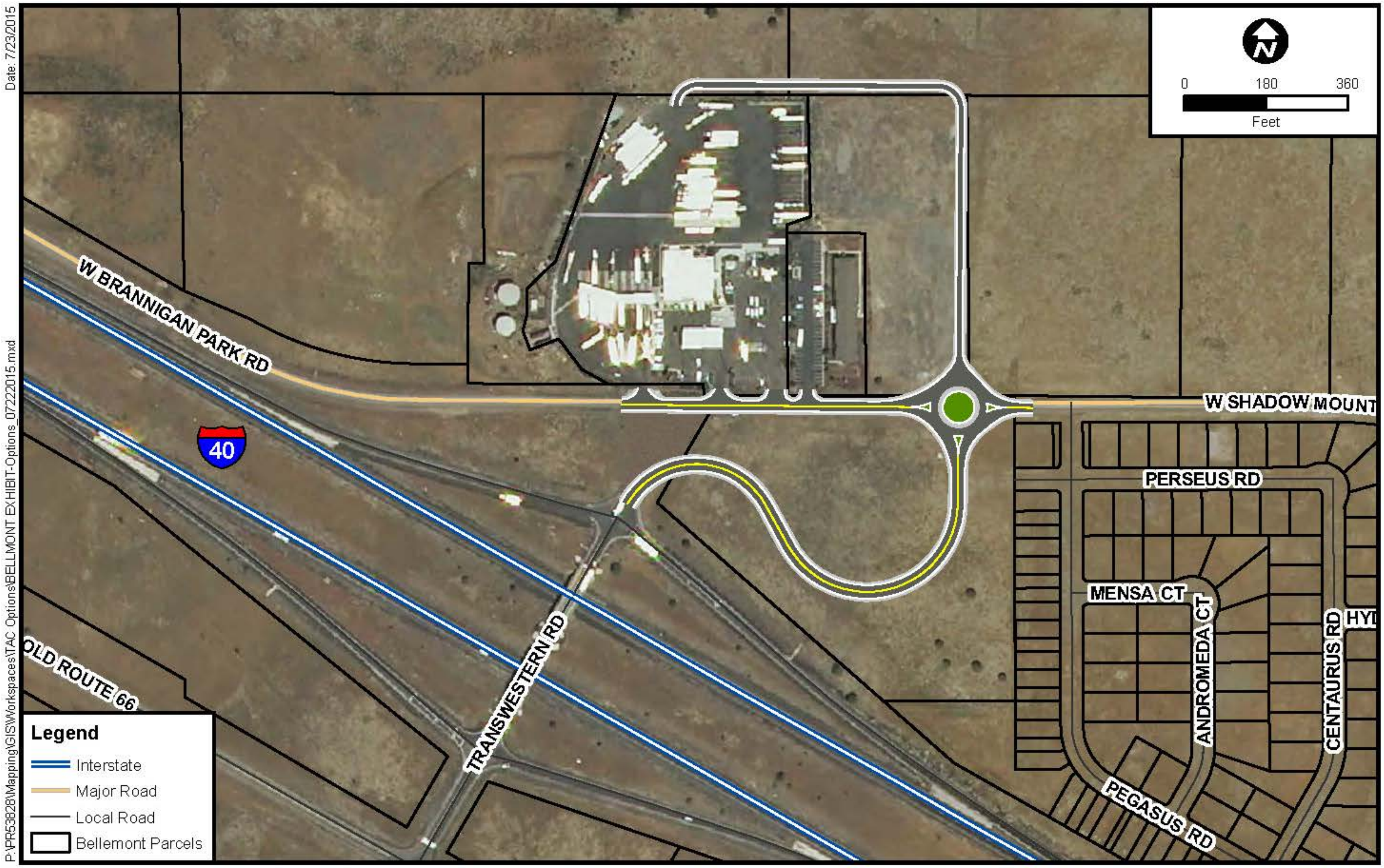
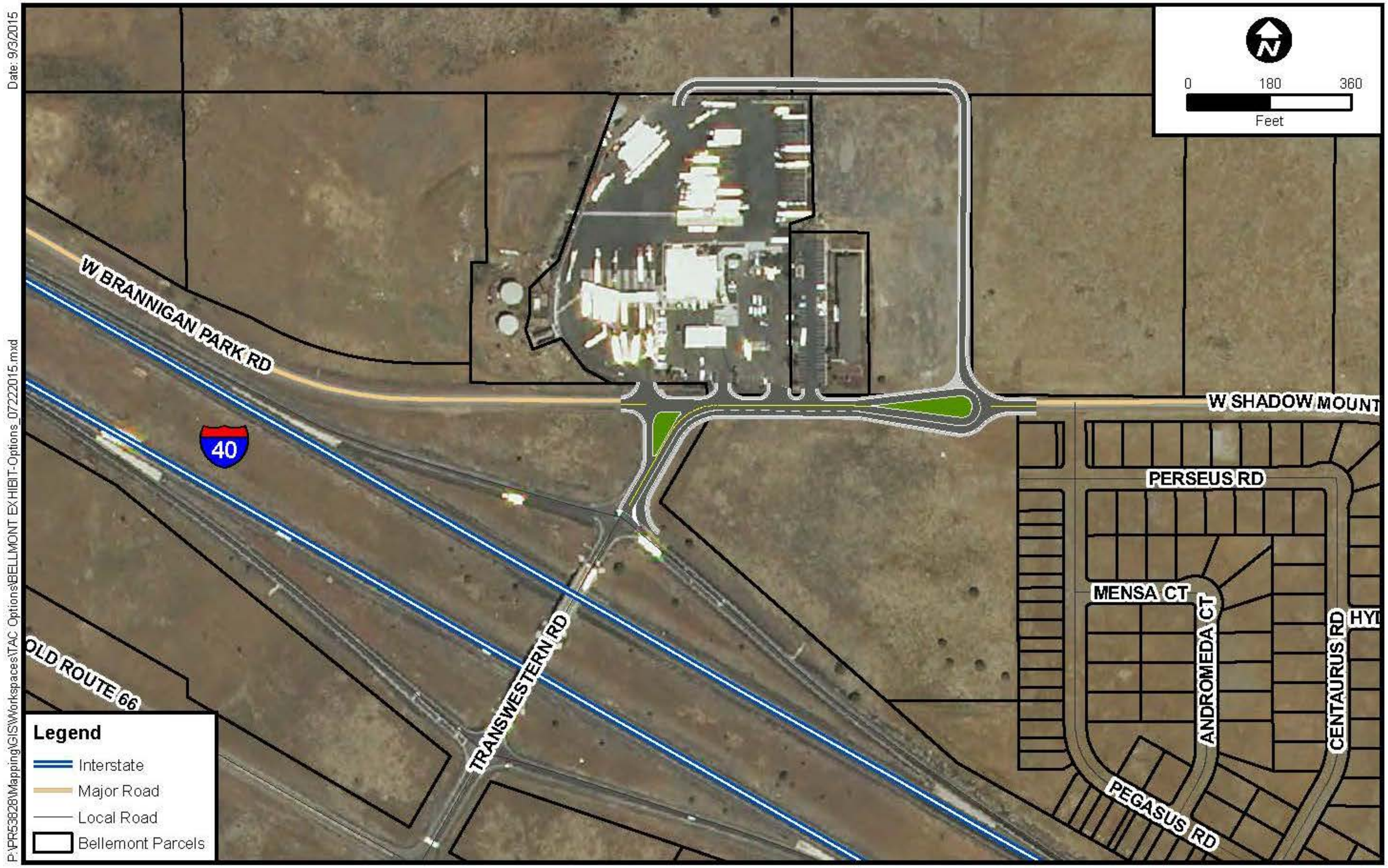


Figure 13 – Concept 2



Source: Coconino County GIS

Figure 14 – Concept 3



Source: Coconino County GIS

Figure 15 – Concept 4

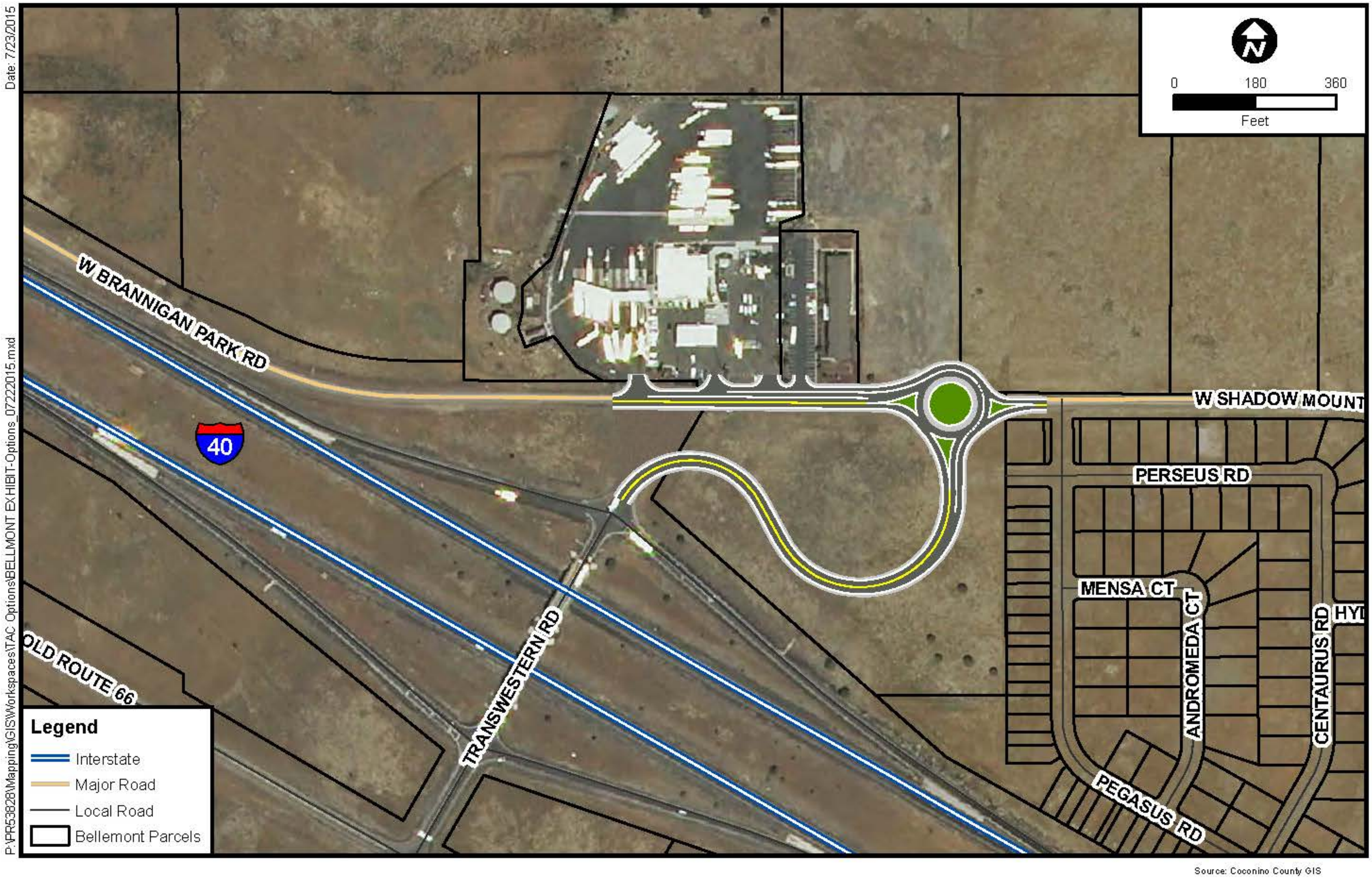
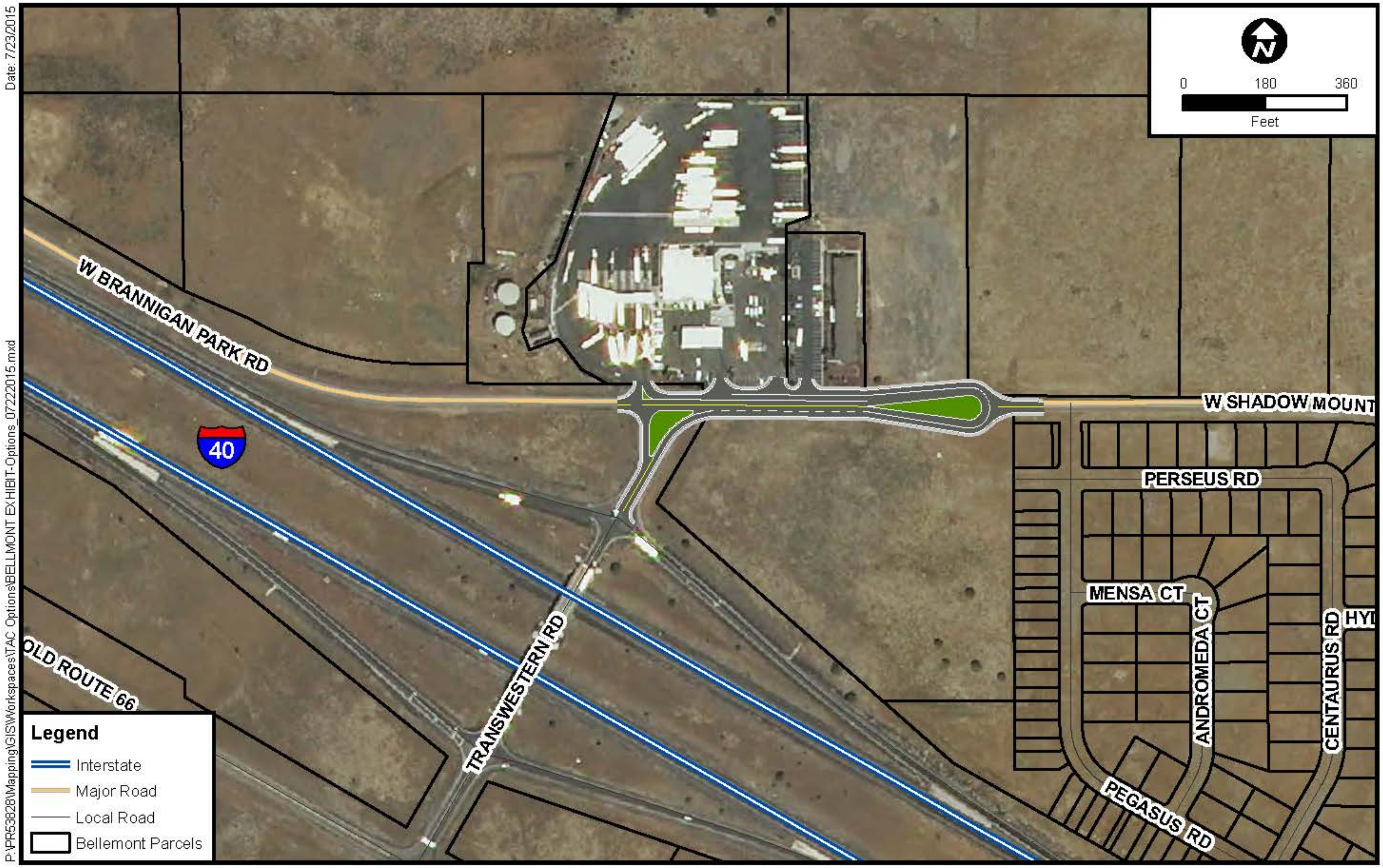


Figure 16 – Concept 5



Source: Coconino County GIS

6.2. Potential Bicycle and Pedestrian Network Improvements

Potential improvements to the bicycle and pedestrian network were generated to address gaps outlined in Section 5.2. The existing bicycle and pedestrian facilities are limited within the Study Area. There are no designated bike lanes, sidewalks or multi-use paths along Brannigan Park Road or Shadow Mountain Drive. Existing sidewalks are located within the residential developments and are disconnected from the commercial developments at the Pilot Travel Center. Currently, bicyclists and pedestrians share the roadway with motorists. Most of the marked and unmarked roadway shoulders are too narrow to accommodate both vehicular and multi-modal transportation. One bicycle and pedestrian concept was developed and is outlined below.

- ***Wide Shoulders on Shadow Mountain Drive*** – Illustrated in ***Figure 17***, wide shoulders on Shadow Mountain Drive will provide a linkage for non-motorized travel between the residential areas and Pilot Travel Center, including associated restaurants and convenience store. According to the 2012 AASHTO Guide for the Development of Bicycle Facilities and the 2013 ADOT Bicycle and Pedestrian Plan Update, paved wide shoulders are considered best practice for rural roadways. A wide shoulder will facilitate the separation of travel modes along Shadow Mountain Drive and encourage the use of alternative modes of travel. Specific treatments for bicycle and pedestrian movements through a potential roundabout would be addressed during final design.

  Wide shoulders on Shadow Mountain Drive address the gap between the commercial and residential areas within the Study Area. Detached pathways were originally investigated. Coconino County, however, does not typically maintain these types of facilities and the concept was not pursued further.

At a regional level, the planned USBR 66 follows I-40 adjacent to the Study Area and is one of four designated bike routes in Arizona. A portion of Brannigan Park Road was adopted by the County Board of Supervisors as an alternate route. These designations are included herein for reference only.

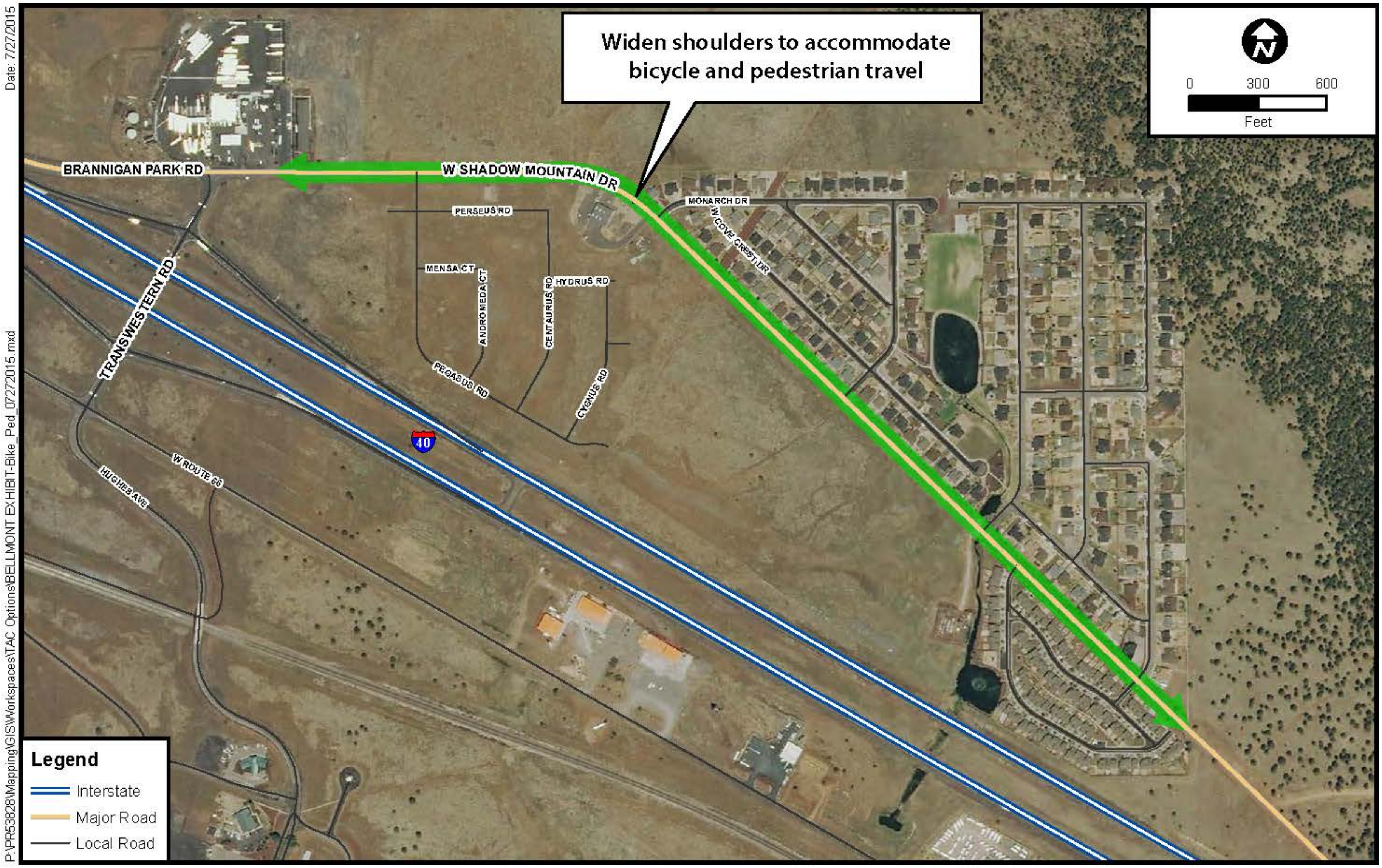
6.3. Potential Transit Network Improvements

Potential improvements to the transit network were generated by prior studies, as outlined in Section 5.3, and are outlined below.

- ***Commuter Express Service*** – To provide regional services, the *Flagstaff Regional Five-year and Long Range Transit Plan* (May 2013) includes the potential for commuter express service to the Study Area if funding is identified.
- ***Park-and-ride Lot*** – To support the implementation of the service plan from *A Coordinated Transit Plan for ECoNA in Northern Arizona* (January 2014), the study recommended a new park-and-ride lot at the Bellemont TI. The addition of a park-and-ride could support the van pool program recommended in the *Mountain Mobility Business Plan 2015-2019*.

The potential transit network improvements listed above are incorporated herein to carry the concepts forward for future regional transit studies. Previous studies briefly included the above potential improvements as smaller elements of a greater network; substantial demand for transit was not identified. Therefore, no further evaluation of these elements was conducted as part of this study.

Figure 17 – Wide Shoulders on Shadow Mountain Drive



Source: Coconino County GIS

6.4. Planning Level Cost Estimates

Planning level cost estimates were developed for the above potential improvements to provide an "order of magnitude" cost. These costs were developed utilizing 2015 dollars and are based on the general description of the potential improvement provided. ***Potential right-of-way costs are not included in the estimates***. Planning level cost estimates for Concepts 2-5 considered the following factors:

- Construction items, such as pavement, earthwork, and traffic control;
- Administrative items, such as design, construction and engineering administration, and quality control; and
- Contingencies, including unidentified items (30%) and construction (5%).

As improvements advance in the project development process, more detailed project cost estimates that consider specific existing site conditions, such as topography and right-of-way constraints, will need to be developed.

The Concept 1 cost estimate was sourced from the I-40, Bellemont to Winona Initial DCR and inflated from 2011 to 2015 dollars using the Consumer Price Index from the Bureau of Labor Statistics. This Initial DCR developed concepts to a greater level of detail, and as such, generated more detailed cost estimates. Right-of-way costs were excluded in the cost estimates developed as part of this study.

Planning level cost estimates are presented in ***Figure 21***.

6.5. Access Management Policy Considerations

Currently, there is limited formal guidance provided for access management by Coconino County and ADOT, as outlined in Sections 3.9.1.2 and 5.1.2. Access management is the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway. The purpose of access management is to provide access to land development in a manner that preserves the safety and efficiency of the transportation system. Access management provides a cost effective approach to improve roadway safety and reduce congestion. Failure to manage access creates adverse social, economic, and environmental impacts. Successful access management results include:

- Reduced vehicular crashes and collisions including pedestrians and cyclists.
- Reduced travel delays, fuel consumption, and vehicular emissions as numerous driveways and traffic signals intensify congestion and delays along major roads.
- Reduced cut-through traffic in residential areas due to overburdened arterials.
- Reduced unsightly commercial strip development.

Access management helps preserve long-term property values and the economic viability of abutting development. In addition, well-designed circulation systems promote efficient travel and can improve the aesthetics of a corridor. Motorists are more likely to travel a corridor that is aesthetically pleasing, has efficient traffic movement, and is safer to drive. This results in increased economic vitality for the area.

Conflict points are the points at which a roadway user can cross, merge, diverge, etc. with another roadway user. Drivers make more mistakes and are more likely to have collisions when they are presented with complex driving situations created by numerous conflicts. Simplifying the driving task results in fewer collisions, improves safety, and reduces congestion. A less complex driving environment is accomplished by limiting the number and type of conflicts between vehicles.

The Transportation Research Board (TRB) *Access Management Manual, Second Addition* (2014) provides approaches to the various typical access management elements, including:

- Access management definitions.
- Functional classification with assigned ranges for speed limits, number of access points, bicycle facility requirements, and recommendations regarding on-street parking.
- Typical roadway sections.
- Access and intersection spacing, including access type and median/median breaks.
- Driveway location, width, and curb radius.
- Guidance for cross and shared access.
- Guidance for service roads.
- Guidance regarding bicycle, pedestrian, and transit facilities, including bus pull outs.
- Site design requirements.

Access management guidelines for the Bellemont area would likely be prepared by Coconino County. In addition to guidelines, it could be possible to develop a simplified zoning overlay for the area in the interim to direct future development/redevelopment within the Study Area. A zoning overlay could include site access criteria to restrict future access along Brannigan Park Road and Shadow Mountain Drive. It could also be structured to require changes in access for approval of new permits for redevelopment of existing sites. This study also recommends changing the functional classification of Shadow Mountain Drive from local road to collector or higher functional classification: higher functional classifications provide greater access management opportunities.

To facilitate the development of access management guidelines, a brief review of the access management guidelines for the City of Tucson (Tucson) and City of Peoria (Peoria) were conducted. While the character for much of Coconino County differs from these communities, their guidelines provide a reference for content, requirements, and other provisions. Tucson's policies and standards are outlined in the *Transportation Access Management Guidelines* (revised December 2011), which is included in ***Appendix FR-5***. Peoria's policies and standards are outlined in the *Access Management Guidelines* (2011), which is included in ***Appendix FR-6***. Several excerpts from the TRB, Tucson, and Peoria access management documents that are relevant to this study are provided to serve as a reference. Even though ADOT has developed draft access management guidelines, they are not included due to their draft status; however, this document contains many of the same elements.

6.5.1. Functional Classification and Definitions

The TRB manual defines functional classification as, "A system used to group public roadways into classes according to their purpose in moving vehicles and providing access."

Tucson guidelines define functional classifications following definitions. Note this table provides criteria for access, speed, and complete streets, among other features.

Figure 18 – Functional Route Classification (Tucson Guidelines Table 3-1)

Characteristic	Functional Classification		
	Arterial Street	**Collector Street**	**Local Street**
Primary Function	Through traffic movement, limited direct land access	traffic movement, land access, collect & distribute traffic between streets and arterials	land access
Continuity	continuous	not necessarily continuous	not continuous
Spacing	1-2 miles	½ mile or less	as needed
Typical % of Surface Street System Travel Volume Carried	65-80%	5-20%	10-30%
Direct Land Access	limited	limited – less restrictive	local access
Speed Limit	30-55 mph	30-40 mph	25 mph
Parking	prohibited	prohibited, unless approved due to special conditions	permitted
Bicycle Facility	Yes, striped	Yes, striped	Yes, not striped

Peoria's Guidelines provide the following definitions, which are more general than Tucson's definitions.

Figure 19 – Functional Classification (Peoria Guidelines Table 1)

TABLE 1. FUNCTIONAL CLASSIFICATION	
Freeway	A major highway that provides access via interchanges only.
Major Arterial	A roadway of regional importance intended to serve high volumes of traffic traveling relatively long distances. The roadway is also access controlled and primarily intended to serve through traffic.
Minor Arterial	A roadway that is similar in function to major arterials, but operated under lower traffic volumes, serves trips of shorter distances, and provides a higher degree of property access than major arterials.
Major Collector	A roadway that provides for traffic movement between arterials and local streets and carries moderate traffic volumes over moderate distances.
Minor Collector	A roadway that is similar in function to a major collector, but carries lower traffic volumes over shorter distances and has a higher degree of property access. Minor Collectors may also provide direct access to abutting properties except individual residences.
Local Street	A roadway intended to provide access to abutting properties that tends to accommodate lower traffic volumes, serve short trips, and provide connection to collector streets. The roadway also provides mobility within a neighborhood.
Rural Street	Similar to a local roadway, but in a rural setting versus an urban or suburban environment.

6.5.2. Unsignalized Access Spacing

Unsignalized access spacing impacts the speed and safety of a roadway. The TRB *Access Management Manual, Second Edition* (2014) identifies multiple approaches to unsignalized connection spacing, including:

- Independent access connections,
- Upstream functional distance
- Turn lane design
- Safety
- Stopping sight distance
- Intersection sight distance
- Decision sight distance
- Right-turn conflict overlap and
- Egress capacity
- Travel Speed

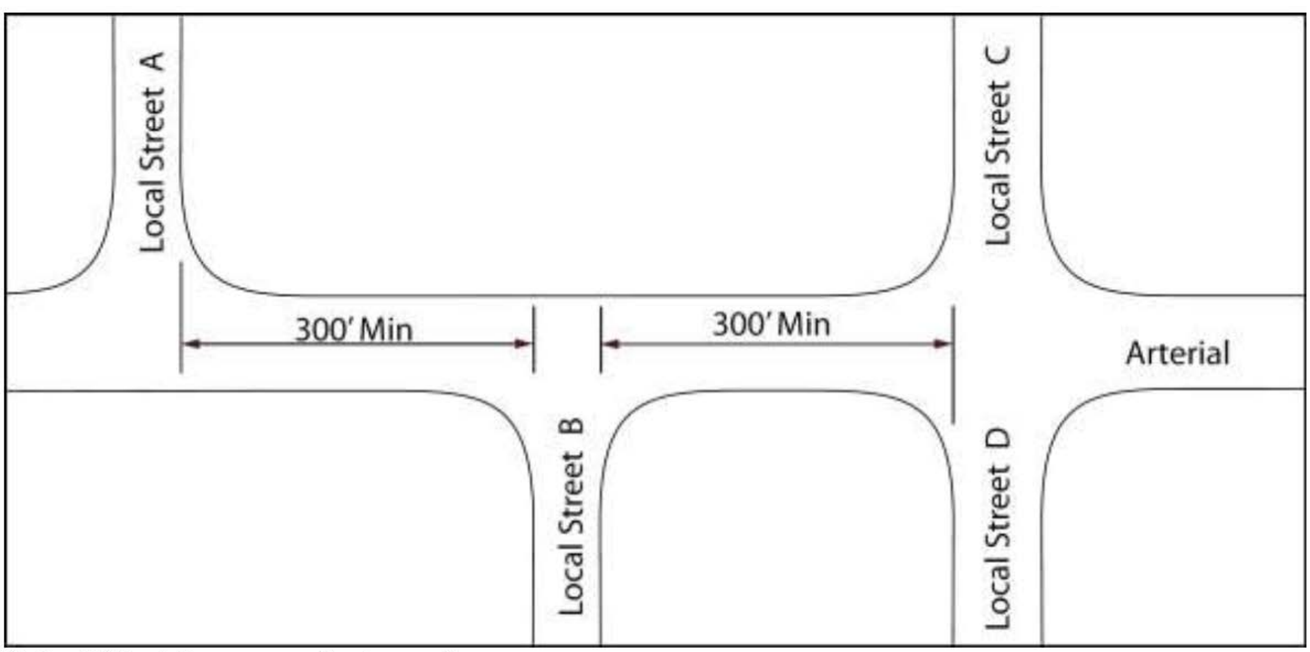
Table 15 – TRB EXHIBIT 15-13 Unsignalized Access Spacing Based on Adjacent and Independent Connections

Posted Speed (mph)	Functional Distance (ft)		Ideal Spacing (ft)
	Downstream[a]	Upstream[b]	
20	160	60	220
25	230	95	325
30	320	135	455
35	440	185	625
40	580	240	820
45	740	206	1,045
50	950	375	1,325
55	1,200	455	1,655
60	1,520	540	2,060
65	1,990	635	2,625
70	2,580	735	3,315
75	3,360	840	4,200

NOTE: All functional distances and spacing are exclusive of queue storage
[a]See Section 14.3.1, Exhibit 14-11
[b]See Section 14.2. Assumes 2.0-s perception-reaction time (see Exhibit 14-3) and a deceleration rate acceptable to most drivers (see Exhibit 14-4) for the example distances

Tucson provides guidance for unsignalized intersection spacing, with a provision that, "where intersection signalization is likely in the future, ½ mile intersection spacing should govern."

Figure 20 – Minimum Unsignalized Intersection Spacing (Tucson Guidelines Figure 4-1)



Note: 150' minimum on collector roadways

Tucson's guidelines also identify minimum spacing between unsignalized median openings. Note in ***Table 16***, allowable spacing is dependent upon speed. A second guideline is provided in ***Table 17*** which dictates allowable spacing by functional classification. The guidelines indicate the most conservative governs.

Table 16 – Minimum Spacing Between Unsignalized Median Openings (Tucson Guidelines Table 4-2)

Speed Limit(mph)	Minimum Spacing (feet)
30	370
35	460
40	530
45	670
50	780
55	910

Guidelines for unsignalized median openings by functional classification.

Table 17 – Guidelines for Spacing Median Openings (Tucson Guidelines Table 4-3)

Street Functional Classification	Spacing of Median Openings (in feet)		
	Urban	Suburban	Rural
Arterial	660	660	1320
Collector	330	660	1320

Peoria provides guidance for required spacing for both signalized and unsignalized connections by functional class as shown in ***Table 18***.

Table 18 – Guidelines for Spacing Signalized and Unsignalized Connections by Functional Classification (Peoria Guidelines Table 3)

TABLE 3			
FUNCTIONAL CLASSIFICATION		MINIMUM SPACING STANDARD	
Roadway A	Roadway B	Signalized Connections	Unsignalized Connections
Major Arterial	Major Arterial	1 mile	1 mile
Major Arterial	Minor Arterial	1 mile	1 mile
Major Arterial	Major Collector	½ mile	½ mile
Major Arterial	Minor Collector	½ mile	½ mile
Minor Arterial	Minor Arterial	1 mile	½ mile
Minor Arterial	Major Collector	½ mile	½ mile
Minor Arterial	Minor Collector	None*	¼ mile
Major Collector	Major Collector	None*	¼ mile
Major Collector	Minor Collector	None*	1/8 mile

*Signalized intersections at these locations are not desired.

Peoria also offers guidance on median openings as follows:

Full median openings shall be located, at a minimum:

- Every 1/2 mile on major and minor arterials
- Every 1/4 mile on collectors that are not anticipated to become arterials.
- The Engineer Director may permit median openings at smaller intervals for built-up areas.

6.5.3. Driveway Spacing

The TRB *Access Management Manual, Second Edition* (2014) generally recommends that driveway spacing requirements be included as part of "connection spacing" criteria, so that all connections are reviewed concurrently.

Design requirements for driveway locations onto arterial and collector roadways in all new development are as follows:

1. Entrance and exit drives crossing arterials and collectors are limited to two per 300 feet of frontage along any major roadway. The nearest pavement edges should be spaced at least 80 feet apart (Figure 5-4).
2. A minimum of one hundred and fifty feet, measured at curbline, shall separate the nearest pavement edge of any ingress or egress driveway and the curbline to any signalized or major intersection with arterial and collector roadways. (Figure 5-4)
3. On divided arterial and collector roadways, at full median openings, access points on both sides of the roadway should align (Figure 5-5) or be offset from the median opening by at least 150 feet (Figure 5-6). If the noted design requirements for driveway locations cannot be met, then driveway turning movement restrictions may be imposed. See Section 5.10 for movement restrictions.

4. On undivided arterial and collector roadways, at the access points on both sides of the roadway should align, or be offset by at least 300 feet for arterials, and 150 feet for collectors (Figure 5-7). If the noted design requirements for driveway locations cannot be met, then driveway turning movement restrictions may be imposed. See Section 5.10 for movement restrictions.
5. There should be no direct residential lot access to arterials. Direct residential lot access to collectors should be avoided in new roadway development.
6. All new development should promote cross access agreements to limit the number of driveways crossing arterial and collector roadways. See Figure 5-8 for the benefits of shared and cross access management.
7. To limit access on major roadways, a local access lane can be incorporated into the design when multiple existing parcels have direct access to a collector or arterial roadway (Figure 5-9).
8. Area, neighborhood, and corridor plans and studies may further restrict driveway locations. For example, the Houghton Area Master Plan limits driveways on Houghton Rd. to ¼ mile spacing.
9. At locations near major intersections where the property is adjacent to a bus stop, consideration shall be provided for safe loading and unloading of passengers. See the Transit Facilities section (Section 5.16) and Bus Bay Details (Figures 5-14 and 5-15).

The Tucson Access Management Guidelines also call for varying levels of traffic impact analysis based upon the size of a proposed development/redevelopment.

Peoria provides guidance on driveway spacing as a function of the type of facility, roadway speed, and required corner clearance.

> *Driveways should be offset from median openings by the following: At least 60 m (200 ft) when two low-volume traffic generators are involved, The greater of 60 m (200 ft) or the established median opening spacing interval when one major traffic generator is involved, and at least two times the established median opening spacing interval when two major traffic generators are involved.*
>
> *Major generators are those developments that are estimated to generate 500 vehicle trips or more during either of the a.m. or p.m. peak hours. On streets with posted speed limits or prima facie speed limits of less than 30 mph the minimum access spacing may be reduced to 50 feet*

Required spacing by speed:

Table 19 – Minimum Access Spacing (feet) (Peoria Guidelines Table 1)

Table 1. Minimum Access Spacing (feet)

Speed (mph)	Spacing
30	150
35	180
40	230
45	260
50	290

Required spacing by corner clearance:

Table 20 – Minimum Corner Clearance (feet) (Peoria Guidelines Table 2)

Table 2. Minimum Corner Clearance (feet)

	Distance From Near Side of Street to Near Side of Access Driveway	
Speed (mph)	Major Generator	Minor Generator
30	200	145
35	295	230
40	390	310
45	425	325
50	450	345

Additional criteria are offered in Peoria's guidelines.

6.5.4. Driveway Design

Driveway design geometrics impact progression through a corridor. The design of access points must consider the type of vehicle that will utilize the driveway. For example, large trucks have a large turning radius and need more room to turn. Similarly, they require greater storage lengths to queue. The time of day (peak travel time vs. off peak) and number of large vehicles should be considered when selecting a driveway type. Recommended driveway curb radii vary based on site use and roadway speed (TRB, *Access Management Manual, Second Edition* (2014)).

Tucson's guidelines identify criteria for driveway profiles, turning movement restrictions, driveway widths, throat length, and other design considerations. Table 5-2 from their guidelines is included below as an example reference for curb return radius.

Table 21 – Minimum Curb Return Radius (Tucson Guidelines Table 5-2)

	Arterial Street	Collector Street	Local Street	Driveway/ PAAL
Arterial Street	30'	25'	25'	25'
Collector Street	25'	25'	25'	25'
Local Street	25'	25'	18'	18'
Driveway/PAAL	25'	25'	18'	18'

Note: Traffic study to allow radii reduction or approval by TDOT

6.5.5. Bicyclists and Pedestrians

The TRB *Access Management Manual, Second Edition* (2014) provides guidance for accommodating bicyclists and pedestrians throughout the manual.

Both Tucson and Peoria identify access considerations for bicyclists and pedestrians that complement their design guidelines.

6.6. Additional Considerations

This section outlines additional considerations that were identified through TAC and public input that have the potential to improve the study area transportation network, but are either beyond Coconino County's typical purview or the scope of this study. They are listed below in three groups: 1) Policy considerations; 2) Pilot Travel Center site considerations; and 3) Other considerations.

Policy Considerations

The following policy considerations pertain to ADOT.

- Reopen closed ADOT rest areas, including the Parks Rest Area on I-40.
- Prohibit truck parking on the Bellemont TI ramps.
- Increase trash collection on the Bellemont TI ramps.
- Improve response time for snow removal.

Pilot Travel Center Site Considerations

The following potential improvements pertain to the Pilot Travel Center site, which should be presented to Pilot Travel Center for consideration.

- Relocate truck fueling station away from intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive.
- Revise on-site circulation to utilize an alternative driveway for truck traffic.
- Improve signing for non-truck traffic (passenger cars and recreational vehicles).
- Add stop-control for trucks leaving the site.
- Denote a dedicated fire lane along the west side of the site, adjacent to the fueling station.

Other Considerations

The following are other considerations within the study area not previously addressed.

- Provide a covered, lighted school bus stop.
- Pave and maintain Forest Service Road 649 as an alternate ingress/egress point from the residential development (Flagstaff Meadows).
- Provide additional signing and enforcement along Brannigan Park Road.
- Improve lighting on the Bellemont TI ramps and Transwestern Road.
- Relocate mail boxes from the Pilot Travel Center to a location within the residential development.
- Add a gate to the fence along Shadow Mountain Drive, at the I-40 underpass for use by cyclists and runners.

7.0 Traffic Analysis of Potential Roadway Network Improvements

7.1. Traffic Operational Analysis

Capacity analyses were conducted for the 2025 and 2035 build conditions for each of the five potential roadway concepts outlined in Section 6.1. Traffic projections developed in Section 4.4 were used for the analyses of the potential roadway concepts. *Synchro* software using the *Highway Capacity Manual* (HCM) methodology was generally used. For the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive, where three of the four approaches are stop-controlled, *SimTraffic* software was used for the evaluation. *Sidra* software using HCM roundabout methodology was used to evaluate the roundabouts. Results are summarized in tables below; traffic software results are included in the Appendix as follows:

- Concept 1 – ***Table 22*** and ***Appendix FR-7***;
- Concept 2 – ***Table 23*** and ***Appendix FR-8***;
- Concept 3 – ***Table 24*** and ***Appendix FR-9***;
- Concept 4 – ***Table 25*** and ***Appendix FR-10***; and
- Concept 5 – ***Table 26*** and ***Appendix FR-11***.

Results are presented in terms of LOS and delay. LOS is a qualitative value of how well a roadway or intersection operates. A grading system of A through F is assigned. LOS A represents free-flow traffic operations with little vehicle delay; LOS F represents substantial congestion and vehicle delay. Operations of LOS C and better are typically considered good and acceptable in rural areas; LOS D is often acceptable in urban areas. Operations of LOS E or F typically need attention.

Table 22 – Roadway Concept 1 Traffic Analysis										
	Eastbound		Westbound		Northbound		Southbound		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
	EB I-40 Ramps & Transwestern Road Roundabout									
2025 AM	A	8.7			A	7.2	A	7.3	**A**	**7.5**
2025 MD	A	9.3			A	6.7	A	5.5	**A**	**6.5**
2025 PM	A	7.0			A	9.4	A	6.1	**A**	**7.8**
2035 AM	B	10.3			A	8.2	A	8.5	**A**	**8.7**
2035 MD	B	10.7			A	7.5	A	5.8	**A**	**7.3**
2035 PM	A	7.8			B	11.9	A	6.5	**A**	**9.2**
	WB I-40 Ramps & Transwestern Road Roundabout									
2025 AM			A	8.4	A	5.3	A	7.9	**A**	**7.8**
2025 MD			A	8.3	A	5.1	A	6.7	**A**	**6.8**
2025 PM			B	11.2	A	5.1	A	6.8	**A**	**8.5**
2035 AM			A	9.6	A	5.4	A	9.1	**A**	**8.9**
2035 MD			A	9.6	A	5.3	A	7.5	**A**	**7.6**
2035 PM			B	14.6	A	5.2	A	7.4	**B**	**10.4**
	Transwestern Road & Brannigan Park/Shadow Mountain Roundabout									
2025 AM	B	11.0	A	6.6	A	5.3			**A**	**7.9**
2025 MD	A	8.5	A	4.9	A	6.1			**A**	**7.0**
2025 PM	A	8.5	A	5.4	A	7.4			**A**	**7.6**
2035 AM	B	14.2	A	7.6	A	5.6			**A**	**9.5**
2035 MD	A	9.8	A	5.4	A	6.6			**A**	**7.9**
2035 PM	B	10.0	A	6.1	A	8.4			**A**	**8.8**

Table 23 – Roadway Concept 2 Traffic Analysis										
	Eastbound		Westbound		Northbound		Southbound		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
	EB I-40 Ramps & Transwestern Road									
2025 AM	D	29.5			A	0.0	A	6.8	**A**	**9.5**
2025 MD	C	17.3			A	0.0	A	4.9	**A**	**5.4**
2025 PM	C	18.4			A	0.0	A	7.4	**A**	**5.7**
2035 AM	F	58.3			A	0.0	A	7.0	**B**	**14.0**
2035 MD	C	21.1			A	0.0	A	5.0	**A**	**6.5**
2035 PM	C	24.7			A	0.0	A	7.8	**A**	**7.0**
	WB I-40 Ramps & Transwestern Road									
2025 AM			B	11.1	A	1.1	A	0.0	**A**	**3.0**
2025 MD			B	11.1	A	1.7	A	0.0	**A**	**3.4**
2025 PM			B	12.1	A	2.0	A	0.0	**A**	**5.9**
2035 AM			B	12.0	A	1.0	A	0.0	**A**	**3.3**
2035 MD			B	11.9	A	1.8	A	0.0	**A**	**3.7**
2035 PM			B	13.7	A	1.9	A	0.0	**A**	**6.7**
	Transwestern Road & Brannigan Park/Shadow Mountain Roundabout									
2025 AM	B	11.0	A	7.3	A	7.0			**A**	**8.6**
2025 MD	A	8.5	A	5.4	A	8..0			**A**	**8.0**
2025 PM	A	8.7	A	6.0	B	11.5			**B**	**10.0**
2035 AM	B	14.2	A	8.7	A	7.5			**B**	**10.4**
2035 MD	A	9.8	A	6.1	A	9.0			**A**	**9.1**
2035 PM	B	10.0	A	6.9	B	14.7			**B**	**12.4**

Table 24 – Roadway Concept 3 Traffic Analysis										
	Eastbound		Westbound		Northbound		Southbound		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
	EB I-40 Ramps & Transwestern Road									
2025 AM	D	29.5			A	0.0	A	6.8	**A**	**9.5**
2025 MD	C	17.3			A	0.0	A	4.9	**A**	**5.4**
2025 PM	C	18.4			A	0.0	A	7.4	**A**	**5.7**
2035 AM	F	58.3			A	0.0	A	7.0	**B**	**14.0**
2035 MD	C	21.1			A	0.0	A	5.0	**A**	**6.5**
2035 PM	C	24.7			A	0.0	A	7.8	**A**	**7.0**
	WB I-40 Ramps & Transwestern Road									
2025 AM			B	13.7*	A	1.1	A	0.0	**A**	**1.6**
2025 MD			B	13.7*	A	1.7	A	0.0	**A**	**1.6**
2025 PM			B	12.7*	A	2.0	A	0.0	**A**	**1.6**
2035 AM			C	16.0*	A	1.0	A	0.0	**A**	**1.8**
2035 MD			C	15.5*	A	1.8	A	0.0	**A**	**1.8**
2035 PM			B	13.8*	A	1.9	A	0.0	**A**	**1.6**
	Transwestern Road & Brannigan Park									
2025 AM	A	3.4	A	6.8	A	2.0	A	6.0	**A**	**4.8**
2025 MD	A	2.5	A	6.3	A	1.9	A	5.8	**A**	**3.9**
2025 PM	A	3.2	A	7.2	A	2.4	A	5.6	**A**	**4.2**
2035 AM	A	4.2	A	8.2	A	2.0	A	6.7	**A**	**5.7**
2035 MD	A	2.6	A	6.9	A	2.1	A	6.1	**A**	**4.2**
2035 PM	A	3.4	A	8.2	A	2.5	A	6.2	**A**	**4.6**
	Brannigan Park/Shadow Mountain & U-Turn Roundabout									
2025 AM	A	5.8	A	6.7					**A**	**6.3**
2025 MD	A	6.0	A	5.0					**A**	**5.8**
2025 PM	A	6.8	A	4.6					**A**	**6.4**
2035 AM	A	6.1	A	7.7					**A**	**7.0**
2035 MD	A	6.4	A	5.5					**A**	**6.2**
2035 PM	A	7.5	A	6.0					**A**	**7.4**

* Delay is for left turn only. Right turn delay is 0.0 seconds.

Table 25 – Roadway Concept 4 Traffic Analysis										
	Eastbound		Westbound		Northbound		Southbound		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
	EB I-40 Ramps & Transwestern Road									
2025 AM	D	29.5			A	0.0	A	6.8	**A**	**9.5**
2025 MD	C	17.3			A	0.0	A	4.9	**A**	**5.4**
2025 PM	C	18.4			A	0.0	A	7.4	**A**	**5.7**
2035 AM	F	58.3			A	0.0	A	7.0	**B**	**14.0**
2035 MD	C	21.1			A	0.0	A	5.0	**A**	**6.5**
2035 PM	C	24.7			A	0.0	A	7.8	**A**	**7.0**
	WB I-40 Ramps & Transwestern Road									
2025 AM			B	11.1	A	1.1	A	0.0	**A**	**3.0**
2025 MD			B	11.1	A	1.7	A	0.0	**A**	**3.4**
2025 PM			B	12.1	A	2.0	A	0.0	**A**	**5.9**
2035 AM			B	12.0	A	1.0	A	0.0	**A**	**3.3**
2035 MD			B	11.9	A	1.8	A	0.0	**A**	**3.7**
2035 PM			B	13.7	A	1.9	A	0.0	**A**	**6.7**
	Transwestern Road & Brannigan Park/Shadow Mountain Roundabout									
2025 AM	B	11.0	A	6.6	A	5.3			**A**	**7.9**
2025 MD	A	8.5	A	4.9	A	6.1			**A**	**7.0**
2025 PM	A	8.5	A	5.4	A	7.4			**A**	**7.6**
2035 AM	B	14.2	A	7.6	A	5.6			**A**	**9.5**
2035 MD	A	9.8	A	5.4	A	6.6			**A**	**7.9**
2035 PM	B	10.0	A	6.1	A	8.4			**A**	**8.8**

Table 26 – Roadway Concept 5 Traffic Analysis										
	Eastbound		Westbound		Northbound		Southbound		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
	EB I-40 Ramps & Transwestern Road									
2025 AM	D	29.5			A	0.0	A	6.8	**A**	**9.5**
2025 MD	C	17.3			A	0.0	A	4.9	**A**	**5.4**
2025 PM	C	18.4			A	0.0	A	7.4	**A**	**5.7**
2035 AM	F	58.3			A	0.0	A	7.0	**B**	**14.0**
2035 MD	C	21.1			A	0.0	A	5.0	**A**	**6.5**
2035 PM	C	24.7			A	0.0	A	7.8	**A**	**7.0**
	WB I-40 Ramps & Transwestern Road									
2025 AM			B	11.1	A	1.1	A	0.0	**A**	**3.0**
2025 MD			B	11.2	A	1.7	A	0.0	**A**	**3.5**
2025 PM			B	12.1	A	2.0	A	0.0	**A**	**5.9**
2035 AM			B	12.0	A	1.0	A	0.0	**A**	**3.3**
2035 MD			B	11.9	A	1.8	A	0.0	**A**	**3.8**
2035 PM			B	13.7	A	1.9	A	0.0	**A**	**6.7**
	Transwestern Road & Brannigan Park									
2025 AM	A	3.7	A	6.2	A	1.6	A	6.0	**A**	**4.6**
2025 MD	A	2.4	A	5.2	A	1.8	A	6.0	**A**	**3.6**
2025 PM	A	3.2	A	6.0	A	2.1	A	5.8	**A**	**3.8**
2035 AM	A	3.8	A	6.9	A	1.6	A	6.6	**A**	**5.0**
2035 MD	A	3.0	A	5.8	A	1.9	A	5.7	**A**	**3.9**
2035 PM	A	3.5	A	6.8	A	2.1	A	5.9	**A**	**4.2**
	Brannigan Park/Shadow Mountain & U-Turn Roundabout									
2025 AM	A	5.3	A	7.2					**A**	**6.4**
2025 MD	A	6.2	A	5.1					**A**	**6.0**
2025 PM	A	7.2	A	5.5					**A**	**7.0**
2035 AM	A	5.6	A	7.6					**A**	**6.7**
2035 MD	A	6.7	A	5.6					**A**	**6.5**
2035 PM	A	8.2	A	6.3					**A**	**7.9**

7.2. Interpretation of Results

The capacity analysis results summarized in ***Table 22*** through ***Table 26*** show that the intersections for all five roadway concepts will generally operate at an overall LOS A, with an occasional LOS B. However, as documented in the no-build (existing conditions) analysis in Section 3.10, the primary concern is the lack of storage for trucks queueing to use the fuel station at the Pilot Travel Center.

Trucks waiting for occupied fueling stations stop and wait through the driveway and into the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive. This periodically blocks the intersection. Incidents where three or four trucks are stopped along Transwestern Road are common, and can occasionally reach seven or eight trucks. At an average spacing of 85 feet per truck, the queue for waiting trucks is routinely over 300 feet, and can occasionally reach close to 700 feet. Concepts 1, 4 and 5 provide a longer than existing storage length of approximately 500 feet. While this length will accommodate the 300 foot queues routinely seen, a 300 foot queue will block the other nearby driveways serving passenger cars. In addition, queues over 500 feet will block the westbound traffic from Shadow Mountain Drive from being able to access I-40. While Concepts 1, 4 and 5 will have the capacity to handle the traffic demand, there is concern that queued trucks will cause blockages and create access problems similar to what exists today.

Concepts 2 and 3 address truck queuing at the Pilot Travel Center fueling station by constructing a new local access road from Transwestern Road to the north side of the site. Trucks would proceed to the back of the Pilot Travel Center site, encouraging on-site truck storage. Also, the new local access road provides the necessary storage for waiting trucks away from Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive and should eliminate the blockages seen today.

One concern just outside of the Study Area will exist in Concepts 2 through 5 for the 2035 AM peak hour. The I-40 eastbound exit ramp intersection with Transwestern Road will operate with an overall LOS of B; however, the eastbound approach will be at LOS F. This operational issue is projected to occur during just one hour of the day. The intersection may need improvement by 2035, with a roundabout as an appropriate type of improvement. This issue does not exist with Concept 1.

8.0 Evaluation of Potential Improvements

8.1. Evaluation Criteria

Evaluation criteria were developed with the TAC and PMT. These criteria were used to evaluate potential projects. The evaluation criteria are the following:

- ***Mobility*** – How well potential improvements enhance mobility, alleviate congestion, and enhance connectivity with one or more modes of transportation.
- ***Consistency with planned improvements*** – How well potential improvements provide connectivity with future planned improvements and proposed developments while minimizing "throw away" infrastructure.
- ***Safety impact*** – How well potential improvements address pedestrian or bicyclist safety and/or how they may reduce vehicular crashes.
- ***Property impacts*** – How substantial potential improvements impact existing and planned land uses, including future development opportunities and creation of remnant parcels.
- ***Environmental compatibility*** – How potential improvements may impact the environment, such as the natural environment, land use, cultural resources, and socioeconomic factors. The likely extent of environmental permitting, investigations, and remediation was also considered.
- ***Public input*** – Input on potential improvements from stakeholders and the general public.
- ***Cost*** – Planning-level cost estimates, as described in Section 6.4, were developed for each potential improvement.
- ***Funding availability*** – Assessment of the financial feasibility to implement proposed improvements, including the ability to leverage funding from agencies, property owners, or other organizations.

8.2. Evaluation of Potential Improvements

The analysis of proposed improvements is summarized in ***Figure 21***. The table includes a qualitative rating as follows for each criterion:

- (+) represents an advantage;
- (o) represents neutral impacts; and
- (-) represents a disadvantage.

The ratings will be used to determine whether proposed improvements are feasible and to determine which of the major roadway concepts are recommended. The evaluation criteria are not weighted.

Figure 21 – Qualitative Project Evaluation

	Mobility	Consistency w/Planned Improvements	Safety Impact	Property Impacts	Environmental Compatibility	Public Input	Cost* ($ million)	Funding Availability
Roadway Network Improvements								
Concept 1	Neutral	Advantage	Neutral	Disadvantage	Neutral	Disadvantage	$25.8	Disadvantage
Concept 2	Advantage	Advantage	Advantage	Disadvantage	Neutral	Neutral	$2.0	Advantage
Concept 3	Advantage	Advantage	Advantage	Advantage	Neutral	Advantage	$1.6	Advantage
Concept 4	Neutral	Advantage	Neutral	Disadvantage	Neutral	Disadvantage	$1.8	Advantage
Concept 5	Neutral	Advantage	Neutral	Advantage	Neutral	Disadvantage	$1.3	Advantage
Bicycle and Pedestrian Network Improvements								
Wide shoulders	Advantage	Neutral	Advantage	Neutral	Neutral	Advantage	$0.8	Advantage

*Potential right-of-way costs are not included.

Advantage **Neutral** **Disadvantage**

9.0 Hybrid Concept 2/3

Concepts 2 and 3 scored the best overall and were generally preferred by the TAC, stakeholders, and the public. Based upon input from these groups, Hybrid Concept 2/3 was developed to incorporate desirable elements from Concepts 2 and 3. In general, maintaining the existing location for Transwestern Road from Concept 3 was preferred; the roundabout from Concept 2 was preferred to the raindrop to better accommodate future development and maneuverability. Hybrid Concept 2/3 is illustrated in ***Figure 22***.

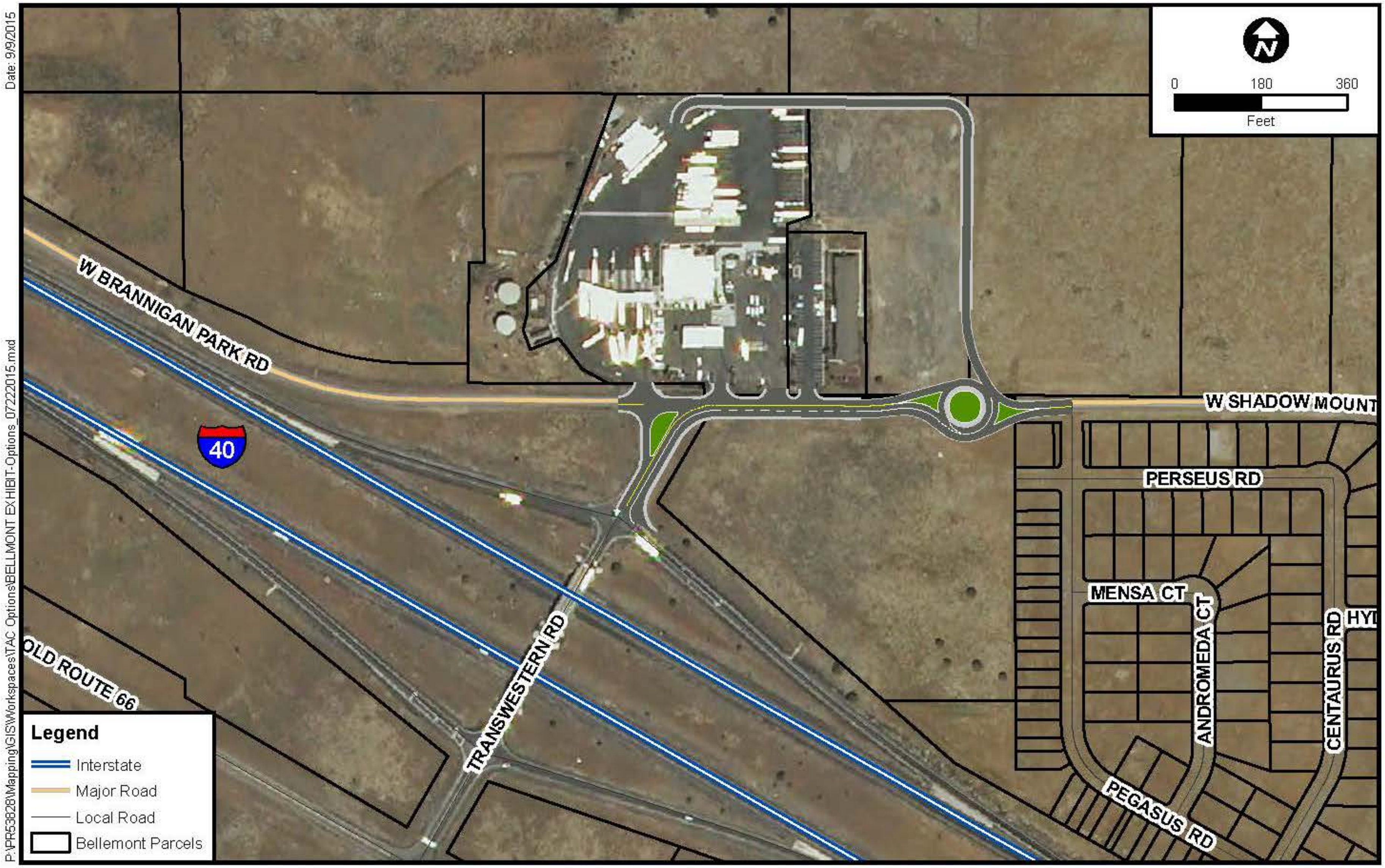
Similar to Concept 3, Hybrid Concept 2/3 widens Transwestern Road by one northbound lane, creating a dual-lane right-turn to eastbound Shadow Mountain Drive. Similar to Concept 2, a new two-lane roundabout is constructed on Shadow Mountain Drive at the approximate location of the roundabout proposed in *the I-40 Bellemont to Winona Initial DCR*. A new one-lane, one-way local access road is provided along the parcel boundary on the north side of the new roundabout. As in Concept 2, a median "pork chop" island at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive relocates the Transwestern Road northbound to westbound left-turn traffic movement to the roundabout. It should be noted that Hybrid Concept 2/3 is conceptual in nature and refinements may be desirable during final design.

Hybrid Concept 2/3 addresses the congestion and safety need at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive by relocating the intersection to the east, away from the Pilot Travel Center and other nearby driveways. The new local access road would provide truck access to the rear of the Pilot Travel Center site. Trucks queuing for the Pilot Travel Center fueling station would be stored on onsite, or perhaps the new local access road, freeing Shadow Mountain Drive from truck storage.

Based on the traffic operational analysis performed for Concepts 2 and 3, it is anticipated that Hybrid Concept 2/3 will generally operate at an overall LOS A or B for all five roadways.

The qualitative evaluation for Hybrid Concept 2/3, consistent with the analysis performed above in Section 8.0, is provided in ***Figure 22***, as well as the planning level cost estimate.

Figure 22 – Hybrid Concept 2/3



Source: Coconino County GIS

Figure 23 – Qualitative Evaluation for Hybrid Concept 2/3

	Mobility	Consistency w/Planned Improvements	Safety Impact	Property Impacts	Environmental Compatibility	Public Input**	Cost* ($ million)	Funding Availability
Hybrid Concept 2/3	+	+	+	+	○	+	$1.8	+

*Potential right-of-way costs are not included.
**Hybrid Concept 2/3 was developed after the final Public Open House held on August 5, 2015. This rating is based upon input received regarding elements of Concepts 2 and 3 that were incorporated into Hybrid Concept 2/3.

Advantage + **Neutral** ○ **Disadvantage** −

10.0 Recommendations

Improvements were assigned to near-term (5-year), mid-term (10-year), and long-term (20-year) time frames based on technical analysis, potential funding availability, and recommendations from other studies. Coconino County and partner agencies should consider these priorities in future programming updates.

10.1. Near-term (5-Year)

- Construct roadway Hybrid Concept 2/3.
- Widen the shoulders on Shadow Mountain Drive.
- Develop access management guidelines.

10.2. Mid-term (10-Year)

- Extend basic commuter service per the *Flagstaff Regional Five-Year and Long Range Transit Plan* (May 2013), depending on future transit studies and programming.
- Provide park-and-ride lot per *A Coordinated Transit Plan for ECoNA in Northern Arizona* (January 2014), depending on future transit studies and programming.

10.3. Long-term (20-Year)

- Monitor commercial development in the Camp Navajo Industrial Park. Based on the traffic forecasts completed for this study and documented in Section 4.4, the near-term roadway improvement recommendations (Hybrid Concept 2/3) should sufficiently manage Study Area future traffic demands and truck traffic. A primary need for Concept 1, which is the recommendation from the I-40 Bellemont to Winona Initial DCR, appears to have been based on anticipated substantial commercial development in the Camp Navajo Industrial Park; combined with other potential developments at the TI, the I-40 Bellemont to Winona Initial DCR attributed a potential increase of 26,600 vehicles per day by 2040 east and west of the Bellemont TI. The Camp Navajo Industrial park has been in the planning stage for nearly ten years but has not yet developed. Should the Camp Navajo Industrial Park develop in the future, the traffic forecasts and traffic capacity analysis performed as part of this study should be revisited prior to programming Concept 1.

11.0 Implementation

This study serves as the first step in the project development process. The results of this study are preliminary in nature; changes may be necessary as the recommendations advance. The following general steps should be taken to implement the recommendations of this study:

- Finalize the recommendations implementation schedule.
- Obtain approval of recommendations from the Coconino County Board of Supervisors.
- Update the Coconino County Capital Improvement Plan.
- Update the Flagstaff Metropolitan Planning Organization Transportation Improvement Program.
- Incorporate recommendations into existing and future planning documents.
- Complete scoping and final design phases of the project development process. The recommendations illustrated herein are conceptual in nature; formal project scoping will need to be completed, including required typical local, state, and federal agency approvals. Additional research, analysis, coordination, and/or permitting will be required prior to construction. Future design and construction will need to be coordinated with stakeholders such as the Pilot Travel Center and emergency responders.
- Finalize funding for improvements. Limited funding has been secured by Coconino County, as described below in Section 11.1; however, opportunities to leverage resources and obtain additional funds through agency and private stakeholder partnerships could be realized.
- Continue to support transit opportunities at a regional level.
- Develop access management guidelines/policy to protect transportation infrastructure investments, improve safety, and reduce congestion.
- Change the functional classification of Shadow Mountain Drive from local road to collector or higher functional classification.
- Further investigate opportunities for the additional considerations listed in Section 6.6.

11.1. Potential Funding Sources

Proposition (Prop) 403 was passed by voters in November 2014 and provides $3 million for the Bellemont TI modification between FY 2015-2019. This proposition supports Coconino County's 10-year Roads CIP. Prop 403 was proposed to bridge a gap in available Coconino County funding for transportation maintenance and improvements. As such, any other project costs must be able to be reasonably borne by Coconino County, or through a partnership with another agency or private party. For example, it may be desirable to construct a portion of the recommended short-term improvement project (Hybrid Concept 2/3) utilizing a Public Private Partnership (P3) with the Pilot Travel Center.

Other potential funding sources, as well as their limitations, are described below. This does not represent a limitation on funds to be used, but rather a starting point. Should additional resources surface, Coconino County should consider their use.

11.1.1. Federal Funds

Community Development Block Grant (CDBG) (funded through United States Department of Housing and Urban Development (HUD)) – CDBG funds are dispersed with a prioritization to benefit low- and moderate-income persons. The objective of CDBG funding is to provide improved community facilities and services, which may include eliminating imminent threats to health and wellness or eliminating slums or blight. As is relevant to this Study, eligible activities include construction or reconstruction of streets and other public facilities.

Congestion Mitigation and Air Quality Improvement (CMAQ) Program (funded through MAP-21) – CMAQ provides a flexible funding source to state and local governments for transportation projects and programs to help reduce congestion and improve air quality for nonattainment and maintenance areas. Eligible activities include, but are not limited to: projects that improve traffic flow, such as improving signalization, constructing high-occupancy vehicle (HOV) lanes, improving intersections, and adding turning lanes. Other approved activities include projects to improve incident and emergency response or improve mobility. Funds may be used for projects that shift traffic demand to nonpeak hours or other transportation modes, increase vehicle occupancy rates, or otherwise reduce demand. There is some expanded authority to use funds for transit operations. Funds may not be used for projects that increase the number of single occupant vehicles in the network.

Highway Safety Improvement Program (HSIP) (funded through MAP-21) – HSIP provides funding to improve safety on public roads and to reduce accident related injuries and deaths.

Transportation Alternatives Program (TAP) (funded through MAP-21) – TAP combines funding from several previous programs, including Transportation Enhancements, Recreational Trails, Safe Routes to School, and other discretionary programs. TAP funds may be used for planning, design, and construction of surface transportation features. This includes, among other things, infrastructure to provide safe routes to non-drivers, such as children, older adults, and individuals with disabilities to access daily needs.

Safe Routes to School (part of Transportation Alternatives Program in MAP-21) – Safe Routes to School funding has been combined with other programs into the TAP. States have the option to continue operating this program, or to use the funding through the TAP.

Surface Transportation Program (STP) (funded through MAP-21) – STP provides funding to states and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals. Eligible activities are numerous and include: intersections with high accident rates or levels of congestion; construction and operational improvements for a minor collector in the same corridor and in proximity to an National Highway System (NHS) route (if the improvement is more cost-effective than an NHS improvement and will enhance NHS level of service and regional traffic flow), and TAP projects. In general, STP projects may not be on local or rural minor collectors; however, there are a number of exceptions to this requirement.

11.1.2. State Funds

Greater Arizona Development Authority (GADA) – Managed by the Water Infrastructure Finance Authority of Arizona (WIFA), GADA's goals are to lower the costs of financing and help accelerate project development for public facilities owned, operated and maintained by a political subdivision, special district or Indian tribe. To accomplish this, GADA is authorized under statute to offer both financial and technical assistance programs. Grants are typically used for early stage project development; loans typically are used for technical assistance in the final phases of project development. Due to funding limitations, no loan or grant opportunities are currently available.

Highway Extension and Expansion Loan Program (HELP) – This program provides the State and communities with a financing mechanism to stretch transportation dollars for eligible highway projects in Arizona and bridge the gap between needs and available revenues. The minimum loan amount is $250,000; grants are not available. HELP loans are not currently available due to budget limitations.

Highway User Revenue Fund (HURF) – HURF provides funding to cities, towns, counties, and to the State Highway Fund for highway construction, improvements, and other related expenses.

11.1.3. Local/Other Funds

Development Impact Fees - Development impact fees are one time fees typically assessed at the time building permits are issued and are intended to financially support infrastructure costs associated with new development. The fees are paid by the developer, and are typically in turn passed to the homebuyer or commercial property owner.

Developer Contributions – These funds would be provided by a developer through a development agreement with the local agency.

General Funds – General funds are non-dedicated funds that may be used for any lawful purpose.

Improvement Districts – Improvement districts are authorized by the State legislature for the construction of a wide range of public works facilities. Improvement districts are initiated by property owners who combine resources with a county and/or town to finance improvements. The property owners are then assessed over multiple years to repay their share of the cost of the improvement.

Revenue Bonds – Counties and municipalities can issue bonds against their revenues to accelerate project construction. This can reduce the impacts of funding capital improvement projects and distributes the costs over the life of the project.

Public-Private Partnerships – Public private partnerships are allowed under Title 28 of the Arizona Revised Statues and enable a public agency and a private-sector entity to enter into an agreement allowing the private-sector partner to have an increased level of participation in a public project. This may include funding, design, construction, operation, and/or management and will extend as agreed upon by the two entities.

APPENDIX FR-1

Reference Document Catalog

Bellemont Access Management & Multi-Modal Transportation Study
Reference Documents Summary Table

ID	Document				Source			
	Title	Description	Author	Dated	Provider	Contact	Date Provided	Collected By
B-001	Bellemont Access Management & Multi-Modal Transportation Study	ADOT PARA Application	Tim Dalegowski	Mar 2014	ADOT	H. Yaqub	Nov 2014	JP
B-002	Bellemont Area Plan	Amendment to Coconino County Comprehensive Plan	Bellemont and County Community Dev.	Jul 1985	internet	N/A	May 2014	DB
B-003	Initial DCR, I-40 Bellemont to Winona	Design Concept Report for I-40, Bellemont to Winona	Stanley Consultants	Feb. 2011	internet	N/A	Jul 2014	DB
B-004	Flagstaff Regional Plan 2030	ADOT PARA Application	Kimley Horn, Flagstaff, FMPO, Coconino County	Nov. 2001	internet	N/A	Jan 2015	DB
B-005	Flagstaff Regional Five-Year and Long Range Transit Plan	Transit Plan to establish service, funding, implementation	NAIPTA, Kimley Hord and Nelson/Nygaard	May 2013	ADOT site	N/A	Jan 2015	MS
B-006	Coconino County Comprehensive Plan	Overall plan to direct growth and development	Coconino County	Sep 2003	Coconino Website	N/A	Jan 2015	MS
B-007	A Coordinated Transit Plan for ECoNA in Northern Arizona	For Community Transportation Association of America	LSC Transportation Consultants	Jan 2014	NAIPTA	Erika Mazza	Jan 2015	FTP
B-008	Coordinated Public Transit Human Services Transportation Plan	Plan to improve transit service for disafvantaged population	FMPO	Jun 2014	internet	N/A	Jan 2015	MS
B-009	Flagstaff Pathways 2030 Regional Transportation Plan	RTP Update for 2030 transp. investments for Flagstaff	FMPO	Dec 2009	internet	N/A	Jan 2015	MS
B-010	ADOT Statewide Bicycle and Pedestrian Plan Update	2013 update	Kimley Horn	Jun 2013	internet	N/A	Jan 2015	DB
B-011	I-40 Corridor Profile Study Working Paper 1	Literature review and district discussions	Kimley Horn & Cambridge Systematics	Aug 2014	internet	N/A	Jan 2015	DB
B-012	I-40 Corridor Profile Study Working Paper 2	Performance framework and Corridor Health Assessment	Kimley Horn & Cambridge Systematics	Jan 2015	internet	N/A	Jan 2015	DB
B-013	Census quick facts	People, business, geography quick facts	United States Census Bureau		internet	N/A	Jan 2015	DB
B-014	Flagstaff Meadows Units 1 & 3 Final Plats; Townhomes at Flagstaff Meadows Final	Final plats for Flagstaff Meadows	various engineering firms	2001-2007	internet	N/A	Jan 2015	DB
B-015	FEMA Firmettes	Flood Insurance Rate Map for study area	FEMA	Sep 2010	internet	N/A	Jan 2015	DB
B-016	ADOT Functional Classification Maps for Coconino County and Flagstaff	Maps indicating roadway fucntional classification	ADOT	8/13 & 8/14	internet	N/A	Jan 2015	DB
B-017	Draft Land and Resource Management Plan for the Coconino National Forest	Proposed land management plan for Coconino NF	USDA	Oct 2013	USDA website	N/A	Feb 2015	DB
B-018	Coconino County Demographic Update	Coconino County census data	Coconino County	2000, 2010	email from Combrink	J.Trupiano	Feb 2015	DB
B-019	Bellemont Wildlife HDMS	Information for at Risk Wildlife Within Study Area	AZG&F	Feb 2015	AZG&F		Mar 2015	DB
B-020	Mountain Mobility Business Plan 2015-2019	Focuses on transit for eldery, disabled, low income	NAIPTA	Sep 2013	NAIPTA	Erika Mazza	Feb 2015	MS
B-021	Coconino County Engineering Design and Construction Manual	Provides standards, specifications for Coconino County	F.G Stanley, Coconino County Public Works	not listed	Coconino Website	N/A	Mar 2015	AH
B-022	Cultural Surveys	GIS Database of cultural resources	Arizona State University	Jul 1905	AZSITE Website	N/A	Mar 2015	DB
B-023	Historical Survey Plats	Historic hand-drawn survet plats	various	1878-1928	AZSITE Website	N/A	Mar 2015	DB
B-024	Wildlife Linkage Zones	Arizona wildlife species identified by linkage zones	Arizona Department of Transportation	2006	AZG&F	N/A	Mar 2015	DB
B-025	Coconino County Capital Improvement Plan	A 10-year Roads CIP for maintaining and improving roads	Coconino County	2014	Coconino Website	N/A	Mar 2015	AH
B-026	Census and ACS Information for Study Area	Population, race, poverty tract, disability, etc data	United States Census Bureau	2000-2013	internet	N/A	Mar 2015	AH-DB
B-027	ADOT Access Management Guidelines - DRAFT	Draft access management guidelines	ADOT	Nov. 2014	ACEC	Janice Burnett	Jan 2015	JP
B-028	Various access management guidelines	Various county access management guidelines	varies	varies	internet	N/A	Mar 2015	DB
B-029	AASHTO US Bicycle Route System Working Paper 1 Draft	Identification and evaluation of routes	Kimley Horn, Lee Engineering	Oct. 2014	internet	N/A	Mar 2015	DB
B-030	ADOT 2013 AADT report	2013 traffic volumes	ADOT	Jul 1905	internet	N/A	Jan-15	RK
B-031	Coconino County Roads CIP		Coconino County		internet	N/A	Mar-15	DB

APPENDIX FR-2

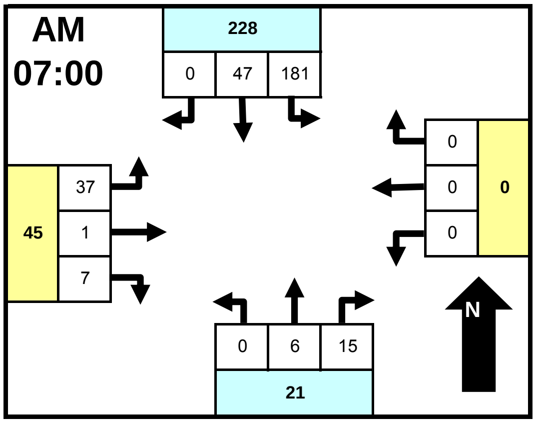
Traffic Count Data and Classification Counts

TRAFFIC RESEARCH & ANALYSIS, INC.
Specializing in Traffic Data Collection

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Intersection TMC: 1500009
Count Date: 2/12/2015

	From North				From East				From South				From West				INTSEC
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP				



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
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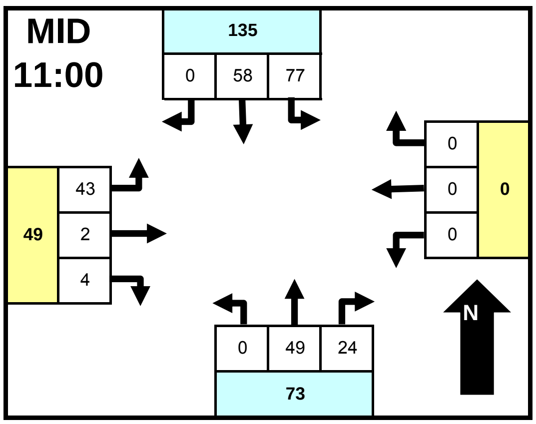
6:15	24	6	0	0	0	0	0	0	0	3	3	0	4	0	0	0	40
6:30	27	9	0	0	0	0	0	0	0	2	1	0	7	0	1	0	47
6:45	29	11	0	0	0	0	0	0	0	0	3	0	5	0	2	0	50
7:00	47	9	0	0	0	0	0	0	0	3	3	0	8	1	0	0	71
7:15	35	7	0	0	0	0	0	0	0	1	4	0	12	0	1	0	60
7:30	57	16	0	0	0	0	0	0	0	1	3	0	10	0	4	0	91
7:45	42	15	0	0	0	0	0	0	0	1	5	0	7	0	2	0	72
Total	276	87	0	0	0	0	0	0	0	18	29	0	56	1	10	0	477
Peak	181	47	0	0	0	0	0	0	0	6	15	0	37	1	7	0	294



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
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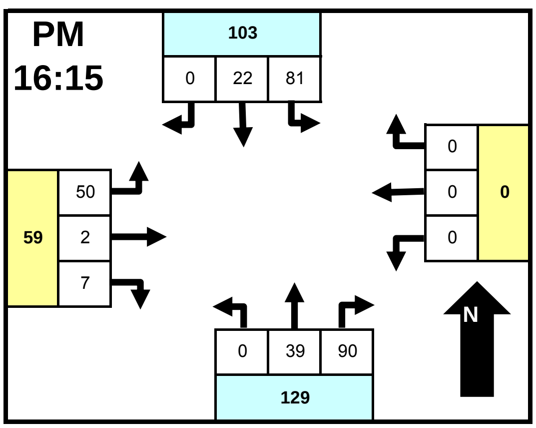
11:15	19	11	0	0	0	0	0	0	0	11	11	0	12	1	3	0	68
11:30	15	14	0	0	0	0	0	0	0	11	6	0	7	0	0	0	53
11:45	19	12	0	0	0	0	0	0	0	7	0	0	14	1	1	0	54
12:00	20	8	0	0	0	0	0	0	0	7	7	0	12	0	2	0	56
12:15	18	15	0	0	0	0	0	0	0	9	1	0	9	0	1	0	53
12:30	16	10	0	0	0	0	0	0	0	5	4	0	16	1	0	0	52
12:45	13	10	0	0	0	0	0	0	0	5	4	0	4	0	1	0	37
Total	144	101	0	0	0	0	0	0	0	75	40	0	84	3	8	0	455
Peak	77	58	0	0	0	0	0	0	0	49	24	0	43	2	4	0	257



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
16:00	15	8	0	0	0	0	0	0	0	2	13	0	4	1	0	0	43
16:15	22	10	0	0	0	0	0	0	0	12	31	0	14	0	4	0	93
16:30	15	3	0	0	0	0	0	0	0	15	35	0	12	1	2	0	83
16:45	19	3	0	0	0	0	0	0	0	6	8	0	10	1	1	0	48
17:00	25	6	0	0	0	0	0	0	0	6	16	0	14	0	0	0	67
17:15	21	6	0	0	0	0	0	0	0	8	10	0	15	0	2	0	62
17:30	17	10	0	0	0	0	0	0	0	5	5	0	8	0	3	0	48
17:45	11	6	0	0	0	0	0	0	0	4	4	0	17	0	1	0	43
Total	145	52	0	0	0	0	0	0	0	58	122	0	94	3	13	0	487
Peak	81	22	0	0	0	0	0	0	0	39	90	0	50	2	7	0	291

Intersection Statistics

Per	Peak Hour	Pk Hr Vol	Peak Intvl	Pk Intv Vol
AM	7:00 AM	294	7:30 AM	91
MID	11:00 AM	257	11:00 AM	82
PM	4:15 PM	291	4:15 PM	93

Approach Statistics

Per	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol
AM	7:00 AM	228	7:00 AM	0	6:00 AM	26	7:00 AM	45
MID	11:00 AM	135	11:00 AM	0	11:00 AM	73	11:45 AM	57
PM	4:45 PM	107	4:45 PM	0	4:15 PM	129	5:00 PM	60

Comments

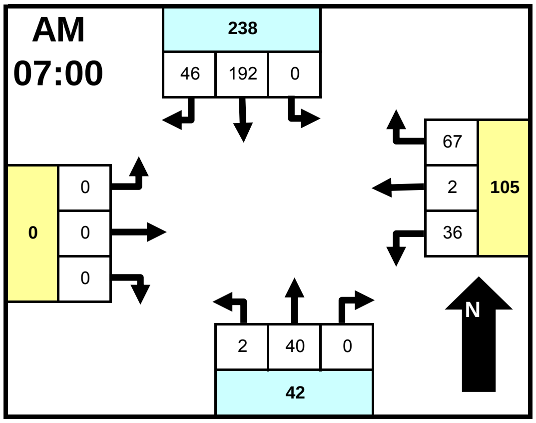
Approach & Departure Volumes (No Peds)

Per	Approach	Depart	Approach	Depart	Approach	Depart	Approach	Depart
AM	363	74	0	306	47	97	67	0
MID	245	159	0	187	115	109	95	0
PM	197	152	0	270	180	65	110	0

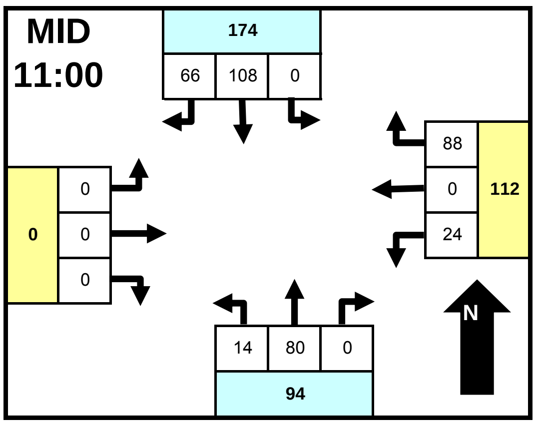
TRAFFIC RESEARCH & ANALYSIS, INC.
Specializing in Traffic Data Collection

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

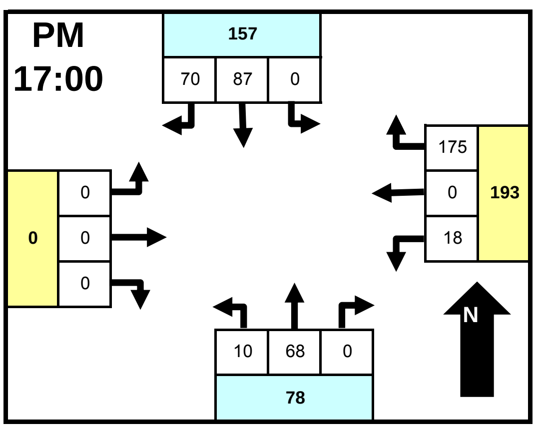
Intersection TMC: 1500010
Count Date: 2/12/2015



	From North				From East				From South				From West				INTSEC
	HUGHES AVE				I-40 WB OFF RAMP				HUGHES AVE				I-40 WB ON RAMP				
Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
6:00	0	20	12	0	10	0	13	0	3	7	0	0	0	0	0	0	65
6:15	0	25	7	0	5	0	11	0	0	7	0	0	0	0	0	0	55
6:30	0	31	15	0	5	2	7	0	1	8	0	0	0	0	0	0	69
6:45	0	34	6	0	6	0	8	0	0	5	0	0	0	0	0	0	59
7:00	0	49	9	0	7	1	14	0	1	8	0	0	0	0	0	0	89
7:15	0	37	8	0	6	0	14	0	0	13	0	0	0	0	0	0	78
7:30	0	61	12	0	10	1	18	0	1	11	0	0	0	0	0	0	114
7:45	0	45	17	0	13	0	21	0	0	8	0	0	0	0	0	0	104
Total	0	302	86	0	62	4	106	0	6	67	0	0	0	0	0	0	633
Peak	0	192	46	0	36	2	67	0	2	40	0	0	0	0	0	0	385



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
11:00	0	37	13	0	7	0	19	0	6	26	0	0	0	0	0	0	108
11:15	0	27	19	0	4	0	23	0	3	20	0	0	0	0	0	0	96
11:30	0	19	15	0	8	0	23	0	2	16	0	0	0	0	0	0	83
11:45	0	25	19	0	5	0	23	0	3	18	0	0	0	0	0	0	93
12:00	0	23	11	0	6	0	27	0	2	16	0	0	0	0	0	0	85
12:15	0	24	16	0	9	1	20	0	1	18	0	0	0	0	0	0	89
12:30	0	19	19	0	7	0	33	0	4	17	0	0	0	0	0	0	99
12:45	0	20	26	0	3	0	31	0	3	7	0	0	0	0	0	0	90
Total	0	194	138	0	49	1	199	0	24	138	0	0	0	0	0	0	743
Peak	0	108	66	0	24	0	88	0	14	80	0	0	0	0	0	0	380



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
16:00	0	16	17	0	7	1	25	0	0	6	0	0	0	0	0	0	72
16:15	0	23	22	0	8	0	35	0	7	19	0	0	0	0	0	0	114
16:30	0	16	15	0	3	0	26	0	9	19	0	0	0	0	0	0	88
16:45	0	22	13	0	0	0	28	0	2	14	0	0	0	0	0	0	79
17:00	0	29	15	0	2	0	46	0	3	16	0	0	0	0	0	0	111
17:15	0	24	19	0	3	0	52	0	5	20	0	0	0	0	0	0	123
17:30	0	20	21	0	7	0	42	0	1	11	0	0	0	0	0	0	102
17:45	0	14	15	0	6	0	35	0	1	21	0	0	0	0	0	0	92
Total	0	164	137	0	36	1	289	0	28	126	0	0	0	0	0	0	781
Peak	0	87	70	0	18	0	175	0	10	68	0	0	0	0	0	0	428

Intersection Statistics

Per	Peak Hour	Pk Hr Vol	Peak Intvl	Pk Intv Vol
AM	7:00 AM	385	7:30 AM	114
MID	11:00 AM	380	11:00 AM	108
PM	5:00 PM	428	5:15 PM	123

Approach Statistics

Per	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol
AM	7:00 AM	238	7:00 AM	105	7:00 AM	42	7:00 AM	0
MID	11:00 AM	174	12:00 PM	137	11:00 AM	94	11:00 AM	0
PM	4:45 PM	163	5:00 PM	193	4:15 PM	89	4:15 PM	0

Comments

Approach & Departure Volumes (No Peds)

Per	Approach	Depart	Approach	Depart	Approach	Depart	Approach	Depart
AM	388	173	172	0	73	364	0	96
MID	332	337	249	0	162	243	0	163
PM	301	415	326	0	154	200	0	166

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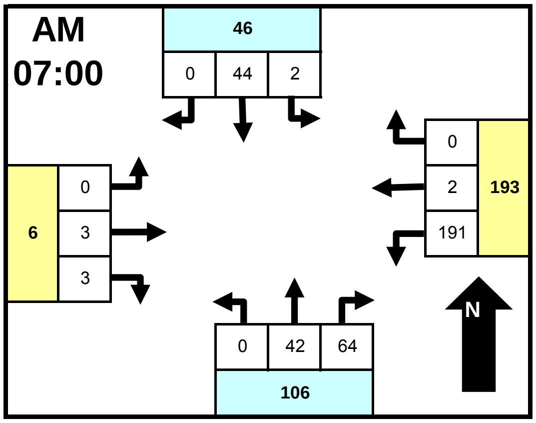
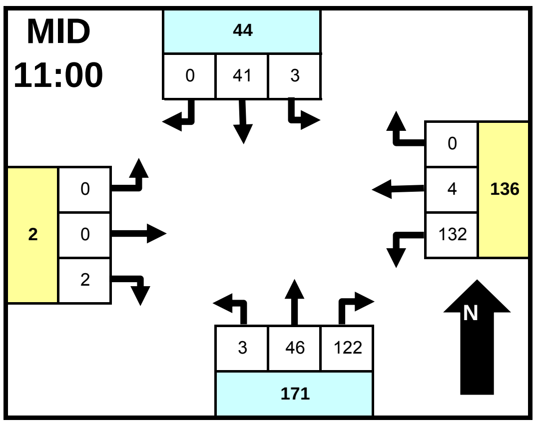
Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Intersection TMC: 1500011
Count Date: 2/12/2015

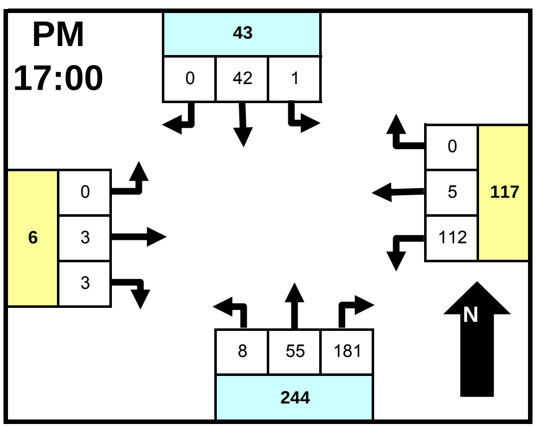
	From North				From East				From South				From West				INTSEC
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD				
Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
6:00	0	13	0	0	19	0	0	0	1	6	13	0	0	0	0	0	52
6:15	0	6	0	0	26	0	0	0	2	6	9	0	0	0	0	0	49
6:30	0	8	0	0	37	0	0	0	1	7	8	0	0	0	0	0	61
6:45	1	11	0	0	29	0	0	0	0	6	7	0	0	0	0	0	54
7:00	1	10	0	0	46	0	0	0	0	12	9	0	0	0	0	0	78
7:15	0	8	0	0	38	0	0	0	0	10	15	0	0	1	0	0	72
7:30	0	15	0	0	58	0	0	0	0	10	20	0	0	1	1	0	105
7:45	1	11	0	0	49	2	0	0	0	10	20	0	0	1	2	0	96
Total	3	82	0	0	302	2	0	0	4	67	101	0	0	3	3	0	567
Peak	2	44	0	0	191	2	0	0	0	42	64	0	0	3	3	0	351



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
11:00	0	15	0	0	37	2	0	0	0	9	39	0	0	0	0	0	102
11:15	0	10	0	0	37	1	0	0	1	12	28	0	0	0	0	0	89
11:30	2	6	0	0	26	0	0	0	0	12	29	0	0	0	0	0	75
11:45	1	10	0	0	32	1	0	0	2	13	26	0	0	0	2	0	87
12:00	0	8	0	0	25	0	0	0	1	12	29	0	0	0	1	0	76
12:15	0	10	0	0	29	0	0	0	1	11	26	0	0	0	1	0	78
12:30	4	12	0	0	25	0	0	0	2	20	26	0	0	0	1	0	90
12:45	0	10	0	0	35	0	0	0	1	9	29	0	0	0	1	0	85
Total	7	81	0	0	246	4	0	0	8	98	232	0	0	0	6	0	682
Peak	3	41	0	0	132	4	0	0	3	46	122	0	0	0	2	0	353



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
16:00	0	10	0	0	22	0	0	0	1	2	28	0	0	2	0	0	65
16:15	0	13	0	0	32	0	0	0	1	8	42	0	0	1	0	0	97
16:30	0	5	0	0	24	3	0	0	2	13	33	0	0	1	0	0	81
16:45	2	12	0	0	22	2	0	0	0	13	30	0	0	0	1	0	82
17:00	0	14	0	0	29	1	0	0	3	14	44	0	0	0	1	0	106
17:15	0	10	0	0	32	3	0	0	3	13	57	0	0	1	1	0	120
17:30	0	9	0	0	31	1	0	0	1	13	41	0	0	1	1	0	98
17:45	1	9	0	0	20	0	0	0	1	15	39	0	0	1	0	0	86
Total	3	82	0	0	212	10	0	0	12	91	314	0	0	7	4	0	735
Peak	1	42	0	0	112	5	0	0	8	55	181	0	0	3	3	0	410



Intersection Statistics

Per	Peak Hour	Pk Hr Vol	Peak Intvl	Pk Intv Vol
AM	7:00 AM	351	7:30 AM	105
MID	11:00 AM	353	11:00 AM	102
PM	5:00 PM	410	5:15 PM	120

Approach Statistics

Per	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol
AM	6:45 AM	46	7:00 AM	193	7:00 AM	106	7:00 AM	6
MID	11:45 AM	45	11:00 AM	136	11:00 AM	171	11:45 AM	5
PM	4:45 PM	47	4:45 PM	121	5:00 PM	244	4:45 PM	6

Comments

Approach & Departure Volumes (No Peds)

Per	Approach	Depart	Approach	Depart	Approach	Depart	Approach	Depart
AM	85	67	304	107	172	387	6	6
MID	88	98	250	239	338	333	6	12
PM	85	91	222	324	417	298	11	22

TRAFFIC RESEARCH & ANALYSIS, INC.
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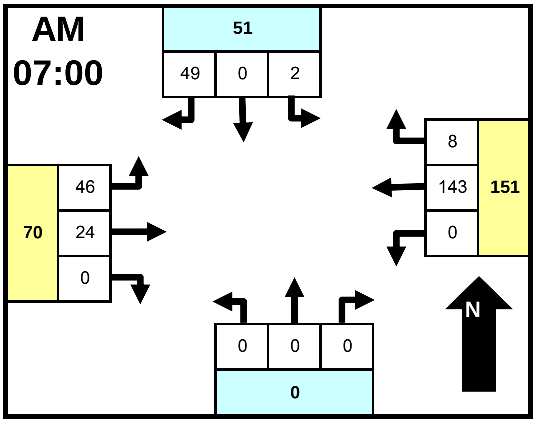
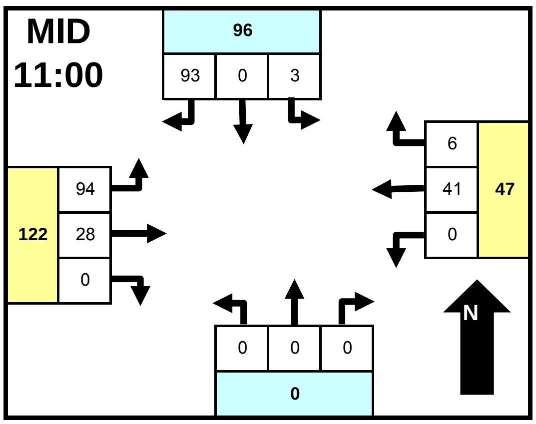
Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Intersection TMC: 1500012
Count Date: 2/12/2015

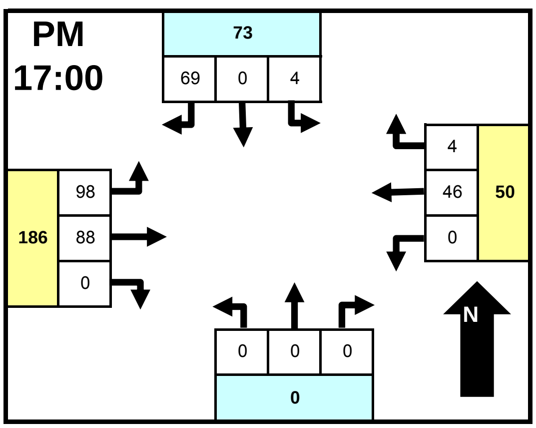
	From North				From East				From South				From West				INTSEC
	PILOT MIDDLE DRIVEWA				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD				
Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
6:00	0	0	8	0	0	12	1	0	0	0	0	0	9	4	0	0	34
6:15	0	0	10	0	0	14	1	0	0	0	0	0	8	1	0	0	34
6:30	0	0	11	0	0	26	1	0	0	0	0	0	6	3	0	0	47
6:45	0	0	10	0	0	21	1	0	0	0	0	0	6	2	0	0	40
7:00	0	0	10	0	0	37	2	0	0	0	0	0	8	3	0	0	60
7:15	1	0	7	0	0	29	1	0	0	0	0	0	10	5	0	0	53
7:30	0	0	13	0	0	45	2	0	0	0	0	0	16	8	0	0	84
7:45	1	0	19	0	0	32	3	0	0	0	0	0	12	8	0	0	75
Total	2	0	88	0	0	216	12	0	0	0	0	0	75	34	0	0	427
Peak	2	0	49	0	0	143	8	0	0	0	0	0	46	24	0	0	272



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
11:00	1	0	28	0	0	10	1	0	0	0	0	0	31	6	0	0	77
11:15	1	0	24	0	0	12	1	0	0	0	0	0	22	6	0	0	66
11:30	0	0	16	0	0	12	1	0	0	0	0	0	25	6	0	0	60
11:45	1	0	25	0	0	7	3	0	0	0	0	0	16	10	0	0	62
12:00	0	0	16	0	0	8	0	0	0	0	0	0	25	5	0	0	54
12:15	1	0	18	0	0	12	0	0	0	0	0	0	18	7	0	0	56
12:30	0	0	15	0	0	9	1	0	0	0	0	0	25	8	0	0	58
12:45	0	0	30	0	0	6	0	0	0	0	0	0	19	9	0	0	64
Total	4	0	172	0	0	76	7	0	0	0	0	0	181	57	0	0	497
Peak	3	0	93	0	0	41	6	0	0	0	0	0	94	28	0	0	265



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
16:00	1	0	15	0	0	8	1	0	0	0	0	0	21	10	0	0	56
16:15	1	0	18	0	0	14	2	0	0	0	0	0	23	22	0	0	80
16:30	2	0	21	0	0	5	0	0	0	0	0	0	17	13	0	0	58
16:45	0	0	15	0	0	9	1	0	0	0	0	0	16	16	0	0	57
17:00	0	0	17	0	0	12	1	0	0	0	0	0	29	16	0	0	75
17:15	1	0	23	0	0	11	2	0	0	0	0	0	25	32	0	0	94
17:30	3	0	16	0	0	16	1	0	0	0	0	0	22	20	0	0	78
17:45	0	0	13	0	0	7	0	0	0	0	0	0	22	20	0	0	62
Total	8	0	138	0	0	82	8	0	0	0	0	0	175	149	0	0	560
Peak	4	0	69	0	0	46	4	0	0	0	0	0	98	88	0	0	309



Intersection Statistics

Per	Peak Hour	Pk Hr Vol	Peak Intvl	Pk Intv Vol
AM	7:00 AM	272	7:30 AM	84
MID	11:00 AM	265	11:00 AM	77
PM	5:00 PM	309	5:15 PM	94

Approach Statistics

Per	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol
AM	7:00 AM	51	7:00 AM	151	7:00 AM	0	7:00 AM	70
MID	11:00 AM	96	11:00 AM	47	11:00 AM	0	11:00 AM	122
PM	4:30 PM	79	4:45 PM	53	4:45 PM	0	5:00 PM	186

Comments

Approach & Departure Volumes (No Peds)

Per	Approach	Depart	Approach	Depart	Approach	Depart	Approach	Depart
AM	90	87	228	36	0	0	109	304
MID	176	188	83	61	0	0	238	248
PM	146	183	90	157	0	0	324	220

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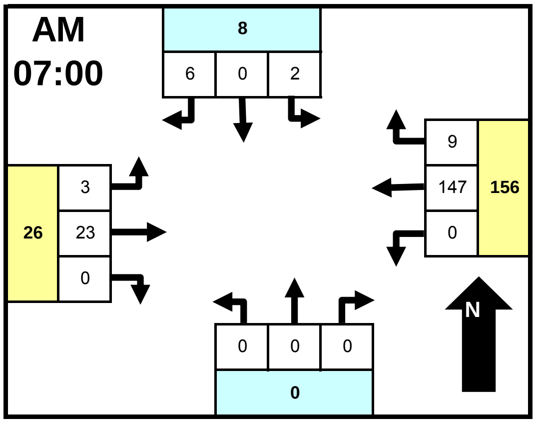
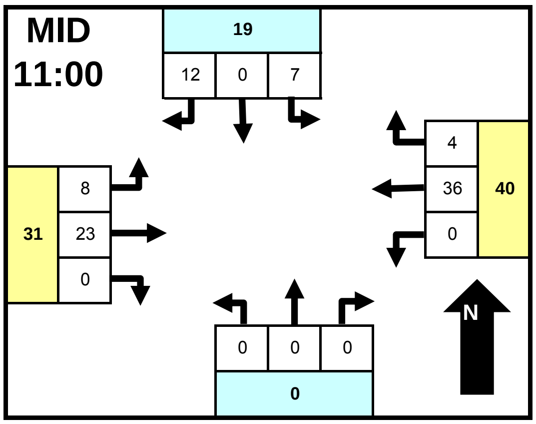
Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Intersection TMC: 1500013
Count Date: 2/12/2015

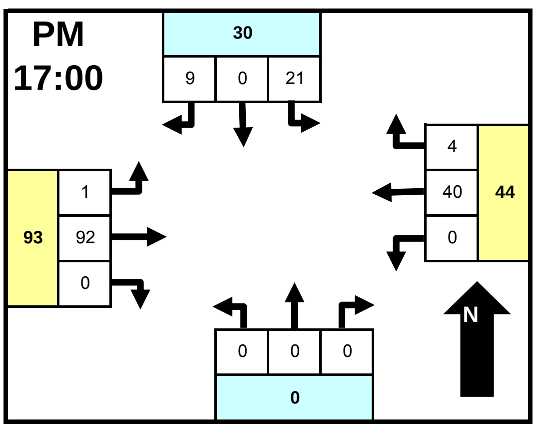
	From North				From East				From South				From West				INTSEC
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANIIGAN PARK RD				



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
6:00	0	0	0	0	0	13	0	0	0	0	0	0	0	4	0	0	17
6:15	0	0	0	0	0	16	1	0	0	0	0	0	0	1	0	0	18
6:30	0	0	0	0	0	26	1	0	0	0	0	0	0	3	0	0	30
6:45	1	0	0	0	0	22	1	0	0	0	0	0	0	2	0	0	26
7:00	1	0	1	0	0	39	4	0	0	0	0	0	1	2	0	0	48
7:15	0	0	2	0	0	30	3	0	0	0	0	0	1	4	0	0	40
7:30	0	0	2	0	0	43	2	0	0	0	0	0	0	9	0	0	56
7:45	1	0	1	0	0	35	0	0	0	0	0	0	1	8	0	0	46
Total	3	0	6	0	0	224	12	0	0	0	0	0	3	33	0	0	281
Peak	2	0	6	0	0	147	9	0	0	0	0	0	3	23	0	0	190



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
11:00	1	0	2	0	0	9	1	0	0	0	0	0	1	6	0	0	20
11:15	1	0	4	0	0	9	2	0	0	0	0	0	3	4	0	0	23
11:30	3	0	3	0	0	10	1	0	0	0	0	0	3	4	0	0	24
11:45	2	0	3	0	0	8	0	0	0	0	0	0	1	9	0	0	23
12:00	0	0	0	0	0	7	1	0	0	0	0	0	0	5	0	0	13
12:15	3	0	7	0	0	6	4	0	0	0	0	0	2	6	0	0	28
12:30	3	0	3	0	0	5	2	0	0	0	0	0	1	7	0	0	21
12:45	0	0	1	0	0	6	3	0	0	0	0	0	2	7	0	0	19
Total	13	0	23	0	0	60	14	0	0	0	0	0	13	48	0	0	171
Peak	7	0	12	0	0	36	4	0	0	0	0	0	8	23	0	0	90



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
16:00	4	0	1	0	0	8	1	0	0	0	0	0	0	11	0	0	25
16:15	4	0	3	0	0	13	2	0	0	0	0	0	3	20	0	0	45
16:30	0	0	0	0	0	5	0	0	0	0	0	0	1	14	0	0	20
16:45	1	0	1	0	0	11	0	0	0	0	0	0	1	15	0	0	29
17:00	5	0	0	0	0	12	2	0	0	0	0	0	0	16	0	0	35
17:15	6	0	4	0	0	9	2	0	0	0	0	0	1	33	0	0	55
17:30	5	0	4	0	0	13	0	0	0	0	0	0	0	23	0	0	45
17:45	5	0	1	0	0	6	0	0	0	0	0	0	0	20	0	0	32
Total	30	0	14	0	0	77	7	0	0	0	0	0	6	152	0	0	286
Peak	21	0	9	0	0	40	4	0	0	0	0	0	1	92	0	0	167

Intersection Statistics

Per	Peak Hour	Pk Hr Vol	Peak Intvl	Pk Intv Vol
AM	7:00 AM	190	7:30 AM	56
MID	11:00 AM	90	12:15 PM	28
PM	5:00 PM	167	5:15 PM	55

Approach Statistics

Per	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol
AM	7:00 AM	8	7:00 AM	156	7:00 AM	0	7:00 AM	26
MID	11:30 AM	21	11:00 AM	40	11:00 AM	0	11:00 AM	31
PM	5:00 PM	30	4:45 PM	49	4:45 PM	0	5:00 PM	93

Comments

Approach & Departure Volumes (No Peds)

Per	Approach	Depart	Approach	Depart	Approach	Depart	Approach	Depart
AM	9	15	236	36	0	0	36	230
MID	36	27	74	61	0	0	61	83
PM	44	13	84	182	0	0	158	91

TRAFFIC RESEARCH & ANALYSIS, INC.
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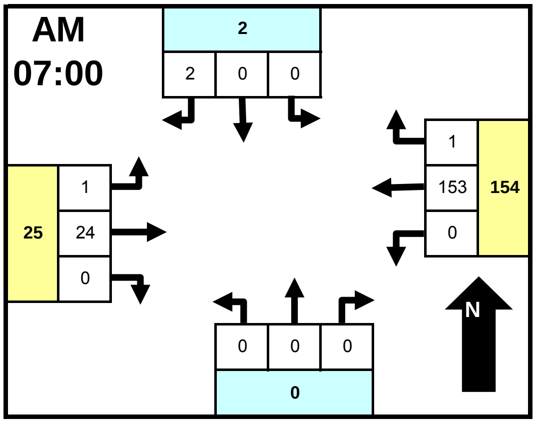
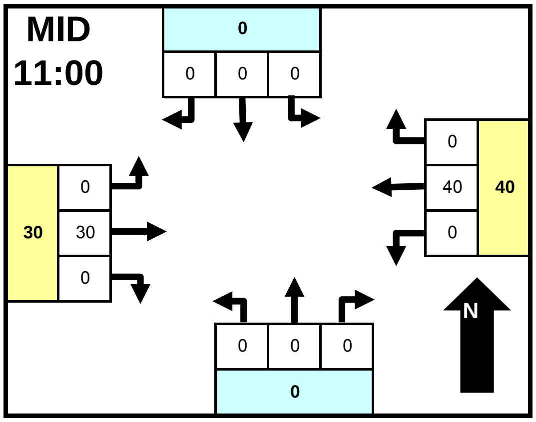
Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

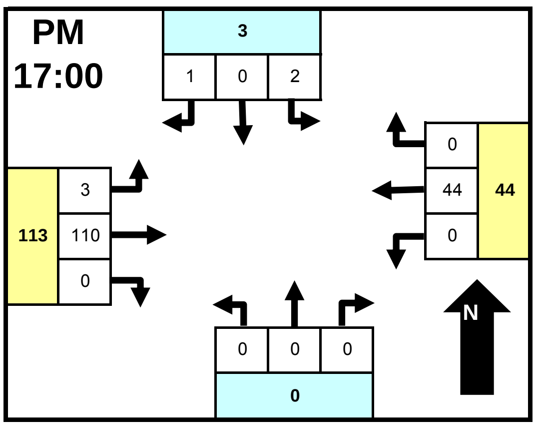
Intersection TMC: 1500014
Count Date: 2/12/2015



	From North	MOTEL 6 DRIVEWAY			From East	BRANNIGAN PARK RD			From South	NONE			From West	BRANNIGAN PARK RD			INTSEC
Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
6:00	0	0	1	0	0	12	0	0	0	0	0	0	0	4	0	0	17
6:15	0	0	0	0	0	16	0	0	0	0	0	0	0	1	0	0	17
6:30	0	0	0	0	0	28	0	0	0	0	0	0	0	3	0	0	31
6:45	1	0	0	0	0	23	1	0	0	0	0	0	0	3	0	0	28
7:00	0	0	0	0	0	43	0	0	0	0	0	0	0	3	0	0	46
7:15	0	0	0	0	0	31	0	0	0	0	0	0	0	4	0	0	35
7:30	0	0	1	0	0	46	1	0	0	0	0	0	0	8	0	0	56
7:45	0	0	1	0	0	33	0	0	0	0	0	0	1	9	0	0	44
Total	1	0	3	0	0	232	2	0	0	0	0	0	1	35	0	0	274
Peak	0	0	2	0	0	153	1	0	0	0	0	0	1	24	0	0	181



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
11:00	0	0	0	0	0	10	0	0	0	0	0	0	0	7	0	0	17
11:15	0	0	0	0	0	10	0	0	0	0	0	0	0	5	0	0	15
11:30	0	0	0	0	0	12	0	0	0	0	0	0	0	7	0	0	19
11:45	0	0	0	0	0	8	0	0	0	0	0	0	0	11	0	0	19
12:00	0	0	0	0	0	8	0	0	0	0	0	0	0	5	0	0	13
12:15	0	0	1	0	0	9	0	0	0	0	0	0	1	8	0	0	19
12:30	0	0	0	0	0	7	0	0	0	0	0	0	0	10	0	0	17
12:45	1	0	0	0	0	8	0	0	0	0	0	0	0	7	0	0	16
Total	1	0	1	0	0	72	0	0	0	0	0	0	1	60	0	0	135
Peak	0	0	0	0	0	40	0	0	0	0	0	0	0	30	0	0	70



Time	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	TOTAL
16:00	0	0	0	0	0	9	0	0	0	0	0	0	1	13	0	0	23
16:15	0	0	0	0	0	15	0	0	0	0	0	0	1	24	0	0	40
16:30	0	0	0	0	0	5	0	0	0	0	0	0	0	14	0	0	19
16:45	0	0	1	0	0	9	0	0	0	0	0	0	0	17	0	0	27
17:00	0	0	1	0	0	14	0	0	0	0	0	0	0	20	0	0	35
17:15	2	0	0	0	0	11	0	0	0	0	0	0	0	40	0	0	53
17:30	0	0	0	0	0	13	0	0	0	0	0	0	2	26	0	0	41
17:45	0	0	0	0	0	6	0	0	0	0	0	0	1	24	0	0	31
Total	2	0	2	0	0	82	0	0	0	0	0	0	5	178	0	0	269
Peak	2	0	1	0	0	44	0	0	0	0	0	0	3	110	0	0	160

Intersection Statistics

Per	Peak Hour	Pk Hr Vol	Peak Intvl	Pk Intv Vol
AM	7:00 AM	181	7:30 AM	56
MID	11:00 AM	70	11:30 AM	19
PM	5:00 PM	160	5:15 PM	53

Approach Statistics

Per	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol	Peak Hour	Pk Hr Vol
AM	6:00 AM	2	7:00 AM	154	7:00 AM	0	7:00 AM	25
MID	12:00 PM	2	11:00 AM	40	11:00 AM	0	11:45 AM	35
PM	4:30 PM	4	4:45 PM	47	4:45 PM	0	5:00 PM	113

Comments

Approach & Departure Volumes (No Peds)

Per	Approach	Depart	Approach	Depart	Approach	Depart	Approach	Depart
AM	4	3	234	36	0	0	36	235
MID	2	1	72	61	0	0	61	73
PM	4	5	82	180	0	0	183	84

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	6
File Number:	1500541	Direction:	EB
Route:	BRANNIGAN PARK RD	Latitude:	35.23788
Location:	E of HUGHES AVE	Longitude:	-111.82058

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 0:00	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 0:15	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 0:30	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 0:45	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 1:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 1:15	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 1:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 1:45	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 2:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 2:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 2:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 2:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 3:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 3:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 3:30	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 3:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 4:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 4:15	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 4:30	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 4:45	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 5:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 5:15	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 5:30	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 5:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 6:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 6:15	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 6:30	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 6:45	5	0	3	1	0	1	0	0	0	0	0	0	0	0	20.0%	0.0%
2/12/2015 7:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 7:15	4	0	2	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 7:30	8	0	5	0	2	0	1	0	0	0	0	0	0	0	37.5%	0.0%
2/12/2015 7:45	9	0	7	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 8:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 8:15	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 8:30	4	0	3	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 8:45	4	0	2	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 9:00	7	0	2	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 9:15	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 9:30	6	0	3	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 9:45	7	0	5	1	1	0	0	0	0	0	0	0	0	0	14.3%	0.0%
2/12/2015 10:00	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 10:15	5	0	2	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 10:30	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 10:45	4	0	3	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 11:00	7	0	4	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 11:15	5	0	3	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 11:30	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 11:45	11	0	7	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	6
File Number:	1500541	Direction:	EB
Route:	BRANNIGAN PARK RD	Latitude:	35.23788
Location:	E of HUGHES AVE	Longitude:	-111.82058

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 12:00	5	0	3	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 12:15	8	0	7	0	0	0	1	0	0	0	0	0	0	0	12.5%	0.0%
2/12/2015 12:30	9	0	7	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 12:45	8	0	5	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 13:00	11	0	7	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 13:15	4	0	2	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 13:30	8	0	6	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 13:45	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 14:00	13	0	8	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 14:15	6	0	3	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 14:30	7	0	6	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 14:45	15	0	12	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 15:00	16	0	12	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 15:15	13	0	8	3	2	0	0	0	0	0	0	0	0	0	15.4%	0.0%
2/12/2015 15:30	12	0	7	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 15:45	22	0	16	6	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 16:00	15	0	12	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 16:15	24	0	15	7	1	1	0	0	0	0	0	0	0	0	8.3%	0.0%
2/12/2015 16:30	15	0	10	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 16:45	17	0	9	7	0	1	0	0	0	0	0	0	0	0	5.9%	0.0%
2/12/2015 17:00	19	0	14	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 17:15	39	0	24	15	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 17:30	29	0	21	7	0	1	0	0	0	0	0	0	0	0	3.4%	0.0%
2/12/2015 17:45	26	0	17	9	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 18:00	14	0	13	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 18:15	24	0	19	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 18:30	19	0	15	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 18:45	20	0	16	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 19:00	14	0	10	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 19:15	19	0	14	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 19:30	16	0	10	6	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 19:45	18	0	12	6	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 20:00	17	0	12	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 20:15	17	0	14	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 20:30	11	0	9	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 20:45	12	0	8	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 21:00	4	0	3	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 21:15	10	0	5	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 21:30	3	0	1	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 21:45	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 22:00	10	0	9	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 22:15	7	0	2	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 22:30	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 22:45	4	0	3	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 23:00	4	0	1	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 23:15	7	0	5	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 23:30	4	0	2	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 23:45	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Totals	**761**	**0**	**533**	**216**	**6**	**4**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.6%**	**0.0%**

AM Peak Hr	**11:45 AM**
AM Peak Vol	**33**
AM PHF	**0.750**
PM Peak Hr	**5:00 PM**
PM Peak Vol	**113**
PM PHF	**0.724**

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	6
File Number:	1500542	Direction:	WB
Route:	BRANNIGAN PARK RD	Latitude:	35.23788
Location:	E of HUGHES AVE	Longitude:	-111.82058

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 0:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 0:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 0:30	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 0:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 1:00	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 1:15	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 1:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 1:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 2:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 2:30	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 2:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 3:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 3:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 3:30	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 3:45	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 4:00	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 4:15	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 4:30	8	0	5	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 4:45	4	0	3	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 5:00	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 5:15	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 5:30	13	0	12	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 5:45	13	0	5	8	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 6:00	12	0	9	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 6:15	16	0	11	4	1	0	0	0	0	0	0	0	0	0	6.3%	0.0%
2/12/2015 6:30	28	0	22	6	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 6:45	22	0	13	8	0	1	0	0	0	0	0	0	0	0	4.5%	0.0%
2/12/2015 7:00	43	0	30	13	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 7:15	32	0	21	11	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 7:30	48	0	36	9	2	0	1	0	0	0	0	0	0	0	6.3%	0.0%
2/12/2015 7:45	32	0	26	6	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 8:00	19	0	15	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 8:15	18	0	11	7	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 8:30	11	0	9	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 8:45	17	0	15	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 9:00	13	0	12	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 9:15	14	0	9	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 9:30	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 9:45	8	0	3	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 10:00	5	0	4	0	1	0	0	0	0	0	0	0	0	0	20.0%	0.0%
2/12/2015 10:15	8	0	7	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 10:30	8	0	7	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 10:45	8	0	6	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 11:00	10	0	6	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 11:15	11	0	8	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 11:30	12	0	8	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 11:45	6	0	5	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%

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Client:	Burgess and Niple	Site Ref:	6
File Number:	1500542	Direction:	WB
Route:	BRANNIGAN PARK RD	Latitude:	35.23788
Location:	E of HUGHES AVE	Longitude:	-111.82058

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 12:00	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 12:15	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 12:30	6	0	5	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 12:45	8	0	6	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 13:00	7	0	2	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 13:15	5	0	2	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 13:30	6	0	4	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 13:45	13	0	11	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 14:00	6	0	2	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 14:15	10	0	8	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 14:30	6	0	4	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 14:45	6	0	5	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 15:00	11	0	8	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 15:15	12	0	6	4	1	1	0	0	0	0	0	0	0	0	16.7%	0.0%
2/12/2015 15:30	7	0	5	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 15:45	9	0	8	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 16:00	9	0	5	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 16:15	15	1	10	4	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 16:30	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 16:45	6	0	5	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 17:00	16	0	11	4	0	1	0	0	0	0	0	0	0	0	6.3%	0.0%
2/12/2015 17:15	12	0	9	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 17:30	13	0	8	5	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 17:45	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 18:00	8	0	5	3	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 18:15	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 18:30	9	0	7	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 18:45	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 19:00	4	0	3	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 19:15	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 19:30	10	0	9	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 19:45	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 20:00	3	0	1	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 20:15	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 20:30	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 20:45	4	0	3	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 21:00	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 21:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 21:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 21:45	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 22:00	6	0	4	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 22:15	4	0	2	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 22:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 22:45	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 23:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 23:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 23:30	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 23:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
Day Totals	**761**	**1**	**552**	**199**	**5**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.2%**	**0.0%**

AM Peak Hr	**7:00 AM**
AM Peak Vol	**155**
AM PHF	**0.807**
PM Peak Hr	**4:45 PM**
PM Peak Vol	**47**
PM PHF	**0.734**

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	5
File Number:	1500539	Direction:	NB
Route:	HUGHES AVE	Latitude:	35.23638
Location:	At I-40	Longitude:	-111.82316

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 0:00	6	0	1	2	0	1	0	0	0	2	0	0	0	0	16.7%	33.3%
2/12/2015 0:15	6	0	1	3	1	1	0	0	0	0	0	0	0	0	33.3%	0.0%
2/12/2015 0:30	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0.0%	50.0%
2/12/2015 0:45	6	0	1	1	0	0	2	0	0	1	1	0	0	0	33.3%	33.3%
2/12/2015 1:00	5	0	1	1	0	1	0	0	0	2	0	0	0	0	20.0%	40.0%
2/12/2015 1:15	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0.0%	50.0%
2/12/2015 1:30	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0%	100.0%
2/12/2015 1:45	5	0	1	1	0	0	0	0	0	3	0	0	0	0	0.0%	60.0%
2/12/2015 2:00	5	1	0	0	0	0	1	0	0	3	0	0	0	0	20.0%	60.0%
2/12/2015 2:15	3	0	1	0	0	0	0	0	0	2	0	0	0	0	0.0%	66.7%
2/12/2015 2:30	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0.0%	100.0%
2/12/2015 2:45	4	0	2	0	0	0	0	0	0	2	0	0	0	0	0.0%	50.0%
2/12/2015 3:00	4	1	2	0	0	0	1	0	0	0	0	0	0	0	25.0%	0.0%
2/12/2015 3:15	7	1	1	1	0	0	1	0	0	3	0	0	0	0	14.3%	42.9%
2/12/2015 3:30	5	0	0	1	0	0	1	0	0	2	0	0	1	0	20.0%	60.0%
2/12/2015 3:45	8	0	1	2	0	0	1	0	0	4	0	0	0	0	12.5%	50.0%
2/12/2015 4:00	9	1	3	2	0	0	2	0	0	1	0	0	0	0	22.2%	11.1%
2/12/2015 4:15	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0%	100.0%
2/12/2015 4:30	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0.0%	50.0%
2/12/2015 4:45	3	0	0	2	0	0	0	0	0	1	0	0	0	0	0.0%	33.3%
2/12/2015 5:00	6	1	1	0	0	0	1	0	0	3	0	0	0	0	16.7%	50.0%
2/12/2015 5:15	6	0	2	1	0	0	0	0	0	3	0	0	0	0	0.0%	50.0%
2/12/2015 5:30	10	0	6	1	0	0	1	0	0	2	0	0	0	0	10.0%	20.0%
2/12/2015 5:45	9	1	4	1	0	0	1	0	0	2	0	0	0	0	11.1%	22.2%
2/12/2015 6:00	12	0	4	6	0	0	1	0	0	1	0	0	0	0	8.3%	8.3%
2/12/2015 6:15	7	0	2	3	0	0	0	0	0	2	0	0	0	0	0.0%	28.6%
2/12/2015 6:30	13	1	5	4	0	1	1	0	0	1	0	0	0	0	15.4%	7.7%
2/12/2015 6:45	5	0	1	3	0	0	0	0	0	1	0	0	0	0	0.0%	20.0%
2/12/2015 7:00	7	0	1	2	0	0	0	0	0	2	1	0	0	1	0.0%	57.1%
2/12/2015 7:15	18	0	9	5	0	0	1	0	1	2	0	0	0	0	5.6%	16.7%
2/12/2015 7:30	16	1	5	7	0	0	2	1	0	0	0	0	0	0	18.8%	0.0%
2/12/2015 7:45	9	0	2	3	0	0	1	0	0	3	0	0	0	0	11.1%	33.3%
2/12/2015 8:00	7	0	2	2	0	1	0	0	0	2	0	0	0	0	14.3%	28.6%
2/12/2015 8:15	10	1	1	3	0	0	1	0	0	3	0	0	0	1	10.0%	40.0%
2/12/2015 8:30	14	0	3	5	0	1	0	0	0	5	0	0	0	0	7.1%	35.7%
2/12/2015 8:45	9	0	3	2	0	1	0	0	0	2	0	0	1	0	11.1%	33.3%
2/12/2015 9:00	19	2	8	2	0	0	0	0	0	7	0	0	0	0	0.0%	36.8%
2/12/2015 9:15	8	1	4	0	1	0	1	0	0	1	0	0	0	0	25.0%	12.5%
2/12/2015 9:30	6	0	3	2	0	0	0	0	0	1	0	0	0	0	0.0%	16.7%
2/12/2015 9:45	10	1	2	3	1	0	1	0	0	2	0	0	0	0	20.0%	20.0%
2/12/2015 10:00	6	0	2	2	0	0	0	0	0	2	0	0	0	0	0.0%	33.3%
2/12/2015 10:15	12	1	4	6	0	0	0	0	0	1	0	0	0	0	0.0%	8.3%
2/12/2015 10:30	22	1	6	4	1	0	3	0	0	7	0	0	0	0	18.2%	31.8%
2/12/2015 10:45	20	3	9	3	0	0	4	0	0	1	0	0	0	0	20.0%	5.0%
2/12/2015 11:00	38	2	19	11	0	0	3	0	0	3	0	0	0	0	7.9%	7.9%
2/12/2015 11:15	24	1	7	11	0	1	1	0	0	3	0	0	0	0	8.3%	12.5%
2/12/2015 11:30	18	0	6	7	1	1	1	0	0	2	0	0	0	0	16.7%	11.1%
2/12/2015 11:45	23	1	7	5	1	2	1	0	1	4	0	0	0	1	17.4%	26.1%

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client: Burgess and Niple
File Number: 1500539
Route: HUGHES AVE
Location: At I-40

Site Ref: 5
Direction: NB
Latitude: 35.23638
Longitude: -111.82316

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 12:00	22	0	12	5	0	0	2	0	0	3	0	0	0	0	9.1%	13.6%
2/12/2015 12:15	18	1	3	7	0	0	0	1	0	6	0	0	0	0	5.6%	33.3%
2/12/2015 12:30	26	2	9	4	1	1	5	0	0	4	0	0	0	0	26.9%	15.4%
2/12/2015 12:45	11	0	5	3	1	0	0	0	0	2	0	0	0	0	9.1%	18.2%
2/12/2015 13:00	13	1	4	4	0	0	1	0	0	3	0	0	0	0	7.7%	23.1%
2/12/2015 13:15	19	0	6	5	0	0	0	0	0	8	0	0	0	0	0.0%	42.1%
2/12/2015 13:30	13	0	8	3	0	0	0	0	0	1	0	1	0	0	0.0%	15.4%
2/12/2015 13:45	18	0	5	5	0	1	4	0	0	3	0	0	0	0	27.8%	16.7%
2/12/2015 14:00	14	0	3	5	0	2	1	0	0	3	0	0	0	0	21.4%	21.4%
2/12/2015 14:15	9	0	3	3	0	0	1	0	0	2	0	0	0	0	11.1%	22.2%
2/12/2015 14:30	34	1	15	13	0	1	1	0	0	2	0	0	0	1	5.9%	8.8%
2/12/2015 14:45	22	1	8	5	1	1	2	0	0	4	0	0	0	0	18.2%	18.2%
2/12/2015 15:00	14	0	4	5	0	0	1	0	1	2	0	0	0	1	7.1%	28.6%
2/12/2015 15:15	21	1	6	8	1	1	2	0	0	2	0	0	0	0	19.0%	9.5%
2/12/2015 15:30	25	2	9	5	1	0	0	0	1	7	0	0	0	0	4.0%	32.0%
2/12/2015 15:45	21	0	12	6	0	1	0	0	0	2	0	0	0	0	4.8%	9.5%
2/12/2015 16:00	6	0	4	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 16:15	22	0	13	8	0	0	0	0	0	1	0	0	0	0	0.0%	4.5%
2/12/2015 16:30	35	2	17	13	1	0	1	0	0	1	0	0	0	0	5.7%	2.9%
2/12/2015 16:45	19	1	6	5	0	1	0	0	0	6	0	0	0	0	5.3%	31.6%
2/12/2015 17:00	27	1	16	4	0	2	3	0	0	0	1	0	0	0	18.5%	3.7%
2/12/2015 17:15	25	0	6	14	0	1	0	0	0	4	0	0	0	0	4.0%	16.0%
2/12/2015 17:30	12	0	3	4	0	1	0	1	0	3	0	0	0	0	16.7%	25.0%
2/12/2015 17:45	24	2	11	3	0	0	2	0	0	6	0	0	0	0	8.3%	25.0%
2/12/2015 18:00	13	0	6	5	0	0	0	0	0	2	0	0	0	0	0.0%	15.4%
2/12/2015 18:15	5	0	1	2	0	0	0	0	0	2	0	0	0	0	0.0%	40.0%
2/12/2015 18:30	10	1	7	0	0	0	1	0	0	1	0	0	0	0	10.0%	10.0%
2/12/2015 18:45	15	0	6	5	1	0	0	0	0	3	0	0	0	0	6.7%	20.0%
2/12/2015 19:00	6	0	2	2	0	0	1	0	0	1	0	0	0	0	16.7%	16.7%
2/12/2015 19:15	15	0	3	4	0	0	4	0	1	3	0	0	0	0	26.7%	26.7%
2/12/2015 19:30	10	0	3	4	0	0	1	0	0	2	0	0	0	0	10.0%	20.0%
2/12/2015 19:45	12	0	6	3	0	0	1	0	0	2	0	0	0	0	8.3%	16.7%
2/12/2015 20:00	13	0	4	2	0	1	0	0	1	5	0	0	0	0	7.7%	46.2%
2/12/2015 20:15	10	1	4	0	0	0	2	0	0	3	0	0	0	0	20.0%	30.0%
2/12/2015 20:30	6	0	1	2	0	0	0	0	0	3	0	0	0	0	0.0%	50.0%
2/12/2015 20:45	8	0	4	0	0	0	0	0	0	4	0	0	0	0	0.0%	50.0%
2/12/2015 21:00	12	0	2	1	0	1	1	0	0	7	0	0	0	0	16.7%	58.3%
2/12/2015 21:15	7	0	2	1	0	0	1	0	0	3	0	0	0	0	14.3%	42.9%
2/12/2015 21:30	10	0	3	0	0	0	1	0	0	6	0	0	0	0	10.0%	60.0%
2/12/2015 21:45	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 22:00	5	0	2	1	0	0	0	0	0	2	0	0	0	0	0.0%	40.0%
2/12/2015 22:15	5	0	2	0	0	0	1	0	0	2	0	0	0	0	20.0%	40.0%
2/12/2015 22:30	5	0	0	2	0	0	0	0	0	3	0	0	0	0	0.0%	60.0%
2/12/2015 22:45	3	0	0	1	0	0	0	0	0	2	0	0	0	0	0.0%	66.7%
2/12/2015 23:00	11	0	5	2	0	0	0	0	0	4	0	0	0	0	0.0%	36.4%
2/12/2015 23:15	4	0	1	2	0	0	1	0	0	0	0	0	0	0	25.0%	0.0%
2/12/2015 23:30	5	0	2	0	0	0	0	0	0	3	0	0	0	0	0.0%	60.0%
2/12/2015 23:45	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Totals	**1114**	**39**	**402**	**300**	**13**	**26**	**75**	**3**	**6**	**239**	**3**	**1**	**2**	**5**	**10.5%**	**23.0%**

AM Peak Hr	**10:30 AM**
AM Peak Vol	**104**
AM PHF	**0.684**
PM Peak Hr	**4:30 PM**
PM Peak Vol	**106**
PM PHF	**0.757**

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	5
File Number:	1500540	Direction:	SB
Route:	HUGHES AVE	Latitude:	35.23638
Location:	At I-40	Longitude:	-111.82316

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 0:00	4	0	2	1	0	0	1	0	0	0	0	0	0	0	25.0%	0.0%
2/12/2015 0:15	8	0	2	1	0	2	0	0	0	3	0	0	0	0	25.0%	37.5%
2/12/2015 0:30	4	1	0	1	0	0	1	0	0	1	0	0	0	0	25.0%	25.0%
2/12/2015 0:45	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0%	100.0%
2/12/2015 1:00	10	0	2	3	1	1	1	0	0	2	0	0	0	0	30.0%	20.0%
2/12/2015 1:15	6	0	3	1	0	1	0	0	0	1	0	0	0	0	16.7%	16.7%
2/12/2015 1:30	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0%	100.0%
2/12/2015 1:45	4	0	0	1	0	0	1	0	0	2	0	0	0	0	25.0%	50.0%
2/12/2015 2:00	3	0	0	1	0	0	0	0	0	2	0	0	0	0	0.0%	66.7%
2/12/2015 2:15	4	0	0	0	0	0	0	0	0	4	0	0	0	0	0.0%	100.0%
2/12/2015 2:30	4	0	2	0	0	0	0	0	0	2	0	0	0	0	0.0%	50.0%
2/12/2015 2:45	3	1	1	0	0	0	1	0	0	0	0	0	0	0	33.3%	0.0%
2/12/2015 3:00	6	0	1	1	0	0	0	0	0	4	0	0	0	0	0.0%	66.7%
2/12/2015 3:15	7	0	4	1	0	1	0	0	0	1	0	0	0	0	14.3%	14.3%
2/12/2015 3:30	7	0	1	2	0	0	0	0	1	3	0	0	0	0	0.0%	57.1%
2/12/2015 3:45	5	0	1	0	0	0	0	0	0	4	0	0	0	0	0.0%	80.0%
2/12/2015 4:00	9	0	5	2	0	0	0	0	0	2	0	0	0	0	0.0%	22.2%
2/12/2015 4:15	7	0	4	2	0	0	1	0	0	0	0	0	0	0	14.3%	0.0%
2/12/2015 4:30	20	1	6	7	0	0	1	0	0	5	0	0	0	0	5.0%	25.0%
2/12/2015 4:45	12	0	8	3	0	0	0	0	0	1	0	0	0	0	0.0%	8.3%
2/12/2015 5:00	17	0	10	5	0	0	0	0	0	2	0	0	0	0	0.0%	11.8%
2/12/2015 5:15	21	0	9	9	0	0	0	0	0	2	0	0	0	1	0.0%	14.3%
2/12/2015 5:30	57	0	35	20	0	0	0	0	0	2	0	0	0	0	0.0%	3.5%
2/12/2015 5:45	74	1	37	34	0	0	1	0	0	1	0	0	0	0	1.4%	1.4%
2/12/2015 6:00	32	0	17	9	0	1	0	0	0	5	0	0	0	0	3.1%	15.6%
2/12/2015 6:15	32	0	10	14	2	1	1	0	0	4	0	0	0	0	12.5%	12.5%
2/12/2015 6:30	33	1	18	12	0	0	2	0	0	0	0	0	0	0	6.1%	0.0%
2/12/2015 6:45	44	0	15	20	0	1	0	0	0	8	0	0	0	0	2.3%	18.2%
2/12/2015 7:00	56	0	30	21	0	1	0	0	0	3	0	0	0	1	1.8%	7.1%
2/12/2015 7:15	45	0	24	17	0	1	1	0	0	2	0	0	0	0	4.4%	4.4%
2/12/2015 7:30	64	0	39	20	0	0	1	0	0	4	0	0	0	0	1.6%	6.3%
2/12/2015 7:45	69	1	29	32	0	1	2	0	0	4	0	0	0	0	4.3%	5.8%
2/12/2015 8:00	38	0	17	14	0	0	0	0	0	7	0	0	0	0	0.0%	18.4%
2/12/2015 8:15	31	0	15	10	1	0	2	0	0	3	0	0	0	0	9.7%	9.7%
2/12/2015 8:30	22	0	9	8	0	0	0	0	0	5	0	0	0	0	0.0%	22.7%
2/12/2015 8:45	44	1	19	19	0	0	0	0	0	5	0	0	0	0	0.0%	11.4%
2/12/2015 9:00	29	0	18	7	0	1	1	0	0	2	0	0	0	0	6.9%	6.9%
2/12/2015 9:15	29	0	12	10	0	0	1	0	0	6	0	0	0	0	3.4%	20.7%
2/12/2015 9:30	20	0	10	8	0	0	1	0	0	1	0	0	0	0	5.0%	5.0%
2/12/2015 9:45	20	0	11	5	0	0	0	0	0	4	0	0	0	0	0.0%	20.0%
2/12/2015 10:00	23	0	11	6	1	0	2	0	1	2	0	0	0	0	13.0%	13.0%
2/12/2015 10:15	25	0	11	7	1	1	1	0	0	4	0	0	0	0	12.0%	16.0%
2/12/2015 10:30	28	0	8	16	0	1	1	0	0	2	0	0	0	0	7.1%	7.1%
2/12/2015 10:45	20	0	10	5	0	0	1	0	0	4	0	0	0	0	5.0%	20.0%
2/12/2015 11:00	45	0	23	15	1	0	1	0	0	5	0	0	0	0	4.4%	11.1%
2/12/2015 11:15	33	1	14	10	0	0	1	0	0	7	0	0	0	0	3.0%	21.2%
2/12/2015 11:30	29	0	11	12	0	1	1	0	0	3	1	0	0	0	6.9%	13.8%
2/12/2015 11:45	29	0	12	10	1	1	1	0	0	4	0	0	0	0	10.3%	13.8%

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	5
File Number:	1500540	Direction:	SB
Route:	HUGHES AVE	Latitude:	35.23638
Location:	At I-40	Longitude:	-111.82316

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 12:00	32	0	18	8	0	1	0	0	0	5	0	0	0	0	3.1%	15.6%
2/12/2015 12:15	33	3	15	9	2	1	1	0	0	2	0	0	0	0	12.1%	6.1%
2/12/2015 12:30	33	0	16	10	0	1	2	0	0	3	1	0	0	0	9.1%	12.1%
2/12/2015 12:45	23	1	7	9	0	1	1	0	0	4	0	0	0	0	8.7%	17.4%
2/12/2015 13:00	28	2	9	6	0	0	3	1	0	7	0	0	0	0	14.3%	25.0%
2/12/2015 13:15	18	0	10	7	0	0	1	0	0	0	0	0	0	0	5.6%	0.0%
2/12/2015 13:30	37	0	14	10	1	1	0	0	1	10	0	0	0	0	5.4%	29.7%
2/12/2015 13:45	34	0	18	12	1	0	0	0	0	3	0	0	0	0	2.9%	8.8%
2/12/2015 14:00	21	0	4	10	0	0	0	0	0	7	0	0	0	0	0.0%	33.3%
2/12/2015 14:15	33	0	13	14	0	2	2	0	0	2	0	0	0	0	12.1%	6.1%
2/12/2015 14:30	27	0	15	9	0	0	1	0	0	2	0	0	0	0	3.7%	7.4%
2/12/2015 14:45	27	1	14	6	0	0	2	0	0	4	0	0	0	0	7.4%	14.8%
2/12/2015 15:00	28	0	14	6	0	0	3	0	0	4	0	0	0	1	10.7%	17.9%
2/12/2015 15:15	38	2	10	13	1	1	4	0	0	7	0	0	0	0	15.8%	18.4%
2/12/2015 15:30	29	0	15	9	1	1	0	0	0	3	0	0	0	0	6.9%	10.3%
2/12/2015 15:45	31	1	15	6	0	0	1	0	0	7	0	0	0	1	3.2%	25.8%
2/12/2015 16:00	25	0	7	13	1	0	1	0	0	3	0	0	0	0	8.0%	12.0%
2/12/2015 16:15	34	0	18	7	1	2	0	0	0	5	0	0	0	1	8.8%	17.6%
2/12/2015 16:30	19	0	10	7	0	0	0	0	0	2	0	0	0	0	0.0%	10.5%
2/12/2015 16:45	23	2	12	6	0	0	0	0	0	3	0	0	0	0	0.0%	13.0%
2/12/2015 17:00	35	0	19	7	0	2	1	0	0	6	0	0	0	0	8.6%	17.1%
2/12/2015 17:15	28	2	10	11	0	2	2	0	0	1	0	0	0	0	14.3%	3.6%
2/12/2015 17:30	29	0	14	11	0	1	0	0	0	3	0	0	0	0	3.4%	10.3%
2/12/2015 17:45	19	1	9	6	0	0	1	0	0	2	0	0	0	0	5.3%	10.5%
2/12/2015 18:00	24	0	14	4	0	1	0	0	0	5	0	0	0	0	4.2%	20.8%
2/12/2015 18:15	11	0	6	3	0	0	0	0	0	2	0	0	0	0	0.0%	18.2%
2/12/2015 18:30	14	0	7	5	0	0	0	0	0	1	0	0	0	1	0.0%	14.3%
2/12/2015 18:45	16	0	12	2	0	0	0	0	0	2	0	0	0	0	0.0%	12.5%
2/12/2015 19:00	10	0	5	2	0	0	0	0	0	3	0	0	0	0	0.0%	30.0%
2/12/2015 19:15	8	0	2	2	0	0	0	0	0	4	0	0	0	0	0.0%	50.0%
2/12/2015 19:30	13	0	7	4	0	0	2	0	0	0	0	0	0	0	15.4%	0.0%
2/12/2015 19:45	15	0	6	3	0	0	1	0	0	5	0	0	0	0	6.7%	33.3%
2/12/2015 20:00	12	2	4	3	0	0	0	0	0	3	0	0	0	0	0.0%	25.0%
2/12/2015 20:15	11	0	6	1	0	1	1	0	0	2	0	0	0	0	18.2%	18.2%
2/12/2015 20:30	8	1	3	2	0	0	1	0	0	1	0	0	0	0	12.5%	12.5%
2/12/2015 20:45	9	1	3	0	0	0	1	0	0	4	0	0	0	0	11.1%	44.4%
2/12/2015 21:00	9	0	2	2	1	0	0	0	0	4	0	0	0	0	11.1%	44.4%
2/12/2015 21:15	8	0	0	3	0	0	0	0	0	5	0	0	0	0	0.0%	62.5%
2/12/2015 21:30	9	0	3	1	1	0	1	0	0	3	0	0	0	0	22.2%	33.3%
2/12/2015 21:45	13	0	4	5	0	1	1	0	0	2	0	0	0	0	15.4%	15.4%
2/12/2015 22:00	5	0	2	1	0	0	0	0	0	2	0	0	0	0	0.0%	40.0%
2/12/2015 22:15	11	0	5	3	0	0	1	0	0	2	0	0	0	0	9.1%	18.2%
2/12/2015 22:30	4	0	2	1	0	0	0	0	0	1	0	0	0	0	0.0%	25.0%
2/12/2015 22:45	7	1	2	1	0	0	2	0	0	1	0	0	0	0	28.6%	14.3%
2/12/2015 23:00	9	1	3	1	0	0	0	0	0	4	0	0	0	0	0.0%	44.4%
2/12/2015 23:15	7	0	4	1	0	0	0	0	0	2	0	0	0	0	0.0%	28.6%
2/12/2015 23:30	8	0	1	3	0	0	0	0	0	4	0	0	0	0	0.0%	50.0%
2/12/2015 23:45	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Totals	**2061**	**29**	**936**	**668**	**18**	**35**	**66**	**1**	**3**	**297**	**2**	**0**	**0**	**6**	**5.8%**	**14.9%**

AM Peak Hr	**7:00 AM**
AM Peak Vol	**234**
AM PHF	**0.848**
PM Peak Hr	**3:00 PM**
PM Peak Vol	**126**
PM PHF	**0.829**

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	3
File Number:	1500537	Direction:	EB
Route:	I-40 EB OFF RAMP	Latitude:	35.23734
Location:	At HUGHES AVE	Longitude:	-111.82586

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 0:00	5	0	0	1	0	0	0	0	0	3	0	1	0	0	0.0%	80.0%
2/12/2015 0:15	4	0	0	2	1	0	0	0	0	0	0	1	0	0	25.0%	25.0%
2/12/2015 0:30	3	0	0	0	0	0	0	0	0	2	0	1	0	0	0.0%	100.0%
2/12/2015 0:45	6	0	1	1	0	0	2	0	0	2	0	0	0	0	33.3%	33.3%
2/12/2015 1:00	5	0	1	1	0	1	0	0	0	2	0	0	0	0	20.0%	40.0%
2/12/2015 1:15	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0%	100.0%
2/12/2015 1:30	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0.0%	100.0%
2/12/2015 1:45	6	0	1	1	0	0	0	0	0	4	0	0	0	0	0.0%	66.7%
2/12/2015 2:00	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0.0%	100.0%
2/12/2015 2:15	4	0	1	1	0	0	0	0	0	2	0	0	0	0	0.0%	50.0%
2/12/2015 2:30	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0.0%	100.0%
2/12/2015 2:45	3	0	1	0	0	0	0	0	0	2	0	0	0	0	0.0%	66.7%
2/12/2015 3:00	4	0	2	0	0	0	0	0	0	2	0	0	0	0	0.0%	50.0%
2/12/2015 3:15	8	0	1	2	0	0	0	0	0	5	0	0	0	0	0.0%	62.5%
2/12/2015 3:30	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0.0%	100.0%
2/12/2015 3:45	8	0	0	1	0	0	0	0	0	7	0	0	0	0	0.0%	87.5%
2/12/2015 4:00	8	0	3	2	0	0	0	0	0	1	0	1	1	0	0.0%	37.5%
2/12/2015 4:15	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0.0%	100.0%
2/12/2015 4:30	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 4:45	4	0	0	2	0	0	0	0	0	2	0	0	0	0	0.0%	50.0%
2/12/2015 5:00	9	0	2	3	0	0	0	0	0	4	0	0	0	0	0.0%	44.4%
2/12/2015 5:15	11	0	3	5	0	0	0	0	0	3	0	0	0	0	0.0%	27.3%
2/12/2015 5:30	18	0	10	4	0	0	0	0	0	3	0	0	1	0	0.0%	22.2%
2/12/2015 5:45	18	0	11	4	0	0	0	0	0	3	0	0	0	0	0.0%	16.7%
2/12/2015 6:00	3	0	0	1	0	0	0	0	0	2	0	0	0	0	0.0%	66.7%
2/12/2015 6:15	4	0	1	1	0	0	0	0	0	2	0	0	0	0	0.0%	50.0%
2/12/2015 6:30	8	0	1	3	0	0	0	0	0	3	0	1	0	0	0.0%	50.0%
2/12/2015 6:45	8	0	1	4	0	0	0	0	0	2	0	1	0	0	0.0%	37.5%
2/12/2015 7:00	7	0	1	1	0	0	0	0	0	5	0	0	0	0	0.0%	71.4%
2/12/2015 7:15	15	0	4	5	0	0	1	0	0	2	0	3	0	0	6.7%	33.3%
2/12/2015 7:30	16	1	6	5	0	0	1	0	0	2	0	1	0	0	6.3%	18.8%
2/12/2015 7:45	9	0	2	3	0	0	1	0	0	3	0	0	0	0	11.1%	33.3%
2/12/2015 8:00	9	0	3	5	0	0	0	0	0	1	0	0	0	0	0.0%	11.1%
2/12/2015 8:15	8	0	1	2	0	0	0	0	0	5	0	0	0	0	0.0%	62.5%
2/12/2015 8:30	11	0	3	3	0	0	0	0	0	4	1	0	0	0	0.0%	45.5%
2/12/2015 8:45	8	1	2	1	0	1	1	0	0	2	0	0	0	0	25.0%	25.0%
2/12/2015 9:00	17	0	2	6	0	0	1	0	0	8	0	0	0	0	5.9%	47.1%
2/12/2015 9:15	8	0	2	1	1	0	0	0	0	3	1	0	0	0	12.5%	50.0%
2/12/2015 9:30	6	0	1	2	0	1	0	0	0	2	0	0	0	0	16.7%	33.3%
2/12/2015 9:45	7	0	2	2	1	0	0	0	0	2	0	0	0	0	14.3%	28.6%
2/12/2015 10:00	7	0	2	2	0	0	0	0	0	3	0	0	0	0	0.0%	42.9%
2/12/2015 10:15	11	0	5	1	0	0	0	1	1	3	0	0	0	0	9.1%	36.4%
2/12/2015 10:30	16	0	4	2	1	0	3	0	0	6	0	0	0	0	25.0%	37.5%
2/12/2015 10:45	14	0	3	5	0	1	0	0	0	5	0	0	0	0	7.1%	35.7%
2/12/2015 11:00	12	0	4	4	0	1	0	0	0	3	0	0	0	0	8.3%	25.0%
2/12/2015 11:15	15	0	4	5	0	1	0	0	0	5	0	0	0	0	6.7%	33.3%
2/12/2015 11:30	8	0	2	3	1	1	0	0	0	1	0	0	0	0	25.0%	12.5%
2/12/2015 11:45	15	0	3	2	2	1	0	0	0	6	1	0	0	0	20.0%	46.7%

Traffic Research & Analysis, Inc.
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Client:	Burgess and Niple	Site Ref:	3
File Number:	1500537	Direction:	EB
Route:	I-40 EB OFF RAMP	Latitude:	35.23734
Location:	At HUGHES AVE	Longitude:	-111.82586

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 12:00	13	0	2	5	0	1	0	0	0	3	1	0	0	1	7.7%	38.5%
2/12/2015 12:15	12	0	1	2	0	0	0	1	0	8	0	0	0	0	8.3%	66.7%
2/12/2015 12:30	15	0	2	2	0	1	0	0	1	8	0	0	1	0	6.7%	66.7%
2/12/2015 12:45	7	0	2	3	0	0	0	0	0	2	0	0	0	0	0.0%	28.6%
2/12/2015 13:00	11	0	4	2	0	0	0	0	0	5	0	0	0	0	0.0%	45.5%
2/12/2015 13:15	16	0	4	5	0	0	0	0	0	7	0	0	0	0	0.0%	43.8%
2/12/2015 13:30	11	0	3	6	0	0	0	0	0	1	1	0	0	0	0.0%	18.2%
2/12/2015 13:45	15	0	2	4	3	0	1	0	0	5	0	0	0	0	26.7%	33.3%
2/12/2015 14:00	13	2	0	6	0	0	0	0	1	2	0	1	1	0	0.0%	38.5%
2/12/2015 14:15	10	0	2	4	0	0	0	0	0	4	0	0	0	0	0.0%	40.0%
2/12/2015 14:30	16	0	4	5	0	2	0	0	0	4	1	0	0	0	12.5%	31.3%
2/12/2015 14:45	16	0	4	4	0	1	0	0	0	3	2	1	0	1	6.3%	43.8%
2/12/2015 15:00	14	0	4	5	0	0	1	0	0	4	0	0	0	0	7.1%	28.6%
2/12/2015 15:15	13	0	5	2	1	0	0	0	1	3	0	1	0	0	7.7%	38.5%
2/12/2015 15:30	16	0	2	5	2	0	0	0	0	6	1	0	0	0	12.5%	43.8%
2/12/2015 15:45	12	0	5	2	0	1	0	0	1	1	0	1	0	1	8.3%	33.3%
2/12/2015 16:00	5	0	2	2	0	0	0	0	0	1	0	0	0	0	0.0%	20.0%
2/12/2015 16:15	18	0	7	8	0	1	0	0	0	2	0	0	0	0	5.6%	11.1%
2/12/2015 16:30	17	0	2	7	0	0	0	0	0	6	0	2	0	0	0.0%	47.1%
2/12/2015 16:45	11	0	1	3	0	1	0	0	0	5	0	0	1	0	9.1%	54.5%
2/12/2015 17:00	14	0	3	4	0	1	0	0	0	3	1	1	1	0	7.1%	42.9%
2/12/2015 17:15	18	0	4	9	1	0	1	0	0	3	0	0	0	0	11.1%	16.7%
2/12/2015 17:30	9	0	3	3	0	0	1	0	0	2	0	0	0	0	11.1%	22.2%
2/12/2015 17:45	20	0	9	3	0	0	0	0	0	7	1	0	0	0	0.0%	40.0%
2/12/2015 18:00	8	0	2	4	0	0	0	0	0	2	0	0	0	0	0.0%	25.0%
2/12/2015 18:15	3	0	1	1	0	0	0	0	0	1	0	0	0	0	0.0%	33.3%
2/12/2015 18:30	7	0	5	0	0	0	0	0	0	2	0	0	0	0	0.0%	28.6%
2/12/2015 18:45	11	0	3	3	0	0	0	0	0	5	0	0	0	0	0.0%	45.5%
2/12/2015 19:00	3	0	0	1	0	0	0	0	0	1	0	0	1	0	0.0%	66.7%
2/12/2015 19:15	10	0	1	1	0	0	1	0	0	6	0	0	1	0	10.0%	70.0%
2/12/2015 19:30	10	0	4	2	0	0	1	0	0	2	0	0	1	0	10.0%	30.0%
2/12/2015 19:45	7	0	3	1	0	0	0	0	0	2	0	1	0	0	0.0%	42.9%
2/12/2015 20:00	10	0	0	2	0	0	0	0	0	7	0	1	0	0	0.0%	80.0%
2/12/2015 20:15	9	0	3	0	0	0	0	0	0	6	0	0	0	0	0.0%	66.7%
2/12/2015 20:30	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0.0%	100.0%
2/12/2015 20:45	7	0	2	0	0	0	0	0	0	4	1	0	0	0	0.0%	71.4%
2/12/2015 21:00	8	0	2	0	0	0	0	0	0	5	0	1	0	0	0.0%	75.0%
2/12/2015 21:15	7	0	1	2	0	0	0	0	0	3	0	0	1	0	0.0%	57.1%
2/12/2015 21:30	10	0	2	1	0	0	0	0	0	6	0	0	1	0	0.0%	70.0%
2/12/2015 21:45	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 22:00	6	0	2	1	0	0	0	0	0	2	0	0	1	0	0.0%	50.0%
2/12/2015 22:15	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0.0%	50.0%
2/12/2015 22:30	6	0	0	2	0	0	0	0	1	3	0	0	0	0	0.0%	66.7%
2/12/2015 22:45	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0.0%	100.0%
2/12/2015 23:00	8	0	2	2	0	0	0	0	0	4	0	0	0	0	0.0%	50.0%
2/12/2015 23:15	5	0	1	1	0	0	0	0	0	3	0	0	0	0	0.0%	60.0%
2/12/2015 23:30	3	0	1	0	0	0	0	0	0	2	0	0	0	0	0.0%	66.7%
2/12/2015 23:45	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0.0%	50.0%
Day Totals	**852**	**4**	**212**	**226**	**14**	**17**	**16**	**2**	**6**	**307**	**12**	**20**	**12**	**4**	**5.8%**	**42.4%**

AM Peak Hr	**10:30 AM**
AM Peak Vol	**57**
AM PHF	**0.891**
PM Peak Hr	**5:00 PM**
PM Peak Vol	**61**
PM PHF	**0.762**

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	4
File Number:	1500538	Direction:	EB
Route:	I-40 EB ON RAMP	Latitude:	35.23508
Location:	At HUGHES AVE	Longitude:	-111.82134

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 0:00	8	0	1	4	0	0	1	0	0	1	0	0	1	0	12.5%	25.0%
2/12/2015 0:15	7	1	2	0	0	0	1	0	0	2	0	1	0	0	14.3%	42.9%
2/12/2015 0:30	4	0	0	1	0	1	0	0	0	2	0	0	0	0	25.0%	50.0%
2/12/2015 0:45	3	0	1	1	1	0	0	0	0	0	0	0	0	0	33.3%	0.0%
2/12/2015 1:00	9	0	1	2	1	0	2	0	0	2	0	1	0	0	33.3%	33.3%
2/12/2015 1:15	7	0	3	2	0	1	0	0	0	1	0	0	0	0	14.3%	14.3%
2/12/2015 1:30	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0%	100.0%
2/12/2015 1:45	4	0	0	1	0	0	0	0	0	3	0	0	0	0	0.0%	75.0%
2/12/2015 2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 2:15	3	0	0	0	0	0	1	0	0	2	0	0	0	0	33.3%	66.7%
2/12/2015 2:30	4	0	2	0	0	0	0	0	0	2	0	0	0	0	0.0%	50.0%
2/12/2015 2:45	6	0	2	0	0	0	1	0	0	3	0	0	0	0	16.7%	50.0%
2/12/2015 3:00	5	1	0	0	0	0	2	0	0	2	0	0	0	0	40.0%	40.0%
2/12/2015 3:15	4	0	2	0	0	0	1	0	0	1	0	0	0	0	25.0%	25.0%
2/12/2015 3:30	6	0	0	2	0	0	0	0	0	4	0	0	0	0	0.0%	66.7%
2/12/2015 3:45	4	0	0	1	0	0	0	0	0	3	0	0	0	0	0.0%	75.0%
2/12/2015 4:00	10	0	1	5	0	0	1	0	0	2	0	1	0	0	10.0%	30.0%
2/12/2015 4:15	6	0	3	2	0	0	0	0	0	1	0	0	0	0	0.0%	16.7%
2/12/2015 4:30	13	0	3	4	0	0	0	0	0	5	0	1	0	0	0.0%	46.2%
2/12/2015 4:45	5	0	2	1	0	0	1	0	0	1	0	0	0	0	20.0%	20.0%
2/12/2015 5:00	8	0	5	1	0	0	0	0	0	2	0	0	0	0	0.0%	25.0%
2/12/2015 5:15	4	0	0	1	0	0	0	0	0	3	0	0	0	0	0.0%	75.0%
2/12/2015 5:30	20	0	13	4	0	0	1	0	0	2	0	0	0	0	5.0%	10.0%
2/12/2015 5:45	20	1	4	12	0	0	1	0	0	2	0	0	0	0	5.0%	10.0%
2/12/2015 6:00	25	0	12	7	0	1	0	0	0	5	0	0	0	0	4.0%	20.0%
2/12/2015 6:15	27	0	13	7	1	0	0	0	1	4	0	0	1	0	3.7%	22.2%
2/12/2015 6:30	25	0	11	13	0	0	0	0	0	1	0	0	0	0	0.0%	4.0%
2/12/2015 6:45	38	0	12	15	0	2	1	0	0	8	0	0	0	0	7.9%	21.1%
2/12/2015 7:00	47	0	24	17	0	1	0	0	1	3	0	1	0	0	2.1%	10.6%
2/12/2015 7:15	43	0	21	16	0	0	0	0	1	5	0	0	0	0	0.0%	14.0%
2/12/2015 7:30	48	0	27	15	0	0	1	0	0	5	0	0	0	0	2.1%	10.4%
2/12/2015 7:45	60	0	22	26	1	2	0	0	0	5	0	4	0	0	5.0%	15.0%
2/12/2015 8:00	28	0	14	8	0	0	0	0	0	6	0	0	0	0	0.0%	21.4%
2/12/2015 8:15	21	0	8	8	0	0	0	0	0	5	0	0	0	0	0.0%	23.8%
2/12/2015 8:30	22	0	11	6	0	0	0	0	0	5	0	0	0	0	0.0%	22.7%
2/12/2015 8:45	35	0	18	9	0	0	0	0	0	8	0	0	0	0	0.0%	22.9%
2/12/2015 9:00	26	0	13	7	0	1	0	0	1	4	0	0	0	0	3.8%	19.2%
2/12/2015 9:15	24	0	11	6	0	0	0	0	0	7	0	0	0	0	0.0%	29.2%
2/12/2015 9:30	14	0	9	3	0	0	0	0	0	2	0	0	0	0	0.0%	14.3%
2/12/2015 9:45	21	2	6	7	0	1	0	0	0	5	0	0	0	0	4.8%	23.8%
2/12/2015 10:00	17	0	8	2	1	0	1	0	0	5	0	0	0	0	11.8%	29.4%
2/12/2015 10:15	28	1	10	10	0	1	1	0	0	4	0	0	1	0	7.1%	17.9%
2/12/2015 10:30	22	0	10	9	0	0	0	1	0	2	0	0	0	0	4.5%	9.1%
2/12/2015 10:45	18	0	4	7	1	1	1	0	1	3	0	0	0	0	16.7%	22.2%
2/12/2015 11:00	31	0	11	10	1	1	0	0	1	7	0	0	0	0	6.5%	25.8%
2/12/2015 11:15	32	0	15	7	1	0	1	0	1	7	0	0	0	0	6.3%	25.0%
2/12/2015 11:30	22	0	9	8	0	1	0	0	0	4	0	0	0	0	4.5%	18.2%
2/12/2015 11:45	18	0	7	6	3	0	0	0	0	2	0	0	0	0	16.7%	11.1%

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
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Client:	Burgess and Niple	Site Ref:	4
File Number:	1500538	Direction:	EB
Route:	I-40 EB ON RAMP	Latitude:	35.23508
Location:	At HUGHES AVE	Longitude:	-111.82134

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 12:00	30	1	13	11	0	0	0	0	0	5	0	0	0	0	0.0%	16.7%
2/12/2015 12:15	17	0	9	3	1	1	0	0	0	3	0	0	0	0	11.8%	17.6%
2/12/2015 12:30	22	0	8	8	0	0	1	0	0	4	0	0	1	0	4.5%	22.7%
2/12/2015 12:45	17	0	5	5	0	1	0	0	0	6	0	0	0	0	5.9%	35.3%
2/12/2015 13:00	26	0	9	4	1	0	0	1	0	10	0	0	1	0	7.7%	42.3%
2/12/2015 13:15	19	2	8	6	0	0	2	0	1	0	0	0	0	0	10.5%	5.3%
2/12/2015 13:30	30	0	11	8	0	1	0	0	1	9	0	0	0	0	3.3%	33.3%
2/12/2015 13:45	34	0	12	16	3	0	0	0	0	3	0	0	0	0	8.8%	8.8%
2/12/2015 14:00	18	0	7	5	0	0	0	0	0	6	0	0	0	0	0.0%	33.3%
2/12/2015 14:15	29	0	9	14	1	0	2	0	0	3	0	0	0	0	10.3%	10.3%
2/12/2015 14:30	43	4	15	19	0	0	0	0	0	5	0	0	0	0	0.0%	11.6%
2/12/2015 14:45	36	0	16	13	0	2	1	0	0	4	0	0	0	0	8.3%	11.1%
2/12/2015 15:00	28	0	11	12	0	0	1	0	1	2	0	0	1	0	3.6%	14.3%
2/12/2015 15:15	36	0	13	10	0	0	2	0	0	9	0	1	1	0	5.6%	30.6%
2/12/2015 15:30	25	0	13	6	0	1	0	0	1	3	0	1	0	0	4.0%	20.0%
2/12/2015 15:45	37	0	16	9	1	0	1	0	0	10	0	0	0	0	5.4%	27.0%
2/12/2015 16:00	31	0	9	16	2	0	0	0	1	3	0	0	0	0	6.5%	12.9%
2/12/2015 16:15	42	0	20	13	1	0	0	0	0	7	0	1	0	0	2.4%	19.0%
2/12/2015 16:30	62	0	30	30	0	1	0	0	0	1	0	0	0	0	1.6%	1.6%
2/12/2015 16:45	27	0	17	4	0	0	0	0	0	5	0	1	0	0	0.0%	22.2%
2/12/2015 17:00	41	1	15	12	1	2	1	0	0	8	0	1	0	0	9.8%	22.0%
2/12/2015 17:15	30	0	11	14	0	1	0	0	0	3	0	0	1	0	3.3%	13.3%
2/12/2015 17:30	25	0	13	10	0	1	0	0	0	0	0	0	1	0	4.0%	4.0%
2/12/2015 17:45	15	0	8	4	0	0	0	0	0	3	0	0	0	0	0.0%	20.0%
2/12/2015 18:00	39	0	16	17	0	0	0	0	0	5	0	1	0	0	0.0%	15.4%
2/12/2015 18:15	13	0	5	6	0	0	0	0	0	2	0	0	0	0	0.0%	15.4%
2/12/2015 18:30	18	0	10	5	0	0	0	0	0	3	0	0	0	0	0.0%	16.7%
2/12/2015 18:45	13	0	7	4	0	0	0	0	0	2	0	0	0	0	0.0%	15.4%
2/12/2015 19:00	14	0	8	4	0	0	0	0	0	2	0	0	0	0	0.0%	14.3%
2/12/2015 19:15	7	0	2	1	0	0	0	0	0	4	0	0	0	0	0.0%	57.1%
2/12/2015 19:30	11	0	4	5	0	0	0	0	0	0	0	0	2	0	0.0%	18.2%
2/12/2015 19:45	11	0	7	0	0	0	0	0	0	4	0	0	0	0	0.0%	36.4%
2/12/2015 20:00	12	0	2	3	0	0	1	0	0	5	0	1	0	0	8.3%	50.0%
2/12/2015 20:15	7	0	1	1	0	0	0	0	0	3	0	1	1	0	0.0%	71.4%
2/12/2015 20:30	6	0	2	2	0	0	0	0	0	2	0	0	0	0	0.0%	33.3%
2/12/2015 20:45	8	0	3	1	0	0	0	0	0	4	0	0	0	0	0.0%	50.0%
2/12/2015 21:00	10	0	2	5	0	0	0	0	0	3	0	0	0	0	0.0%	30.0%
2/12/2015 21:15	9	2	0	3	0	0	2	0	0	2	0	0	0	0	22.2%	22.2%
2/12/2015 21:30	7	2	0	0	1	0	1	0	0	3	0	0	0	0	28.6%	42.9%
2/12/2015 21:45	15	0	4	4	0	0	0	0	0	6	0	1	0	0	0.0%	46.7%
2/12/2015 22:00	7	0	3	1	0	0	0	0	0	3	0	0	0	0	0.0%	42.9%
2/12/2015 22:15	7	0	2	2	0	0	0	0	0	2	0	0	1	0	0.0%	42.9%
2/12/2015 22:30	6	0	2	3	0	0	0	0	0	1	0	0	0	0	0.0%	16.7%
2/12/2015 22:45	3	0	0	1	0	0	0	0	0	1	0	0	1	0	0.0%	66.7%
2/12/2015 23:00	8	0	1	1	0	0	1	0	0	5	0	0	0	0	12.5%	62.5%
2/12/2015 23:15	6	0	1	3	0	0	0	0	0	2	0	0	0	0	0.0%	33.3%
2/12/2015 23:30	15	0	6	5	0	0	0	0	0	4	0	0	0	0	0.0%	26.7%
2/12/2015 23:45	4	0	3	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Totals	**1829**	**18**	**740**	**603**	**23**	**25**	**35**	**2**	**12**	**339**	**0**	**18**	**14**	**0**	**4.6%**	**20.9%**

AM Peak Hr	**7:00 AM**
AM Peak Vol	**198**
AM PHF	**0.825**
PM Peak Hr	**3:45 PM**
PM Peak Vol	**172**
PM PHF	**0.694**

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	1
File Number:	1500535	Direction:	WB
Route:	I-40 WB OFF RAMP	Latitude:	35.23551
Location:	At HUGHES AVE	Longitude:	-111.82021

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 0:00	9	0	6	1	0	0	0	0	0	2	0	0	0	0	0.0%	22.2%
2/12/2015 0:15	6	0	4	1	0	0	0	0	0	0	0	0	0	1	0.0%	16.7%
2/12/2015 0:30	4	0	0	0	0	0	0	0	0	4	0	0	0	0	0.0%	100.0%
2/12/2015 0:45	12	0	9	2	0	0	0	0	0	1	0	0	0	0	0.0%	8.3%
2/12/2015 1:00	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 1:15	5	0	3	1	0	0	0	0	0	0	0	0	1	0	0.0%	20.0%
2/12/2015 1:30	4	0	3	0	0	0	0	0	0	1	0	0	0	0	0.0%	25.0%
2/12/2015 1:45	6	0	3	1	0	0	0	0	0	2	0	0	0	0	0.0%	33.3%
2/12/2015 2:00	6	0	2	1	0	0	0	0	0	3	0	0	0	0	0.0%	50.0%
2/12/2015 2:15	3	0	0	0	1	0	0	0	0	1	0	0	1	0	33.3%	66.7%
2/12/2015 2:30	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 2:45	9	0	8	0	0	0	0	0	0	1	0	0	0	0	0.0%	11.1%
2/12/2015 3:00	6	0	2	1	0	0	0	0	0	3	0	0	0	0	0.0%	50.0%
2/12/2015 3:15	6	0	5	0	0	0	0	0	0	1	0	0	0	0	0.0%	16.7%
2/12/2015 3:30	10	0	7	1	0	0	0	0	0	2	0	0	0	0	0.0%	20.0%
2/12/2015 3:45	7	0	6	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 4:00	7	0	4	0	0	0	0	0	0	3	0	0	0	0	0.0%	42.9%
2/12/2015 4:15	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 4:30	6	0	4	1	0	0	0	0	0	1	0	0	0	0	0.0%	16.7%
2/12/2015 4:45	17	0	6	8	0	0	0	1	0	2	0	0	0	0	5.9%	11.8%
2/12/2015 5:00	17	0	5	9	0	0	0	0	0	3	0	0	0	0	0.0%	17.6%
2/12/2015 5:15	23	0	10	10	0	1	0	0	0	2	0	0	0	0	4.3%	8.7%
2/12/2015 5:30	46	0	21	22	0	0	0	1	0	2	0	0	0	0	2.2%	4.3%
2/12/2015 5:45	59	0	31	24	0	1	1	0	0	1	0	0	1	0	3.4%	3.4%
2/12/2015 6:00	29	0	23	4	1	0	0	0	0	1	0	0	0	0	3.4%	3.4%
2/12/2015 6:15	15	0	6	5	0	0	0	0	0	4	0	0	0	0	0.0%	26.7%
2/12/2015 6:30	19	0	10	4	0	1	1	0	0	3	0	0	0	0	10.5%	15.8%
2/12/2015 6:45	15	0	8	4	0	0	0	0	0	2	0	0	1	0	0.0%	20.0%
2/12/2015 7:00	23	0	13	3	0	1	0	0	1	5	0	0	0	0	4.3%	26.1%
2/12/2015 7:15	20	0	11	5	1	0	0	0	0	3	0	0	0	0	5.0%	15.0%
2/12/2015 7:30	32	0	18	9	2	0	1	0	0	2	0	0	0	0	9.4%	6.3%
2/12/2015 7:45	35	0	20	10	0	0	0	0	0	4	0	0	1	0	0.0%	14.3%
2/12/2015 8:00	33	0	21	7	1	0	0	0	0	4	0	0	0	0	3.0%	12.1%
2/12/2015 8:15	26	0	13	4	1	0	1	0	0	7	0	0	0	0	7.7%	26.9%
2/12/2015 8:30	31	0	18	5	0	0	1	0	1	6	0	0	0	0	3.2%	22.6%
2/12/2015 8:45	22	0	4	14	0	0	0	0	1	3	0	0	0	0	0.0%	18.2%
2/12/2015 9:00	27	0	15	8	0	0	0	1	0	3	0	0	0	0	3.7%	11.1%
2/12/2015 9:15	32	0	17	10	0	0	1	0	0	4	0	0	0	0	3.1%	12.5%
2/12/2015 9:30	29	0	9	11	0	1	1	0	0	7	0	0	0	0	6.9%	24.1%
2/12/2015 9:45	23	0	13	4	0	0	0	0	1	5	0	0	0	0	0.0%	26.1%
2/12/2015 10:00	35	0	25	6	0	0	1	0	0	3	0	0	0	0	2.9%	8.6%
2/12/2015 10:15	28	0	11	9	1	0	0	0	0	7	0	0	0	0	3.6%	25.0%
2/12/2015 10:30	29	0	10	12	0	0	1	0	2	4	0	0	0	0	3.4%	20.7%
2/12/2015 10:45	21	1	9	7	0	0	1	0	0	3	0	0	0	0	4.8%	14.3%
2/12/2015 11:00	29	0	12	10	1	0	0	0	1	4	0	1	0	0	3.4%	20.7%
2/12/2015 11:15	30	1	16	5	0	1	0	0	0	7	0	0	0	0	3.3%	23.3%
2/12/2015 11:30	33	0	17	8	0	0	1	0	0	6	1	0	0	0	3.0%	21.2%
2/12/2015 11:45	28	0	14	8	2	0	0	0	0	4	0	0	0	0	7.1%	14.3%

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	1
File Number:	1500535	Direction:	WB
Route:	I-40 WB OFF RAMP	Latitude:	35.23551
Location:	At HUGHES AVE	Longitude:	-111.82021

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 12:00	34	0	15	12	0	1	0	0	0	5	0	1	0	0	2.9%	17.6%
2/12/2015 12:15	31	0	14	8	0	2	2	0	0	5	0	0	0	0	12.9%	16.1%
2/12/2015 12:30	41	0	25	10	0	0	1	0	0	5	0	0	0	0	2.4%	12.2%
2/12/2015 12:45	36	1	19	10	1	1	0	1	1	2	0	0	0	0	8.3%	8.3%
2/12/2015 13:00	30	0	16	9	0	0	0	0	0	5	0	0	0	0	0.0%	16.7%
2/12/2015 13:15	20	0	12	4	0	0	0	0	0	3	0	1	0	0	0.0%	20.0%
2/12/2015 13:30	31	0	13	10	1	1	0	0	1	4	0	1	0	0	6.5%	19.4%
2/12/2015 13:45	27	0	15	7	0	0	1	1	0	3	0	0	0	0	7.4%	11.1%
2/12/2015 14:00	40	0	18	14	0	0	0	0	1	6	0	1	0	0	0.0%	20.0%
2/12/2015 14:15	41	0	24	10	1	0	0	0	2	4	0	0	0	0	2.4%	14.6%
2/12/2015 14:30	34	0	14	10	0	0	2	0	2	6	0	0	0	0	5.9%	23.5%
2/12/2015 14:45	39	0	25	6	0	1	0	0	0	7	0	0	0	0	2.6%	17.9%
2/12/2015 15:00	42	1	15	16	0	0	2	0	0	8	0	0	0	0	4.8%	19.0%
2/12/2015 15:15	23	0	6	7	1	0	0	0	1	8	0	0	0	0	4.3%	39.1%
2/12/2015 15:30	26	0	12	10	1	0	0	0	0	3	0	0	0	0	3.8%	11.5%
2/12/2015 15:45	45	0	27	11	0	0	0	0	0	6	0	0	1	0	0.0%	15.6%
2/12/2015 16:00	35	0	12	19	1	1	0	0	0	2	0	0	0	0	5.7%	5.7%
2/12/2015 16:15	46	0	21	18	0	1	0	0	0	6	0	0	0	0	2.2%	13.0%
2/12/2015 16:30	31	0	13	11	0	0	0	0	0	7	0	0	0	0	0.0%	22.6%
2/12/2015 16:45	28	0	12	10	0	1	0	0	1	4	0	0	0	0	3.6%	17.9%
2/12/2015 17:00	51	1	26	17	1	0	1	0	0	4	0	0	1	0	3.9%	9.8%
2/12/2015 17:15	62	0	30	24	0	0	0	0	1	6	0	1	0	0	0.0%	12.9%
2/12/2015 17:30	50	0	24	14	0	0	0	1	0	10	0	0	1	0	2.0%	22.0%
2/12/2015 17:45	41	0	22	13	0	0	0	0	0	6	0	0	0	0	0.0%	14.6%
2/12/2015 18:00	33	0	20	7	0	0	0	0	0	5	0	1	0	0	0.0%	18.2%
2/12/2015 18:15	47	1	23	13	1	0	0	0	0	8	0	1	0	0	2.1%	19.1%
2/12/2015 18:30	31	0	18	9	0	1	0	0	0	2	0	1	0	0	3.2%	9.7%
2/12/2015 18:45	29	0	19	8	0	0	0	0	0	2	0	0	0	0	0.0%	6.9%
2/12/2015 19:00	29	0	14	9	0	0	0	0	0	6	0	0	0	0	0.0%	20.7%
2/12/2015 19:15	32	0	21	8	0	0	0	0	0	3	0	0	0	0	0.0%	9.4%
2/12/2015 19:30	27	0	14	11	0	0	0	0	0	2	0	0	0	0	0.0%	7.4%
2/12/2015 19:45	27	0	12	10	0	1	0	0	0	4	0	0	0	0	3.7%	14.8%
2/12/2015 20:00	20	0	11	4	1	0	0	0	0	4	0	0	0	0	5.0%	20.0%
2/12/2015 20:15	26	0	13	6	1	0	1	0	0	4	0	1	0	0	7.7%	19.2%
2/12/2015 20:30	24	0	13	6	0	0	0	0	0	5	0	0	0	0	0.0%	20.8%
2/12/2015 20:45	18	0	12	5	0	0	0	0	0	1	0	0	0	0	0.0%	5.6%
2/12/2015 21:00	14	0	6	4	1	0	0	0	0	3	0	0	0	0	7.1%	21.4%
2/12/2015 21:15	15	0	9	3	0	0	0	0	0	3	0	0	0	0	0.0%	20.0%
2/12/2015 21:30	19	0	10	4	0	0	2	0	0	3	0	0	0	0	10.5%	15.8%
2/12/2015 21:45	11	0	7	3	0	0	0	0	0	0	0	1	0	0	0.0%	9.1%
2/12/2015 22:00	16	0	8	4	0	0	0	0	0	3	0	1	0	0	0.0%	25.0%
2/12/2015 22:15	12	0	3	5	0	0	0	0	0	3	0	0	1	0	0.0%	33.3%
2/12/2015 22:30	9	0	3	1	0	0	0	0	0	4	0	0	1	0	0.0%	55.6%
2/12/2015 22:45	11	0	5	3	0	0	0	0	0	3	0	0	0	0	0.0%	27.3%
2/12/2015 23:00	5	0	3	1	0	0	0	0	0	1	0	0	0	0	0.0%	20.0%
2/12/2015 23:15	12	0	9	2	0	0	0	0	0	1	0	0	0	0	0.0%	8.3%
2/12/2015 23:30	8	1	1	3	0	0	1	0	0	2	0	0	0	0	12.5%	25.0%
2/12/2015 23:45	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Totals	**2282**	**7**	**1164**	**668**	**22**	**17**	**24**	**6**	**17**	**333**	**1**	**12**	**10**	**1**	**3.0%**	**16.4%**

AM Peak Hr	**5:15 AM**
AM Peak Vol	**157**
AM PHF	**0.665**
PM Peak Hr	**5:00 PM**
PM Peak Vol	**204**
PM PHF	**0.823**

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	2
File Number:	1500536	Direction:	WB
Route:	I-40 WB ON RAMP	Latitude:	35.23761
Location:	At HUGHES AVE	Longitude:	-111.82431

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 0:00	8	0	3	0	0	0	0	0	0	4	0	1	0	0	0.0%	62.5%
2/12/2015 0:15	3	0	1	0	0	0	0	0	0	2	0	0	0	0	0.0%	66.7%
2/12/2015 0:30	5	0	1	1	0	0	1	0	0	2	0	0	0	0	20.0%	40.0%
2/12/2015 0:45	4	0	0	0	0	0	0	1	0	3	0	0	0	0	25.0%	75.0%
2/12/2015 1:00	6	1	1	0	0	0	1	0	0	3	0	0	0	0	16.7%	50.0%
2/12/2015 1:15	3	0	1	1	0	0	0	0	0	1	0	0	0	0	0.0%	33.3%
2/12/2015 1:30	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0.0%	50.0%
2/12/2015 1:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--
2/12/2015 2:00	4	0	0	1	0	0	0	0	0	3	0	0	0	0	0.0%	75.0%
2/12/2015 2:15	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0%	100.0%
2/12/2015 2:30	4	0	1	0	0	0	0	0	0	3	0	0	0	0	0.0%	75.0%
2/12/2015 2:45	5	0	1	1	1	0	0	0	0	2	0	0	0	0	20.0%	40.0%
2/12/2015 3:00	7	0	3	0	0	0	0	0	0	3	0	0	1	0	0.0%	57.1%
2/12/2015 3:15	3	0	1	1	0	0	0	0	0	1	0	0	0	0	0.0%	33.3%
2/12/2015 3:30	3	0	1	1	0	0	0	0	0	1	0	0	0	0	0.0%	33.3%
2/12/2015 3:45	6	0	2	1	0	0	1	0	0	2	0	0	0	0	16.7%	33.3%
2/12/2015 4:00	3	0	0	1	0	0	0	0	0	2	0	0	0	0	0.0%	66.7%
2/12/2015 4:15	7	0	1	0	0	0	1	0	0	5	0	0	0	0	14.3%	71.4%
2/12/2015 4:30	4	0	2	1	0	0	0	0	0	1	0	0	0	0	0.0%	25.0%
2/12/2015 4:45	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0%	100.0%
2/12/2015 5:00	7	0	1	5	0	0	0	0	0	1	0	0	0	0	0.0%	14.3%
2/12/2015 5:15	10	0	3	4	0	0	1	0	0	2	0	0	0	0	10.0%	20.0%
2/12/2015 5:30	9	1	2	2	0	0	0	0	1	2	1	0	0	0	0.0%	44.4%
2/12/2015 5:45	4	0	3	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
2/12/2015 6:00	15	0	4	4	0	0	0	0	0	7	0	0	0	0	0.0%	46.7%
2/12/2015 6:15	8	0	5	1	1	0	0	0	0	1	0	0	0	0	12.5%	12.5%
2/12/2015 6:30	16	1	5	4	0	0	1	0	0	5	0	0	0	0	6.3%	31.3%
2/12/2015 6:45	9	0	3	1	0	0	0	0	0	3	0	0	2	0	0.0%	55.6%
2/12/2015 7:00	11	2	4	1	0	0	0	1	0	3	0	0	0	0	9.1%	27.3%
2/12/2015 7:15	9	0	2	2	0	0	0	0	0	5	0	0	0	0	0.0%	55.6%
2/12/2015 7:30	14	0	3	3	1	1	0	0	0	6	0	0	0	0	14.3%	42.9%
2/12/2015 7:45	15	0	4	5	1	0	0	0	0	5	0	0	0	0	6.7%	33.3%
2/12/2015 8:00	16	0	9	3	1	2	0	0	0	1	0	0	0	0	18.8%	6.3%
2/12/2015 8:15	11	0	2	3	0	0	0	0	0	6	0	0	0	0	0.0%	54.5%
2/12/2015 8:30	16	1	5	1	0	0	2	0	1	6	0	0	0	0	12.5%	43.8%
2/12/2015 8:45	14	0	5	5	0	1	1	0	0	2	0	0	0	0	14.3%	14.3%
2/12/2015 9:00	18	0	6	1	0	0	0	0	1	10	0	0	0	0	0.0%	61.1%
2/12/2015 9:15	17	0	7	2	0	0	1	1	0	6	0	0	0	0	11.8%	35.3%
2/12/2015 9:30	13	1	1	4	0	0	1	0	0	6	0	0	0	0	7.7%	46.2%
2/12/2015 9:45	16	0	5	3	1	0	0	0	0	7	0	0	0	0	6.3%	43.8%
2/12/2015 10:00	22	0	7	3	0	1	0	0	0	10	1	0	0	0	4.5%	50.0%
2/12/2015 10:15	15	0	6	4	0	0	0	0	0	5	0	0	0	0	0.0%	33.3%
2/12/2015 10:30	15	1	6	3	0	0	1	0	0	4	0	0	0	0	6.7%	26.7%
2/12/2015 10:45	13	0	5	1	0	0	1	0	0	5	1	0	0	0	7.7%	46.2%
2/12/2015 11:00	22	0	5	5	0	0	0	0	0	12	0	0	0	0	0.0%	54.5%
2/12/2015 11:15	22	0	9	7	1	0	0	0	0	5	0	0	0	0	4.5%	22.7%
2/12/2015 11:30	18	0	9	4	0	1	1	0	0	3	0	0	0	0	11.1%	16.7%
2/12/2015 11:45	21	0	13	2	0	0	0	0	1	4	1	0	0	0	0.0%	28.6%

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

Client:	Burgess and Niple	Site Ref:	2
File Number:	1500536	Direction:	WB
Route:	I-40 WB ON RAMP	Latitude:	35.23761
Location:	At HUGHES AVE	Longitude:	-111.82431

Date/Time	Total	cls01	cls02	cls03	cls04	cls05	cls06	cls07	cls08	cls09	cls10	cls11	cls12	cls13	pct SU	pct CB
2/12/2015 12:00	14	0	6	3	0	2	0	0	0	3	0	0	0	0	14.3%	21.4%
2/12/2015 12:15	18	1	7	4	0	0	1	0	0	4	1	0	0	0	5.6%	27.8%
2/12/2015 12:30	22	0	9	6	0	0	1	0	0	5	0	1	0	0	4.5%	27.3%
2/12/2015 12:45	31	0	18	5	0	1	1	0	0	6	0	0	0	0	6.5%	19.4%
2/12/2015 13:00	21	0	12	5	0	0	1	0	0	3	0	0	0	0	4.8%	14.3%
2/12/2015 13:15	17	0	6	3	1	1	0	1	0	5	0	0	0	0	17.6%	29.4%
2/12/2015 13:30	13	0	4	3	0	0	0	0	0	6	0	0	0	0	0.0%	46.2%
2/12/2015 13:45	19	0	11	6	0	0	0	0	1	1	0	0	0	0	0.0%	10.5%
2/12/2015 14:00	16	0	7	2	0	0	1	0	0	4	0	2	0	0	6.3%	37.5%
2/12/2015 14:15	23	0	10	6	0	0	0	1	0	4	2	0	0	0	4.3%	26.1%
2/12/2015 14:30	21	0	13	6	0	0	0	0	0	1	0	1	0	0	0.0%	9.5%
2/12/2015 14:45	21	0	13	5	0	0	0	0	0	3	0	0	0	0	0.0%	14.3%
2/12/2015 15:00	16	0	5	5	1	0	0	0	0	5	0	0	0	0	6.3%	31.3%
2/12/2015 15:15	16	0	4	7	0	1	0	0	0	4	0	0	0	0	6.3%	25.0%
2/12/2015 15:30	14	0	7	1	0	0	0	0	0	6	0	0	0	0	0.0%	42.9%
2/12/2015 15:45	20	0	11	3	0	0	0	0	0	5	1	0	0	0	0.0%	30.0%
2/12/2015 16:00	18	0	10	2	1	0	1	0	0	4	0	0	0	0	11.1%	22.2%
2/12/2015 16:15	29	0	12	10	0	0	1	0	0	5	0	0	1	0	3.4%	20.7%
2/12/2015 16:30	26	0	15	7	0	0	0	0	0	4	0	0	0	0	0.0%	15.4%
2/12/2015 16:45	13	0	5	3	0	0	0	0	0	5	0	0	0	0	0.0%	38.5%
2/12/2015 17:00	19	0	6	7	1	0	0	0	0	5	0	0	0	0	5.3%	26.3%
2/12/2015 17:15	27	0	10	10	0	0	0	0	0	6	0	0	1	0	0.0%	25.9%
2/12/2015 17:30	20	0	9	3	0	0	1	1	2	4	0	0	0	0	10.0%	30.0%
2/12/2015 17:45	20	0	10	4	0	1	0	0	0	5	0	0	0	0	5.0%	25.0%
2/12/2015 18:00	17	0	8	4	1	0	0	0	0	3	0	0	1	0	5.9%	23.5%
2/12/2015 18:15	22	0	10	4	0	0	0	0	0	7	0	1	0	0	0.0%	36.4%
2/12/2015 18:30	16	0	9	1	0	1	2	0	0	3	0	0	0	0	18.8%	18.8%
2/12/2015 18:45	12	0	6	0	0	0	0	1	0	4	0	1	0	0	8.3%	41.7%
2/12/2015 19:00	8	0	4	3	0	0	0	0	0	1	0	0	0	0	0.0%	12.5%
2/12/2015 19:15	15	0	8	2	0	0	0	0	0	5	0	0	0	0	0.0%	33.3%
2/12/2015 19:30	8	0	4	0	0	0	1	0	0	3	0	0	0	0	12.5%	37.5%
2/12/2015 19:45	15	0	6	4	0	0	0	0	0	5	0	0	0	0	0.0%	33.3%
2/12/2015 20:00	6	0	3	0	0	0	0	0	0	3	0	0	0	0	0.0%	50.0%
2/12/2015 20:15	4	0	0	1	0	0	0	0	0	3	0	0	0	0	0.0%	75.0%
2/12/2015 20:30	15	1	6	2	2	0	0	0	0	4	0	0	0	0	13.3%	26.7%
2/12/2015 20:45	5	0	1	2	0	0	0	0	0	2	0	0	0	0	0.0%	40.0%
2/12/2015 21:00	14	0	5	3	0	0	1	0	0	5	0	0	0	0	7.1%	35.7%
2/12/2015 21:15	3	0	0	1	0	0	0	0	0	2	0	0	0	0	0.0%	66.7%
2/12/2015 21:30	6	0	2	0	1	0	0	0	0	3	0	0	0	0	16.7%	50.0%
2/12/2015 21:45	7	0	4	0	0	0	0	0	0	3	0	0	0	0	0.0%	42.9%
2/12/2015 22:00	13	0	6	2	0	1	1	0	0	3	0	0	0	0	15.4%	23.1%
2/12/2015 22:15	11	0	6	0	1	0	0	0	0	4	0	0	0	0	9.1%	36.4%
2/12/2015 22:30	3	0	1	0	0	0	0	0	0	0	0	1	1	0	0.0%	66.7%
2/12/2015 22:45	5	0	3	0	0	0	0	0	0	2	0	0	0	0	0.0%	40.0%
2/12/2015 23:00	10	0	4	1	0	0	1	0	0	4	0	0	0	0	10.0%	40.0%
2/12/2015 23:15	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0.0%	50.0%
2/12/2015 23:30	5	1	1	0	0	0	1	0	0	2	0	0	0	0	20.0%	40.0%
2/12/2015 23:45	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Totals	**1172**	**11**	**477**	**240**	**16**	**14**	**29**	**7**	**7**	**348**	**8**	**8**	**7**	**0**	**5.6%**	**32.3%**

AM Peak Hr	**11:00 AM**
AM Peak Vol	**83**
AM PHF	**0.943**
PM Peak Hr	**3:45 PM**
PM Peak Vol	**93**
PM PHF	**0.802**

TRUCK PERCENTAGE CALCULATIONS

Intersection: 150009 Hughes Avenue & I-40 EB Ramp

AM PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	47	9	0	0	0	0	0	0	0	3	3	0	8	1	0	0
7:15	35	7	0	0	0	0	0	0	0	1	4	0	12	0	1	0
7:30	57	16	0	0	0	0	0	0	0	1	3	0	10	0	4	0
7:45	42	15	0	0	0	0	0	0	0	1	5	0	7	0	2	0
TOTAL	181	47	0	0	0	0	0	0	0	6	15	0	37	1	7	0

Buses

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0
7:30	0	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0
7:45	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	3	0	0	0	0	0	0	0	2	2	0	1	0	0	0

Articulated Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	6	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
7:15	4	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
7:30	9	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0
7:45	3	1	0	0	0	0	0	0	0	0	0	0	4	0	0	0
TOTAL	22	1	0	0	0	0	0	0	0	0	0	0	18	0	1	0

	North LT	North Thru	North RT	North Ped	East LT	East Thru	East RT	East Ped	South LT	South Thru	South RT	South Ped	West LT	West Thru	West RT	West Ped
Truck %	13.3%	8.5%								33.3%	13.3%		51.4%	0.0%	14.3%	

Midday PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	24	21	0	0	0	0	0	0	0	20	7	0	10	0	0	0
11:15	19	11	0	0	0	0	0	0	0	11	11	0	12	1	3	0
11:30	15	14	0	0	0	0	0	0	0	11	6	0	7	0	0	0
11:45	19	12	0	0	0	0	0	0	0	7	0	0	14	1	1	0
TOTAL	77	58	0	0	0	0	0	0	0	49	24	0	43	2	4	0

Buses

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0
11:30	1	2	0	0	0	0	0	0	0	2	0	0	2	0	0	0
11:45	2	1	0	0	0	0	0	0	0	0	0	0	2	1	0	0
TOTAL	3	3	0	0	0	0	0	0	0	2	4	0	6	1	0	0

Articulated Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	9	2	0	0	0	0	0	0	0	2	1	0	3	0	0	0
11:15	4	1	0	0	0	0	0	0	0	0	1	0	4	0	1	0
11:30	3	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0
11:45	2	2	0	0	0	0	0	0	0	0	0	0	8	0	0	0
TOTAL	18	6	0	0	0	0	0	0	0	3	2	0	16	0	1	0

Truck %	27.3%	15.5%								10.2%	25.0%		51.2%	50.0%	25.0%	

PM Peak Hour

All Vehicles

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	25	6	0	0	0	0	0	0	0	6	16	0	14	0	0	0
17:15	21	6	0	0	0	0	0	0	0	8	10	0	15	0	2	0
17:30	17	10	0	0	0	0	0	0	0	5	5	0	8	0	3	0
17:45	11	6	0	0	0	0	0	0	0	4	4	0	17	0	1	0
TOTAL	74	28	0	0	0	0	0	0	0	23	35	0	54	0	6	0

Buses

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	1	3	0	0	0	0	0	0	0	0	3	0	1	0	0	0
17:15	2	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0
17:30	1	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
TOTAL	4	4	0	0	0	0	0	0	0	2	5	0	2	0	1	0

Articulated Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 EB ON RAMP				HUGHES AVE				I-40 EB OFF RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	9	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0
17:15	2	1	0	0	0	0	0	0	0	1	1	0	3	0	0	0
17:30	1	2	0	0	0	0	0	0	0	1	0	0	3	0	0	0
17:45	3	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
TOTAL	15	3	0	0	0	0	0	0	0	2	2	0	18	0	0	0

Truck %	25.7%	25.0%								17.4%	20.0%		37.0%		16.7%	

TRUCK PERCENTAGE CALCULATIONS

Intersection: 1500010 Hughes Avenue & I-40 WB Ramp

AM PEAK HOUR

All Vehicles

	From North HUGHES AVE				From East I-40 WB OFF RAMP				From South HUGHES AVE				From West I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	49	9	0	7	1	14	0	1	8	0	0	0	0	0	0
7:15	0	37	8	0	6	0	14	0	0	13	0	0	0	0	0	0
7:30	0	61	12	0	10	1	18	0	1	11	0	0	0	0	0	0
7:45	0	45	17	0	13	0	21	0	0	8	0	0	0	0	0	0
TOTAL	0	192	46	0	36	2	67	0	2	40	0	0	0	0	0	0

Buses

	From North HUGHES AVE				From East I-40 WB OFF RAMP				From South HUGHES AVE				From West I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
7:30	0	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0
7:45	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
TOTAL	0	1	3	0	0	0	4	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North HUGHES AVE				From East I-40 WB OFF RAMP				From South HUGHES AVE				From West I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	1	0	1	0	0	2	0	0	0	0	0	0
7:30	0	1	0	0	0	0	3	0	1	0	0	0	0	0	0	0
7:45	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	2	2	0	1	0	4	0	1	2	0	0	0	0	0	0

Articulated Trucks

	From North HUGHES AVE				From East I-40 WB OFF RAMP				From South HUGHES AVE				From West I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	6	4	0	0	0	7	0	0	5	0	0	0	0	0	0
7:15	0	5	5	0	0	0	5	0	0	6	0	0	0	0	0	0
7:30	0	8	5	0	0	1	1	0	0	3	0	0	0	0	0	0
7:45	0	4	5	0	0	0	5	0	0	4	0	0	0	0	0	0
TOTAL	0	23	19	0	0	1	18	0	0	18	0	0	0	0	0	0
Truck %		13.5%	52.2%		2.8%	50.0%	38.8%		50.0%	50.0%						

Midday PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	HUGHES AVE				I-40 WB OFF RAMP				HUGHES AVE				I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	37	13	0	7	0	19	0	6	26	0	0	0	0	0	0
11:15	0	27	19	0	4	0	23	0	3	20	0	0	0	0	0	0
11:30	0	19	15	0	8	0	23	0	2	16	0	0	0	0	0	0
11:45	0	25	19	0	5	0	23	0	3	18	0	0	0	0	0	0
TOTAL	0	108	66	0	24	0	88	0	14	80	0	0	0	0	0	0

Buses

	From North				From East				From South				From West			
	HUGHES AVE				I-40 WB OFF RAMP				HUGHES AVE				I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
11:30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 WB OFF RAMP				HUGHES AVE				I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0
11:15	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0
11:30	0	1	1	0	1	0	0	0	1	2	0	0	0	0	0	0
11:45	0	2	0	0	1	0	2	0	1	2	0	0	0	0	0	0
TOTAL	0	3	3	0	2	0	5	0	2	6	0	0	0	0	0	0

Articulated Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 WB OFF RAMP				HUGHES AVE				I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	7	8	0	2	0	6	0	3	3	0	0	0	0	0	0
11:15	0	5	5	0	1	0	8	0	0	4	0	0	0	0	0	0
11:30	0	3	3	0	1	0	5	0	0	2	0	0	0	0	0	0
11:45	0	3	6	0	1	0	4	0	0	7	0	0	0	0	0	0
TOTAL	0	18	22	0	5	0	23	0	3	16	0	0	0	0	0	0
Truck %		19.4%	39.4%		29.2%		33.0%		35.7%	27.5%						

PM Peak Hour

All Vehicles

	From North				From East				From South				From West			
	HUGHES AVE				I-40 WB OFF RAMP				HUGHES AVE				I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	29	15	0	2	0	46	0	3	16	0	0	0	0	0	0
17:15	0	24	19	0	3	0	52	0	5	20	0	0	0	0	0	0
17:30	0	20	21	0	7	0	42	0	1	11	0	0	0	0	0	0
17:45	0	14	15	0	6	0	35	0	1	21	0	0	0	0	0	0
TOTAL	0	87	70	0	18	0	175	0	10	68	0	0	0	0	0	0

Buses

	From North				From East				From South				From West			
	HUGHES AVE				I-40 WB OFF RAMP				HUGHES AVE				I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
17:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
TOTAL	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 WB OFF RAMP				HUGHES AVE				I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	4	2	0	0	0	1	0	0	1	0	0	0	0	0	0
17:15	0	2	0	0	0	0	1	0	1	1	0	0	0	0	0	0
17:30	0	2	1	0	0	0	1	0	1	1	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	8	3	0	0	0	3	0	2	3	0	0	0	0	0	0

Articulated Trucks

	From North				From East				From South				From West			
	HUGHES AVE				I-40 WB OFF RAMP				HUGHES AVE				I-40 WB ON RAMP			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	9	4	0	0	0	7	0	0	6	0	0	0	0	0	0
17:15	0	2	5	0	1	0	7	0	0	4	0	0	0	0	0	0
17:30	0	1	7	0	2	0	9	0	0	3	0	0	0	0	0	0
17:45	0	5	4	0	0	0	6	0	0	8	0	0	0	0	0	0
TOTAL	0	17	20	0	3	0	29	0	0	21	0	0	0	0	0	0

Truck %		31.0%	32.9%		16.7%		19.4%		20.0%	35.3%						

TRUCK PERCENTAGE CALCULATIONS

Intersection: 1500011 Hughes Avenue & Brannigan Park Road

AM PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	1	10	0	0	46	0	0	0	0	12	9	0	0	0	0	0
7:15	0	8	0	0	38	0	0	0	0	10	15	0	0	1	0	0
7:30	0	15	0	0	58	0	0	0	0	10	20	0	0	1	1	0
7:45	1	11	0	0	49	2	0	0	0	10	20	0	0	1	2	0
TOTAL	2	44	0	0	191	2	0	0	0	42	64	0	0	3	3	0

Buses

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
7:30	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0
7:45	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
TOTAL	0	0	0	0	4	0	0	0	0	0	4	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
7:30	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0
7:45	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0
TOTAL	0	1	0	0	1	0	0	0	0	3	4	0	0	0	0	0

Articulated Trucks

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	10	0	0	0	0	0	0	0	11	1	0	0	0	0	0
7:15	0	8	0	0	1	0	0	0	0	9	0	0	0	0	0	0
7:30	0	14	0	0	0	0	0	0	0	6	0	0	0	0	0	0
7:45	0	10	0	0	0	0	0	0	0	9	0	0	0	0	0	0
TOTAL	0	42	0	0	1	0	0	0	0	35	1	0	0	0	0	0
Truck %	0.0%	97.7%			3.1%	0.0%				90.5%	14.1%			0.0%	0.0%	

Midday PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	15	0	0	37	2	0	0	0	9	39	0	0	0	0	0
11:15	0	10	0	0	37	1	0	0	1	12	28	0	0	0	0	0
11:30	2	6	0	0	26	0	0	0	0	12	29	0	0	0	0	0
11:45	1	10	0	0	32	1	0	0	2	13	26	0	0	0	2	0
TOTAL	3	41	0	0	132	4	0	0	3	46	122	0	0	0	2	0

Buses

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
11:30	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	1	1	0	0	0	0	3	0	0	0	0	0
11:15	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0
11:30	0	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0
11:45	0	1	0	0	1	0	0	0	0	3	2	0	0	0	0	0
TOTAL	0	1	0	0	4	1	0	0	0	4	9	0	0	0	0	0

Articulated Trucks

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	15	0	0	0	0	0	0	0	8	0	0	0	0	0	0
11:15	0	10	0	0	0	0	0	0	0	11	0	0	0	0	0	0
11:30	0	6	0	0	0	0	0	0	0	8	0	0	0	0	0	0
11:45	0	9	0	0	0	0	0	0	0	10	0	0	0	0	0	0
TOTAL	0	40	0	0	0	0	0	0	0	37	0	0	0	0	0	0

	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
Truck %	0.0%	100.0%			3.8%	25.0%			0.0%	89.1%	8.2%				0.0%	

PM Peak Hour

All Vehicles

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	14	0	0	29	1	0	0	3	14	44	0	0	0	1	0
17:15	0	10	0	0	32	3	0	0	3	13	57	0	0	1	1	0
17:30	0	9	0	0	31	1	0	0	1	13	41	0	0	1	1	0
17:45	1	9	0	0	20	0	0	0	1	15	39	0	0	1	0	0
TOTAL	1	42	0	0	112	5	0	0	8	55	181	0	0	3	3	0

Buses

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
17:15	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	5	0	0	0	0	2	1	0	0	0	0	0
17:15	0	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0
17:30	0	1	0	0	2	0	0	0	0	1	1	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	2	0	0	8	0	0	0	0	4	3	0	0	0	0	0

Articulated Trucks

	From North				From East				From South				From West			
	HUGHES AVE				BRANNIGAN PARK RD				HUGHES AVE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	13	0	0	0	0	0	0	1	11	0	0	0	0	0	0
17:15	0	7	0	0	0	0	0	0	0	12	0	0	0	0	0	0
17:30	0	8	0	0	0	0	0	0	0	12	0	0	0	0	0	0
17:45	0	9	0	0	0	0	0	0	0	14	0	0	0	0	0	0
TOTAL	0	37	0	0	0	0	0	0	1	49	0	0	0	0	0	0

Truck %	0.0%	92.9%			8.9%	0.0%			12.5%	96.4%	2.2%			0.0%	0.0%	

TRUCK PERCENTAGE CALCULATIONS

Intersection: 1500012 Brannigan Park Rd & Pilot Middle Driveway

AM PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	10	0	0	37	2	0	0	0	0	0	8	3	0	0
7:15	1	0	7	0	0	29	1	0	0	0	0	0	10	5	0	0
7:30	0	0	13	0	0	45	2	0	0	0	0	0	16	8	0	0
7:45	1	0	19	0	0	32	3	0	0	0	0	0	12	8	0	0
TOTAL	2	0	49	0	0	143	8	0	0	0	0	0	46	24	0	0

Buses

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
7:30	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0
7:45	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
TOTAL	0	0	1	0	0	3	0	0	0	0	0	0	1	3	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
7:30	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
7:45	0	0	1	0	0	2	0	0	0	0	0	0	0	1	0	0
TOTAL	0	0	1	0	0	3	0	0	0	0	0	0	1	3	0	0

Articulated Trucks

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
7:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
7:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0

	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
Truck %	0.0%		6.1%			4.9%	0.0%						6.5%	25.0%		

Midday PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	1	0	28	0	0	10	1	0	0	0	0	0	31	6	0	0
11:15	1	0	24	0	0	12	1	0	0	0	0	0	22	6	0	0
11:30	0	0	16	0	0	12	1	0	0	0	0	0	25	6	0	0
11:45	1	0	25	0	0	7	3	0	0	0	0	0	16	10	0	0
TOTAL	3	0	93	0	0	41	6	0	0	0	0	0	94	28	0	0

Buses

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	1	0	0	0	0	0	0	2	1	0	0
11:15	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0
11:30	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0
11:45	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0
TOTAL	0	0	3	0	0	2	0	0	0	0	0	0	4	4	0	0

Articulated Trucks

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	North LT	North Thru	North RT	North Ped	East LT	East Thru	East RT	East Ped	South LT	South Thru	South RT	South Ped	West LT	West Thru	West RT	West Ped
Truck %	0.0%		3.2%			7.3%	0.0%						5.3%	14.3%		

PM Peak Hour

All Vehicles

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	17	0	0	12	1	0	0	0	0	0	29	16	0	0
17:15	1	0	23	0	0	11	2	0	0	0	0	0	25	32	0	0
17:30	3	0	16	0	0	16	1	0	0	0	0	0	22	20	0	0
17:45	0	0	13	0	0	7	0	0	0	0	0	0	22	20	0	0
TOTAL	4	0	69	0	0	46	4	0	0	0	0	0	98	88	0	0

Buses

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
17:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	1	0	0	3	0	0	0	0	0	0	0	1	0	0
17:15	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
17:30	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	1	0	0	6	0	0	0	0	0	0	1	3	0	0

Articulated Trucks

	From North				From East				From South				From West			
	PILOT MIDDLE DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Truck %	0.0%		1.4%			15.2%	0.0%						1.0%	4.5%		

TRUCK PERCENTAGE CALCULATIONS

Intersection: 1500013 Brannigan Park & Pilot East Driveway

AM PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	1	0	1	0	0	39	4	0	0	0	0	0	1	2	0	0
7:15	0	0	2	0	0	30	3	0	0	0	0	0	1	4	0	0
7:30	0	0	2	0	0	43	2	0	0	0	0	0	0	9	0	0
7:45	1	0	1	0	0	35	0	0	0	0	0	0	1	8	0	0
TOTAL	2	0	6	0	0	147	9	0	0	0	0	0	3	23	0	0

Buses

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0
7:45	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	2	0	0	2	0	0	0	0	0	0	0	2	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
7:30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
7:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0

Articulated Trucks

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	North LT	North Thru	North RT	North Ped	East LT	East Thru	East RT	East Ped	South LT	South Thru	South RT	South Ped	West LT	West Thru	West RT	West Ped
Truck %	0.0%		33.3%			1.4%	0.0%						0.0%	17.4%		

Midday PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	1	0	2	0	0	9	1	0	0	0	0	0	1	6	0	0
11:15	1	0	4	0	0	9	2	0	0	0	0	0	3	4	0	0
11:30	3	0	3	0	0	10	1	0	0	0	0	0	3	4	0	0
11:45	2	0	3	0	0	8	0	0	0	0	0	0	1	9	0	0
TOTAL	7	0	12	0	0	36	4	0	0	0	0	0	8	23	0	0

Buses

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11:30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0
TOTAL	0	0	3	0	0	0	0	0	0	0	0	0	3	1	0	0

Articulated Trucks

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Truck %	0.0%		33.3%			0.0%	0.0%						37.5%	4.3%		

PM Peak Hour

All Vehicles

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	5	0	0	0	0	12	2	0	0	0	0	0	0	16	0	0
17:15	6	0	4	0	0	9	2	0	0	0	0	0	1	33	0	0
17:30	5	0	4	0	0	13	0	0	0	0	0	0	0	23	0	0
17:45	5	0	1	0	0	6	0	0	0	0	0	0	0	20	0	0
TOTAL	21	0	9	0	0	40	4	0	0	0	0	0	1	92	0	0

Buses

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0
17:15	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	1	0	0	1	0	0	0	0	0	0	0	2	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	2	0	0	3	0	0	0	0	0	0	0	3	0	0

Articulated Trucks

	From North				From East				From South				From West			
	PILOT EAST DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Truck %	0.0%		22.2%			7.5%	0.0%						0.0%	3.3%		

TRUCK PERCENTAGE CALCULATIONS

Intersection: 1500014 Brannigan Park & Days Inn

AM PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	43	0	0	0	0	0	0	0	3	0	0
7:15	0	0	0	0	0	31	0	0	0	0	0	0	0	4	0	0
7:30	0	0	1	0	0	46	1	0	0	0	0	0	0	8	0	0
7:45	0	0	1	0	0	33	0	0	0	0	0	0	1	9	0	0
TOTAL	0	0	2	0	0	153	1	0	0	0	0	0	1	24	0	0

Buses

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0
7:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
7:30	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
7:45	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	1	0	0	1	1	0	0	0	0	0	0	2	0	0

Articulated Trucks

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	N LT	N Thru	N RT	N Ped	E LT	E Thru	E RT	E Ped	S LT	S Thru	S RT	S Ped	W LT	W Thru	W RT	W Ped
Truck %			50.0%			2.0%	100.0%						0.0%	16.7%		

Midday PEAK HOUR

All Vehicles

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	10	0	0	0	0	0	0	0	7	0	0
11:15	0	0	0	0	0	10	0	0	0	0	0	0	0	5	0	0
11:30	0	0	0	0	0	12	0	0	0	0	0	0	0	7	0	0
11:45	0	0	0	0	0	8	0	0	0	0	0	0	0	11	0	0
TOTAL	0	0	0	0	0	40	0	0	0	0	0	0	0	30	0	0

Buses

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Articulated Trucks

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	From North				From East				From South				From West			
Truck %						0.0%								3.3%		

PM Peak Hour

All Vehicles

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	1	0	0	14	0	0	0	0	0	0	0	20	0	0
17:15	2	0	0	0	0	11	0	0	0	0	0	0	0	40	0	0
17:30	0	0	0	0	0	13	0	0	0	0	0	0	2	26	0	0
17:45	0	0	0	0	0	6	0	0	0	0	0	0	1	24	0	0
TOTAL	2	0	1	0	0	44	0	0	0	0	0	0	3	110	0	0

Buses

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Single-Unit Trucks

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	4	0	0	0	0	0	0	1	2	0	0

Articulated Trucks

	From North				From East				From South				From West			
	MOTEL 6 DRIVEWAY				BRANNIGAN PARK RD				NONE				BRANNIGAN PARK RD			
	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped	LT	Thru	RT	Ped
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	North LT	North Thru	North RT	North Ped	East LT	East Thru	East RT	East Ped	South LT	South Thru	South RT	South Ped	West LT	West Thru	West RT	West Ped
Truck %	0.0%		0.0%			9.1%							33.3%	1.8%		

APPENDIX FR-3

Synchro Analysis Output

HCM 2010 TWSC
2: Hughes Avenue & Interstate 40 WB On-Ramp/Interstate 40 WB Off-Ramp

3/9/2015

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	36	2	67	2	40	0	0	192	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	57	4	92	4	57	0	0	267	74

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	371	408	57	342	0	0	57	0	0
Stage 1	66	66	-	-	-	-	-	-	-
Stage 2	305	342	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	6.59	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	3.651	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	628	466	914	993	-	-	1547	-	-
Stage 1	954	755	-	-	-	-	-	-	-
Stage 2	745	561	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	625	0	914	993	-	-	1547	-	-
Mov Cap-2 Maneuver	625	0	-	-	-	-	-	-	-
Stage 1	950	0	-	-	-	-	-	-	-
Stage 2	745	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	993	-	-	625	914	1547	-	-
HCM Lane V/C Ratio	0.004	-	-	0.099	0.101	-	-	-
HCM Control Delay (s)	8.6	0	-	11.4	9.4	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.3	0	-	-

Intersection	
Int Delay, s/veh	7.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	37	1	7	0	0	0	0	6	15	181	47	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	53	4	18	0	0	0	0	13	22	252	71	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	599	610	71				71	0	0	35	0	0
Stage 1	575	575	-				-	-	-	-	-	-
Stage 2	24	35	-				-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34				4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426				2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	392	412	959				1529	-	-	1508	-	-
Stage 1	476	506	-				-	-	-	-	-	-
Stage 2	884	870	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	324	0	959				1529	-	-	1508	-	-
Mov Cap-2 Maneuver	324	0	-				-	-	-	-	-	-
Stage 1	393	0	-				-	-	-	-	-	-
Stage 2	884	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.2	0	6.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1529	-	-	324	959	1508	-	-
HCM Lane V/C Ratio	-	-	-	0.177	0.018	0.167	-	-
HCM Control Delay (s)	0	-	-	18.5	8.8	7.9	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.6	0.1	0.6	-	-

HCM research does not support more than two 'Stop' controlled approaches at the intersection.

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	46	24	143	8	2	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	72	75	79	67	50	64
Heavy Vehicles, %	7	25	5	0	0	6
Mvmt Flow	70	35	199	13	4	84

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	212	0	-	0	382	206
Stage 1	-	-	-	-	206	-
Stage 2	-	-	-	-	176	-
Critical Hdwy	4.17	-	-	-	6.4	6.26
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.263	-	-	-	3.5	3.354
Pot Cap-1 Maneuver	1329	-	-	-	624	824
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	859	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1329	-	-	-	590	824
Mov Cap-2 Maneuver	-	-	-	-	590	-
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	813	-

Approach	EB	WB	SB
HCM Control Delay, s	5.2	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1329	-	-	-	808
HCM Lane V/C Ratio	0.053	-	-	-	0.11
HCM Control Delay (s)	7.9	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.4

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	24	153	1	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	67	83	25	92	25
Heavy Vehicles, %	0	17	2	50	0	50
Mvmt Flow	4	39	203	4	0	9

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	207	0	-	0	253	205
Stage 1	-	-	-	-	205	-
Stage 2	-	-	-	-	48	-
Critical Hdwy	4.1	-	-	-	6.4	6.7
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.75
Pot Cap-1 Maneuver	1376	-	-	-	740	728
Stage 1	-	-	-	-	834	-
Stage 2	-	-	-	-	980	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1376	-	-	-	738	728
Mov Cap-2 Maneuver	-	-	-	-	738	-
Stage 1	-	-	-	-	834	-
Stage 2	-	-	-	-	977	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1376	-	-	-	728
HCM Lane V/C Ratio	0.003	-	-	-	0.012
HCM Control Delay (s)	7.6	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.6					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	23	147	9	2	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	64	85	56	50	75
Heavy Vehicles, %	0	17	1	0	0	33
Mvmt Flow	4	40	190	18	4	9

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	208	0	-	0	247	199
Stage 1	-	-	-	-	199	-
Stage 2	-	-	-	-	48	-
Critical Hdwy	4.1	-	-	-	6.4	6.53
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.597
Pot Cap-1 Maneuver	1375	-	-	-	746	769
Stage 1	-	-	-	-	839	-
Stage 2	-	-	-	-	980	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1375	-	-	-	744	769
Mov Cap-2 Maneuver	-	-	-	-	744	-
Stage 1	-	-	-	-	839	-
Stage 2	-	-	-	-	977	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1375	-	-	-	760
HCM Lane V/C Ratio	0.003	-	-	-	0.017
HCM Control Delay (s)	7.6	0	-	-	9.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.1	0.0
Total Delay (hr)	0.0	0.3	0.0	0.1	0.4
Total Del/Veh (s)	4.8	4.5	0.5	5.9	3.5
Stop Delay (hr)	0.0	0.2	0.0	0.0	0.3
Stop Del/Veh (s)	3.2	3.3	0.3	3.1	2.4

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	24	0	88	14	80	0	0	108	66
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	96	58	77	92	92	73	87
Heavy Vehicles, %	2	2	2	29	2	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	35	0	101	27	114	0	0	163	83

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	371	413	114	246	0	0	114	0	0
Stage 1	167	167	-	-	-	-	-	-	-
Stage 2	204	246	-	-	-	-	-	-	-
Critical Hdwy	6.69	6.52	6.53	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.018	3.597	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	579	529	861	1145	-	-	1475	-	-
Stage 1	801	760	-	-	-	-	-	-	-
Stage 2	770	703	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	565	0	861	1145	-	-	1475	-	-
Mov Cap-2 Maneuver	565	0	-	-	-	-	-	-	-
Stage 1	781	0	-	-	-	-	-	-	-
Stage 2	770	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	1.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1145	-	-	565	861	1475	-	-
HCM Lane V/C Ratio	0.023	-	-	0.062	0.117	-	-	-
HCM Control Delay (s)	8.2	0	-	11.8	9.7	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.4	0	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	43	2	4	0	0	0	0	49	24	77	58	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	50	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	50	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	61	4	13	0	0	0	0	88	48	106	92	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	416	440	92	92	0	0	136	0	0
Stage 1	304	304	-	-	-	-	-	-	-
Stage 2	112	136	-	-	-	-	-	-	-
Critical Hdwy	6.91	7	6.45	4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.959	4.45	3.525	2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	510	446	906	1503	-	-	1308	-	-
Stage 1	649	585	-	-	-	-	-	-	-
Stage 2	804	701	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	467	0	906	1503	-	-	1308	-	-
Mov Cap-2 Maneuver	467	0	-	-	-	-	-	-	-
Stage 1	594	0	-	-	-	-	-	-	-
Stage 2	804	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.2	0	4.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1503	-	-	467	906	1308	-	-
HCM Lane V/C Ratio	-	-	-	0.141	0.015	0.081	-	-
HCM Control Delay (s)	0	-	-	14	9	8	0	-
HCM Lane LOS	A	-	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0	0.3	-	-

HCM research does not support more than two 'Stop' controlled approaches at the intersection.

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	94	28	41	6	3	93
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	76	70	85	50	75	83
Heavy Vehicles, %	5	14	7	0	0	3
Mvmt Flow	136	44	53	13	4	123

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	66	0	-	0	376	60
Stage 1	-	-	-	-	60	-
Stage 2	-	-	-	-	316	-
Critical Hdwy	4.15	-	-	-	6.4	6.23
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.245	-	-	-	3.5	3.327
Pot Cap-1 Maneuver	1517	-	-	-	629	1003
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	744	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1517	-	-	-	571	1003
Mov Cap-2 Maneuver	-	-	-	-	571	-
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	676	-

Approach	EB	WB	SB
HCM Control Delay, s	5.7	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1517	-	-	-	978
HCM Lane V/C Ratio	0.09	-	-	-	0.131
HCM Control Delay (s)	7.6	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.3	-	-	-	0.4

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	30	40	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	68	83	92	92	92
Heavy Vehicles, %	0	3	0	0	0	0
Mvmt Flow	0	49	53	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	53	0	-	0	102	53
Stage 1	-	-	-	-	53	-
Stage 2	-	-	-	-	49	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1566	-	-	-	901	1020
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	979	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1566	-	-	-	901	1020
Mov Cap-2 Maneuver	-	-	-	-	901	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	979	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1566	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	8	23	36	4	7	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	67	64	90	50	58	75
Heavy Vehicles, %	38	4	0	0	0	33
Mvmt Flow	13	40	44	9	13	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	53	0	-	0	114	48
Stage 1	-	-	-	-	48	-
Stage 2	-	-	-	-	66	-
Critical Hdwy	4.48	-	-	-	6.4	6.53
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.542	-	-	-	3.5	3.597
Pot Cap-1 Maneuver	1351	-	-	-	887	940
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	962	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1351	-	-	-	878	940
Mov Cap-2 Maneuver	-	-	-	-	878	-
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	952	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1351	-	-	-	912
HCM Lane V/C Ratio	0.01	-	-	-	0.034
HCM Control Delay (s)	7.7	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.1	0.0
Total Delay (hr)	0.0	0.2	0.0	0.1	0.3
Total Del/Veh (s)	3.1	4.3	0.6	5.6	2.6
Stop Delay (hr)	0.0	0.1	0.0	0.0	0.2
Stop Del/Veh (s)	4.0	3.6	0.3	2.8	1.8

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	18	0	175	10	68	0	0	87	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	83	75	92
Heavy Vehicles, %	2	2	2	17	2	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	31	0	229	22	92	0	0	128	84

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				305	347	92	211	0	0	92	0	0
Stage 1				136	136	-	-	-	-	-	-	-
Stage 2				169	211	-	-	-	-	-	-	-
Critical Hdwy				6.57	6.52	6.39	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1				5.57	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.57	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.653	4.018	3.471	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver				657	576	921	1260	-	-	1503	-	-
Stage 1				855	784	-	-	-	-	-	-	-
Stage 2				826	728	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver				645	0	921	1260	-	-	1503	-	-
Mov Cap-2 Maneuver				645	0	-	-	-	-	-	-	-
Stage 1				840	0	-	-	-	-	-	-	-
Stage 2				826	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	1.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1260	-	-	645	921	1503	-	-
HCM Lane V/C Ratio	0.017	-	-	0.048	0.249	-	-	-
HCM Control Delay (s)	7.9	0	-	10.9	10.2	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	1	0	-	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	50	2	7	0	0	0	0	39	90	81	22	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	92	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	70	2	15	0	0	0	0	60	180	120	35	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	425	515	35	35	0	0	240	0	0
Stage 1	275	275	-	-	-	-	-	-	-
Stage 2	150	240	-	-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37	4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453	2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	525	466	997	1576	-	-	1198	-	-
Stage 1	697	686	-	-	-	-	-	-	-
Stage 2	799	711	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	471	0	997	1576	-	-	1198	-	-
Mov Cap-2 Maneuver	471	0	-	-	-	-	-	-	-
Stage 1	626	0	-	-	-	-	-	-	-
Stage 2	799	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	0	6.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1576	-	-	471	997	1198	-	-
HCM Lane V/C Ratio	-	-	-	0.153	0.015	0.101	-	-
HCM Control Delay (s)	0	-	-	14	8.7	8.3	0	-
HCM Lane LOS	A	-	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0	0.3	-	-

HCM research does not support more than two 'Stop' controlled approaches at the intersection.

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	98	88	46	4	4	69
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	69	72	50	33	75
Heavy Vehicles, %	1	5	15	0	0	1
Mvmt Flow	128	140	70	9	13	101

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	79	0	-	0	472	75
Stage 1	-	-	-	-	75	-
Stage 2	-	-	-	-	397	-
Critical Hdwy	4.11	-	-	-	6.4	6.21
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.309
Pot Cap-1 Maneuver	1526	-	-	-	554	989
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	683	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1526	-	-	-	504	989
Mov Cap-2 Maneuver	-	-	-	-	504	-
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	621	-

Approach	EB	WB	SB
HCM Control Delay, s	3.6	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1526	-	-	-	889
HCM Lane V/C Ratio	0.084	-	-	-	0.129
HCM Control Delay (s)	7.6	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.3	-	-	-	0.4

Intersection						
Int Delay, s/veh	0.8					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	110	44	0	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	38	69	79	92	25	25
Heavy Vehicles, %	33	2	9	0	0	0
Mvmt Flow	9	175	61	0	9	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	61	0	-	0	254	61
Stage 1	-	-	-	-	61	-
Stage 2	-	-	-	-	193	-
Critical Hdwy	4.43	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.497	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1366	-	-	-	739	1010
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	845	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1366	-	-	-	734	1010
Mov Cap-2 Maneuver	-	-	-	-	734	-
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	839	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1366	-	-	-	808
HCM Lane V/C Ratio	0.006	-	-	-	0.016
HCM Control Delay (s)	7.7	0	-	-	9.5
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	92	40	4	21	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	70	77	50	88	56
Heavy Vehicles, %	0	3	8	0	0	22
Mvmt Flow	4	145	57	9	26	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	66	0	-	0	215	62
Stage 1	-	-	-	-	62	-
Stage 2	-	-	-	-	153	-
Critical Hdwy	4.1	-	-	-	6.4	6.42
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.498
Pot Cap-1 Maneuver	1549	-	-	-	778	949
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1549	-	-	-	776	949
Mov Cap-2 Maneuver	-	-	-	-	776	-
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	877	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1549	-	-	-	837
HCM Lane V/C Ratio	0.003	-	-	-	0.052
HCM Control Delay (s)	7.3	0	-	-	9.5
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.2	0.0
Total Delay (hr)	0.0	0.2	0.1	0.1	0.3
Total Del/Veh (s)	5.0	4.4	0.7	6.4	2.4
Stop Delay (hr)	0.0	0.1	0.0	0.0	0.2
Stop Del/Veh (s)	3.8	3.5	0.3	3.5	1.6

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	36	2	109	2	40	0	0	329	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	72	6	136	6	72	0	0	416	93

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	546	593	72	510	0	0	72	0	0
Stage 1	83	83	-	-	-	-	-	-	-
Stage 2	463	510	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	6.59	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	3.651	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	497	360	896	849	-	-	1528	-	-
Stage 1	938	741	-	-	-	-	-	-	-
Stage 2	632	466	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	494	0	896	849	-	-	1528	-	-
Mov Cap-2 Maneuver	494	0	-	-	-	-	-	-	-
Stage 1	931	0	-	-	-	-	-	-	-
Stage 2	632	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	0.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	849	-	-	494	896	1528	-	-
HCM Lane V/C Ratio	0.007	-	-	0.157	0.152	-	-	-
HCM Control Delay (s)	9.3	0	-	13.6	9.7	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.6	0.5	0	-	-

HCM 2010 TWSC
3: Hughes Avenue & Interstate 40 EB Off-Ramp/Interstate 40 EB On-Ramp

Intersection	
Int Delay, s/veh	10

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	37	1	7	0	0	0	0	6	15	314	47	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	66	6	22	0	0	0	0	17	28	397	89	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	914	928	89	89	0	0	44	0	0
Stage 1	884	884	-	-	-	-	-	-	-
Stage 2	30	44	-	-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34	4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426	2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	248	270	937	1506	-	-	1496	-	-
Stage 1	332	366	-	-	-	-	-	-	-
Stage 2	878	862	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	179	0	937	1506	-	-	1496	-	-
Mov Cap-2 Maneuver	179	0	-	-	-	-	-	-	-
Stage 1	239	0	-	-	-	-	-	-	-
Stage 2	878	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	31.2	0	6.8
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1506	-	-	179	937	1496	-	-
HCM Lane V/C Ratio	-	-	-	0.401	0.023	0.266	-	-
HCM Control Delay (s)	0	-	-	38	8.9	8.3	0	-
HCM Lane LOS	A	-	-	E	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.8	0.1	1.1	-	-

HCM research does not support more than two 'Stop' controlled approaches at the intersection.

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	46	24	143	8	2	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	72	75	79	67	50	64
Heavy Vehicles, %	7	25	5	0	0	6
Mvmt Flow	88	44	250	16	6	106

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	266	0	-	0	478	258
Stage 1	-	-	-	-	258	-
Stage 2	-	-	-	-	220	-
Critical Hdwy	4.17	-	-	-	6.4	6.26
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.263	-	-	-	3.5	3.354
Pot Cap-1 Maneuver	1269	-	-	-	550	771
Stage 1	-	-	-	-	790	-
Stage 2	-	-	-	-	821	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1269	-	-	-	511	771
Mov Cap-2 Maneuver	-	-	-	-	511	-
Stage 1	-	-	-	-	790	-
Stage 2	-	-	-	-	763	-

Approach	EB	WB	SB
HCM Control Delay, s	5.4	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1269	-	-	-	752
HCM Lane V/C Ratio	0.069	-	-	-	0.148
HCM Control Delay (s)	8	0	-	-	10.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.5

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	24	153	1	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	67	83	25	92	25
Heavy Vehicles, %	0	17	2	50	0	50
Mvmt Flow	6	49	254	6	0	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	260	0	-	0	317	257
Stage 1	-	-	-	-	257	-
Stage 2	-	-	-	-	60	-
Critical Hdwy	4.1	-	-	-	6.4	6.7
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.75
Pot Cap-1 Maneuver	1316	-	-	-	680	678
Stage 1	-	-	-	-	791	-
Stage 2	-	-	-	-	968	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1316	-	-	-	677	678
Mov Cap-2 Maneuver	-	-	-	-	677	-
Stage 1	-	-	-	-	791	-
Stage 2	-	-	-	-	963	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1316	-	-	-	678
HCM Lane V/C Ratio	0.004	-	-	-	0.016
HCM Control Delay (s)	7.7	0	-	-	10.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	23	147	9	2	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	64	85	56	50	75
Heavy Vehicles, %	0	17	1	0	0	33
Mvmt Flow	6	50	239	22	6	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	261	0	-	0	311	250
Stage 1	-	-	-	-	250	-
Stage 2	-	-	-	-	61	-
Critical Hdwy	4.1	-	-	-	6.4	6.53
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.597
Pot Cap-1 Maneuver	1315	-	-	-	686	719
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	967	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1315	-	-	-	683	719
Mov Cap-2 Maneuver	-	-	-	-	683	-
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	962	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1315	-	-	-	707
HCM Lane V/C Ratio	0.004	-	-	-	0.023
HCM Control Delay (s)	7.7	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.0	0.0	0.2	0.1
Total Delay (hr)	0.1	0.5	0.0	0.1	0.7
Total Del/Veh (s)	4.5	6.2	0.5	7.6	4.5
Stop Delay (hr)	0.1	0.4	0.0	0.1	0.6
Stop Del/Veh (s)	4.4	5.1	0.4	4.8	3.6

HCM 2010 TWSC
2: Hughes Avenue & Interate 40 WB On-Ramp/Interate 40 WB Off-Ramp 5/4/2015

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	24	0	144	14	80	0	0	177	66
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	96	58	77	92	92	73	87
Heavy Vehicles, %	2	2	2	29	2	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	44	0	150	33	143	0	0	242	105

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	505	557	143	347	0	0	143	0	0
Stage 1	210	210	-	-	-	-	-	-	-
Stage 2	295	347	-	-	-	-	-	-	-
Critical Hdwy	6.69	6.52	6.53	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.018	3.597	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	482	439	829	1045	-	-	1440	-	-
Stage 1	765	728	-	-	-	-	-	-	-
Stage 2	698	635	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	466	0	829	1045	-	-	1440	-	-
Mov Cap-2 Maneuver	466	0	-	-	-	-	-	-	-
Stage 1	739	0	-	-	-	-	-	-	-
Stage 2	698	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1045	-	-	466	829	1440	-	-
HCM Lane V/C Ratio	0.032	-	-	0.095	0.181	-	-	-
HCM Control Delay (s)	8.6	0	-	13.5	10.3	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.7	0	-	-

HCM 2010 TWSC
3: Hughes Avenue & Interstate 40 EB Off-Ramp/Interstate 40 EB On-Ramp

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	43	2	4	0	0	0	0	49	24	134	58	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	50	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	50	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	77	6	17	0	0	0	0	111	60	168	116	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	592	622	116				116	0	0	171	0	0
Stage 1	451	451	-				-	-	-	-	-	-
Stage 2	141	171	-				-	-	-	-	-	-
Critical Hdwy	6.91	7	6.45				4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	6	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	6	-				-	-	-	-	-	-
Follow-up Hdwy	3.959	4.45	3.525				2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	397	346	878				1473	-	-	1268	-	-
Stage 1	550	498	-				-	-	-	-	-	-
Stage 2	779	675	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	341	0	878				1473	-	-	1268	-	-
Mov Cap-2 Maneuver	341	0	-				-	-	-	-	-	-
Stage 1	472	0	-				-	-	-	-	-	-
Stage 2	779	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.3	0	4.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1473	-	-	341	878	1268	-	-
HCM Lane V/C Ratio	-	-	-	0.242	0.019	0.132	-	-
HCM Control Delay (s)	0	-	-	18.9	9.2	8.3	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.1	0.5	-	-

HCM research does not support more than two 'Stop' controlled approaches at the intersection.

HCM 2010 TWSC
13: Brannigan Park Road & Pilot Middle Driveway

Intersection	
Int Delay, s/veh	6.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	94	28	41	6	3	93
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	76	70	85	50	75	83
Heavy Vehicles, %	5	14	7	0	0	3
Mvmt Flow	171	55	67	17	6	155

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	83	0	-	0	472	75
Stage 1	-	-	-	-	75	-
Stage 2	-	-	-	-	397	-
Critical Hdwy	4.15	-	-	-	6.4	6.23
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.245	-	-	-	3.5	3.327
Pot Cap-1 Maneuver	1495	-	-	-	554	984
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	683	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1495	-	-	-	489	984
Mov Cap-2 Maneuver	-	-	-	-	489	-
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	602	-

Approach	EB	WB	SB
HCM Control Delay, s	5.8	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1495	-	-	-	951
HCM Lane V/C Ratio	0.114	-	-	-	0.168
HCM Control Delay (s)	7.7	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.4	-	-	-	0.6

Intersection							
Int Delay, s/veh	0						

Movement	EBL	EBT		WBT	WBR	SBL	SBR
Vol, veh/h	0	30		40	0	0	0
Conflicting Peds, #/hr	0	0		0	0	0	0
Sign Control	Free	Free		Free	Free	Stop	Stop
RT Channelized	-	None		-	None	-	None
Storage Length	-	-		-	-	0	-
Veh in Median Storage, #	-	0		0	-	0	-
Grade, %	-	0		0	-	0	-
Peak Hour Factor	92	68		83	92	92	92
Heavy Vehicles, %	0	3		0	0	0	0
Mvmt Flow	0	61		67	0	0	0

Major/Minor	Major1			Major2		Minor2	
Conflicting Flow All	67	0		-	0	128	67
Stage 1	-	-		-	-	67	-
Stage 2	-	-		-	-	61	-
Critical Hdwy	4.1	-		-	-	6.4	6.2
Critical Hdwy Stg 1	-	-		-	-	5.4	-
Critical Hdwy Stg 2	-	-		-	-	5.4	-
Follow-up Hdwy	2.2	-		-	-	3.5	3.3
Pot Cap-1 Maneuver	1547	-		-	-	871	1002
Stage 1	-	-		-	-	961	-
Stage 2	-	-		-	-	967	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1547	-		-	-	871	1002
Mov Cap-2 Maneuver	-	-		-	-	871	-
Stage 1	-	-		-	-	961	-
Stage 2	-	-		-	-	967	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1547	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	8	23	36	4	7	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	67	64	90	50	58	75
Heavy Vehicles, %	38	4	0	0	0	33
Mvmt Flow	16	50	55	11	17	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	66	0	-	0	144	61
Stage 1	-	-	-	-	61	-
Stage 2	-	-	-	-	83	-
Critical Hdwy	4.48	-	-	-	6.4	6.53
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.542	-	-	-	3.5	3.597
Pot Cap-1 Maneuver	1335	-	-	-	853	924
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	945	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1335	-	-	-	843	924
Mov Cap-2 Maneuver	-	-	-	-	843	-
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	934	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1335	-	-	-	887
HCM Lane V/C Ratio	0.012	-	-	-	0.044
HCM Control Delay (s)	7.7	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.2	0.0
Total Delay (hr)	0.0	0.3	0.1	0.1	0.5
Total Del/Veh (s)	4.4	5.6	0.7	7.2	3.4
Stop Delay (hr)	0.0	0.3	0.0	0.1	0.4
Stop Del/Veh (s)	4.5	5.0	0.3	4.4	2.7

HCM 2010 TWSC
2: Hughes Avenue & Interate 40 WB On-Ramp/Interate 40 WB Off-Ramp

5/4/2015

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	18	0	309	10	68	0	0	162	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	83	75	92
Heavy Vehicles, %	2	2	2	17	2	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	39	0	368	28	116	0	0	216	105

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	440	492	116	321	0	0	116	0	0
Stage 1	171	171	-	-	-	-	-	-	-
Stage 2	269	321	-	-	-	-	-	-	-
Critical Hdwy	6.57	6.52	6.39	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1	5.57	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.57	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.653	4.018	3.471	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver	547	478	892	1144	-	-	1473	-	-
Stage 1	824	757	-	-	-	-	-	-	-
Stage 2	743	652	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	533	0	892	1144	-	-	1473	-	-
Mov Cap-2 Maneuver	533	0	-	-	-	-	-	-	-
Stage 1	803	0	-	-	-	-	-	-	-
Stage 2	743	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.8	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1144	-	-	533	892	1473	-	-
HCM Lane V/C Ratio	0.024	-	-	0.073	0.412	-	-	-
HCM Control Delay (s)	8.2	0	-	12.3	11.8	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	2	0	-	-

HCM 2010 TWSC
3: Hughes Avenue & Interstate 40 EB Off-Ramp/Interstate 40 EB On-Ramp

5/4/2015

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	50	2	7	0	0	0	0	39	90	153	22	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	92	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	87	3	19	0	0	0	0	75	226	207	43	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	645	758	43				43	0	0	301	0	0
Stage 1	457	457	-				-	-	-	-	-	-
Stage 2	188	301	-				-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37				4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453				2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	386	339	986				1566	-	-	1135	-	-
Stage 1	570	571	-				-	-	-	-	-	-
Stage 2	767	669	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	314	0	986				1566	-	-	1135	-	-
Mov Cap-2 Maneuver	314	0	-				-	-	-	-	-	-
Stage 1	463	0	-				-	-	-	-	-	-
Stage 2	767	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.8	0	7.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1566	-	-	314	986	1135	-	-
HCM Lane V/C Ratio	-	-	-	0.288	0.02	0.182	-	-
HCM Control Delay (s)	0	-	-	21	8.7	8.9	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.2	0.1	0.7	-	-

HCM research does not support more than two 'Stop' controlled approaches at the intersection.

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	98	88	46	4	4	69
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	69	72	50	33	75
Heavy Vehicles, %	1	5	15	0	0	1
Mvmt Flow	161	176	88	11	17	127

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	99	0	-	0	592	94
Stage 1	-	-	-	-	94	-
Stage 2	-	-	-	-	498	-
Critical Hdwy	4.11	-	-	-	6.4	6.21
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.309
Pot Cap-1 Maneuver	1500	-	-	-	472	966
Stage 1	-	-	-	-	935	-
Stage 2	-	-	-	-	615	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1500	-	-	-	416	966
Mov Cap-2 Maneuver	-	-	-	-	416	-
Stage 1	-	-	-	-	935	-
Stage 2	-	-	-	-	542	-

Approach	EB	WB	SB
HCM Control Delay, s	3.7	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1500	-	-	-	837
HCM Lane V/C Ratio	0.107	-	-	-	0.172
HCM Control Delay (s)	7.7	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.4	-	-	-	0.6

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	110	44	0	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	38	69	79	92	25	25
Heavy Vehicles, %	33	2	9	0	0	0
Mvmt Flow	11	220	77	0	11	6

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	77	0	-	0	319	77
Stage 1	-	-	-	-	77	-
Stage 2	-	-	-	-	242	-
Critical Hdwy	4.43	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.497	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1347	-	-	-	678	990
Stage 1	-	-	-	-	951	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1347	-	-	-	672	990
Mov Cap-2 Maneuver	-	-	-	-	672	-
Stage 1	-	-	-	-	951	-
Stage 2	-	-	-	-	796	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1347	-	-	-	753
HCM Lane V/C Ratio	0.008	-	-	-	0.022
HCM Control Delay (s)	7.7	0	-	-	9.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

HCM 2010 TWSC
17: Brannigan Park Road & Pilot East Driveway

5/4/2015

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	92	40	4	21	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	70	77	50	88	56
Heavy Vehicles, %	0	3	8	0	0	22
Mvmt Flow	6	181	72	11	33	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	83	0	-	0	269	77
Stage 1	-	-	-	-	77	-
Stage 2	-	-	-	-	192	-
Critical Hdwy	4.1	-	-	-	6.4	6.42
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.498
Pot Cap-1 Maneuver	1527	-	-	-	725	931
Stage 1	-	-	-	-	951	-
Stage 2	-	-	-	-	845	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1527	-	-	-	722	931
Mov Cap-2 Maneuver	-	-	-	-	722	-
Stage 1	-	-	-	-	951	-
Stage 2	-	-	-	-	842	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1527	-	-	-	794
HCM Lane V/C Ratio	0.004	-	-	-	0.069
HCM Control Delay (s)	7.4	0	-	-	9.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.2	0.0
Total Delay (hr)	0.0	0.3	0.1	0.1	0.6
Total Del/Veh (s)	3.4	6.3	0.9	7.9	3.0
Stop Delay (hr)	0.0	0.3	0.0	0.1	0.4
Stop Del/Veh (s)	3.6	5.7	0.4	5.1	2.3

HCM 2010 TWSC
2: Hughes Avenue & Interate 40 WB On-Ramp/Interate 40 WB Off-Ramp

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	36	2	133	2	40	0	0	404	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	86	7	166	7	86	0	0	511	112

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				666	722	86	623	0	0	86	0	0
Stage 1				99	99	-	-	-	-	-	-	-
Stage 2				567	623	-	-	-	-	-	-	-
Critical Hdwy				6.43	7	6.59	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1				5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy				3.527	4.45	3.651	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver				423	300	880	764	-	-	1510	-	-
Stage 1				922	729	-	-	-	-	-	-	-
Stage 2				566	411	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver				419	0	880	764	-	-	1510	-	-
Mov Cap-2 Maneuver				419	0	-	-	-	-	-	-	-
Stage 1				913	0	-	-	-	-	-	-	-
Stage 2				566	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.1	0.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	764	-	-	419	880	1510	-	-
HCM Lane V/C Ratio	0.009	-	-	0.221	0.189	-	-	-
HCM Control Delay (s)	9.8	0	-	16	10	0	-	-
HCM Lane LOS	A	A	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.7	0	-	-

Intersection	
Int Delay, s/veh	15.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	37	1	7	0	0	0	0	6	15	386	47	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	79	7	26	0	0	0	0	20	33	489	106	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	1119	1136	106				106	0	0	53	0	0
Stage 1	1083	1083	-				-	-	-	-	-	-
Stage 2	36	53	-				-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34				4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426				2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	184	204	917				1485	-	-	1485	-	-
Stage 1	262	296	-				-	-	-	-	-	-
Stage 2	872	855	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	120	0	917				1485	-	-	1485	-	-
Mov Cap-2 Maneuver	120	0	-				-	-	-	-	-	-
Stage 1	170	0	-				-	-	-	-	-	-
Stage 2	872	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	69.7	0	7.1
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1485	-	-	120	917	1485	-	-
HCM Lane V/C Ratio	-	-	-	0.716	0.029	0.329	-	-
HCM Control Delay (s)	0	-	-	88.3	9	8.6	0	-
HCM Lane LOS	A	-	-	F	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	3.9	0.1	1.5	-	-

HCM research does not support more than two 'Stop' controlled approaches at the intersection.

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	46	24	143	8	2	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	72	75	79	67	50	64
Heavy Vehicles, %	7	25	5	0	0	6
Mvmt Flow	105	53	299	20	7	126

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	318	0	-	0	573	309
Stage 1	-	-	-	-	309	-
Stage 2	-	-	-	-	264	-
Critical Hdwy	4.17	-	-	-	6.4	6.26
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.263	-	-	-	3.5	3.354
Pot Cap-1 Maneuver	1214	-	-	-	484	722
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	785	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1214	-	-	-	441	722
Mov Cap-2 Maneuver	-	-	-	-	441	-
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	715	-

Approach	EB	WB	SB
HCM Control Delay, s	5.5	0	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1214	-	-	-	700
HCM Lane V/C Ratio	0.087	-	-	-	0.19
HCM Control Delay (s)	8.2	0	-	-	11.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.3	-	-	-	0.7

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	24	153	1	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	67	83	25	92	25
Heavy Vehicles, %	0	17	2	50	0	50
Mvmt Flow	7	59	304	7	0	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	311	0	-	0	379	307
Stage 1	-	-	-	-	307	-
Stage 2	-	-	-	-	72	-
Critical Hdwy	4.1	-	-	-	6.4	6.7
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.75
Pot Cap-1 Maneuver	1261	-	-	-	627	633
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1261	-	-	-	623	633
Mov Cap-2 Maneuver	-	-	-	-	623	-
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	950	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1261	-	-	-	633
HCM Lane V/C Ratio	0.005	-	-	-	0.021
HCM Control Delay (s)	7.9	0	-	-	10.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	23	147	9	2	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	64	85	56	50	75
Heavy Vehicles, %	0	17	1	0	0	33
Mvmt Flow	7	59	285	27	7	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	312	0	-	0	371	299
Stage 1	-	-	-	-	299	-
Stage 2	-	-	-	-	72	-
Critical Hdwy	4.1	-	-	-	6.4	6.53
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.597
Pot Cap-1 Maneuver	1260	-	-	-	634	673
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1260	-	-	-	630	673
Mov Cap-2 Maneuver	-	-	-	-	630	-
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	950	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1260	-	-	-	658
HCM Lane V/C Ratio	0.005	-	-	-	0.03
HCM Control Delay (s)	7.9	0	-	-	10.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.2	0.0	0.2	0.1
Total Delay (hr)	0.2	0.8	0.0	0.2	1.2
Total Del/Veh (s)	8.1	8.2	0.6	8.4	6.0
Stop Delay (hr)	0.2	0.7	0.0	0.1	1.0
Stop Del/Veh (s)	7.9	7.3	0.3	5.4	5.2

HCM 2010 TWSC
2: Hughes Avenue & Interate 40 WB On-Ramp/Interate 40 WB Off-Ramp

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	24	0	174	14	80	0	0	217	66
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	96	58	77	92	92	73	87
Heavy Vehicles, %	2	2	2	29	2	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	53	0	181	40	171	0	0	297	125

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	611	673	171	422	0	0	171	0	0
Stage 1	251	251	-	-	-	-	-	-	-
Stage 2	360	422	-	-	-	-	-	-	-
Critical Hdwy	6.69	6.52	6.53	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.018	3.597	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	416	377	798	977	-	-	1406	-	-
Stage 1	732	699	-	-	-	-	-	-	-
Stage 2	650	588	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	397	0	798	977	-	-	1406	-	-
Mov Cap-2 Maneuver	397	0	-	-	-	-	-	-	-
Stage 1	699	0	-	-	-	-	-	-	-
Stage 2	650	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.9	1.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	977	-	-	397	798	1406	-	-
HCM Lane V/C Ratio	0.041	-	-	0.133	0.227	-	-	-
HCM Control Delay (s)	8.8	0	-	15.5	10.8	0	-	-
HCM Lane LOS	A	A	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.9	0	-	-

HCM 2010 TWSC
3: Hughes Avenue & Interstate 40 EB Off-Ramp/Interstate 40 EB On-Ramp

5/4/2015

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	43	2	4	0	0	0	0	49	24	166	58	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	50	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	50	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	92	7	20	0	0	0	0	133	72	208	139	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	723	759	139	139	0	0	205	0	0
Stage 1	554	554	-	-	-	-	-	-	-
Stage 2	169	205	-	-	-	-	-	-	-
Critical Hdwy	6.91	7	6.45	4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.959	4.45	3.525	2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	329	285	852	1445	-	-	1231	-	-
Stage 1	489	444	-	-	-	-	-	-	-
Stage 2	755	651	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	269	0	852	1445	-	-	1231	-	-
Mov Cap-2 Maneuver	269	0	-	-	-	-	-	-	-
Stage 1	400	0	-	-	-	-	-	-	-
Stage 2	755	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23.1	0	5.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1445	-	-	269	852	1231	-	-
HCM Lane V/C Ratio	-	-	-	0.367	0.023	0.169	-	-
HCM Control Delay (s)	0	-	-	25.9	9.3	8.5	0	-
HCM Lane LOS	A	-	-	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.6	0.1	0.6	-	-

HCM research does not support more than two 'Stop' controlled approaches at the intersection.

HCM 2010 TWSC
13: Brannigan Park Road & Pilot Middle Driveway

Intersection	
Int Delay, s/veh	6.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	94	28	41	6	3	93
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	76	70	85	50	75	83
Heavy Vehicles, %	5	14	7	0	0	3
Mvmt Flow	204	66	80	20	7	185

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	99	0	-	0	563	89
Stage 1	-	-	-	-	89	-
Stage 2	-	-	-	-	474	-
Critical Hdwy	4.15	-	-	-	6.4	6.23
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.245	-	-	-	3.5	3.327
Pot Cap-1 Maneuver	1475	-	-	-	491	966
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	630	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1475	-	-	-	420	966
Mov Cap-2 Maneuver	-	-	-	-	420	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	539	-

Approach	EB	WB	SB
HCM Control Delay, s	5.9	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1475	-	-	-	925
HCM Lane V/C Ratio	0.138	-	-	-	0.207
HCM Control Delay (s)	7.8	0	-	-	9.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.5	-	-	-	0.8

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	30	40	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	68	83	92	92	92
Heavy Vehicles, %	0	3	0	0	0	0
Mvmt Flow	0	73	80	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	80	0	-	0	153	80
Stage 1	-	-	-	-	80	-
Stage 2	-	-	-	-	73	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1531	-	-	-	843	986
Stage 1	-	-	-	-	948	-
Stage 2	-	-	-	-	955	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1531	-	-	-	843	986
Mov Cap-2 Maneuver	-	-	-	-	843	-
Stage 1	-	-	-	-	948	-
Stage 2	-	-	-	-	955	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1531	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

HCM 2010 TWSC
17: Brannigan Park Road & Pilot East Driveway

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	8	23	36	4	7	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	67	64	90	50	58	75
Heavy Vehicles, %	38	4	0	0	0	33
Mvmt Flow	20	59	66	13	20	26

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	79	0	-	0	172	73
Stage 1	-	-	-	-	73	-
Stage 2	-	-	-	-	99	-
Critical Hdwy	4.48	-	-	-	6.4	6.53
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.542	-	-	-	3.5	3.597
Pot Cap-1 Maneuver	1320	-	-	-	823	909
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	930	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1320	-	-	-	810	909
Mov Cap-2 Maneuver	-	-	-	-	810	-
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	915	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1320	-	-	-	864
HCM Lane V/C Ratio	0.015	-	-	-	0.054
HCM Control Delay (s)	7.8	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.0	0.0	0.2	0.1
Total Delay (hr)	0.1	0.5	0.1	0.2	0.8
Total Del/Veh (s)	5.8	7.2	0.8	8.0	4.1
Stop Delay (hr)	0.1	0.4	0.0	0.1	0.6
Stop Del/Veh (s)	5.8	6.7	0.3	5.1	3.4

Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	18	0	380	10	68	0	0	200	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	83	75	92
Heavy Vehicles, %	2	2	2	17	2	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	46	0	452	33	139	0	0	267	126

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	534	597	139	392	0	0	139	0	0
Stage 1	205	205	-	-	-	-	-	-	-
Stage 2	329	392	-	-	-	-	-	-	-
Critical Hdwy	6.57	6.52	6.39	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1	5.57	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.57	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.653	4.018	3.471	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver	482	416	866	1075	-	-	1445	-	-
Stage 1	795	732	-	-	-	-	-	-	-
Stage 2	697	606	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	466	0	866	1075	-	-	1445	-	-
Mov Cap-2 Maneuver	466	0	-	-	-	-	-	-	-
Stage 1	769	0	-	-	-	-	-	-	-
Stage 2	697	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.6	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1075	-	-	466	866	1445	-	-
HCM Lane V/C Ratio	0.031	-	-	0.1	0.522	-	-	-
HCM Control Delay (s)	8.5	0	-	13.6	13.6	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	3.1	0	-	-

HCM 2010 TWSC
3: Hughes Avenue & Interstate 40 EB Off-Ramp/Interstate 40 EB On-Ramp

Intersection	
Int Delay, s/veh	7.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	50	2	7	0	0	0	0	39	90	190	22	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	92	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	104	4	23	0	0	0	0	89	270	257	52	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	789	924	52	52	0	0	359	0	0
Stage 1	565	565	-	-	-	-	-	-	-
Stage 2	224	359	-	-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37	4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453	2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	315	271	975	1554	-	-	1078	-	-
Stage 1	505	511	-	-	-	-	-	-	-
Stage 2	737	631	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	238	0	975	1554	-	-	1078	-	-
Mov Cap-2 Maneuver	238	0	-	-	-	-	-	-	-
Stage 1	381	0	-	-	-	-	-	-	-
Stage 2	737	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	28	0	7.8
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1554	-	-	238	975	1078	-	-
HCM Lane V/C Ratio	-	-	-	0.454	0.024	0.238	-	-
HCM Control Delay (s)	0	-	-	32.1	8.8	9.4	0	-
HCM Lane LOS	A	-	-	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	2.2	0.1	0.9	-	-

HCM research does not support more than two 'Stop' controlled approaches at the intersection.

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	98	88	46	4	4	69
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	69	72	50	33	75
Heavy Vehicles, %	1	5	15	0	0	1
Mvmt Flow	192	210	105	13	20	152

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	119	0	-	0	707	112
Stage 1	-	-	-	-	112	-
Stage 2	-	-	-	-	595	-
Critical Hdwy	4.11	-	-	-	6.4	6.21
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.309
Pot Cap-1 Maneuver	1475	-	-	-	405	944
Stage 1	-	-	-	-	918	-
Stage 2	-	-	-	-	555	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1475	-	-	-	345	944
Mov Cap-2 Maneuver	-	-	-	-	345	-
Stage 1	-	-	-	-	918	-
Stage 2	-	-	-	-	473	-

Approach	EB	WB	SB
HCM Control Delay, s	3.7	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1475	-	-	-	785
HCM Lane V/C Ratio	0.131	-	-	-	0.219
HCM Control Delay (s)	7.8	0	-	-	10.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.4	-	-	-	0.8

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	110	44	0	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	38	69	79	92	25	25
Heavy Vehicles, %	33	2	9	0	0	0
Mvmt Flow	13	263	92	0	13	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	92	0	-	0	381	92
Stage 1	-	-	-	-	92	-
Stage 2	-	-	-	-	289	-
Critical Hdwy	4.43	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.497	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1329	-	-	-	625	971
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	765	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1329	-	-	-	618	971
Mov Cap-2 Maneuver	-	-	-	-	618	-
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	757	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	10.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1329	-	-	-	703
HCM Lane V/C Ratio	0.01	-	-	-	0.028
HCM Control Delay (s)	7.7	0	-	-	10.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	92	40	4	21	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	70	77	50	88	56
Heavy Vehicles, %	0	3	8	0	0	22
Mvmt Flow	7	217	86	13	39	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	99	0	-	0	322	92
Stage 1	-	-	-	-	92	-
Stage 2	-	-	-	-	230	-
Critical Hdwy	4.1	-	-	-	6.4	6.42
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.498
Pot Cap-1 Maneuver	1507	-	-	-	676	913
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	813	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1507	-	-	-	673	913
Mov Cap-2 Maneuver	-	-	-	-	673	-
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	809	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1507	-	-	-	753
HCM Lane V/C Ratio	0.004	-	-	-	0.088
HCM Control Delay (s)	7.4	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.2	0.1
Total Delay (hr)	0.1	0.5	0.2	0.2	1.0
Total Del/Veh (s)	5.2	8.8	1.1	10.0	4.1
Stop Delay (hr)	0.1	0.5	0.1	0.1	0.8
Stop Del/Veh (s)	5.4	8.3	0.4	7.2	3.3

APPENDIX FR-4

Crash Data

Arizona Department of Transportation
Traffic Records Section
Standard Detailed Report

	IncidentId	Incident Date	Incident Time	IncidentOnroad	IncidentCrossingFeature	IncidentOffset	IncidentInjurySeverityDesc	IncidentFirstHarmfulDesc	IncidentCollisionMannerDesc	IncidentLightConditionDesc	IncidentWeatherDesc	IncidentIntersectionTypeDesc	IncidentJunctionRelationDesc	UnitBodyStyleDesc	UnitTravelDirectionDesc	UnitActionDesc	UnitRoadConditionDesc1	UnitSurfaceConditionDesc1	UnitEventSequenceDesc1
1	2553347	10/14/2011	15:40	I 040185G	03 NAVAJO ARMY DEPOT RD	0	NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	LEFT_TURN	DAYLIGHT	CLEAR	INTERSECTION_AS_PART_OF_INTERCHANGE	INTERSECTION_RELATED_INTERCHANGE	TRUCK_TT_TRUCK_TRACTOR	1 - NORTH	MAKING_LEFT_TURN	NO_CONTRIBUTING_CIRCUMSTANCES	WET	MOTOR_VEHICLE_IN_TRANSPORT
2	2676100	12/15/2012	14:30	03 NAVAJO ARMY DEPOT RD	I 040185G	0	NO_INJURY	GUARDRAIL_FACE	SINGLE VEHICLE	DAYLIGHT	SNOW	T_INTESECTION	ENTRANCE_EXIT_RAMP_INTERCHANGE	TRUCK_TT_TRUCK_TRACTOR	4 - WEST	MAKING_RIGHT_TURN	ROAD_SURFACE_CONDITION	SNOW	GUARDRAIL_FACE
3	2349228	10/15/2009	11:30	I 040185A	03 NAVAJO ARMY DEPOT RD	0	NO_INJURY	GUARDRAIL_END	SINGLE VEHICLE	DAYLIGHT	CLEAR	INTERSECTION_AS_PART_OF_INTERCHANGE	OTHER_PART_OF_INTERCHANGE	TRUCK_TT_TRUCK_TRACTOR	1 - NORTH	MAKING_LEFT_TURN	LANE_CLOSURE	DRY	GUARDRAIL_END
4	2384987	2/22/2010	10:14	I 040185A	I 040	-0.02	NO_INJURY	GUARDRAIL_END	SINGLE VEHICLE	DAYLIGHT	CLOUDY	NOT_AT_AN_INTERSECTION	ENTRANCE_EXIT_RAMP_INTERCHANGE	PASSENGER_34PU_PICKUP_3_4_TON	3 - EAST	OTHER	NO_CONTRIBUTING_CIRCUMSTANCES	ICE_FROST	RAN_OFF_ROAD_LEFT
5	2517757	4/17/2011	14:25	I 040185A	03 NAVAJO ARMY DEPOT RD	0	NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	SIDESWIPE_OPPOSITE_DIRECTION	DAYLIGHT	CLEAR	T_INTESECTION	INTERSECTION_INTERCHANGE	TRUCK_TK_TRUCK	3 - EAST	MAKING_LEFT_TURN	NO_CONTRIBUTING_CIRCUMSTANCES	DRY	MOTOR_VEHICLE_IN_TRANSPORT
6	2634319	7/25/2012	10:20	I 040185C	M185	0.18	NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	SIDESWIPE_SAME_DIRECTION	DAYLIGHT	CLEAR	FOUR_WAY_INTERSECTION	ENTRANCE_EXIT_RAMP_INTERCHANGE	TRUCK_TT_TRUCK_TRACTOR	4 - WEST	MAKING_RIGHT_TURN	NO_CONTRIBUTING_CIRCUMSTANCES	DRY	MOTOR_VEHICLE_IN_TRANSPORT
7	2684359	12/30/2012	19:38	I 040185C	03 HUGES RD	0	NO_INJURY	OTHER_FIXED_OBJECT	SINGLE VEHICLE	DARK_NOT_LIGHTED	SNOW	FOUR_WAY_INTERSECTION	INTERSECTION_INTERCHANGE	PASSENGER_2DSD_SEDAN_2_DR	4 - WEST	GOING_STRAIGHT_AHEAD	NO_CONTRIBUTING_CIRCUMSTANCES	SNOW	OTHER_FIXED_OBJECT
8	2694345	1/28/2013	16:23	I 040185C	M185	0.17	NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	SIDESWIPE_SAME_DIRECTION	DAYLIGHT	SNOW	T_INTESECTION	INTERSECTION_RELATED_INTERCHANGE	PASSENGER_4DSW_STATION_WAGON_4_DR	4 - WEST	SLOWING_IN_TRAFFICWAY	ROAD_SURFACE_CONDITION	SNOW	MOTOR_VEHICLE_IN_TRANSPORT
9	2695536	2/10/2013	13:38	I 040185C	M185	0.17	NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	SIDESWIPE_SAME_DIRECTION	DAYLIGHT	BLOWING_SNOW	FOUR_WAY_INTERSECTION	ENTRANCE_EXIT_RAMP_INTERCHANGE	TRUCK_TT_TRUCK_TRACTOR	4 - WEST	STOPPED_IN_TRAFFICWAY	ROAD_SURFACE_CONDITION	SNOW	MOTOR_VEHICLE_IN_TRANSPORT
10	2450944	8/13/2010	18:15	I 040185C	M185	0.13	NO_INJURY	UNKNOWN	REAR_TO_SIDE	DAYLIGHT	CLEAR	UNKNOWN	NOT_JUNCTION_RELATED	NOT_REPORTED	99 - UNKNOWN	OTHER	OTHER	DRY	PARKED_MOTOR_VEHICLE
11	2637972	8/4/2012	11:50	I 040185G	M185	0.05	NO_INJURY	PARKED_MOTOR_VEHICLE	REAR_END	DAYLIGHT	CLOUDY	NOT_AT_AN_INTERSECTION	NOT_JUNCTION_RELATED	TRUCK_TT_TRUCK_TRACTOR	4 - WEST	BACKING	No Data	DRY	PARKED_MOTOR_VEHICLE
12	2409617	12/29/2010	12:05	I 040185J	M185	0.05	NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	REAR_END	DAYLIGHT	SNOW	NOT_AT_AN_INTERSECTION	NOT_JUNCTION_RELATED	TRUCK_TT_TRUCK_TRACTOR	4 - WEST	GOING_STRAIGHT_AHEAD	ROAD_SURFACE_CONDITION	SNOW	MOTOR_VEHICLE_IN_TRANSPORT
13	2570758	12/17/2011	20:25	03 NAVAJO ARMY DEPOT RD	I 040185J	0.014	NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	OTHER	DARK_LIGHTED	CLEAR	FOUR_WAY_INTERSECTION	ENTRANCE_EXIT_RAMP_NON_INTERCHANGE	PASSENGER_4DSW_STATION_WAGON_4_DR	2 - SOUTH	DRIVERLESS_MOVING_VEHICLE	OTHER	WET	MOTOR_VEHICLE_IN_TRANSPORT
14	2719931	3/9/2013	13:08	03 BRANNIGAN PARK RD	03 HUGES RD	0	NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	OTHER	DAYLIGHT	SNOW	T_INTESECTION	INTERSECTION_NON_INTERCHANGE	PASSENGER_12PU_PICKUP_1_2_TON	2 - SOUTH	MAKING_LEFT_TURN	NO_CONTRIBUTING_CIRCUMSTANCES	SNOW	MOTOR_VEHICLE_IN_TRANSPORT
15	S1104008	10/4/2011	7:42	Branninan Park Rd	Hughes Ave		NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	LEFT_TURN	DAYLIGHT	UNKNOWN	T_INTESECTION	INTERSECTION_NON_INTERCHANGE	PASSENGER_12PU_PICKUP_1_2_TON	4 - WEST	MAKING_LEFT_TURN			MOTOR_VEHICLE_IN_TRANSPORT
16		7/20/2012	23:27	Branninan Park Rd	Huges Rd		POSSIBLE_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	SIDESWIPE_OPPOSITE_DIRECTION	DARK	CLOUDY	T_INTESECTION	INTERSECTION_NON_INTERCHANGE	TRUCK_TT_TRUCK_TRACTOR	1 - NORTH	BRAKES FALIED		DRY	MOTOR_VEHICLE_IN_TRANSPORT
17	S1003253	9/6/2010	3:00	Shadow Mountain Road			NON_CAPACITATING_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	SINGLE VEHICLE	DUSK	CLEAR	NOT_AT_AN_INTERSECTION	NOT_JUNCTION_RELATED	MOTORCYCLE	3 - EAST	Negotiating a curve	BAD TIRES	DRY	MOTOR_VEHICLE_IN_TRANSPORT
18	S1201057	3/23/2012	20:56	Shadow Mountain Road	I-40 INTERCHANGE		NO_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	SIDESWIPE_OPPOSITE_DIRECTION	DARK	CLEAR	T_INTESECTION	INTERSECTION_NON_INTERCHANGE	PASSENGER_12PU_PICKUP_1_2_TON	3 - EAST	GOING STRAIGHT AHEAD		DRY	MOTOR_VEHICLE_IN_TRANSPORT
19		9/23/2013	16:10	Shadow Mountain Road	Fossil Creek		NON_CAPACITATING_INJURY	MOTOR_VEHICLE_IN_TRANSPORT	ANGLE	DAYLIGHT	CLEAR	T_INTESECTION	INTERSECTION_NON_INTERCHANGE	MOTORCYCLE	2- WEST	MAKING_LEFT_TURN		DRY	MOTOR_VEHICLE_IN_TRANSPORT

Crashes by Number and Severity

	2009	2010	2011	2012	2013	2014	% of Crashes	Total
Fatal	0	0	0	0	0	0	0%	**0**
Incapacitating Injury	0	0	0	0	0	0	0%	**0**
Non Capacitating	0	1	0	0	1	0	11%	**2**
Possibly Injury	0	2	0	1	0	0	5%	**1**
Property Damage Only	1	3	4	5	3	0	84%	**16**
Total	**1**	**6**	**4**	**6**	**4**	**0**	100%	**19**

Crashes by Manner of Collision

	2009	2010	2011	2012	2013	2014	% of Crashes	Total
Single Vehicle	1	2	0	2	0	0	26%	**5**
Rear End	0	1	0	1	0	0	11%	**2**
Sideswipe Same Direction	0	0	0	1	2	0	16%	**3**
Sideswipe Opposite Direction	0	0	1	2	0	0	16%	**3**
Left Turn	0	0	2	0	0	0	11%	**2**
Angle	0	0	0	0	1	0	5%	**1**
Rear to Side	0	1	0	0	0	0	5%	**1**
Other	0	0	1	0	1	0	11%	**2**
Total	1	4	4	6	4	0	100%	**19**

Crashes by Harmful Event

	2009	2010	2011	2012	2013	2014	% of Crashes	Total
Motor Vehicle in Transport		2	4	3	4		68%	**13**
Guardrail	1	1		1			16%	**3**
Parked Vehicle		1		1			11%	**2**
Other Fixed Object				1			5%	**1**
Total	1	4	4	6	4	0	100%	**19**

Crashes by Unit Body Style

	2009	2010	2011	2012	2013	2014	% of Crashes	Total
Tractor Trailer Truck	1	1	2	4	1		47%	**9**
Passenger Car		1	2	2	2		37%	**7**
Motorcycle		1			1		11%	**2**
Unknown		1					5%	**1**
Total	1	4	4	6	4	0	100%	**19**

Crashes by Surface Conditions

	2009	2010	2011	2012	2013	2014	% of Crashes	Total
Dry	1	2	1	4	1		47%	**9**
Wet			2				11%	**2**
Snow		1		2	3		32%	**6**
Ice/Frost		1					5%	**1**
Unknown		1					5%	**1**
Total	1	5	3	6	4	0	100%	**19**

Crashes by Light Conditions

	2009	2010	2011	2012	2013	2014	% of Crashes	Total
Daylight	1	4	3	3	4		79%	**15**
Dark			1	3			21%	**4**
Dusk		1					5%	**1**
Total	1	4	4	6	4	0	105%	**19**

Crashes by Roadway

	2009	2010	2011	2012	2013	2014	% of Crashes	Total
EB On-Ramp		1					5%	**1**
EB Off-Ramp		1		2	2		26%	**5**
WB On-Ramp			1	1			11%	**2**
WB Off-Ramp	1	1	1				16%	**3**
Crossroad			2				11%	**2**
Branningan&Shadow Mnt.		1	1	2	2		32%	**6**
Total	0	2	5	2	2	0	32%	**19**

APPENDIX FR-5

City of Tucson Transportation Access Management Guidelines

ADOPTED BY
MAYOR AND COUNCIL
MARCH 17, 2003
REVISED
DECEMBER 2011

UPDATE TO ORDINANCE 9823
TRANSPORTATION
Access Management Guidelines

for the *City of Tucson, Arizona*

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1.0 INTRODUCTION

Access management refers to the regulation of the design, spacing, and operation of intersections, driveways and median openings to a roadway. Its objectives are to enable access to land uses while maintaining roadway safety and mobility through controlling access location, design, spacing and operation. This is particularly important for major roadways intended to provide efficient service to through-traffic movements.

Transportation Access Management Guidelines for the City of Tucson was prepared from a compilation of multiple sources. The Guidelines describe the overall concept of access management, review current practice, and set forth basic policy, planning, and design guidelines. The Guidelines provide consistent and effective access management policies for the City of Tucson. The guidelines presented are consistent with those established by the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), the Transportation Research Board (TRB), and the Institute of Transportation Engineers (ITE).

For purposes of this report, "access" means the direct physical connection of adjoining land to a roadway via a street or driveway. These guidelines have been adopted as ordinance and are applicable to all public and private developments within the City of Tucson rights-of-way.

2.0 PRINCIPLES OF ACCESS MANAGEMENT

Fundamental to recognizing the need for access management is to understand that *movement of traffic and direct access to property are in mutual conflict*. No facility can move traffic effectively and also provide unlimited access at the same time. Extreme examples of this concept are the freeway and the cul-de-sac: freeways move traffic very well with few opportunities for access, while cul-de-sacs provide unlimited opportunities for access, but don't move traffic very well.

Crashes and congestion are frequent outcomes of attempting to simultaneously provide both mobility and access on the same street. Poor planning and inadequate control of access can quickly lead to an unnecessarily high number of direct accesses along roadways. The movements that occur on and off roadways at driveway locations, when those driveways are too closely spaced, can make it very difficult for through traffic to flow smoothly at desired speeds and levels of safety. AASHTO states that "the number of crashes is disproportionately higher at driveways than at other intersections; thus their design and location merit special consideration."[1] Additionally, research documented in the 6th *Edition ITE Traffic Engineering Handbook* confirms a direct relationship between crash and driveway frequency, driveway activity, and median access.

[1] AASHTO, "A Policy on Geometric Design of Highways and Streets," 2004

Fewer direct access points, greater separation between driveways, and better driveway design and location are the basic elements of access management. When these techniques are implemented uniformly and comprehensively, there is less occasion for through traffic to slow down and change lanes in order to avoid turning traffic.

Consequently, with good access management, the flow of traffic will be smoother and average travel times will be shorter. There will also be less potential for crashes. According to the FHWA, before and after analyses show that those routes with well managed access can experience 50% fewer crashes[2] than comparable facilities with no access controls.

Figure 2-1 shows the relationship between mobility, access, and the functional classification of streets.

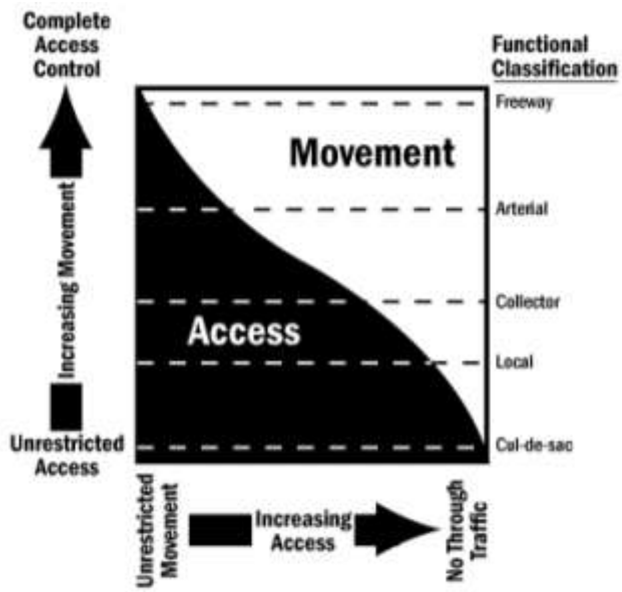


Figure 2-1 – Movement vs. Access[3]

A "vicious cycle" of traffic congestion found in many areas of the country is shown in **Figure 2-2**. An effective access management program ends a cycle of road improvements followed by increased access, increased congestion, and the need for more road improvements.

[2] Transportation Research Board, "Access Management Manual," 2004.
[3] Adopted from: NCHRP Report 348 "Access Management Policies and Guidelines for Activity Centers." Metro Trans Group, TRB Washington DC, 1992.

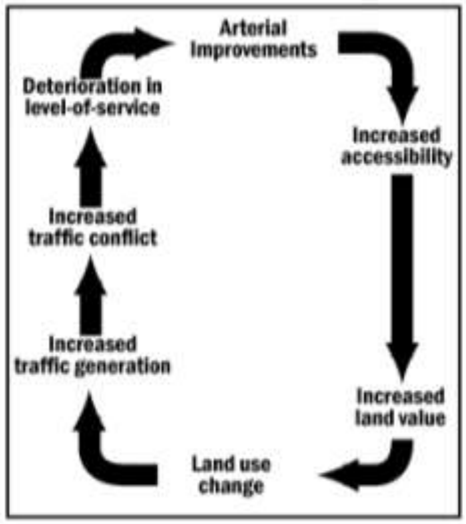


Figure 2-2 – Cycle of Traffic Congestion[4]

An effective access management program accomplishes the following:

1) ***Limits the number of conflict points at driveway locations.*** Conflict points are indicators of the potential for crashes. The more conflict points that occur at an intersection, the higher the potential for crashes. The number of conflict points is significantly reduced when left turns and cross street through movements are restricted.
2) ***Separate conflict areas.*** Intersections created by streets and driveways represent basic conflict areas. Adequate spacing between intersections allows drivers to react to one intersection at a time, and reduces the potential for conflicts.
3) ***Reduces interference to through traffic.*** Through traffic often needs to slow down for vehicles exiting, entering, or turning across the roadway. Providing turning lanes, designing driveways with appropriate and adequate turning radii, and restricting turning movements in and out of driveways allows turning traffic to get out of the way of through traffic.
4) ***Provides sufficient spacing for at-grade, signalized intersections.*** Good spacing of signalized intersections reduces conflict areas and increases the potential for smooth traffic progression.
5) ***Provides adequate on-site circulation and storage.*** The design of good internal vehicle circulation in parking areas and on local streets reduces the number of driveways that businesses need for access to the major roadway.

[4] Adapted from: Vergil G. Stover and Frank J. Koepke, "Transportation and Land Development, Institute of Transportation Engineers, 1988.

3.0 ROADWAY FUNCTIONAL CLASSIFICATION

Access and mobility are competing functions. This recognition is fundamental to the design of roadway systems that preserve public investments, contribute to traffic safety, reduce fuel consumption and vehicle emissions, and do not become functionally obsolete. Suitable functional design of the roadway system also preserves the private investment in residential and commercial development.

The 2004 *AASHTO Policy on Geometric Design of Highways and Streets* ("Green Book") recognizes that a functionally designed circulation system provides for distinct travel stages, that each stage should be handled by a separate facility and that "the failure to recognize and accommodate by suitable design each of the different stages of the movement hierarchy is a prominent cause of roadway obsolescence."[5] The AASHTO policy also indicates that the same principles of design should be applied to access drives and comparable street intersections.

A typical trip on an urban street system can be described as occurring in identifiable steps or stages as illustrated in **Figure 3-1** and **Figure 3-2**. These stages can be sorted into a definite hierarchy with respect to how the competing functions of mobility and access are satisfied. At the low end of the hierarchy are roadway facilities that provide good access to abutting properties, but provide limited opportunity for through movement. Vehicles entering or exiting a roadway typically perform the ingress or egress maneuver at a very low speed, momentarily blocking through traffic and impeding the movement of traffic on the roadway. At the high end of the hierarchy are facilities that provide good mobility by limiting and controlling access to the roadway, thereby reducing conflicts that slow the flow of through traffic.

A transition occurs each time that a vehicle passes from one roadway to another and should be accommodated by a facility specifically designed to handle the movement. Even the area of transition between a driveway and a local street should be considered as an intersection and be treated accordingly. However, the design of these intersections poses few problems since speeds and volumes are low. Many urban circulation systems use the entire range of facilities in the order presented here, but it is not always necessary or desirable that they do so.

The functional classification system divides streets into three basic types: arterials, collectors, and local streets. The function of an arterial is to provide for mobility of through traffic. Access to an arterial is controlled to reduce interference and facilitate through movement. Collector streets provide a mix for the functions of mobility and access, and therefore accomplish neither well. The primary purpose of local streets is to provide direct access to adjoining property.

[5] AASHTO, "A Policy on Geometric Design of Highways and Streets," 2004

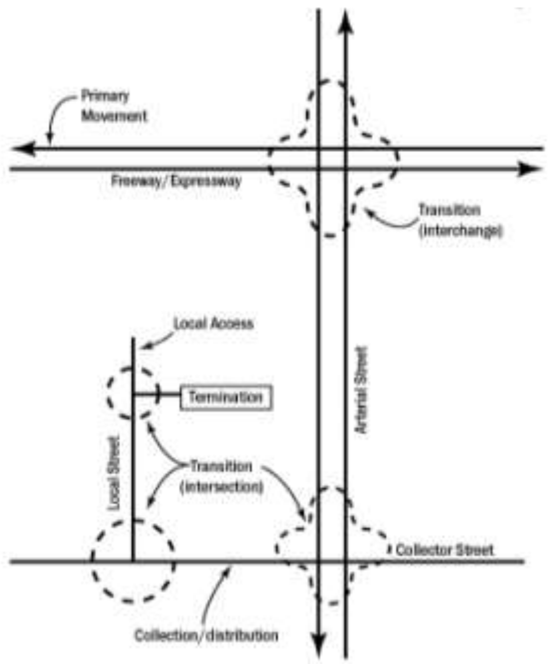


Figure 3-1 – Hierarchy of Movement in a Functional Circulation System[6]

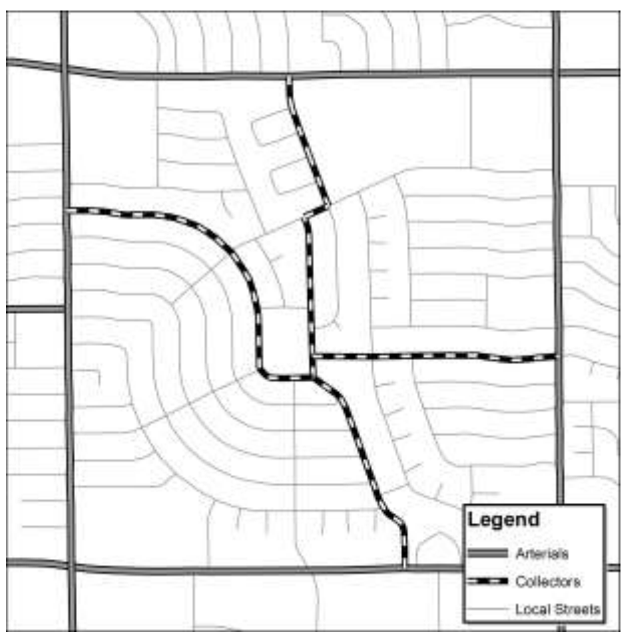


Figure 3-2 – Suburban Street Network[7]

[6] Adopted from: "A Policy on Geometric Design of Highways and Streets. Chapter 1, Washington DC, AASHTO, 2004.

[7] Adopted from: AASHTO "A Policy on Geometric Design of Highways and Streets," Exhibit 1-4. Schematic Illustration of a Portion of a Suburban Street Network (Tucson at 22nd and Wilmot), 2004.

Each class of roadway has its own geometric, traffic control, and spacing requirements. The general types of facilities and their characteristics are summarized in **Table 3-1**. This table provides a broad guide in setting access spacing standards that are keyed to functional classes of roadways.

The City of Tucson has defined functional classifications of roadways through the Mayor and Council approved Major Streets and Routes Plan (MS&R). The MS&R document provides roadway classifications and the associated cross section and right-of-way requirements and can be accessed by contacting the Tucson Department of Transportation (TDOT) or Planning and Development Services Department.

Table 3-1 – Functional Route Classification

Characteristic	Functional Classification		
	Arterial Street	**Collector Street**	**Local Street**
Primary Function	Through traffic movement, limited direct land access	traffic movement, land access, collect & distribute traffic between streets and arterials	land access
Continuity	continuous	not necessarily continuous	not continuous
Spacing	1-2 miles	½ mile or less	as needed
Typical % of Surface Street System Travel Volume Carried	65-80%	5-20%	10-30%
Direct Land Access	limited	limited – less restrictive	local access
Speed Limit	30-55 mph	30-40 mph	25 mph
Parking	prohibited	prohibited, unless approved due to special conditions	permitted
Bicycle Facility	Yes, striped	Yes, striped	Yes, not striped

4.0 ACCESS SPACING

Access spacing guidelines are keyed to allowable access levels, roadway speeds, and operating environments. They apply to new land developments and to significant changes in the size and nature of existing developments. Access to land parcels that do not conform to the spacing criteria may be necessary when no alternative reasonable access is provided. However, the basis for these variations should be clearly indicated and approved by a City representative.

4.1 Signalized Intersections

In order to maintain efficient traffic flow and safety, signalized intersections should be limited to locations along the city arterial and collector streets where the progressive movement of traffic will not be significantly impeded. Uniform, or near uniform, spacing of traffic signals is critical for the progression of traffic in all directions. Failure to gain proper spacing will result in severe degradation to the system's operation. Spacing between traffic signals, pedestrian crossing needs, and left-turn arrows, are dictated by two critical factors to ensure good progression, 1) traffic signal cycle length, and 2) desired vehicle speed.

The majority of Tucson employs a grid system: arterials are spaced at 1-mile, and collectors are spaced at ½-mile. Consistent with the Tucson grid street system, traffic signals are to be spaced at ½ mile (2,640 feet). This spacing enables an operating speed of 40 miles per hour (mph) and a 90-second traffic signal cycle length that properly serves pedestrians and left-turn arrows. If additional green time is desired for pedestrians and left-turn arrows, a 120-second cycle length may be considered; however, this enables an operating speed of approximately 30 mph. This lower operating speed is often unacceptable to drivers and can lead to disregard of speed limits and rushing from red light to red light. The optimum spacing for signalized intersections is detailed in **Table 4-1**.

As a guideline, traffic signal cycle lengths should be kept as short as possible; cycle lengths of 150 seconds or more should be avoided. Excessively long cycle lengths result in long vehicle queues, unreasonable delays, and potential air quality problems. Special split phase operations should be avoided.

The Mayor and Council may approve deviations to ½-mile spacing of signals as conditions warrant. If non-standard traffic signal spacing is under consideration, the following actions should be taken to mitigate the associated problems:

1) The group proposing the installation or retention of the traffic signal shall pay for its installation.
2) The actual or proposed traffic levels shall meet 1.5 times the volume requirements published in the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) for traffic signal warrants. Warrants other than eight-hour volume warrants and crash warrants will be carefully evaluated before being accepted and approved by Traffic Engineering staff.

3) In order to mitigate negative effects of non-standard signal spacing, roundabout, or Florida “T” intersections/operations should be installed if possible. Florida “T” intersection designs may impact roadway access. A traffic engineering report will be required to address mitigation to impacted access.
4) Non-standard spaced traffic signals should be designed to operate in a two-phase mode. Additional phases and protected left-turn arrow movements are to be avoided whenever possible.

Table 4-1 – Optimum Spacing of Signalized Intersections[8]

Cycle Length (sec)	Operating Speed (mph)					
	30	35	40	45	50	55
	Distance in feet					
60	1320	1540	1760	1980	2200	2430
70	1540	1800	2050	2310	2560	2830
80	1760	2050	2350	2640	2930	3230
90*	1980	2310	2640	2970	3300	3630
100	2200	2570	2930	3300	3670	4030
110	2420	2830	3220	3630	4040	4430
120*	2640	3080	3520	3960	4400	4840
150**	3300	3850	4400	4950	5500	6050

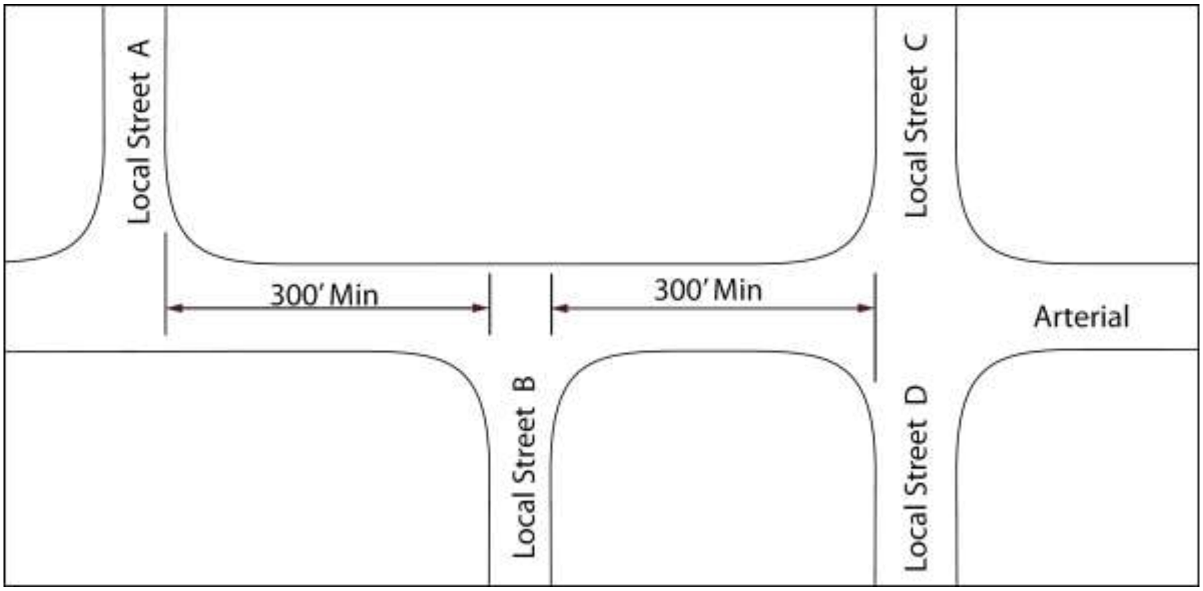
*90 and 120 cycles lengths are the most used cycle lengths for the City of Tucson
** Represents maximum cycle length for actuated signal if all phases are fully used. This cycle length or greater cycle lengths should be avoided.

4.2 Unsignalized Roadway Intersections

Unsignalized intersections typically consist of an intersection between a collector or arterial and a local street or high volume driveway. Unsignalized intersections are more common than signalized intersections and need to be designed to allow for proper spacing for safe access. The ideal spacing between unsignalized intersections is 600 feet or more. However, such spacing may be difficult to achieve based on existing roadway conditions and/or site development needs. To accommodate for such conditions, minimum distances between unsignalized roadway intersections can be applied. The minimum offset for consecutive unsignalized roadway intersections on the same or opposite side of an undivided street shall be 300 feet from adjacent edges of pavement along arterial roadways. Along collector roadways, the minimum offset shall be 150’. For streets with raised medians, intersections on opposite sides of the street can be treated separately. In addition to the 150-foot minimum, spacing, adequate intersection spacing should be provided for any dedicated turn lane needs. **Figure 4-1** illustrates the minimum unsignalized roadway intersection spacing for an undivided roadway. Driveway locations are addressed in Section 5.4.

[8] Source: Stover, Vergil G. “Access Control Issues Related to Urban Arterial Intersections,” Transportation Research Board, 1993.

Unsignalized roadway intersection spacing guidelines should be applied to both public streets and private driveways, which are discussed in Section 5.4. The minimum acceptable spacing is affected by surrounding land uses; spacing between unsignalized intersections may need to be increased at large developments. Where intersection signalization is likely in the future, ½ mile intersection spacing should govern.



Note: 150' minimum on collector roadways

Figure 4-1 – Minimum Unsignalized Intersection Spacing

4.3 Median Openings

Median openings are provided at all signalized at-grade intersections, and generally at unsignalized junctions of arterial and collector streets. They may be provided where they will have minimum impact on roadway flow.

Minimum desired spacing of unsignalized median openings as functions of speed are given in **Table 4-2**. These minimum distances should be limited to retrofit situations. Ideally, spacing of median openings should be limited to locations that are suitable for future signalization. Directional median openings, where left-turns into a driveway are allowed, but left-turns exiting are prohibited, for driveway openings can be spaced so long as sufficient storage for left-turning vehicles is provided, subject to minimum unsignalized and driveway spacing requirements (see Figure 4-3).

Table 4-2 – Minimum Spacing Between Unsignalized Median Openings[9]

Speed Limit(mph)	Minimum Spacing (feet)
30	370
35	460
40	530
45	670
50	780
55	910

Minimum desired spacing of unsignalized median openings as a function of roadway functional classification are given in **Table 4-3.** This spacing will accommodate traffic signal requirements, storage space needed for left turns, bay tapers, and roadway aesthetic and landscaping goals. When evaluating the minimum spacing requirements, the most conservative requirements as specified in **Table 4-2** and **Table 4-3** shall govern.

Table 4-3 – Guidelines for Spacing Median Openings[10]

Street Functional Classification	Spacing of Median Openings (in feet)		
	Urban	Suburban	Rural
Arterial	660	660	1320
Collector	330	660	1320

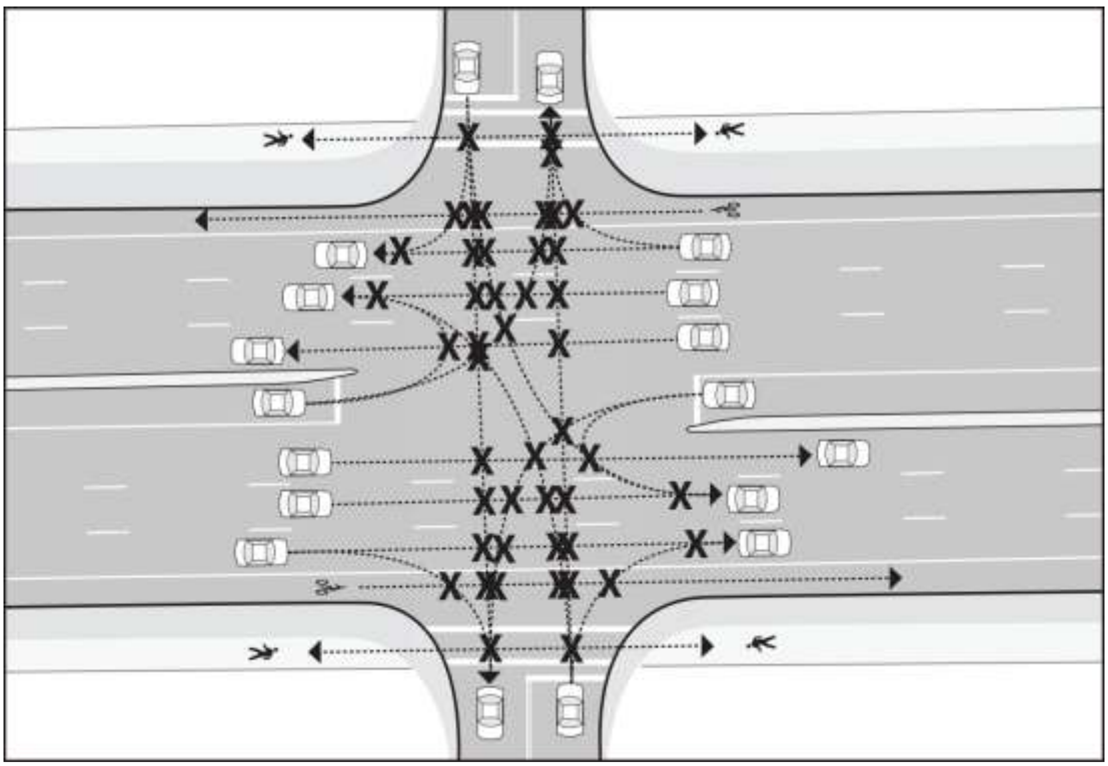
Median openings can be subject to closure where traffic volumes warrant signals, but signal spacing is inappropriate. Median openings should be set far enough back from nearby traffic signals to avoid possible interference with intersection queues. In all cases, left-turn storage within the median opening should be designed for the maximum future queue.

All median spacing guidelines are to be considered minimums and are not automatic. The following will be considered when evaluating a request for a median opening:

1) The City may require a traffic engineering analysis by a professional traffic engineer before approving any median opening request. Such an analysis should address the issues stated in 2 through 9, and should be at the sole expense of the requestor.
2) Directional median openings should be investigated as a first option over a full median opening. As shown in **Figures 4-2 and 4-3,** directional median openings reduce the number of conflicts and improve arterial safety.
3) The proposed median opening must be necessary for adequate access to an abutting property and must improve circulation both on- and off-site.
4) The proposed median opening will not cause a significant problem elsewhere (e.g. increased traffic in neighborhoods, increased crashes in another location, etc.)

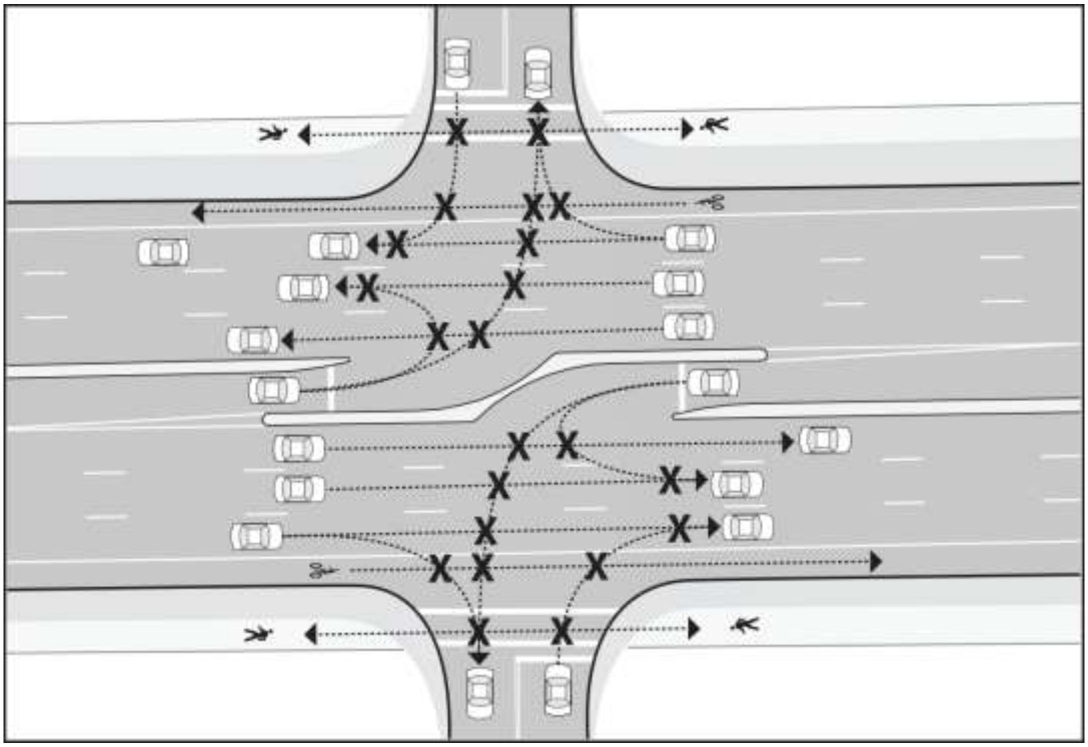
[9] Source: Koepke, Frank J., and Stover, Vergil G., 1988.
[10] Adapted from: Koepke, Frank J., and Stover, Vergil G., 1988.

5) Full consideration should be given to adjacent and opposite properties. Median opening locations for individual developments should be coordinated with other affected property owners.
6) The location and design of any proposed median opening must meet acceptable engineering design standards for expected traffic speeds and volumes.
7) The proposed median opening will not interfere with the continuity of traffic flow at or between intersections.
8) The proposed full median opening will not be at a location where driveways on opposite sides of the roadway do not align.
9) Emergency vehicle access should be reviewed to provide adequate police and fire vehicle entry.
10) The group proposing the median opening is responsible to pay for the design and construction of improvements.
11) The City may require cross access agreements for adjacent developments and properties if a median opening request is granted.



X = potential conflict
Number of conflicts = 60

Figure 4-2 – Full Median Opening



X = potential conflict
Number of conflicts = 22

Figure 4-3 – Directional Median Opening

4.4 Alternatives to Standard Signalized Intersections

When traffic volumes exceed the capacity of standard signalized intersections or construction of a standard signalized intersection is not otherwise desirable or feasible, alternative designs such as grade-separated, indirect left turn, continuous flow, roundabouts, and Florida T-intersections should be considered. When a developer proposes an alternative intersection design, the developer will be responsible for funding the project, providing a traffic study, and documenting public response of the alternate design.

Due to potential geometric and right-of-way requirements associated with alternative designs, special consideration and coordination with adjacent land owners will be required.

4.5 Pedestrian and Bicycle Crossing Device Guidelines

Guidelines for the installation of pedestrian and bicycle traffic control devices are set forth in the MUTCD, published by the Federal Highway Administration. Final approval of all devices and locations will be by the City of Tucson Department of Transportation.

4.5.1 Marked Crosswalks

Crosswalk lines should not be used indiscriminately. An engineering study should be performed before a marked crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign. The engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors. Crosswalk markings are normally not used at intersections with driveways. Refer to the Manual on Uniform Traffic Control (MUTCD) for details on crosswalk marking installation. All proposed crosswalks shall be approved by the City of Tucson Department of Transportation.

When used, crosswalk markings shall be located so that the curb ramps are within the extension of the crosswalk markings. Refer to the City of Tucson/Pima County Pavement Marking Design Manual for details for crosswalk installation.

4.5.2 School Crosswalks

The developer shall consult with City of Tucson Traffic Engineering Division staff for assistance regarding school crosswalk considerations.

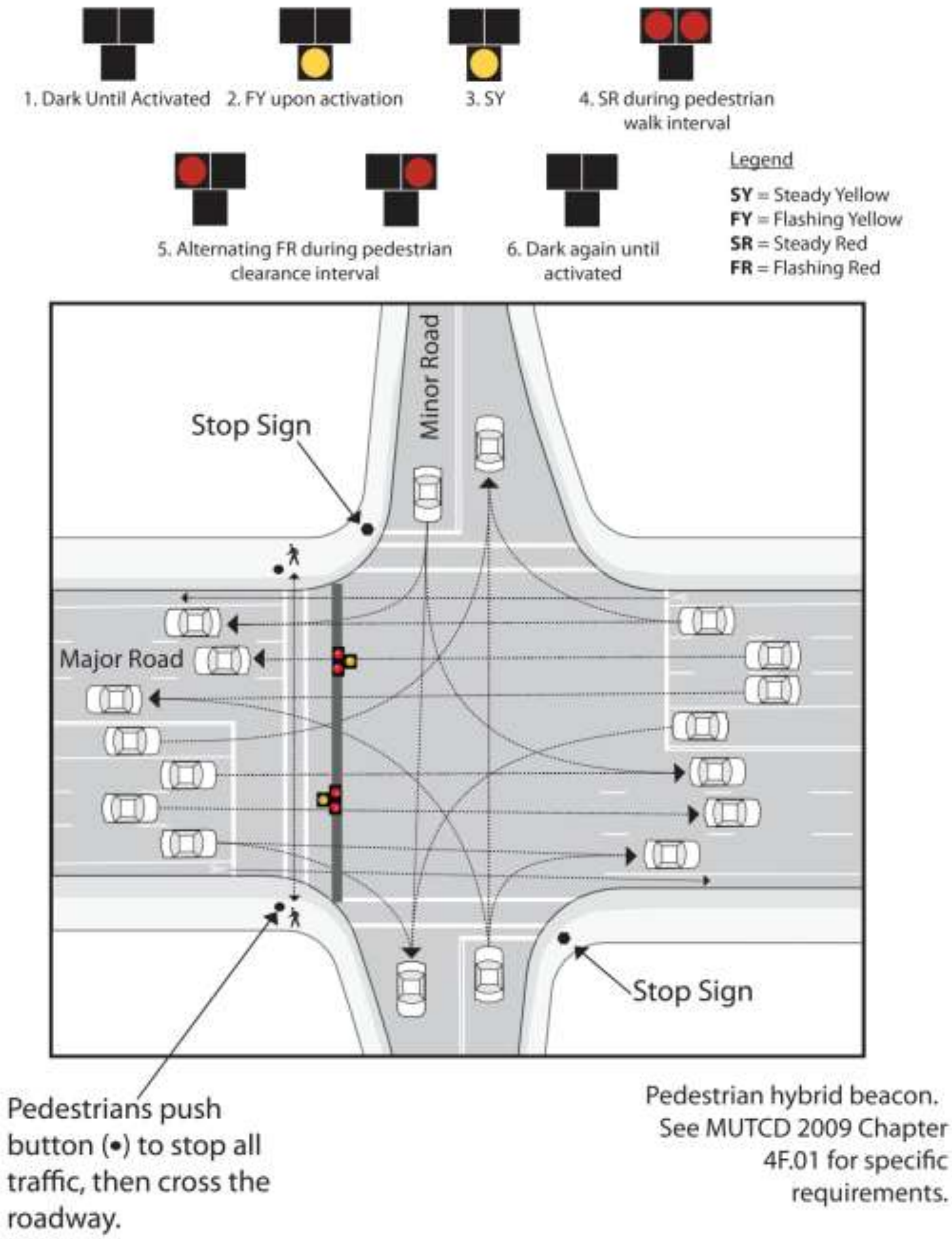
*4.5.3 HAWK – **H**igh Intensity **A**ctivated Cross**W**al**K***

The High Intensity Activated Crosswalk (HAWK) consists of Red-Yellow-Red signal format for motorists. The signals remain off until a pedestrian activates the system by pressing a button. First, a FLASHING YELLOW light warns motorists that a pedestrian is present. The signal then changes to SOLID YELLOW, alerting drivers to prepare to stop. The signal then turns SOLID RED and shows the pedestrian a “WALK” symbol. The signal then begins FLASHING RED, and the pedestrian is shown a flashing “DON’T WALK” symbol with a countdown timer. During the FLASHING RED drivers are to make a full stop to ensure that the crosswalk is free of pedestrians, and then proceed. In school zones, drivers must wait until the children and crossing guard are completely out of the crossing before proceeding.

Locations considered for the installation of marked crosswalks with pedestrian actuated beacon signal lights and signage should generally meet the following criteria:

1) Meet the warrants and design guidelines provided in the Manual on Uniform Traffic Control Devices 2009 (or latest edition), Chapter 4F Pedestrian Hybrid Beacons.
2) A traffic engineering analysis with approval from the Director of Transportation and Mayor and Council.
3) There is no other crossing controlled by a traffic signal, stop sign, or crossing guard within 600 feet of the proposed location.

Figure 4-4 illustrates the various vehicular, pedestrian, and bicycle movements that are made at a HAWK.



*Striping Details to be coordinated with the City of Tucson Department of Transportation staff.

Figure 4-4 – HAWK

*4.5.4 TOUCAN – **T**w**O** Gro**U**ps **CAN** Cross*

The TwO GroUps CAN cross (TOUCAN) system was designed to provide a safe crossing for two groups, pedestrians and bicyclists. TOUCANs are placed at intersections of major streets where bicycle and pedestrian crossing activity is heavy. They are also placed along roadways that are prioritized for non-motorized uses, such as along "Bicycle Boulevards" at intersections with arterials or major collectors.

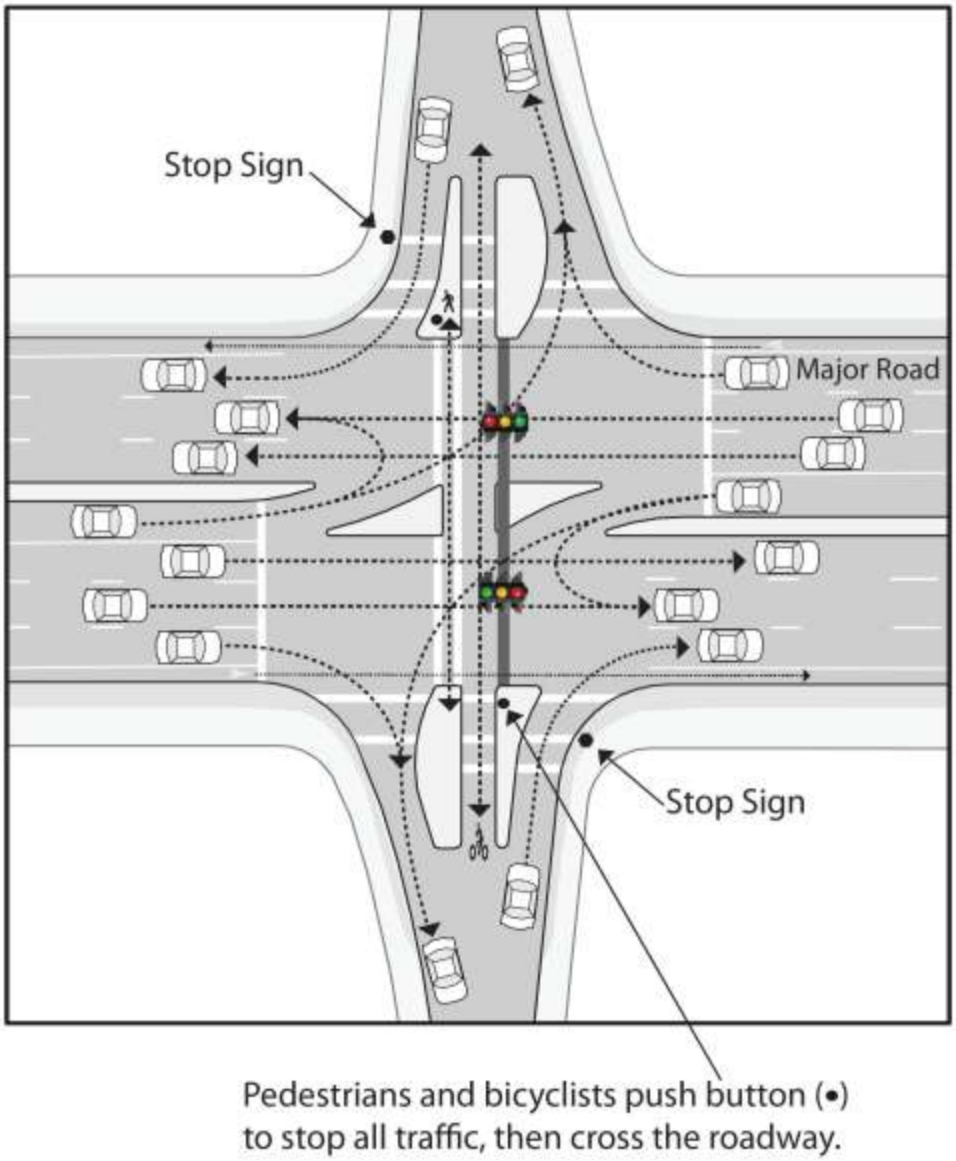
At a TOUCAN signal, motorized traffic on the minor street is not allowed to proceed through the intersection, decreasing the number of cars on neighborhood streets, and enhancing the neighborhood's quality of life.

A TOUCAN rests on a green for the major road. A bicyclist or pedestrian activates the signal by depressing a push button. Bicyclists respond to a bicycle signal and use a special lane when crossing. Pedestrians get a standard WALK indication and have a separate, adjacent crosswalk. The system uses a standard signal for motorists.

The TOUCAN crossing is designed specifically to facilitate bicycle access. Locations considered for the installation of a TOUCAN should generally meet the following criteria:

1) Meet MUTCD warrants for consideration of a traffic signal installation or conduct a traffic engineering analysis for justification, to be approved by the Director of Transportation and approved by Mayor and Council.
2) Ability to install barrier islands to prohibit motor vehicle traffic on the minor street from crossing the street; only right turns are permitted from the minor street to the major street.
3) Coordinate with emergency services to determine if through movements for emergency vehicles will be required, and design accordingly.
4) TOUCANs should be used mainly on major bicycle routes and bicycle boulevards.

Figure 4-5 illustrates the various vehicular, pedestrian, and bicycle movements that are made at a TOUCAN.



*Striping Details to be coordinated with the City of Tucson Department of Transportation staff.

Figure 4-5 – TOUCAN

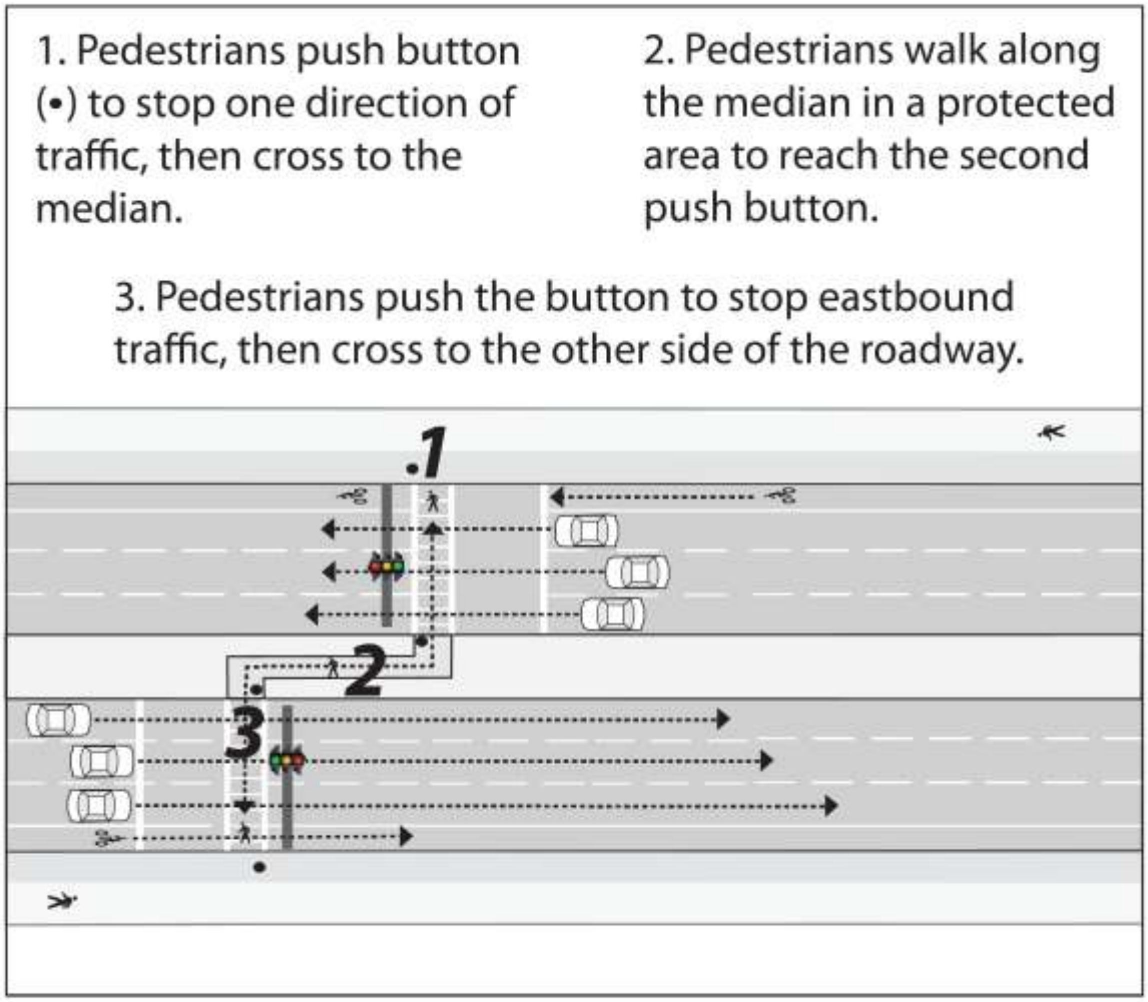
*4.5.5 PELICAN – **P**edestrian **LI**ght **C**ontrol **A**ctivatio**N***

The PEdestrian LIght Control ActivatioN (PELICAN) is placed mid-block on major streets and provides a safe, two-stage crossing for pedestrians. The PELICAN uses two, standard Red-Yellow-Green signals. The signals remain green for motorists until a pedestrian activates them using a push button. When a pedestrian presses the button, the signal turns YELLOW, then RED, alerting oncoming motorized traffic to stop. A "WALK" symbol prompts the pedestrian to proceed across half of the road to the median. The pedestrian then walks a short distance along the median to activate the second push button to cross the second half of the road. The same process is followed. The pedestrian presses the button, the traffic signal turns RED and oncoming traffic stops. The pedestrian then proceeds to the other side of the road. Artwork is sometimes incorporated into the design of PELICANs to make them easily noticeable. PELICANs minimize the potential for stops, delays, and crashes. Bicyclists using the PELICAN should yield to pedestrians using the device.

Locations considered for the installation of this combination of devices should generally meet the following criteria:

1) The location shall have a demonstrated need for a pedestrian crossing through a traffic analysis.
2) If designed as a school crossing the location of the PELICAN should be on the the school's "School Route Plan."
3) The proposed location is not within 600 feet of another signalized crossing, STOP sign, or flashing beacon and sign crossing.

Figure 4-6 illustrates the various vehicular, pedestrian, and bicycle movements that are made at a PELICAN.



*Striping Details to be coordinated with the City of Tucson Department of Transportation staff.

Figure 4-6 – PELICAN

5.0 DESIGN STANDARDS

5.1 Street Cross Sections

The reader is referred to the City of Tucson Major Streets & Routes Plan for specific cross sections of roadways.

Cross sections are the combination of the individual design elements that typify the design of the roadway. Cross section elements include the pavement surface for driving and parking lanes, curb, bike lanes, alternate mode facilities, sidewalks and additional buffer/landscape areas.

The design of cross-section elements depends upon the facility's intended use. Roads with higher design volumes and speeds require more travel lanes and wider right-of-way than low volume, low speed roads. Furthermore, arterials should include wider shoulders and medians, separate turn lanes, shoulders for use by bicycles, elimination of on-street parking and control of driveway access. For most roadways, an additional buffer area is provided beyond the curb line. This buffer area accommodates the sidewalk area, landscaping, and local utilities. Locating the utilities outside the travel way can minimize traffic disruption if utility repairs or service changes are required.

Typical elements of the roadway cross sections are identified in the following sections. However, few of the dimensions used in street design have been precisely determined by research. Instead, the cross sections usually represent a consensus of opinion based upon engineering judgment and operating experience. Therefore, each of the roadway design elements can be altered to better accommodate various conditions found in Tucson.

5.1.1 Local Streets

Local streets provide direct access to abutting land uses and accommodate local traffic movement. Local streets should be designed to encourage slow speeds and relatively low traffic volumes. The posted speed limit shall be 25 mph. Local streets are not typically striped. On-street parking is usually permitted and bicycles can be accommodated without a separate travel lane.

5.1.2 Collectors

Collector streets provide for traffic movement between local streets and arterial streets. Collector streets also provide access to abutting land uses. Parking is not allowed on collector streets unless approved by Mayor and Council. Individual driveway openings onto collectors should be designed to eliminate backing movements onto the street. Curbside lanes should be wider than 15 feet to provide for bicycle travel. Bicycle lanes shall be provided on any new collector roadway. They should be striped and have a minimum width of 5 feet.

5.1.3 Arterials

Arterial streets provide for major through traffic movement between geographic areas. These roadways typically have some form of access control that limits the locations of driveways. A curbed median should be included in the design of all arterial streets where the curb to curb width exceeds 75 feet. Where traffic volumes create the need for additional capacity, intersection modifications should be pursued prior to further widening. Additional right-turn lanes and dual left-turn lanes or traffic signal modifications can be provided in-lieu of additional travel lanes or roadway widening.

The maximum width of an arterial street should be no more than 6 lanes in the midblock, except where the additional lanes are designated for buses, bicycles, and high-occupancy vehicles. Parking is not allowed on arterial streets unless approved by Mayor and Council, or it is located in the downtown central business district.

5.2 Sight Distance

It is essential to provide sufficient sight distance for vehicles using a driveway. Vehicles should be able to enter and leave the property safely. Refer to the City of Tucson Development Standards for Sight Visibility Triangle Requirements. Alternatively, an engineering analysis may be conducted with the approval from the City of Tucson Department of Transportation, Traffic Engineering Division.

5.3 Turning Lanes

Turning lanes for right and left turns at intersections and driveways may be necessary to improve intersection safety or capacity where speeds, traffic volumes, or turning volumes are high.

Rear-end crashes can be severe on shared lanes. Research has found (**Table 5-1)** that crash rates increase exponentially as the speed differential in the traffic stream increases. As shown, on an arterial street, a vehicle traveling 35 mph slower than other traffic is 180 times more likely to become involved in a crash than a vehicle traveling at the same speed as other traffic.

Table 5-1 – Relative Crash Involvement Rates[11]

Speed Differential (mph)	Relative Crash Potential for:	
	At-Grade Arterials	Freeways
	0-mph Differential	0-mph Differential
0	1	1
-10	2	3.3
-20	6.5	20
-30	45	67
-35	180	N/A

N/A = not available

Separate turning lanes remove the turning vehicle from through traffic, removing the speed differential in the main travel lanes, thereby reducing the frequency and severity of rear-end collisions.

Left-turn lanes increase intersection capacity where left turns would otherwise share the use of a through lane. Shared use of a through lane dramatically reduces capacity, especially when opposing traffic is heavy. One left turn per signal cycle delays 40 percent of the through vehicles in the shared lane; two turns per cycle delays 60 percent.[12]

Figure 5-1 provides City of Tucson Transportation Department left turn lane warrant criteria. Alternatives to these criteria shall be supported by a traffic analysis. The minimum turn lane width is 12 feet unless approved by the Director of Transportation. **Figures 5-2** and **5-3** provide right turn lane warrant criteria. Alternatives to these criteria shall be supported by a traffic analysis.

[11] Source: Institute of Transportation Engineers, 1998.
[12] Source: Transportation Research Board, “Access Management Manual,” 1989.

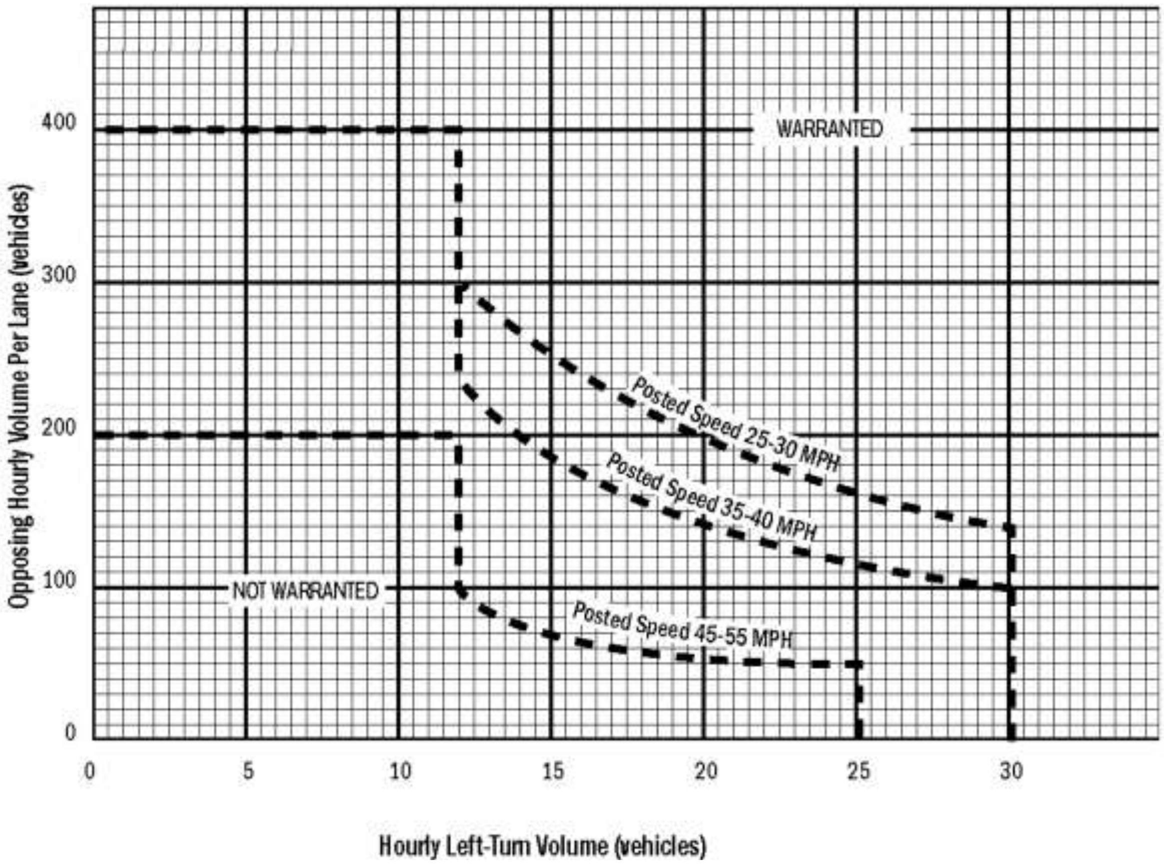


Figure 5-1 – Left Turn Lane Warrant[13]

[13] Idaho Transportation Department, "Traffic Manual," 2011; and, Transportation Research Board, NCHRP Report 348, "Access Management Guidelines for Activity Centers."

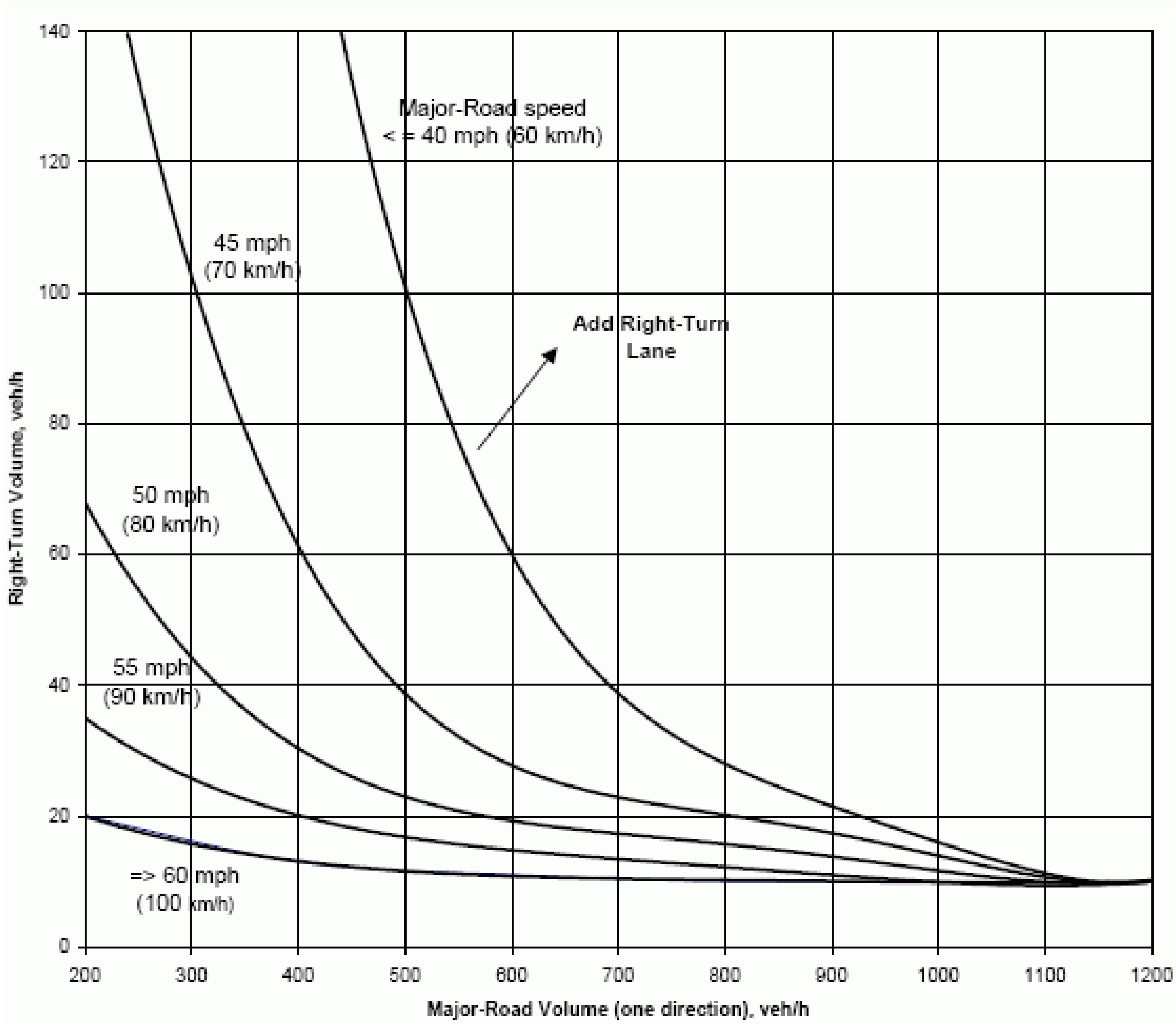
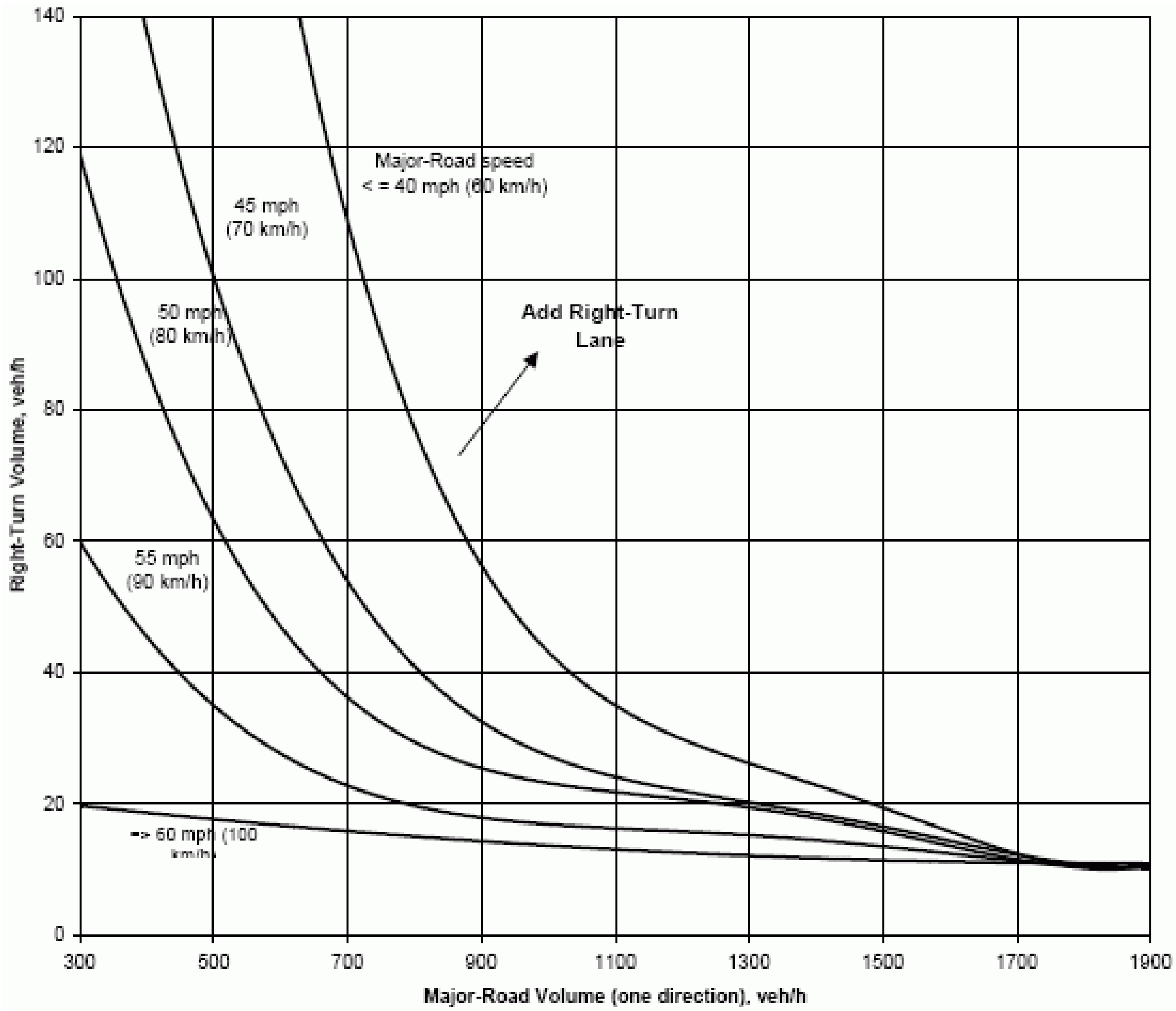


Figure 5-2 – Right Turn Lane Guidelines for Two-Lane Roadway[14]

[14] Source: MoDOT. Engineering Policy Guide. Sheet 940.9.8 "Right Turn Lane Guidelines for Two-Lane Roadways," 2007.



Note: Existing roadway constraints may restrict the ability or need to install turning lanes. Traffic Engineering may require a traffic engineering analysis to support alternative recommendations for the installation of turning lanes.

Figure 5-3 – Right Turn Guidelines for Four-Lane Roadways[15]

5.3.1 Total Turn Lane Length

A separate turning lane consists of a taper plus a full width auxiliary lane. The design of turn lanes is primarily based on the speed at which drivers turn into the lane, the speed to which drivers must reduce in order to turn into the driveway, and the required vehicular storage length. Other special considerations include the volume of trucks that will use the turning lane and the steepness of an ascending or descending grade.

The Pima County Department of Transportation (PCDOT) and the City of Tucson Department of Transportation (TDOT) provide design guidelines for minimum

[15] Source: MoDOT. Engineering Policy Guide. Sheet 940.9.9 “Right Turn Lane Guidelines for Four-Lane Roadways.” 2007.

recommended transitions and storage lengths within the PCDOT/COT Pavement Marking Design Manual. Refer to the PCDOT/COT Pavement Marking Design Manual for minimum standards, Chapter 4 for transition and storage lengths.

At intersections with high traffic volumes, high turning movements, large amounts of truck traffic, steep grades, high speed differentials, and large activity centers, it is recommended that the minimum distances should not be used and a traffic engineering analysis shall be provided. Computerized methods of analysis are recommended, such as the latest addition of the Highway Capacity Software, Trafficware Synchro Software or an equivalent program.

The storage length should be sufficient to store the number of vehicles likely to accumulate during a critical period. The storage length should be sufficient to avoid the possibility of turning vehicles blocking the through lanes due to a lack of storage.

At unsignalized intersections, the storage length, exclusive of taper, may be based on the number of turning vehicles likely to arrive in an average two-minute period in the peak hour. Storage for at least two passenger cars should be provided; with over 10 percent truck traffic, storage should be provided for at least one car and one truck.

At signalized intersections, the required storage length is dependent on the signal cycle length, the signal phasing, and the rate of arrivals and departures of turning vehicles. The required storage length should be based on 1.5 to 2 times the average number of vehicles that would store per cycle. This length will be sufficient to serve heavy surges that occur from time to time. Approved computerized method of analysis can be used to determine queue lengths. The recommended method of analysis is the use of the latest edition of the Highway Capacity Software, Trafficware Synchro Software or an equivalent program.

The Director of Transportation or designated staff may grant written permission from the minimum and maximum guidelines based on site conditions or land use. Conditions that may impact required turn lane length are:

- Right-of-way constraints
- Excessive or expensive utility relocations
- Physical constraints with adjacent driveways, roadways, and/or bus pullouts

5.4 Driveway Locations

Design requirements for driveway locations onto arterial and collector roadways in all new development are as follows:

1) Entrance and exit drives crossing arterials and collectors are limited to two per 300 feet of frontage along any major roadway. The nearest pavement edges should be spaced at least 80 feet apart (**Figure 5-4**).
2) A minimum of one hundred and fifty feet, measured at curbline, shall separate the nearest pavement edge of any ingress or egress driveway and the curbline to any signalized or major intersection with arterial and collector roadways. (**Figure 5-4**)
3) On divided arterial and collector roadways, at full median openings, access points on both sides of the roadway should align (**Figure 5-5**) or be offset from the median opening by at least 150 feet (**Figure 5-6**). If the noted design requirements for driveway locations cannot be met, then driveway turning movement restrictions may be imposed. See Section 5.10 for movement restrictions.
4) On undivided arterial and collector roadways, at the access points on both sides of the roadway should align, or be offset by at least 300 feet for arterials, and 150 feet for collectors (**Figure 5-7**). If the noted design requirements for driveway locations cannot be met, then driveway turning movement restrictions may be imposed. See Section 5.10 for movement restrictions.
5) There should be no direct residential lot access to arterials. Direct residential lot access to collectors should be avoided in new roadway development.
6) All new development should promote cross access agreements to limit the number of driveways crossing arterial and collector roadways. See **Figure 5-8** for the benefits of shared and cross access management.
7) To limit access on major roadways, a local access lane can be incorporated into the design when multiple existing parcels have direct access to a collector or arterial roadway (**Figure 5-9**).
8) Area, neighborhood, and corridor plans and studies may further restrict driveway locations. For example, the Houghton Area Master Plan limits driveways on Houghton Rd. to ¼ mile spacing.
9) At locations near major intersections where the property is adjacent to a bus stop, consideration shall be provided for safe loading and unloading of passengers. See the Transit Facilities section (Section 5.16) and Bus Bay Details (**Figures 5-14 and 5-15**).

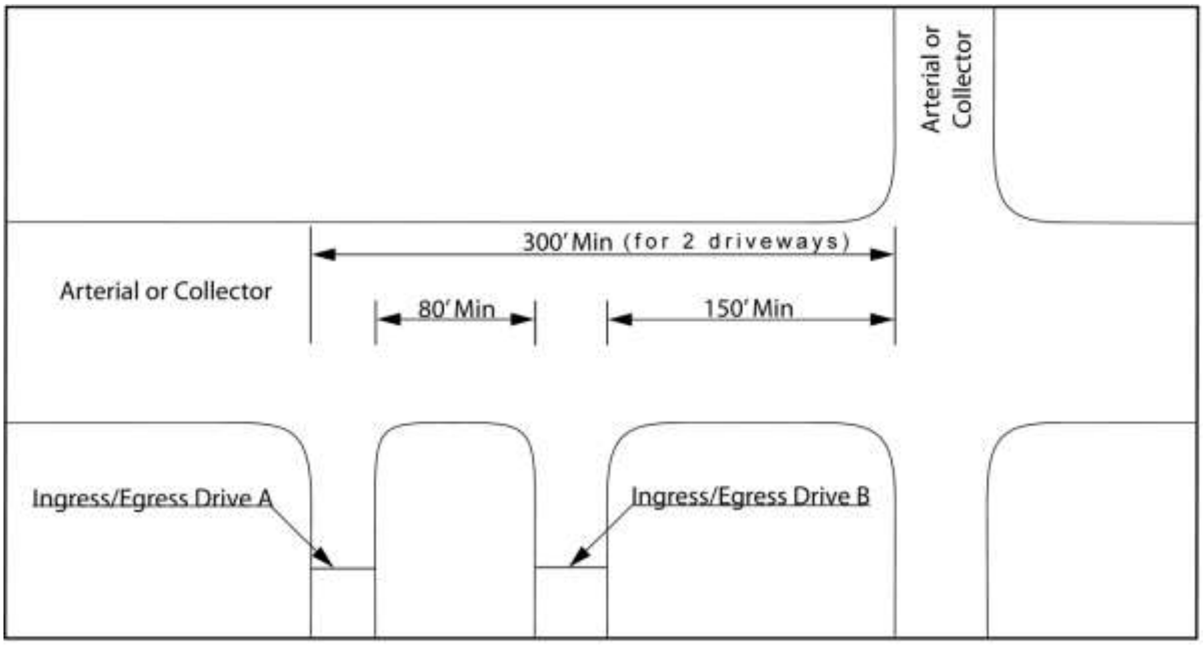


Figure 5-4 – Driveway Location Distances

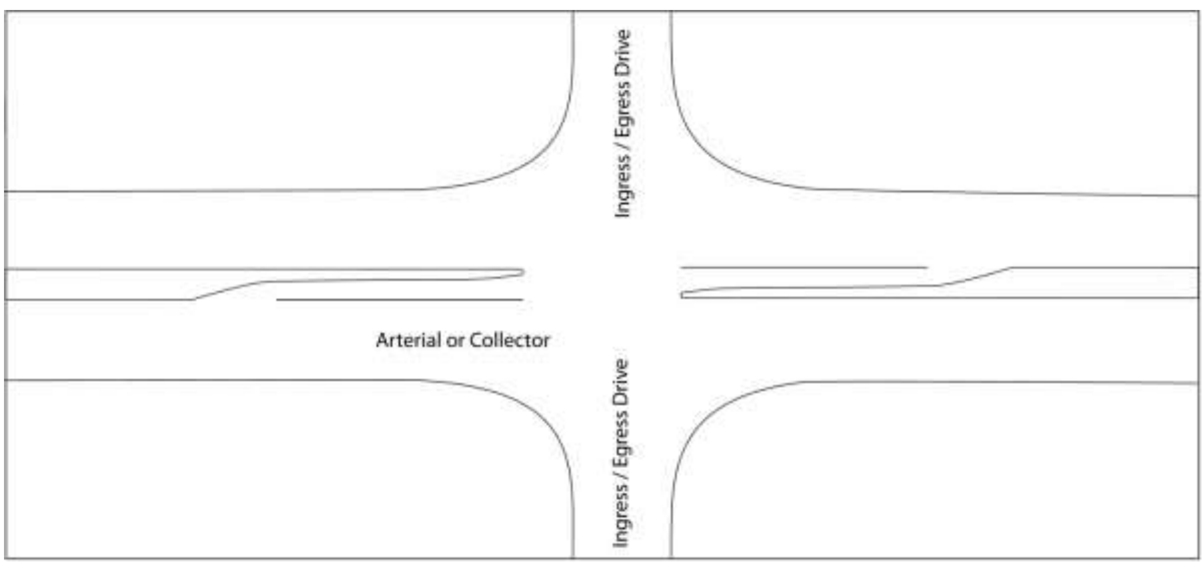


Figure 5-5 – Divided Roadway, Aligned Driveway Locations – Median Opening

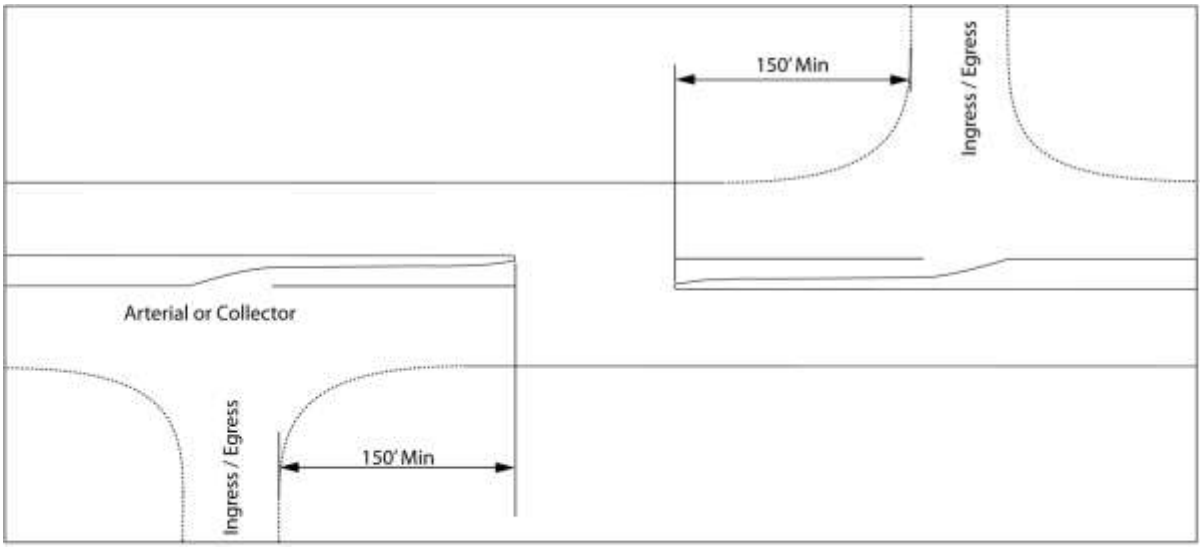


Figure 5-6 – Divided Roadway, 150' Offset Driveway Locations – Median Opening

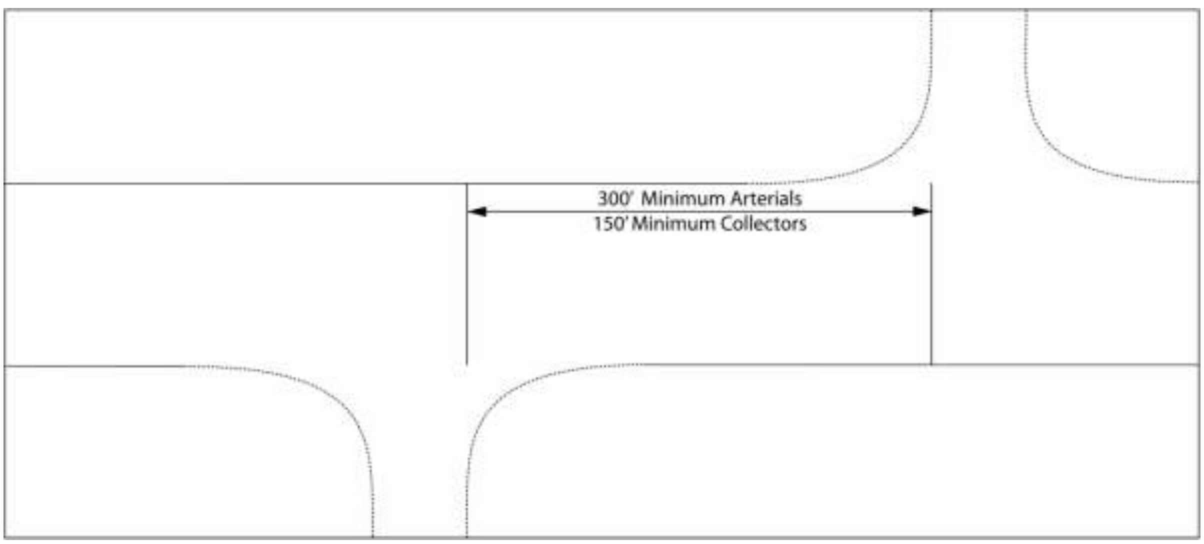


Figure 5-7 – Undivided Roadway, (Major Traffic Generators)

5.5 Cross and Shared Access

Cross access is achieved when property owners agree to allow other parcels to cross their property to access a driveway access point. Shared access is achieved when adjacent property owners agree to share a single driveway that accesses both adjacent properties.

Cross and shared access reduces the number of driveways, the number of driveway conflict points along the arterial, and helps traffic move smoothly along the roadway. **Figure 5-8** illustrates cross and shared access.

Benefits of cross and shared access include:

- Reduces the number of conflict points between vehicles, pedestrians, and bicyclists.
- Reduces congestion by maintaining the flow of traffic along the arterial roadway.
- Provides more area for landscaping.
- Makes the bicycle and pedestrian environment safer.
- Business patrons encounter less congestion; thereby experience fewer delays accessing businesses.

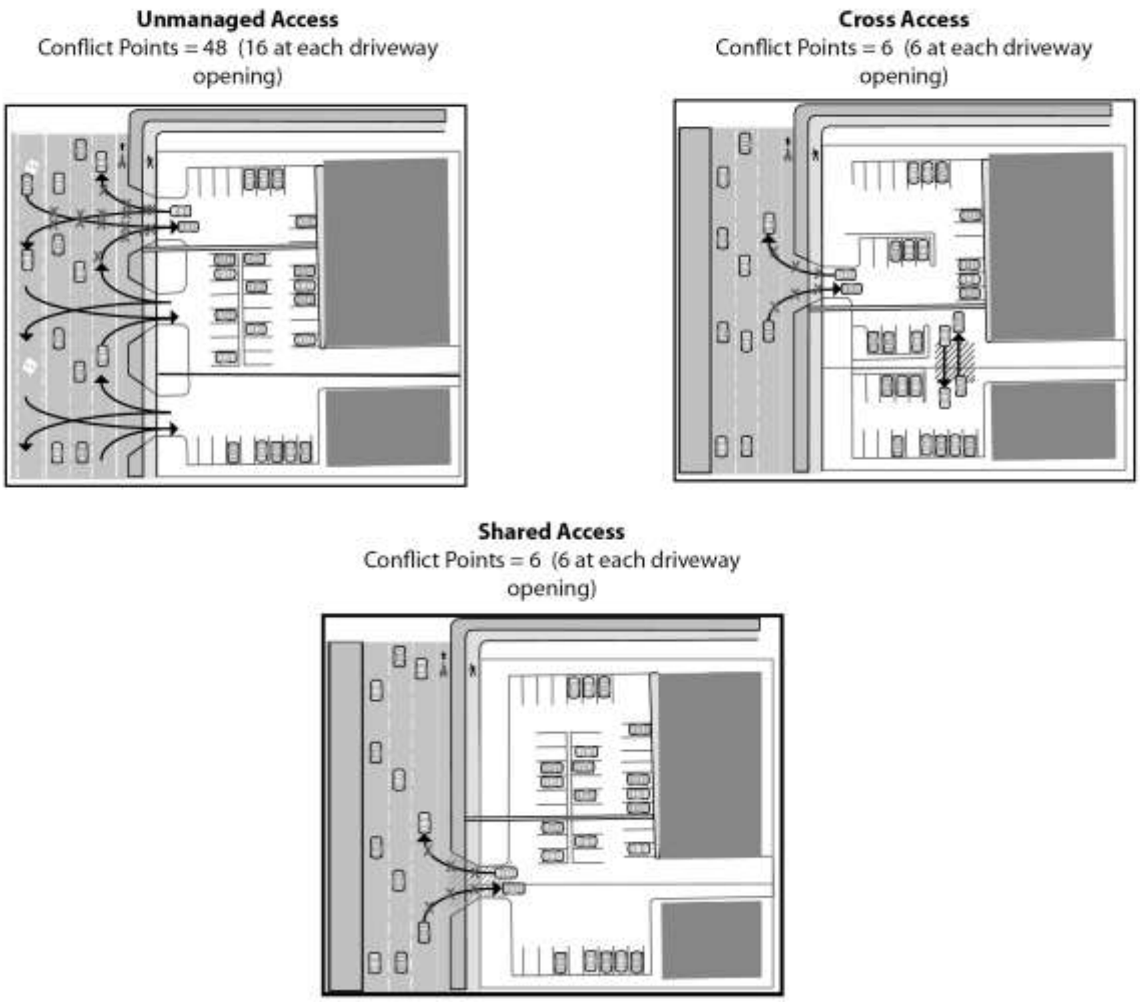


Figure 5-8 – Cross and Shared Access

5.6 Local Access Lanes

Local access lanes may be used in residential or commercial areas. Local access lanes reduce the number of driveways on the arterial, and the number of conflict points. **Figure 5-9** illustrates how a local access lane can be used to provide multiple access points to individual parcels (or different users on a single property), while limiting the number of driveways on the arterial.

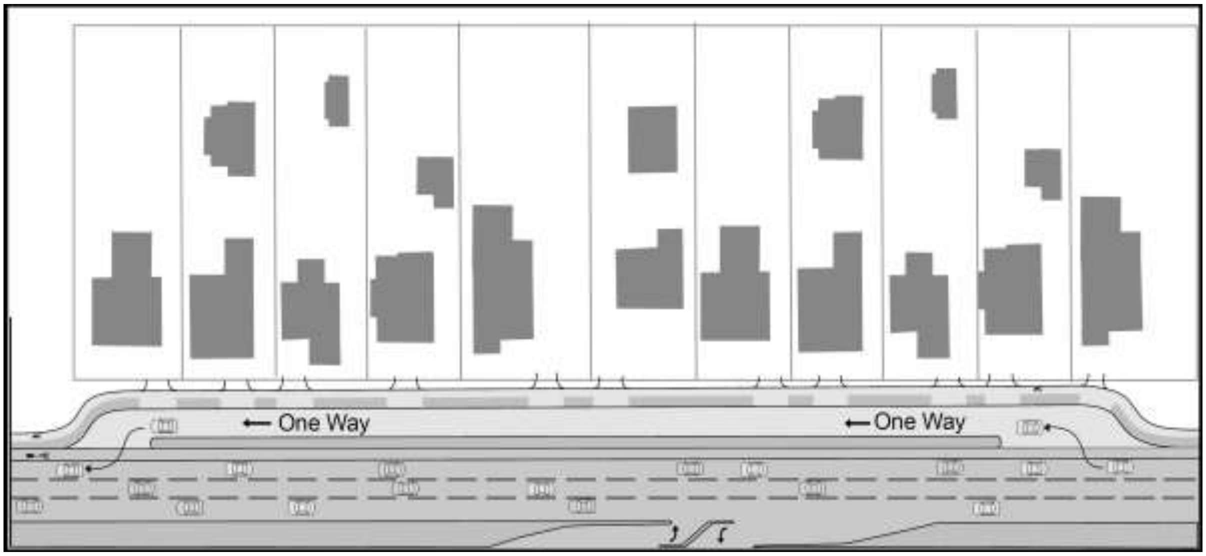


Figure 5-9 – Local Access Lane

Local access lanes include the following benefits:

- Reduces the number of conflict points between vehicles, pedestrians and bicyclists
- Reduces congestion by maintaining the flow of traffic
- Provides more area for landscaping
- Makes the bicycle and pedestrian friendly environment safer
- Business patrons encounter less congestion, thereby experience fewer delays accessing businesses
- Provides parking lane

This concept is not recommended for new developments.

5.7 Driveway Curb Radius

The preferred curb radius is dependent on the type of vehicles to be accommodated, the number of pedestrians crossing the access road, and the operating speed of the accessed roadway. **Table 5-2** presents the minimum curb return radius for connection between two types of streets.

Table 5-2 – Minimum Curb Return Radius[16]

	Arterial Street	Collector Street	Local Street	Driveway/ PAAL
Arterial Street	30'	25'	25'	25'
Collector Street	25'	25'	25'	25'
Local Street	25'	25'	18'	18'
Driveway/PAAL	25'	25'	18'	18'

Note: Traffic study to allow radii reduction or approval by TDOT

5.8 Unsignalized Driveway Entry Width

The entry width is the width needed at the driveway throat to accommodate the path of the turning design vehicle. Design vehicle requirements should be based on land use. Most locations will likely use passenger vehicles as the design vehicle when determining driveway entry widths; land uses with high truck volumes will need to use a truck as the design vehicle. The curb return radii given in **Table 5-2** represent the minimums developed for commonly used design vehicles turning into a driveway from the right-most lane. The entry width will differ from the driveway's overall width, depending on how the driveway is expected to operate. Driveway entries should be placed outside of steep slopes, no access easements, or restricted utility easements.

All curb cuts, curb returns, curb radii, and curb depressions should be located in accordance with the City of Tucson Code, Chapter 25 (see guidelines in **Table 5-3** and illustrated in **Figure 5-10**). For example, the presence of utility poles, catch basins, steep slopes on a property, abnormally high bicycle and/or pedestrian volumes can be cause for an exception. The existing design and land use of the abutting property may also support a change from the guidelines. The exception, however, cannot be against the public interest, safety, convenience or general welfare.

[16] Source: City of Tucson Development Standard No. 3-01.1 Figure 6.

Table 5-3 – Unsignalized Driveway Entry Widths[17]

	Residential Districts	Business Districts	Industrial Districts
Driveway width (min./max.)	**10' / 20'**	**35' max**	**35' max**
Max. driveway width for two adjoining properties (shared access)	**30'**	**35' max**	**35' max**
Max. driveway width at the property line	**n/a**	**30'**	**30'**

Note: The provisions established for curb cuts and driveways for business zoned district shall prevail in all industrial zoned districts for properties fronting on a through street, as defined in the City of Tucson Code, or on a major street as shown on the latest MS&R Plan on file with the Director of Transportation or designated staff.

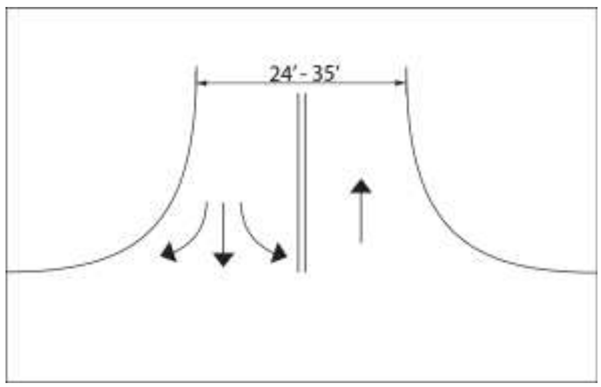


Figure 5-10 – Unsignalized Driveway Entry Width

5.9 Driveway Profiles

The slope of a driveway can dramatically influence its operation. Usage by large vehicles can have a tremendous effect on operations if slopes are severe. The profile, or grade, of a driveway should be designed to provide a comfortable and safe transition for those using the facility, and to accommodate the storm water drainage system and reduce erosion or not impact erosion control, of the roadway. Driveways should also be designed in compliance with Americans with Disabilities Act (ADA) guidelines.

5.10 Driveway Turning Movement Restrictions

Where full-access will impact the safety along the adjacent roadway, the traffic engineering staff may require turning restrictions at driveways. The restriction may be for left-turn movements in or out of the driveway. Turning restrictions may be imposed for driveways that are too close to signalized intersections, or where existing driveways or roadway characteristics may increase accident potential or at locations with a history of high accident rates. **Figure 5-11** provides examples of potential restrictions to turning movements.

[17] Source: Tucson City Code, Section 25-38 to 25-40

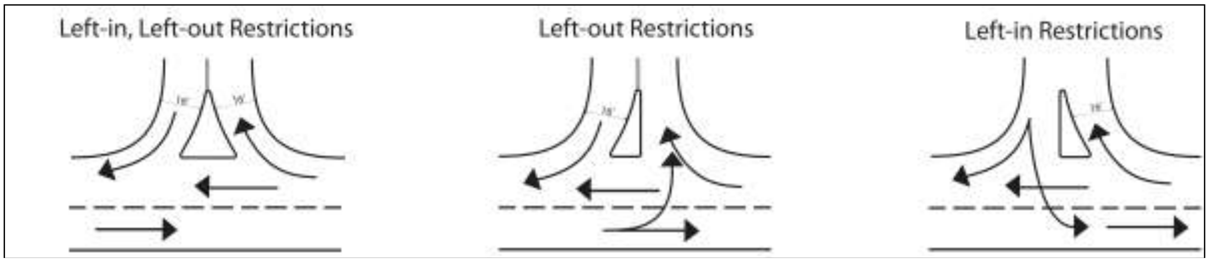


Figure 5-11 – Turning Movement Restrictions

5.11 Driveway Throat Length

The driveway throat should be of sufficient length to enable the intersection of the driveway and abutting roadway and the on-site circulation to function without interference with each other. Drivers entering the site should be able to clear the intersection of the roadway and the driveway before encountering any on-site intersections that are part of the redevelopment circulation. Inadequate throat length results in poor access circulation in the vicinity of the access drive. This produces congestion and high crash rates on the abutting streets as well as on site. Pedestrian/vehicular conflicts may also result from confusion caused by the complex pattern of over-lapping conflict areas.

The exit side of an access connection should be designed to enable traffic leaving the site to do so efficiently. Stop-controlled connections should be of sufficient length to store three passenger cars (one passenger car = 20 feet). **Figure 5-12** illustrates the recommended practices for designing driveway throat lengths.

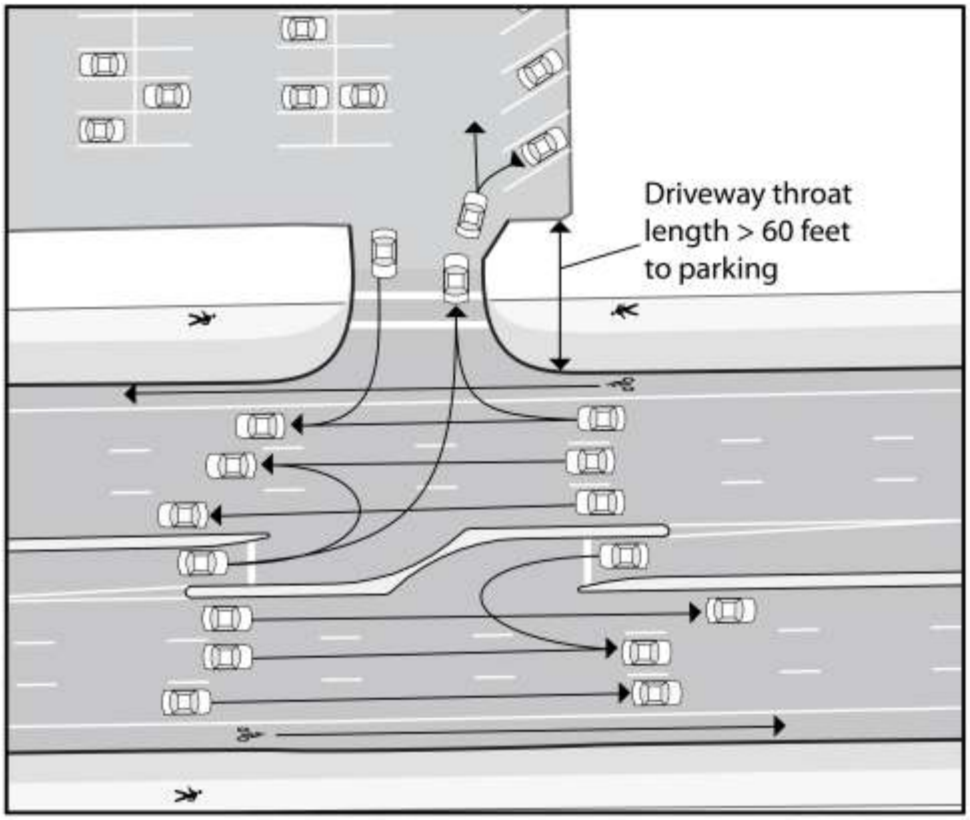


Figure 5-12 – Driveway Throat Length

5.12 Truck Loading Area

Truck loading areas should be designed to minimize conflict with on-site traffic and circulation. Drop-off/loading areas should not be located where they will have an effect on traffic operations on the adjoining roadway.

5.13 Median Design

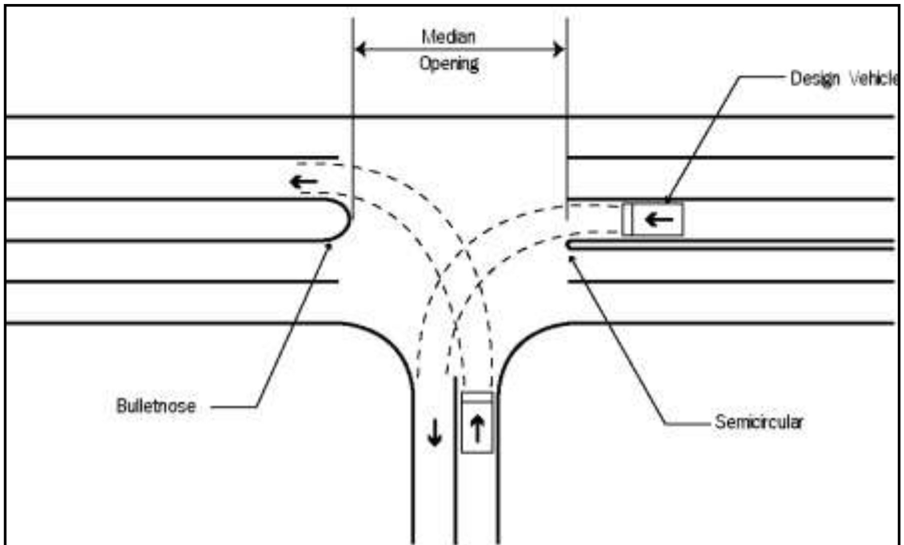
On median-divided roadways, left-turn ingress or egress to a site requires a median opening. Median design elements include the median width, the spacing of median openings (see Section 4.3), and the geometrics of median noses at openings.

Median widths ranging from 6 to 20 feet are desirable for providing separate left-turn lanes.

The design of the median nose can vary from semicircular, usually for medians in the 4-foot to 10-foot range, to bullet nose design, for wider medians and for intersections that will accommodate semi-trailer trucks.

The bullet nose is formed by two symmetrical portions of control radius arcs that are terminated by a median nose radius that is normally one-fifth the width of the median (e.g., a bullet nose design for a median opening in a 20-foot-wide median would have a small nose radius of 4 feet that could connect two 50-foot radii).

The large radii should closely fit the path of the inner rear wheel of the selected design vehicle. The advantages are that the driver of the left-turning vehicle, especially a truck, has a better guide for the maneuver. The median opening can be kept to a minimum, and vehicle encroachment is minimized. **Figure 5-13** indicates the various elements of a median opening design.



Median Openings Design Controls		
Control Radius (feet)	Design Vehicles Accomodated	
	Predominant	Occasional
40	P	SU
50	SU	WB-40
75	WB-40	WB-50

Median Width (feet)	Minimum Median Opening (feet)	
	Semicircular	Bullet Nose
12	88	58
18	82	47
20	80	44
30	70	40 minimum
40	60	40 minimum
50	50	40 minimum
60	40 minimum	40 minimum

Figure 5-13 – Minimum Median Openings[18]

[18] Source: American Association of State Highway and Transportation Officials, "A Policy on Geometric Design of Highways and Streets – 4th Edition," 2001.

5.14 Pedestrian Facilities[19]

Pedestrian facility improvements on major roadway projects should utilize all applicable City of Tucson Development Standards, Pima County/City of Tucson Standard Specifications and Details, and Arizona Department of Transportation (ADOT) Standards, and should be compliant with the transportation and public accommodation provisions of the Americans with Disabilities Act (ADA).

All major roadway projects should include sidewalks on both sides of the improved roadway section. When adequate right-of-way is available, consideration should be given to providing sidewalks and landscape areas between the sidewalk and the roadway of greater width than minimum Development Standard specifications. The path of travel along sidewalks should generally be straight without unnecessary curving or offsets. Consideration should be given to extending sidewalks to local and regional activity centers up to one-quarter mile beyond the project limit, in order to create a convenient, safe, and attractive pedestrian network. Consideration should be given to the utilization of alternative paving materials and designs, such as permeable concrete, unit pavers, scored or sandblasted concrete patterns, and the integration of public art in paving that enhance the overall aesthetic value of the project, contribute to the effectiveness of rainwater harvesting elements, and complement existing and planned future urban design character. Pedestrian access within the public right-of-way should also take into consideration the guidelines and requirements for on-site pedestrian improvements that exist within city codes, area and neighborhood plans, and other land use policy documents that shape development adjacent to the road. Installation of crosswalks across streets and driveways requires approval from the Traffic Engineering Division

5.15 Bicycle Facilities

The City of Tucson desires to provide facilities and infrastructure that support bicycling as a safe and reliable mode of transportation. The City of Tucson frames the development of the City's bikeway network around five types of bicycle facilities:

- Bicycle Route – lower volume streets with a maximum speed limit of 30 mph, with "Bike Route" signs.
- Bicycle Route with Striped Shoulder – on major streets with speed limits 25 mph or more. Striped shoulder consists of a 5-foot-wide paved shoulder with a white edge line.
- Shared-use Path – a paved pathway, 10-foot to 12-foot-wide, physically separated from the street. Shared-use paths are shared with pedestrians and other non-motorized users, and occasionally equestrians. These are suitable for slower speeds. Shared-use-Paths shall be designed in accordance with the American Association of State Highway and Transportation Officials (AASHTO) Guide for Development of Bicycle Facilities. Special consideration should be given to address safety issues where shared use paths are located adjacent to roadways.

[19] Source: City of Tucson Roadway Development Policies, 1998.

- Residential Streets – Selected local streets that have low traffic volumes, and a maximum speed limit of 25 mph. Bicycles and vehicles share the roadway.
- Bicycle boulevards – Bicycle boulevards are low-volume and low-speed streets that have been optimized for bicycle travel through treatments such as traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments. The improvements prioritize bicycle travel on the streets, and lead to an attractive, convenient, and comfortable bicycling environment. These treatments allow through movements for cyclists while discouraging similar through trips by non-local motorized traffic. Motor vehicle access to properties along the route is maintained. Bicycle boulevards are designed to offer the advantages of cycling on shared roadways, but allow the bicyclist to experience lower traffic volumes and lower traffic speeds.

Architects and developers should consider these five types of bicycle facilities throughout the development planning and design process.

The City of Tucson requires that all major roadway projects be designed with a minimum 5-foot-wide or preferred 6-foot-wide bicycle lanes. Additionally, 6-foot-wide bicycle lanes are required on roadways with speeds at or exceeding 40 miles per hour. Bicycle facility improvements on major roadway projects should utilize all appropriate AASHTO design guidelines, MUTCD, City of Tucson Development Standards, and the City of Tucson Specifications and Details.

All major roadway projects involving the reconstruction of intersections should provide for bicycle lanes with striped shoulders or additional outside vehicle lane width for bicycle lanes as part of the intersection improvement. Bicycle-sensitive actuated signal detection or video camera detection should be provided so that the bicyclist can actuate the traffic signal.

All new development should provide safe bicycle access to and from their facility. Development which requires new turn lanes shall maintain or install new bike lanes.

5.16 Transit Facilities

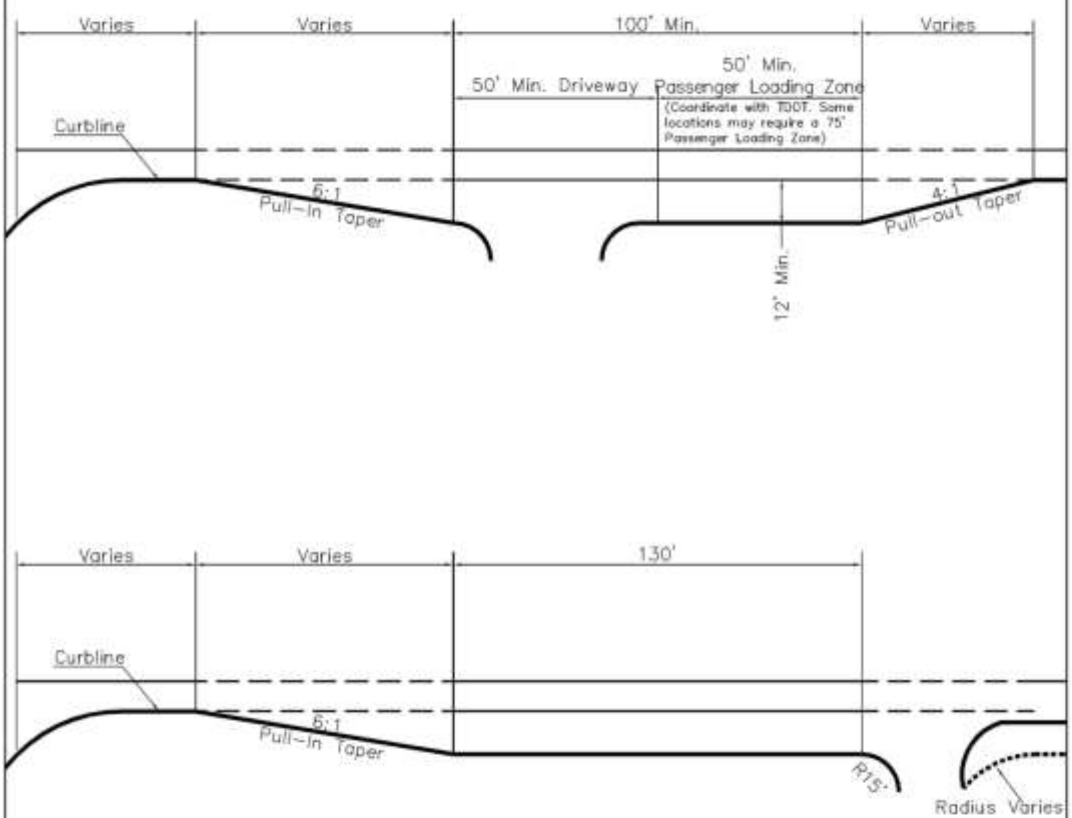
In order to provide convenient access to public transit, bus stops should be placed every one-quarter mile on major roadway projects located along existing local transit routes, and every one-half mile to one mile along express or limited routes. Additional stops may be considered to serve major trip generators. Unless otherwise warranted by overriding safety concerns or passenger convenience issues, bus stops should be located on the far side of the intersection.

Bus shelters should be provided at all bus stops located along major roadways to provide for passenger comfort and safety.

Major roadway or large scale development projects should include bus pullouts at high activity bus stops when warranted by peak hour traffic, peak hour bus frequency, passenger safety concerns, and when adequate right-of-way is available. Bus pullouts should be located on the far side of the intersection in order to utilize signal protection for re-entry into the stream of traffic. Bus pullouts should be carefully planned and designed to minimize transit vehicle delay in re-entering the stream of traffic. Bus pullouts should include shelters and other passenger amenities to provide for customer safety and convenience and should be designed to not conflict with driveway access.

For the design of a bus bay, it is recommended that a minimum 6:1 bay taper be used to provide a 12-foot minimum width bus bay. The bus bays should provide for 100 feet of storage length, unless it is a layover location, and a 4:1 exit taper. **Figures 5-14 and 5-15** provide the bus bay details for two types of design.

BUS PULLOUT EXHIBIT



NOTES:

1. DRIVEWAYS ARE NOT RECOMMENDED IN BUS BAY.
2. IF A DRIVEWAY IS INSTALLED IT SHOULD BE LOCATED PRIOR TO THE 50' MIN. PASSENGER LOADING ZONE OR 45' AWAY FROM THE DESIGNATED BUS STOP.
3. EXISTING ROADWAY CONSTRAINTS MAY RESTRICT THE ABILITY OR NEED TO INSTALL A 12' WIDE BUS BAY. TRAFFIC ENGINEERING MAY REQUIRE A TRAFFIC ENGINEERING ANALYSIS TO SUPPORT ALTERNATIVE RECOMMENDATIONS FOR THE INSTALLATION OF BUS BAYS.

Figure 5-14 – Bus Bay Detail 1 – Major Intersections

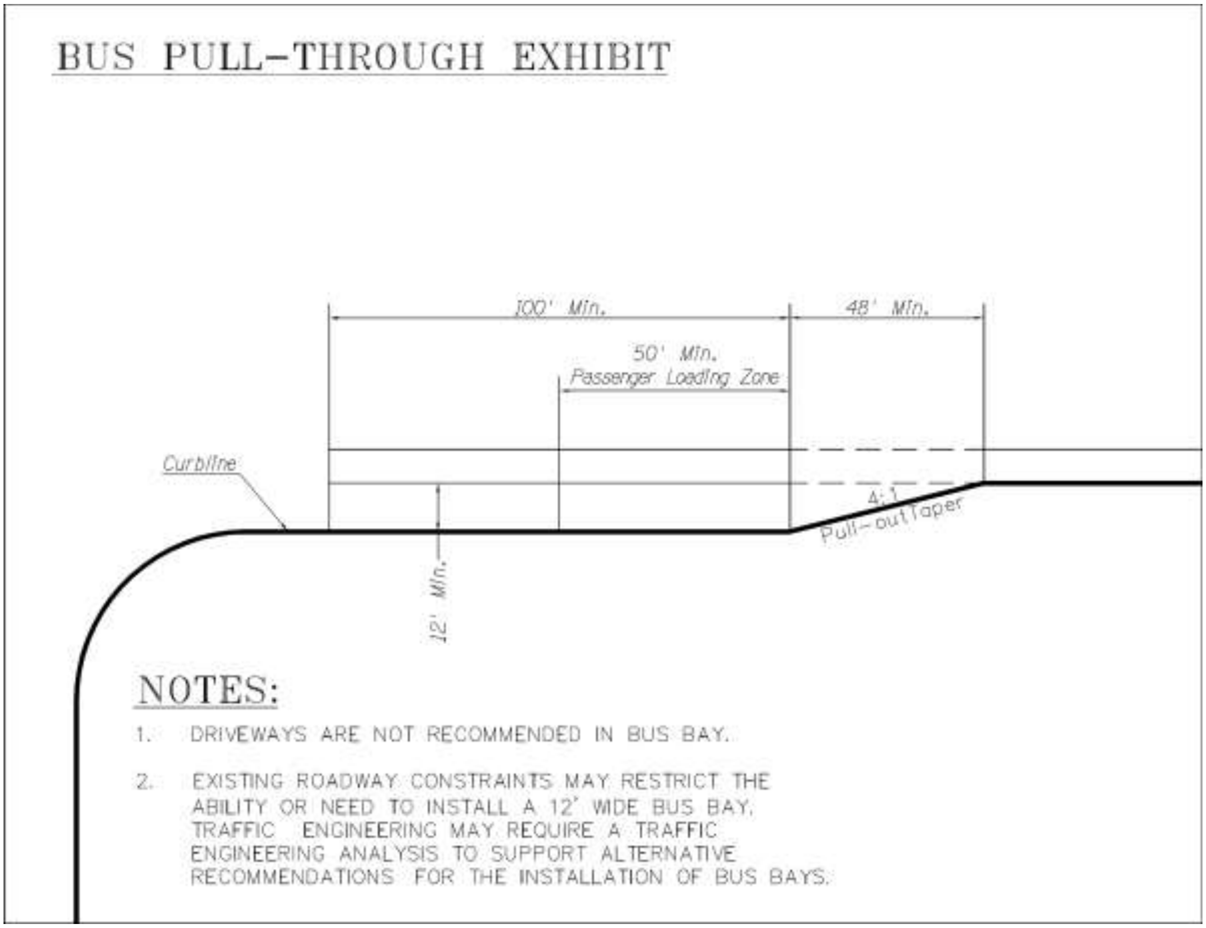


Figure 5-15 – Bus Bay Detail 2 – Minor Intersections

6.0 METHODS OF APPLICATION

6.1 Traffic Impact Analysis

The City may request that a Traffic Impact Analysis (TIA) be prepared for proposed developments consistent with its policies. A detailed description of the methodology and necessary data is presented in Section 6.3.2.

6.2 Variations

Where the City of Tucson finds extraordinary hardships or practical difficulties resulting from strict compliance with approved requirements, the City may approve variations to the requirements, provided that safety standards are met, so that the public interest is served. The City may require that a TIA or other information be submitted when reviewing a request for a variation. Variations may be necessary for exceptions to turning restrictions or spacing standards where it can be demonstrated that no other reasonable options are available.

A petition for any variation should be submitted in writing to the City by the developer or by the developer's traffic engineer. The developer must prove that the variation will not be contrary to the public interest and that unavoidable practical difficulty or unnecessary hardship will result if not granted. The developer should establish and substantiate that the variation conforms to the City's requirements and standards.

Care should be taken in issuing variations. No variation should be granted unless it is found that the following relevant requirements and conditions are satisfied. The City may grant variations whenever it is determined that all of the following criteria have been met:

1) The granting of the variation should be in harmony with the general purpose and intent of the regulations and should not result in undue delay or congestion or be detrimental to the safety of the public using the roadway.
2) There should be proof of unique or existing special circumstances or conditions where strict application of the provisions would deprive the developer of reasonable access. Circumstances that would allow reasonable access to a road or street other than a primary roadway, circumstances where indirect or restricted access can be obtained, or circumstances where engineering or construction solutions can be applied to mitigate the condition should not be considered unique or special.
3) There should be proof of the need for the access and a clear documentation of the practical difficulty or unnecessary hardship. The difficulty or hardship must result from strict application of the provision, and it should be suffered directly and solely by the owner or developer of the property in question.

The City shall render a decision in writing to the developer. Materials documenting the variation are maintained in the City's permit files.

6.3 Site Design

This sub-section sets forth criteria for access control and traffic impact analyses, as they apply to individual developments.

6.3.1 Access Control

Typical access control requirements for arterials and collectors are provided as follows:

1) No driveway access to an arterial street should be allowed for any residential lot. Driveway access to collectors from residential lots should be discouraged and approved on a case-by-case evaluation.
2) No driveway access should be allowed within 150 feet of the nearest curb line of a signalized or major intersection. See Section for 5.0 for specific design criteria.
3) Driveways giving direct access may be denied if alternate access is available.
4) When necessary for the safe and efficient movement of traffic, access points may be required to be designed for right turns in and out only.
5) In most cases driveways will be treated with curb returns along arterial and collector roadways (see Table 5-2).

6.3.2 Traffic Impact Analysis

A TIA is a specialized study of the impacts that a certain type and size of development will have on the surrounding transportation system. A TIA is essential for many access management decisions, such as spacing of driveways, traffic control devices, and traffic safety issues. It is specifically concerned with the generation, distribution, and assignment of traffic to and from new development. A TIA should also be used as part of the site planning process, not merely justification of the site plan. The purpose of this sub-section is to establish uniform guidelines for when a TIA is required and how the study is to be conducted.

6.3.2.1 Requirements A complete TIA should be performed if any of the following situations are proposed:

1) All new developments or additions to existing developments, which are expected to generate more than 100 new peak-hour vehicle trips (total in and out vehicular movements). The peak-hour will be determined by the City's representative.
2) In some cases, a development that generates less than 100 new peak hour trips may require a TIA or a Traffic Statement, if it affects local "problem" areas. These would include high crash locations, currently congested areas, or areas of critical local concern. These cases will be based on the City representative's judgment.
3) All applications for rezoning or special exception (e.g. big box).
4) All applications for annexation.

5) Any change in the land use or density that will change the site traffic generation by more than 15 percent, where at least 100 new peak-hour trips are involved.
6) Any change in the land use that will cause the directional distribution of site traffic to change by more than 20 percent.
7) When the original TIA is more than 2 years old, access decisions are still outstanding, and changes in development have occurred in the site environs.
8) When development agreements are necessary to determine "fair share" contributions to major roadway improvements.
9) Parking in areas of minimum requirements is proposed.

The specific analysis requirements, and level of detail, are determined by the following requirements.

- **CATEGORY I TIA** -- Developments which generate from 100 up to 500 peak hour trips. The study horizon should be limited to the opening year of the development. The minimum study area should include site access drives and adjacent signalized intersections and/or major unsignalized street intersections.

- **CATEGORY II TIA** -- Developments that generate from 500 up to 1,000-peak hour trips. The study horizon should include both the opening year of the development and five years after opening. The minimum study area should include the site access drives and all signalized intersections and/or major unsignalized street intersections within one-half mile of the development.

- **CATEGORY III TIA** -- Developments that generate 1,000 or more peak hour trips. The study horizon should include the opening year of the development, five years after opening and ten years after opening. The minimum study area should include the site access drives and all signalized intersections and/or major unsignalized street intersections within one mile of the development.

6.3.2.2 Qualifications for Preparing Traffic Impact Analysis Documents. The TIA should be conducted and prepared under the direction of a registered professional engineer. The subject engineer should have special training and experience in traffic engineering.

6.3.2.3 Analysis Approach and Methods. The traffic study approach and methods should be guided by the following criteria.

6.3.2.3.1 **STUDY AREA**. The minimum study area should be determined by project type and size in accordance with the criteria previously outlined. The extent of the study area may be either enlarged, or decreased, depending on special conditions as determined by the City's representative.

6.3.2.3.2 **STUDY HORIZON YEARS**. The study horizon years should be determined by project type and size, in accordance with the criteria previously outlined.

6.3.2.3.3 **ANALYSIS TIME PERIOD**. Both the morning and afternoon weekday peak hours should be analyzed, unless the proposed project is expected to generate no trips, or a very low number of trips, during either the morning or evening peak periods. If this is the case, the requirement to analyze one or both of these periods may be waived by the City's representative.

Where the peak traffic hour in the study area occurs during a different time period than the normal morning or afternoon peak travel periods (for example mid-day), or occurs on a weekend, or if the proposed project has unusual peaking characteristics, these additional peak hours should also be analyzed.

6.3.2.3.4 **SEASONAL ADJUSTMENTS**. When directed by the City's representative, the traffic volumes for the analysis hours should be adjusted for the peak season, in cases where seasonal traffic data is available.

6.3.2.3.5 **DATA COLLECTION REQUIREMENTS**. All data should be collected in accordance with the latest edition of the ITE Manual of Traffic Engineering Studies, or as directed by the City of Tucson's Traffic Engineer.

6.3.2.3.5.1 **Traffic volumes.** Manual turning movement counts should be obtained for all existing cross-street intersections to be analyzed during the morning and afternoon peak periods. Turning movement counts may be required during other periods as directed by the City's representative.

6.3.2.3.5.2 **Daily traffic volumes.** The current and projected daily traffic volumes should be presented in the report. If available, daily count data from the City of Tucson, Pima County, or the Pima Association of Governments (PAG) may be used. Where daily count data is not available, mechanical counts will be required at locations agreed upon by the City's representative.

6.3.2.3.5.3 **Crash data.** Traffic crash data should be obtained for the most current three-year period available.

6.3.2.3.5.4 **Roadway and intersection geometrics.** Roadway geometric information should be obtained. This includes, but is not limited to, roadway width, number of lanes, turning lanes, vertical grade, and location of nearby driveways, pedestrian facilities, and lane configuration at intersections.

6.3.2.3.5.5 **Traffic control devices.** The location and type of traffic controls should be identified.

6.3.2.3.5.6 **Bicycle and pedestrian volumes.** When directed by the City of Tucson's traffic engineering staff, bicycle and pedestrian volumes should be collected.

6.3.2.3.6 **TRAFFIC VOLUME FORECASTS**. Future traffic volumes should be estimated using information from transportation models, or applying an annual growth rate to the base-line traffic volumes. The future traffic volumes should be representative of the horizon year for project development. If the annual growth rate method is used, the traffic engineering staff must give prior approval to the growth rate.

In addition, any nearby proposed "on-line" development projects should be taken into consideration when forecasting future traffic volumes. The increase in traffic from proposed "on-line" projects should be compared to the increase in traffic by applying an annual growth rate. This information should be provided by the traffic engineering staff

If modeling information is unavailable, the greatest traffic increase from either the "on-line" developments, the application of an annual growth rate, or a combination of an annual growth rate and "on-line" developments, should be used to forecast the future traffic volumes.

6.3.2.3.7 **TRIP GENERATION**. The latest edition of *Institute of Transportation Engineers (ITE) Trip Generation Handbook* should be used for selecting trip generation rates. Other rates may be used with the approval of the traffic engineering staff in cases where the *ITE Trip Generation Handbook* does not include trip rates for a specific land use category, or includes only limited data, or where local trip rates have been shown to differ from the ITE rates.

Site traffic should be generated for daily, AM, and PM peak hour periods. Adjustments made for "passer-by" and "mixed-use" traffic volumes should follow the methodology outlined in the latest edition of the *ITE Trip Generation Handbook.* A "passer-by" traffic volume discount for commercial centers should not exceed twenty five percent unless approved by the City's representative.

A trip generation table should be prepared showing proposed land use, trip rates, and vehicle trips for daily and peak hour periods and appropriate traffic volume adjustments, if applicable.

6.3.2.3.8 **TRIP DISTRIBUTION AND ASSIGNMENT.** Projected trips should be distributed and added to the projected non-site traffic on the roadways and intersections under study. The specific assumptions and data sources used in deriving trip distribution and assignment should be documented in the report and approved by the City's representative.

Category III TIA's may require the use of a travel demand model based on direction from the City's representative.

The site-generated traffic should be assigned to the street network in the study area based on the approved trip distribution percentages. The site traffic should be combined with the forecasted traffic volumes to show the total traffic conditions estimated at development completion. A figure will be required showing daily and peak period turning movement volumes for each traffic study intersection. In addition, a figure should be prepared showing the base-line volumes with site-generated traffic added to the street network. This figure will represent site specific traffic impacts to existing conditions.

6.3.2.3.9 **CAPACITY ANALYSIS**. Level of service (LOS) should be computed for signalized and unsignalized intersections in accordance with the latest edition of the Highway Capacity Manual. The intersection LOS should be calculated for each of the following conditions (if applicable):

1) Existing peak hour traffic volumes (figure required).
2) Existing peak hour traffic volumes including site-generated traffic (figure required).
3) Future traffic volumes not including site traffic (figure required).
4) Future traffic volumes including site traffic (figure required).

5) LOS results for each traffic volume scenario (table required).

The LOS table should include LOS results for AM and PM peak periods if applicable. The table should show LOS conditions with corresponding vehicle delays for signalized intersections, and LOS conditions for the critical movements at unsignalized intersections. For signalized intersections, the LOS conditions and average vehicle delay should be provided for each approach and the intersection as a whole.

Unless otherwise directed by the City's representative, the capacity analysis for existing signalized intersections should be conducted using the Highway Capacity Manual's Operational Method for each study horizon year. When directed by the City's representative, the capacity analysis should be conducted using the Planning Analysis Method.

When the operational capacity analysis method is used for existing signalized intersections, it should include existing phasing, timing, splits, and cycle lengths during the peak hour periods when available from the City's representative.

For unsignalized intersections, the Highway Capacity Manual methodology should be used.

If the new development is scheduled to be completed in phases, the TIA will, if directed by the City's representative, include a LOS analysis for each separate development phase in addition to the TIA for each horizon year. The incremental increases in site traffic from each phase should be included in the LOS analysis for each preceding year of development completion. A figure will be required for each horizon year of phased development.

6.3.2.3.10 **QUEUE ANALYSIS.** If directed by the City's representative, a queue analysis should be completed using the methods outlined in Section 5.3.2.1 to determine appropriate storage lengths for right turn and left turn lanes into and out of the site.

6.3.2.3.11 **TRAFFIC SIGNAL WARRANT ANALYSIS.** A traffic signal warrant study should be conducted if directed by the City's representative. The analysis will be required for each horizon year.

Traffic signal warrant studies should be conducted by a method pre-approved by the City's representative.

6.3.2.3.12 **CRASH ANALYSIS**. If directed by the City's representative, an analysis of three-year crash data should be conducted to determine the level of safety of the study area and any possible mitigation efforts.

6.3.2.3.13 **SPEED ANALYSIS**. Vehicle speed is used to estimate safe stopping and cross corner sight distances. In general, the posted speed limit is representative of the 85th percentile speed and may be used to calculate safe stopping and cross corner sight distances. If directed by the City's representative, speed counts should be taken in the study area.

6.3.2.3.14 **TRAFFIC SIMULATION**. For a major development, a simulation using SYNCHRO or other approved software should be done to show existing traffic flows and future traffic flows if directed by the City's representative.

6.3.2.3.15 **MITIGATION REQUIREMENTS**. The roadways and intersections within the study area should be analyzed, with and without the proposed development to identify any projected impacts in regard to level of service and safety.

Where the roadway will not operate at Level of Service D or better with the development, the traffic impact of the development on the roadways and intersections within the study area shall be mitigated to Level of Service D.

6.3.2.3.16 **INTER-AGENCY COORDINATION**. When a new development falls within the boundaries of more than one government agency jurisdiction, the TIA should be distributed as an informational report to all affected agencies. The agency with governing powers over the development site will have final approval of the TIA.

6.3.2.4 Report Format. This sub-section provides the format requirements for the general text arrangement of a TIA. Deviations from this format must receive prior approval of the City's representative.

6.3.2.4.1 **TABLE OF CONTENTS**

6.3.2.4.2 **TABLE OF FIGURES**

6.3.2.4.3 **LIST OF TABLES**

6.3.2.4.4 **EXECUTIVE SUMMARY**

Purpose of Report and Study Objectives
Site Location and Study Area
Development Description
Principal Findings

Conclusions

***6.3.2.4.5* PROJECT DESCRIPTION**

Site Location
Land Use and Intensity
Proposed Development Details
Site Plan (readable version should be provided)
Access Geometrics
Development Phasing and Timing

***6.3.2.4.6* EXISTING CONDITIONS**

Study Area
- Roadway System
- Pedestrian/Bicycle Facilities
- Transit
- Sight Distance
- Existing Land Use

***6.3.2.4.7* EXISTING TRAFFIC DATA**

Traffic Counts
Pedestrian Counts (if necessary)
Bicycle Counts (if necessary)
Times Collected
Locations
Types - Daily, Morning, and Afternoon Peak Periods (two hours minimum, and others as required)

***6.3.2.4.8* TRIP GENERATION**

Trip Generation
Pass-by Traffic (if applicable)

***6.3.2.4.9* TRIP DISTRIBUTION AND ASSIGNMENT**

Trip Distribution
Trip Assignment

6.3.2.4.10 **ACCESS**

Site Access
Driveways

6.3.2.4.11 **CRASH ANALYSIS**

Analysis Years
Types of Crashes
DUI
Injury
Non-injury
Fatalities

6.3.2.4.12 **EXISTING TRAFFIC OPERATIONS**

Level of Service
Morning Peak Hour, Afternoon Peak Hour
(And others as required)

6.3.2.4.13 **FUTURE TRAFFIC OPERATIONS WITHOUT PROJECT**

Projections of non-site traffic (Methodology for projections should receive prior approval of City's representative)
Roadway Improvements

Improvements Programmed to Accommodate Non-site Traffic
Additional Alternative Improvements to Accommodate Site Traffic

Level of Service Analysis without Project (for each horizon year including any programmed improvements)

6.3.2.4.14 **TRAFFIC SIGNAL WARRANT ANALYSIS**

Warrant Analysis should be performed for each horizon year with and without project (Methodology for analysis should receive prior approval of City's representative)

6.3.2.4.15 **FUTURE TRAFFIC OPERATIONS WITH PROJECT**

Level of Service Analysis with Project (for each horizon year, including any programmed improvements)

6.3.2.4.16 **SUGGESTED TRAFFIC MITIGATIONS**

Pedestrian/Bicycle Considerations
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6.3.2.4.17 **TURN LANE ANALYSIS**

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6.3.2.4.18 **CONCLUSION**

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Trip Impacts
- Vehicular
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6.3.2.4.19 **APPENDICIES**

Traffic Volume Counts
Capacity Analyses Worksheets
Traffic Signal Warrant Analysis
Crash Data and Summaries
Miscellaneous Addendum

6.4 Existing Problem Areas

Introducing a “retrofit” program of access control to an existing roadway is often difficult. Land for needed improvements is often unavailable, making certain access management techniques impossible to implement and requiring the use of minimum rather than desirable standards. Rights of property access should be respected. Social and political pressures will emerge from abutting property owners who perceive that their access will be unduly restricted and their businesses hurt. The needed cooperation of proximate, sometimes competitive, developments in rationalizing on-site access and driveway locations may be difficult to achieve, as is a comparison of the cost of economic hardship to an individual to the benefits accruing to the general public. Accordingly, the legal, social, and political aspects of access management are particularly relevant in retrofit situations and should be thoroughly understood by public agencies and private groups responsible for implementing access control programs for retrofit projects.

The general reasons underlying retrofit actions include the following:

1) Increased congestion and crashes along a given section of road that are attributed to random or inadequate access;
2) Major construction or design plans for a road that make access management and control essential;
3) Street expansions or improvements that make it practical to reorient access to a cross street and remove (or reduce) arterial access; and
4) Coordinating driveways, on one side of a street, with those planned by a development on the other side.

6.4.1 Types of Action

Most retrofit actions involve the application of accepted traffic engineering techniques that limit the number of conflict points, separate basic conflict areas, limit speed adjustment problems, and remove turning vehicles from the through travel lanes. **Tables 6-1** through **6-4** present the various access management techniques that achieve each of these objectives and mainly apply to retrofit situations.

Table 6-1 – Retrofit Techniques – Category A[20]

CATEGORY A – Limit Number of Conflict Points	
No.	Description
A-1	Install median barrier with no direct left-turn access
A-2	Install raised median divider with left-turn deceleration lanes
A-3	Install one-way operations on the roadway
A-4	Install traffic signal at high-volume driveways
A-5	Channelize median openings to prevent left-turn ingress and/or egress maneuvers
A-6	Widen right through lane to limit right-turn encroachment onto the adjacent lane to the left
A-7	Install channelizing islands to prevent left-turn deceleration lane vehicles from returning to the through lanes
A-8	Install physical barrier to prevent uncontrolled access along property frontages
A-9	Install median channelization to control the merge of left-turn egress vehicles
A-10	Offset opposing driveways
A-11	Locate driveway opposite a three-leg intersection or driveway and install traffic signals where warranted
A-12	Install two one-way driveways in lieu of one two-way driveway
A-13	Install two two-way driveways with limited turns in lieu of one standard two-way driveway
A-14	Install two one-way driveways in lieu of two two-way driveways
A-15	Install two two-way driveways with limited turns in lieu of two standard two-way driveways
A-16	Install driveway channelizing island to prevent left-turn maneuvers
A-17	Install driveway channelizing island to prevent driveway encroachment conflicts
A-18	Install channelizing island to prevent right-turn deceleration lane vehicles from returning to the through lanes
A-19	Install channelizing island to control the merge area of right-turn egress vehicles
A-20	Regulate the maximum width of driveways

[20] Adapted from: Federal Highway Administration, 1982.

Table 6-2 – Retrofit Techniques – Category B[21]

CATEGORY B – Separate Basic Conflict Areas	
No.	Description
B-1*	Regulate minimum spacing of driveways
B-2	Regulate minimum corner clearance
B-3	Regulate minimum property clearance
B-4*	Optimize driveway spacing in the permit authorization stage
B-5*	Regulate maximum number of driveways per property frontage
B-6	Consolidate access for adjacent properties
B-7	Require roadway damages for extra driveways
B-8	Purchase abutting properties
B-9	Deny access to small frontage
B-10	Consolidate existing access whenever separate parcels are assembled under one purpose, plan, entity, or usage
B-11*	Designate the number of driveways regardless of future subdivision of that property
B-12	Require access on collector street (when available) in lieu of additional driveway on arterial

* = not directly applicable for retrofit

Table 6-3 – Retrofit Techniques – Category C[22]

CATEGORY C – Limit Speed-Adjustment Problems	
No.	Description
C-1	Install traffic signals to slow roadway speeds and meter traffic for larger gaps
C-2	Restrict parking on the roadway next to driveways to increase driveway turning speeds
C-3	Install visual cues of the driveway
C-4	Improve driveway sight distance
C-5	Regulate minimum sight distance
C-6*	Optimize sight distance in the permit authorization stage
C-7	Increase the effective approach width of the driveway (horizontal geometrics)
C-8	Improve the driveway profile (vertical geometrics)
C-9	Require driveway paving
C-10	Regulate driveway construction (performance bond) and maintenance
C-11	Install right-turn acceleration lane
C-12	Install channelizing islands to prevent driveway vehicles from backing onto the arterial
C-13	Install channelizing islands to move ingress merge point laterally away from the arterial
C-14	Move sidewalk-driveway crossing laterally away from the arterial.

* = not directly applicable for retrofit

[21] Adapted from: Federal Highway Administration, 1982.
[22] Adapted from: Federal Highway Administration, 1982.

Table 6-4 – Retrofit Techniques – Category D[23]

CATEGORY D – Remove Turning Vehicles from the Through Lanes	
No.	Description
D-1	Install two-way left-turn lane
D-2	Install continuous left-turn lane
D-3	Install alternating left-turn lane
D-4	Install isolated median and deceleration lane to shadow and store left-turning vehicles
D-5	Install left-turn deceleration lane in lieu of right-angle crossover
D-6	Install median storage for left-turn egress vehicles
D-7	Increase storage capacity of existing left-turn deceleration lane
D-8	Increase the turning speed of right-angle median crossovers by increasing the effective approach width
D-9	Install continuous right-turn lane
D-10	Construct a local service road
D-11*	Construct a bypass road
D-12*	Reroute through traffic
D-13	Install supplementary one-way right-turn driveways to divided roadway (non-capacity warrant)
D-14	Install supplementary access on collector street when available (non-capacity warrant)
D-15	Install additional driveway when total driveway demand exceeds capacity
D-16	Install right-turn deceleration lane
D-17	Install additional exit lane on driveway
D-18	Encourage connections between adjacent properties (even when each has arterial access)
D-19	Require two-way driveway operation where internal circulation is not available
D-20	Require adequate internal design and circulation plan

* = not directly applicable for retrofit

[23] Adapted from: Federal Highway Administration, 1982.

7.0 GUIDELINE REFERENCES

References to standard engineering documents mentioned throughout the text refer to the latest publication or edition of the work.

The following documents were used in developing the City of Tucson Transportation Access Management Guidelines:

American Association of State Highway Officials (AASHO), *Roadside Design Guide*. Washington, DC: 1973.

American Association of State Highway and Transportation Officials (AASHTO "Green Book"), *A Policy on Geometric Design of Highways and Streets*. Washington, DC: 2001 and 2004.

American Public Works Association (Southern Utah Chapter), *Traffic Standards*. St. George, UT: 1996.

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City of Tucson, *Street Development Standard 3-01.*

City of Tucson, *Tucson City Code,* Section 25-38 to 25-40.

City of Tucson Department of Transportation, *Roadway Development Policies, Update to Ordinance 6593*. Tucson, AZ: April 1998.

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Federal Highway Administration, *Access Management, Location and Design*. National Highway Institute Course No. 15255, June 1998.

Flora, John W., and Keitt, Kenneth M., *Access Management for Streets and Highways.* Washington, DC: Federal Highway Administration, FHWA IP-82-3, June 1982.

Idaho Transportation Department, Traffic Manual. 2011.

Institute of Transportation Engineers (ITE), *Traffic Engineering Handbook – 6th Edition*, Washington, DC: 1999.

Koepke, Frank J., and Levinson, H.S., *Access Management Guidelines for Activity Centers.* Washington, DC: Transportation Research Board, NCHRP Report 348, 1992.

Koepke, Frank J., and Stover, Vergil G., *Transportation and Land Development*. Englewood Cliffs, NJ: Prentice Hall, 1988.

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Ronald K. Giguere. *Driveway and Street Intersection Spacing.* Transportation Research Board, Transportation Research Circular 456. Washington, DC, March 1996.

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Transportation Research Board. *Access Management Manual*. Washington, DC: U.S. Department of Transportation, 1989 and 2004.

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Transportation Research Board - National Research Council. *Highway Capacity Manual (HCM)*. Washington, DC, 2000 Fourth edition.

U.S. Department of Transportation – Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD).* Washington, DC: 1988, 2009.

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APPENDIX FR-6

City of Peoria Transportation Access Management Guidelines

CITY OF PEORIA, AZ

Access Management Guidelines

2011

CITY OF PEORIA

Table of Contents

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1.0 INTRODUCTION

Constantly growing traffic congestion, concerns over traffic safety, and the increasing cost of upgrading roads have generated interest in managing the access to the roadway system. Access management attempts to balance the need to provide good mobility for through traffic with the requirements for reasonable access to adjacent land uses

The most important concept in understanding the need for access management is that through movement of traffic and direct access to property are in conflict. An effective access management program will accomplish the following:

- Limit the number of conflict points at driveway locations;
- Conflict points are indicators of the potential for collisions;
- When left turns and cross street through movements are restricted, the number of conflict points are significantly reduced;
- Adequate spacing between intersections allows drivers to react to one intersection at a time, and reduces the potential for conflicts;
- Reduce the interference with through traffic;
- Providing turning lanes, designing driveways with large turning radii, and restricting turning movements in and out of driveways reduces friction to the through movement and enhances safety;
- Provide sufficient spacing for at-grade, signalized intersections;
- Good spacing of signalized intersections reduces conflict areas and increases the potential for smooth traffic progression;
- Provide adequate on-site circulation and storage;
- The design of good internal vehicle circulation in parking areas and on local streets reduces the number of driveways needed for access to commercial and residential developments.

2.0 FUNCTIONAL CLASSIFICATION

The purpose of this section is to discourage the use of local streets for cut through traffic while maintaining the overall connectivity of the roadway system. In addition to the standards outlined in the Infrastructure Design Guidelines, the provisions of this section are intended to improve the safety and convenience for walking and bicycling; facilitate emergency access; reduce vehicle miles traveled; help preserve the use of major roadways for through traffic by providing alternative routes for short local trips and reduce the need for continued road widening which divides neighborhoods with wide expanses of pavement that are difficult and hazardous to cross. Further, it is expected that these provisions will reduce environmental damage by allowing more compact layouts of streets and lots.

TABLE 1. FUNCTIONAL CLASSIFICATION	
Freeway	A major highway that provides access via interchanges only.
Major Arterial	A roadway of regional importance intended to serve high volumes of traffic traveling relatively long distances. The roadway is also access controlled and primarily intended to serve through traffic.
Minor Arterial	A roadway that is similar in function to major arterials, but operated under lower traffic volumes, serves trips of shorter distances, and provides a higher degree of property access than major arterials.
Major Collector	A roadway that provides for traffic movement between arterials and local streets and carries moderate traffic volumes over moderate distances.
Minor Collector	A roadway that is similar in function to a major collector, but carries lower traffic volumes over shorter distances and has a higher degree of property access. Minor Collectors may also provide direct access to abutting properties except individual residences.
Local Street	A roadway intended to provide access to abutting properties that tends to accommodate lower traffic volumes, serve short trips, and provide connection to collector streets. The roadway also provides mobility within a neighborhood.
Rural Street	Similar to a local roadway, but in a rural setting versus an urban or suburban environment.

A. Roadways under the jurisdiction of the City of Peoria shall be classified for the purposes of access management.

B. The City of Peoria's functional classification system is provided in the City of Peoria General Plan.

C. Existing and planned medians on all major arterials, minor arterials, major collectors, and minor collector roadways.

- Medians should be identified by type;
- Non-conforming medians should be identified for future consolidation or closure.

D. The Engineering Director shall be responsible for assigning an access classification to roadway or roadway segments. Factors to be considered in the assignment of an access classification shall include, but not be limited to:

- The current and planned functional classification of the roadway;
- Existing and projected traffic volumes;
- Growth management objectives, and;

- The location within a Traditional Neighborhood Development (TND).

E. Separation between access points on all State Highways shall be in accordance with the Arizona Department of Transportation Access Management Guidelines.

F. Alleys may be included but shall not be required in residential, commercial, or industrial subdivisions, except that alleys shall be required in all subdivisions where:

- The subdivision abuts an existing, partially dedicated alley(s);
- Extension of an alley(s) from an adjoining subdivision is required to complete the established circulation pattern.

3.0 CONNECTIVITY

3.1 CONNECTIVITY WITH SURROUNDING STREETS

A. Local streets must provide for intra-and inter-neighborhood connections to knit developments together, rather than forming barriers between them. The street configuration within each parcel must contribute to the street system of the neighborhood.

B. Potentially signalized, full movement intersections of major or minor collectors with arterial streets should be provided at every 2,640 feet or 1/2 mile along arterial streets, unless rendered infeasible due to unusual topographic features, existing development or a natural area or feature.

C. Additional non-signalized, potentially limited movement, collector intersections with arterial streets should be spaced at intervals not to exceed 1,320 feet or ¼ mile between full movement collector intersections, unless rendered infeasible due to unusual topographic features, existing development or natural features.

D. Street alignments shall be extended to the tract boundary to provide future connection with adjoining unplatted lands, unless otherwise indicated by the Engineering Director.

E. Local streets shall be extended to provide access between adjoining neighborhoods at appropriate intervals.

- Half streets at subdivision boundaries shall be discouraged except where necessary for continuation of existing patterns;
- Platted half-streets abutting the tract to be subdivided and furnishing the sole access to residential lots shall be platted within the tract.

3.2 COMMERCIAL AND RESIDENTIAL DEVELOPMENT CONNECTIVITY

A. All new developments should be designed to discourage the use of local streets by cut-through traffic while maintaining the overall connectivity with the surrounding system of roadways. This may be accomplished through the use of modified grid systems, T-intersections, roadway jogs, or other appropriate traffic calming measures within the development.

3.3 BICYCLES/PEDESTRIAN ACCESS AND CONNECTIVITY

A. Opportunities for bicycle/pedestrian mobility should be enhanced through site design strategies and bicycle/pedestrian access ways that seek to shorten walking distances and increase accessibility between neighborhoods, schools, recreation areas, community centers, shopping areas or employment center.

- All pedestrian crossings should be provided to meet the requirements of the Americans with Disabilities Act (ADA);
- Where the Engineering Director determines that a bicycle/pedestrian connection is desirable and that such access is not conveniently provided by sidewalks adjacent to the streets, the Engineering Director may require the developer to reserve an unobstructed easement to provide such access.

B. Commercial developments shall be designed to support bicycle and pedestrian mobility.

1. Site plans for proposed commercial developments shall address steps to incorporate bicycle and pedestrian mobility. The Site Plan shall address connectivity to nearby residential developments, neighborhood community centers, churches, parks, other commercial and office developments, or other compatible land uses.

    - Safe and convenient pedestrian ways should be provided between parking areas and from the building entrance to surrounding streets, external sidewalks and development outparcels.
    - Pedestrian circulation should be provided between abutting commercial properties through the use of walkways and similar pedestrian-oriented facilities. Bicycle circulation and connectivity between commercial properties should be considered, where feasible.
    - Pedestrian facilities may be incorporated into required landscape buffers.
    - Pedestrian ways may be constructed of paver blocks, concrete, or other suitable materials. Pedestrian ways that traverse parking areas should include reflective striping.

2. Pedestrian refuge shall be incorporated in the design of channelized medians.

3. Bicycle and pedestrian amenities, such as benches, water fountains, or bicycle racks, should be provided for commercial developments of 10,000 square feet or more of gross floor area in accordance with Table 2.

TABLE 2	
Square Feet/ Gross Floor Area	Required Bicycle and/or Pedestrian Amenity
10,000 to 50,000	One bike rack, one bench
50,001 – 100,000	Two bike racks, two benches
100,001 or more	Four bike racks, four benches, outdoor water fountain

•

- Bicycle racks should be located within fifty (5) feet of the main entrance of the primary building.
- Commercial developments of 100,001 or more square feet should incorporate shaded areas into the site plan to facilitate pedestrian and bicycle friendly areas. Shower facilities should also be encouraged for use by the bicycle riders
- Priority should be given to usage of U-type bicycle racks spaced at 18” per the manufacture’s specifications.

4.0 CONNECTION SPACING

4.1 FUNCTIONAL AREA OF AN INTERSECTION

A. For the purpose of the access management plan, the functional area of intersection shall be measured as the minimum physical length, including the taper, maneuver distance plus the queue storage.

B. New connections shall not be permitted within the functional area of an intersection, as established by the minimum connection spacing for each roadway, unless:

- No other reasonable access to the property is available, including side street access and/or joint and cross access with adjacent properties, and,
- The Engineering Director determines that the connection does not create a safety or operational problem upon review of a site-specific study of the proposed connection prepared by a State of Arizona registered engineer and submitted by the applicant.

C. If proposed connections to both the primary and secondary roadway do not meet established spacing standards, then the property shall take access from the roadway with the lower functional classification.

1. An exception may be made by the Engineering Director if:

    a. The proposed spacing of the connection to the primary roadway exceeds the proposed spacing of the connection to the secondary roadway by 20 percent or more; or,

    b. The analysis provided in the site traffic impact analysis demonstrates:

    - The need for access to the primary roadway; and;
    - How sufficient mitigating access management measures, as determined by the Engineering Director, shall be implemented.

4.2 SIGNAL SPACING STANDARDS

A. The City of Peoria encourages the uniform signal spacing in accordance with a roadway’s functional classification.

B. The City will identify current and future locations of signalized intersections.

- The Engineering Director may permit a signalized intersection in prohibited areas, as a necessary measure to address safety and operational issues;

- If a variance is warranted, then the Engineering Director will consider consolidating closely spacing signalized intersections to facilitate consistent, uniform signal spacing.

C. Requests for signalized intersections require a site traffic impact analysis to be conducted by an engineer hired by the applicant. The site TIA must address:

- Speed, cycle length, and minimum progression efficiency for both the peak and off peak periods;
- The computer software to be used;
- Traffic volumes;
- Development conditions;
- Length of roadway segment to be evaluated; and
- Other relevant factors, as specified by the Engineering Director and/or Engineering Department.

4.2.1 INTERSECTIONS

A. The City of Peoria shall maintain a functional classification system and intersection hierarchy.

1. The location and spacing of proposed and existing signalized and unsignalized intersections shall be contingent on the roadways' functional classification. The separation between access points on roadways shall meet or exceed the minimum spacing standards for that classification.

   - The Engineering Director shall approve any deviations from the established signal spacing standards.
   - Deviations from the proposed spacing standards exceeding 10 percent shall not be permitted.
   - An exception may be made by the Engineering Director if a non-conforming signal and/or median opening is closed to accommodate the proposed signalized intersection.

TABLE 3			
FUNCTIONAL CLASSIFICATION		MINIMUM SPACING STANDARD	
Roadway A	Roadway B	Signalized Connections	Unsignalized Connections
Major Arterial	Major Arterial	1 mile	1 mile
Major Arterial	Minor Arterial	1 mile	1 mile
Major Arterial	Major Collector	½ mile	½ mile
Major Arterial	Minor Collector	½ mile	½ mile
Minor Arterial	Minor Arterial	1 mile	½ mile
Minor Arterial	Major Collector	½ mile	½ mile
Minor Arterial	Minor Collector	None*	¼ mile
Major Collector	Major Collector	None*	¼ mile
Major Collector	Minor Collector	None*	1/8 mile

*Signalized intersections at these locations are not desired.

2. New or reconstructed intersections should be limited to locations that preserve functional classification system and maintain the intersection hierarchy.

3. The City shall maintain the intersection hierarchy by avoiding local street connections to arterials that fail to conform to adopted spacing standards or that pose safety or operational problems.

4. Collector streets shall intersect with major collectors or arterial streets at safe and convenient locations.

5. Minor collector and local residential access streets shall connect with surrounding streets to permit the convenient movement of traffic between residential neighborhoods or facilitate emergency access and evacuation, but such connections shall not be permitted where the effect would be to encourage the use of such streets by substantial through traffic.

B. All proposed intersections shall be evaluated to minimize conflicts and designed for anticipated traffic movements.

1. Intersection evaluations shall address:
   a. Traffic factors, including:
      - Capacities;
      - Turning movements;
      - Operations;
      - Vehicle speed;
      - Pedestrian and bicycle facilities and movements;
      - Transit operations;
      - Collision history;
      - Auxiliary lanes; and
      - Connections in the functional area of the intersection.

   b. Physical factors, including:
      - Topography;
      - Existing conditions'
      - Channelization requirements; and,
      - Sight and stopping distance.

   c. Human factors, including
      - Driver habits;
      - Decision and reaction times; and,
      - Natural paths of movements.

C. Analysis of proposed intersections shall include turn lane queue lengths for all arterials and critical intersections.

D. Median openings that encourage U-Turn movements shall be considered before signalizing an intersection.

4.2.2 DRIVEWAY CRITERIA

Access Spacing

Minimum access spacing provides with sufficient perception-reaction time to address one potential conflict area at a time. Guidelines for minimum unsignalized driveway or local street spacing should consider the speed of the major roadway, stopping sight distance, the elimination of right-turn conflict overlays and the functional area of the access points. When a driveway is to be located upstream of a major intersection, the possibility of weaving, or lane shifts, to make a left turn at the major intersection should also be considered.

The functional area of any access point should be kept clear of any additional points of access. Guidelines for minimum access spacing are presented in
Table 1.

Table 1. Minimum Access Spacing (feet)

Speed (mph)	Spacing
30	150
35	180
40	230
45	260
50	290

Corner Clearance

Corner clearance is the distance between an access drive and the nearest cross road intersection. It should provide drivers with adequate perception-reaction time to access potential downstream conflicts and is aimed at preventing the location of driveways within the functional area of an intersection. It will also minimize driveway/intersection conflicts by preventing blockage of driveways upstream of an intersection due to standing traffic queues. Minimum driveway setback distances should take into consideration typical traffic queue lengths while permitting sufficient movement to driveway traffic. The corner clearance on the upstream side of the intersection should be longer than the longest expected queue, or at a minimum, the distances indicated in Table 2. On the downstream side, the minimum distance should conform to Table 2. Driveways on corner lots should be located on the lesser street and near the property line most distant from the intersection.

Table 2. Minimum Corner Clearance (feet)

	Distance From Near Side of Street to Near Side of Access Driveway	
Speed (mph)	Major Generator	Minor Generator
30	200	145
35	295	230
40	390	310
45	425	325
50	450	345

Major generators are those developments that are estimated to generate 500 vehicle trips or more during either of the a.m. or p.m. peak hours. Other development projects are considered minor generators.

Vehicle service stations, which are almost always on corner lots, will want to have up to two driveways on each street. Only one driveway on the major street, located near the property is desirable. Depending on the classification of the intersecting street, one driveway is desirable, two are maximum.

On streets with posted speed limits or prima facie speed limits of less than 30 mph the minimum access spacing may be reduced to 50 feet. Other provisions of Peoria Detail PE-251-3 (Driveway Criteria) will remain in effect.

Notes:

Location and spacing of driveways affect the safety and functional integrity of streets and highways. Too many closely-spaced streets and driveways increase accident potential and delays. Increasing the spacing and providing a greater separation of conflict points, reduce the number and variety of events to which drivers must respond. This translates into fewer accidents, travel time savings, and preservation of capacity.

Reasonable spacing between driveways is important to the safety and capacity of a road, as well as the appearance of a corridor. Managing driveway spacing is essential on roads intended for higher speeds. At higher speeds drivers have less time and distance to react to unexpected situations.

Inadequate corner clearances can result in poor traffic operation (ingress and egress) along with safety backups and capacity problems. Driveways located too close to intersections can add to traffic congestion.

References:

1. Institute of Transportation Engineers (ITE), Traffic Engineering Handbook, 5th Edition, Washington, DC, 1999.

2. Access Management Manual, Transportation Research Board (TRB), 2003.

3. American Association of State Highway and Transportation Officials (AASHTO "Green Book"), A Policy on Geometric Design of Highways and Streets. Washington, DC, 2001.

4. Federal Highway Administration, "Access Management, Location and Design". National Highway Institute Course No. 15225, June 1998.

5. U.S. Department of Transportation – Federal Highway Administration, Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), Washington, DC 2003.

4.3 INTERCHANGE AREAS

A. Driveway connections within 825 feet of an interchange will not be permitted, unless no other reasonable access to the property is available including side street access and/or joint and cross access with adjacent properties.

B. Where interchange area spacing standards cannot be met, the Engineering Director may permit one of the following deviations:

- Joint and/or cross access
- Directional connections (right-in, right out only)

C. Signalized intersections shall be located a minimum of 1,200 feet from interchanges.

D. Median openings are prohibited within 900 feet of an interchange.

E. Any permitted deviation from the corner clearance spacing requirements must be located either at or within 10 feet of the property line furthest from the intersection.

5.0 MEDIANS

5.1 MEDIAN OPENINGS

A. Median openings are prohibited:

- In the functional area of an intersection or other median opening; or,
- Within the physical length of a left-turn bay

B. Median openings should not be constructed:

- Across exclusive right turn lanes; or
- Across regularly forming queues from neighboring intersections

C. Median openings may not exceed the distance specified in the infrastructure Design Guidelines Manual.

- Median openings on major arterials may deviate up to 15 percent from the requirements.

D. Full median openings shall be located, at a minimum:

- Every 1/2 mile on major and minor arterials
- Every 1/4 mile on collectors that are not anticipated to become arterials.
- The Engineer Director may permit median openings at smaller intervals for built-up areas.

E. Directional median openings shall be limited to every 1/4 mile on arterials and major collectors.

- The Engineer Director may permit median openings at smaller intervals for built-up areas.

F. Roadway improvements proposed to any corridor or any development or redevelopment of a property within 600 feet or 1/8 mile of an existing median opening shall trigger an analysis and review of the median opening and median type.

- The Engineering Director shall review the analysis to determine if any modifications to the median are required to ensure safe operation and continued traffic flow and consistency with the access management Plan.

G. Median opening spacing shall be contingent on an evaluation of the following criteria addressed in the site plan:

- Stopping sight distance
- Intersection sight distance
- Operating speeds
- Length of turn lanes
- Right turn conflict overlap
- The size and type of traffic generator
- The potential number of left turns into driveways
- Length of frontage along the street's right-of-way line of the property proposed to be served
- Distance of the proposed opening from adjacent intersections, median openings, and other connections
- The length and width of the left-turn storage lanes should be estimated using standard engineering practices.
- Traffic controls
- Queue storage
- Perception/reaction distance

H. Median openings should reflect street or block spacing and the access classification of the roadway. Spacing between median openings shall be adequate to allow for the introduction of left turn lanes

I. Full median openings shall be consistent with traffic signal spacing criteria

J. The Engineering Director may require separate U-turn median openings at the following locations:

- Locations beyond intersections to accommodate minor turning movements not otherwise provided in the intersection or interchange area.
- Locations just ahead of an intersection to accommodate U-turn movements that would interfere with through and other turning movements at the intersection
- Locations occurring in conjunction with minor crossroads where traffic is not permitted to cross an arterial but instead is required to turn right, enter the through traffic stream, weave to the left, U-turn, and then return.
- Locations on high-speed or high-volume arterials where a crossroad with high-volume traffic, a shopping area, or other traffic generator that needs a median opening nearby and additional median openings would not be practical.
- Locations where regularly spaced median openings facilitate maintenance operations, policing, repair service of stalled vehicles, or other roadway related activities.

K. The length of a median opening shall provide for 50 foot turning radius left-turning vehicles.

Driveways should be offset from median openings by the following: At least 60 m (200 ft) when two low-volume traffic generators are involved, The greater of 60 m (200 ft) or the established median opening spacing interval when one major traffic generator is involved, and at least two times the established median opening spacing interval when two major traffic generators are involved.

5.2 MEDIAN WIDTHS

A. Median widths shall be determined by the median function as well as right-of-way acquisition, maintenance, and construction costs.

- The minimum median widths by function are detailed in Table 4;
- The Engineering Director shall make the final determination on the required median width.

B. The minimum median width must meet or exceed the standards outlined in the Infrastructure Design Guidelines

C. U-Turns from the inside (left-most) left turn bay shall be encouraged on arterials and major collectors where medians widths are sufficient to accommodate dual left-turn lanes.

TABLE 4		
Median Function	Minimum Width (in feet)	Desired Width (in feet)
Separation of opposing traffic Streams	6	10
Pedestrian refuge and room for signs and appurtenances	8	14
Storage of left-turning vehicles		
Single left-turn bay	14	18
Dual left-turn bay	25	30
Protection for passenger vehicles crossing or turning left onto mainline	25	30
Design direction openings for selected ingress/egress movements only	18	30

6.0 INTERNAL SITE CIRCULATION AND OUTPARCELS

A. For the purpose of access management and in the interest of promoting unified access and circulation systems, development sites under the same ownership or consolidated for the purposes of development and comprised of more than one building site shall be considered unified parcels. Accordingly, the following requirements shall apply:

- The number of connections permitted shall be the minimum number necessary to provide reasonable access to the overall site and not the maximum available for that frontage;
- All easements and agreements required by the access management Plan and the land development regulations shall be provided;
- Access to outparcels shall be internalized using the shared circulation system and designed to avoid excessive movement across parking aisles or queuing across surrounding parking and driving aisles;
- The owner and all lessees within the affected area are responsible for compliance with the requirements of this code and both shall be cited for any violation.

B. Where abutting properties are in different ownership and not part of an overall development plan, cooperation between the various owners in development of a unified access and circulation system is encouraged.

C. Access to outparcels shall be internalized using the shared circulation system of the principle development or retail center.

1. The Engineering Director may grant direct access from a collector or arterial to an outparcel, when the outparcel and adjacent development meet or exceeds the following standards established:

    - Connection Spacing Requirements;
    - Internal Site Circulation;
    - Driveways in the Functional Area of an Intersection;
    - Joint and Cross Access Requirements; and;
    - Access is taken from the roadway with the lower functional classification.

D. Access to outparcels shall be designed to avoid excessive movement across parking aisles and queuing across surrounding parking and driving aisles.

7.0 FRONTAGE ROADS

A. Newly installed or retrofitted frontage roads shall be designed and operated as one-way facilities.

- Frontage roads that begin and terminate at each block are preferred and shall be constructed, where feasible.
- Continuous frontage roads are discouraged unless the frontage road is designed to provide alternate access to a freeway or parkway.

B. Connections from the arterial roadway to the frontage road shall be permitted as merging and diverging movements only.

- Signalized intersections between the arterial roadway and the frontage roadway are prohibited.

C. The separation of frontage roads at cross streets should be maximized to ensure sufficient storage for crossroad traffic between the frontage road and arterial.

- The separations between the arterial and the frontage road shall meet or exceed the minimum spacing standards set forth in Table 5 where the arterial and frontage road connect with a perpendicular side street.

D. A landscaped median between the arterial and the frontage road is required. The landscaped median shall be a minimum of 20 feet wide to provide pedestrian refuge and safe placement of traffic control devices and landscaping.

- The Engineering Director may permit an exception up to 10 feet where conditions warrant.

E. Pedestrian and bicycle movements are encouraged on the frontage roads.

F. Parking may be permitted where the frontage roads traverse residential areas.

G. Major activity centers that front along any arterial roadway should incorporate a reverse frontage road into the site plan.

- Frontage roads or additional access points will not be granted where a reverse frontage road is feasible.

TABLE 5		Minimum Separation *
FUNCTIONAL CLASSIFICATION		
Main Roadway	Perpendicular Roadway	
Arterial (Major)	Arterial (Major)	660 feet
Arterial (Major)	Arterial (Minor)	660 feet
Arterial (Major)	Collector (Major)	300 feet
Arterial (Minor)	Collector (Major)	300 feet

* Between the Main Arterial and Frontage Road

APPENDIX FR-7

Concept 1 Traffic Analysis

MOVEMENT SUMMARY

Site: 2025 EB Off-Ramp AM

Option 1
EB I-10 Ramps at Transwestern
2025 AM Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
8	T	20	33.0	0.041	7.9	LOS A	0.1	3.2	0.49	0.64	29.0
18	R	27	13.0	0.046	6.8	LOS A	0.1	3.7	0.49	0.70	28.8
Approach		47	21.6	0.046	7.2	LOS A	0.1	3.7	0.49	0.67	28.9
North: Transwestern											
7	L	399	13.0	0.399	8.0	LOS A	0.0	0.0	0.00	0.71	30.0
4	T	89	9.0	0.086	4.2	LOS A	0.0	0.0	0.00	0.43	34.8
Approach		488	12.3	0.399	7.3	LOS A	0.0	0.0	0.00	0.66	30.8
West: EB I-10 Off											
5	L	65	52.0	0.162	8.7	LOS A	0.3	10.0	0.39	0.83	25.6
12	R	23	14.0	0.162	8.7	LOS A	0.3	10.0	0.39	0.67	27.6
Approach		88	42.1	0.162	8.7	LOS A	0.3	10.0	0.39	0.79	26.0
All Vehicles		622	17.2	0.399	7.5	LOS A	0.3	10.0	0.09	0.68	29.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2025 EB Off-Ramp MD

Option 1
EB I-10 Ramps at Transwestern
2025 MD Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
8	T	115	10.0	0.129	6.5	LOS A	0.4	11.4	0.43	0.60	29.9
18	R	64	25.0	0.129	7.0	LOS A	0.4	11.1	0.42	0.67	28.7
Approach		178	15.4	0.129	6.7	LOS A	0.4	11.4	0.42	0.62	29.5
North: Transwestern											
7	L	169	27.0	0.190	5.9	LOS A	0.0	0.0	0.00	0.71	30.0
4	T	116	16.0	0.119	4.8	LOS A	0.0	0.0	0.00	0.43	34.8
Approach		285	22.5	0.190	5.5	LOS A	0.0	0.0	0.00	0.59	31.8
West: EB I-10 Off											
5	L	78	77.0	0.171	9.3	LOS A	0.3	10.3	0.31	0.75	25.3
12	R	10	33.0	0.171	9.3	LOS A	0.3	10.3	0.31	0.58	27.3
Approach		88	72.0	0.171	9.3	LOS A	0.3	10.3	0.31	0.73	25.5
All Vehicles		551	28.1	0.190	6.5	LOS A	0.4	11.4	0.19	0.62	29.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2025 EB Off-Ramp PM

Option 1
EB I-10 Ramps at Transwestern
2025 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
8	T	76	17.0	0.115	6.7	LOS A	0.3	9.8	0.43	0.61	29.8
18	R	227	20.0	0.352	10.3	LOS B	1.2	34.9	0.51	0.74	26.8
Approach		304	19.2	0.352	9.4	LOS A	1.2	34.9	0.49	0.71	27.5
North: Transwestern											
7	L	209	26.0	0.234	6.4	LOS A	0.0	0.0	0.00	0.71	30.0
4	T	43	25.0	0.047	4.4	LOS A	0.0	0.0	0.00	0.43	34.8
Approach		252	25.8	0.234	6.1	LOS A	0.0	0.0	0.00	0.66	30.7
West: EB I-10 Off											
5	L	82	37.0	0.150	7.0	LOS A	0.3	9.5	0.30	0.75	26.3
12	R	20	17.0	0.150	7.0	LOS A	0.3	9.5	0.30	0.57	28.7
Approach		102	33.1	0.150	7.0	LOS A	0.3	9.5	0.30	0.72	26.7
All Vehicles		658	23.9	0.352	7.8	LOS A	1.2	34.9	0.27	0.69	28.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: 2035 EB Off-Ramp AM

Option 1
EB I-10 Ramps at Transwestern
2035 AM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
8	T	20	33.0	0.046	8.9	LOS A	0.1	3.5	0.53	0.69	28.4
18	R	33	13.0	0.065	7.8	LOS A	0.2	5.2	0.54	0.76	28.1
Approach		53	20.5	0.065	8.2	LOS A	0.2	5.2	0.53	0.73	28.2
North: Transwestern											
7	L	487	13.0	0.487	9.4	LOS A	0.0	0.0	0.00	0.71	30.0
4	T	110	9.0	0.106	4.4	LOS A	0.0	0.0	0.00	0.43	34.8
Approach		597	12.3	0.487	8.5	LOS A	0.0	0.0	0.00	0.66	30.8
West: EB I-10 Off											
5	L	78	52.0	0.223	10.3	LOS B	0.4	14.2	0.44	0.86	24.9
12	R	34	14.0	0.223	10.3	LOS B	0.4	14.2	0.44	0.70	26.8
Approach		112	40.4	0.223	10.3	LOS B	0.4	14.2	0.44	0.81	25.4
All Vehicles		762	17.0	0.487	8.7	LOS A	0.4	14.2	0.10	0.69	29.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: 2035 EB Off-Ramp MD

Option 1
EB I-10 Ramps at Transwestern
2035 MD Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
8	T	131	10.0	0.159	7.3	LOS A	0.5	14.1	0.47	0.65	29.3
18	R	73	25.0	0.159	7.8	LOS A	0.5	13.7	0.47	0.72	28.2
Approach		204	15.4	0.159	7.5	LOS A	0.5	14.1	0.47	0.67	28.9
North: Transwestern											
7	L	200	27.0	0.225	6.3	LOS A	0.0	0.0	0.00	0.71	30.0
4	T	138	16.0	0.141	5.0	LOS A	0.0	0.0	0.00	0.43	34.8
Approach		338	22.5	0.225	5.8	LOS A	0.0	0.0	0.00	0.59	31.8
West: EB I-10 Off											
5	L	97	77.0	0.251	10.7	LOS B	0.4	15.8	0.35	0.80	24.7
12	R	30	33.0	0.251	10.7	LOS B	0.4	15.8	0.35	0.63	26.6
Approach		128	66.6	0.251	10.7	LOS B	0.4	15.8	0.35	0.76	25.1
All Vehicles		669	28.7	0.251	7.3	LOS A	0.5	15.8	0.21	0.65	29.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2035 EB Off-Ramp PM

Option 1
EB I-10 Ramps at Transwestern
2035 PM Peak
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
8	T	83	17.0	0.136	7.5	LOS A	0.4	11.6	0.48	0.66	29.3
18	R	273	20.0	0.456	13.2	LOS B	1.8	51.9	0.58	0.83	25.3
Approach		356	19.3	0.456	11.9	LOS B	1.8	51.9	0.56	0.79	26.1
North: Transwestern											
7	L	257	26.0	0.286	7.0	LOS A	0.0	0.0	0.00	0.71	30.0
4	T	50	25.0	0.055	4.5	LOS A	0.0	0.0	0.00	0.43	34.8
Approach		307	25.8	0.286	6.6	LOS A	0.0	0.0	0.00	0.66	30.7
West: EB I-10 Off											
5	L	95	37.0	0.192	7.8	LOS A	0.4	12.4	0.34	0.79	26.0
12	R	30	17.0	0.192	7.8	LOS A	0.4	12.4	0.34	0.61	28.2
Approach		125	32.2	0.192	7.8	LOS A	0.4	12.4	0.34	0.75	26.5
All Vehicles		788	23.9	0.456	9.2	LOS A	1.8	51.9	0.31	0.73	27.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2025 WB Off-Ramp AM

Option 1
WB I-10 Ramps at Transwestern
2025 AM Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	10	50.0	0.054	5.3	LOS A	0.0	0.0	0.00	0.91	30.0
8	T	71	50.0	0.054	5.3	LOS A	0.0	0.0	0.00	0.41	34.8
Approach		81	50.0	0.054	5.3	LOS A	0.0	0.0	0.00	0.48	34.1
East: WB I-10 Off											
1	L	72	50.0	0.289	8.4	LOS A	0.6	19.9	0.20	0.76	25.7
16	R	138	39.0	0.289	8.4	LOS A	0.6	19.9	0.20	0.51	28.0
Approach		210	42.8	0.289	8.4	LOS A	0.6	19.9	0.20	0.59	27.1
North: Transwestern											
4	T	418	14.0	0.311	7.8	LOS A	1.2	33.4	0.29	0.48	29.1
14	R	96	52.0	0.311	8.3	LOS A	1.0	31.6	0.29	0.59	28.0
Approach		513	21.1	0.311	7.9	LOS A	1.2	33.4	0.29	0.50	28.9
All Vehicles		805	29.7	0.311	7.8	LOS A	1.2	33.4	0.24	0.52	28.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: 2025 WB Off-Ramp MD

Option 1
WB I-10 Ramps at Transwestern
2025 MD Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	34	36.0	0.102	5.2	LOS A	0.0	0.0	0.00	0.87	30.0
8	T	143	28.0	0.102	5.1	LOS A	0.0	0.0	0.00	0.41	34.8
Approach		177	29.6	0.102	5.1	LOS A	0.0	0.0	0.00	0.50	33.7
East: WB I-10 Off											
1	L	47	29.0	0.280	8.3	LOS A	0.6	19.5	0.28	0.81	25.9
16	R	158	33.0	0.280	8.3	LOS A	0.6	19.5	0.28	0.57	28.1
Approach		204	32.1	0.280	8.3	LOS A	0.6	19.5	0.28	0.62	27.5
North: Transwestern											
4	T	247	19.0	0.215	6.6	LOS A	0.7	20.8	0.25	0.46	29.8
14	R	103	39.0	0.215	7.0	LOS A	0.6	20.1	0.24	0.56	28.7
Approach		350	24.9	0.215	6.7	LOS A	0.7	20.8	0.25	0.49	29.5
All Vehicles		732	28.0	0.280	6.8	LOS A	0.7	20.8	0.19	0.53	29.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2025 WB Off-Ramp PM

Option 1
WB I-10 Ramps at Transwestern
2025 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	40	20.0	0.095	5.0	LOS A	0.0	0.0	0.00	0.85	30.0
8	T	123	35.0	0.095	5.1	LOS A	0.0	0.0	0.00	0.41	34.8
Approach		163	31.3	0.095	5.1	LOS A	0.0	0.0	0.00	0.52	33.5
East: WB I-10 Off											
1	L	39	17.0	0.499	11.2	LOS B	1.6	45.3	0.34	0.84	24.6
16	R	369	19.0	0.499	11.2	LOS B	1.6	45.3	0.34	0.60	26.5
Approach		408	18.8	0.499	11.2	LOS B	1.6	45.3	0.34	0.62	26.3
North: Transwestern											
4	T	213	31.0	0.206	6.8	LOS A	0.6	19.2	0.22	0.45	29.7
14	R	109	33.0	0.206	6.9	LOS A	0.6	19.1	0.22	0.55	28.8
Approach		322	31.7	0.206	6.8	LOS A	0.6	19.2	0.22	0.48	29.4
All Vehicles		894	25.7	0.499	8.5	LOS A	1.6	45.3	0.24	0.55	28.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: 2035 WB Off-Ramp AM

Option 1
WB I-10 Ramps at Transwestern
2035 AM Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	10	50.0	0.063	5.4	LOS A	0.0	0.0	0.00	0.92	30.0
8	T	84	50.0	0.063	5.4	LOS A	0.0	0.0	0.00	0.42	34.8
Approach		94	50.0	0.063	5.4	LOS A	0.0	0.0	0.00	0.47	34.2
East: WB I-10 Off											
1	L	87	50.0	0.357	9.6	LOS A	0.8	25.9	0.22	0.77	25.2
16	R	169	39.0	0.357	9.6	LOS A	0.8	25.9	0.22	0.52	27.3
Approach		256	42.7	0.357	9.6	LOS A	0.8	25.9	0.22	0.61	26.5
North: Transwestern											
4	T	513	14.0	0.385	9.0	LOS A	1.6	44.2	0.34	0.51	28.3
14	R	110	52.0	0.385	9.6	LOS A	1.4	41.5	0.33	0.61	27.3
Approach		623	20.7	0.385	9.1	LOS A	1.6	44.2	0.34	0.53	28.1
All Vehicles		973	29.4	0.385	8.9	LOS A	1.6	44.2	0.28	0.54	28.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2035 WB Off-Ramp MD

Option 1
WB I-10 Ramps at Transwestern
2035 MD Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	43	36.0	0.122	5.4	LOS A	0.0	0.0	0.00	0.86	30.0
8	T	169	28.0	0.122	5.3	LOS A	0.0	0.0	0.00	0.41	34.8
Approach		212	29.6	0.122	5.3	LOS A	0.0	0.0	0.00	0.51	33.7
East: WB I-10 Off											
1	L	53	29.0	0.353	9.6	LOS A	0.8	25.9	0.32	0.83	25.3
16	R	196	33.0	0.353	9.6	LOS A	0.8	25.9	0.32	0.60	27.3
Approach		249	32.1	0.353	9.6	LOS A	0.8	25.9	0.32	0.65	26.8
North: Transwestern											
4	T	295	19.0	0.264	7.3	LOS A	0.9	26.6	0.28	0.48	29.3
14	R	126	39.0	0.264	7.8	LOS A	0.8	25.6	0.28	0.58	28.2
Approach		421	25.0	0.264	7.5	LOS A	0.9	26.6	0.28	0.51	29.0
All Vehicles		882	28.1	0.353	7.6	LOS A	0.9	26.6	0.23	0.55	29.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: 2035 WB Off-Ramp PM

Option 1
WB I-10 Ramps at Transwestern
2035 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	40	20.0	0.106	5.1	LOS A	0.0	0.0	0.00	0.87	30.0
8	T	142	35.0	0.106	5.3	LOS A	0.0	0.0	0.00	0.41	34.8
Approach		182	31.7	0.106	5.2	LOS A	0.0	0.0	0.00	0.51	33.6
East: WB I-10 Off											
1	L	47	17.0	0.621	14.6	LOS B	2.5	73.2	0.42	0.87	23.3
16	R	452	19.0	0.621	14.6	LOS B	2.5	73.2	0.42	0.66	24.8
Approach		499	18.8	0.621	14.6	LOS B	2.5	73.2	0.42	0.68	24.7
North: Transwestern											
4	T	260	31.0	0.249	7.4	LOS A	0.8	23.9	0.24	0.45	29.3
14	R	125	33.0	0.249	7.5	LOS A	0.8	23.8	0.24	0.56	28.4
Approach		385	31.6	0.249	7.4	LOS A	0.8	23.9	0.24	0.49	29.0
All Vehicles		1066	25.6	0.621	10.4	LOS B	2.5	73.2	0.28	0.58	27.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2025 Brannigan AM

Option 1
Brannigan at Transwestern
2025 AM Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	165	35.0	0.114	5.3	LOS A	0.3	10.1	0.07	0.68	27.1
18	R	31	2.0	0.114	5.1	LOS A	0.3	10.1	0.07	0.49	29.8
Approach		196	29.7	0.114	5.3	LOS A	0.3	10.1	0.07	0.65	27.5
East: Brannigan											
1	L	232	2.0	0.277	6.6	LOS A	0.9	21.6	0.29	0.75	26.5
6	T	31	2.0	0.277	6.6	LOS A	0.9	21.6	0.29	0.48	29.4
Approach		263	2.0	0.277	6.6	LOS A	0.9	21.6	0.29	0.72	26.8
West: EB I-10 Off											
2	T	13	2.0	0.403	11.0	LOS B	1.3	41.7	0.42	0.56	27.0
12	R	256	35.0	0.403	11.0	LOS B	1.3	41.7	0.42	0.64	26.6
Approach		270	33.4	0.403	11.0	LOS B	1.3	41.7	0.42	0.64	26.6
All Vehicles		728	21.1	0.403	7.9	LOS A	1.3	41.7	0.28	0.67	26.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Option 1
Brannigan at Transwestern
2025 MD Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	268	35.0	0.182	6.1	LOS A	0.6	17.0	0.10	0.67	26.7
18	R	38	2.0	0.182	6.0	LOS A	0.6	17.0	0.10	0.48	29.2
Approach		306	30.9	0.182	6.1	LOS A	0.6	17.0	0.10	0.65	27.0
East: Brannigan											
1	L	51	2.0	0.079	4.9	LOS A	0.2	5.1	0.31	0.79	27.4
6	T	18	2.0	0.079	4.9	LOS A	0.2	5.1	0.31	0.51	30.5
Approach		68	2.0	0.079	4.9	LOS A	0.2	5.1	0.31	0.72	28.1
West: EB I-10 Off											
2	T	24	2.0	0.348	8.5	LOS A	1.2	37.0	0.18	0.40	28.6
12	R	259	35.0	0.348	8.5	LOS A	1.2	37.0	0.18	0.51	27.9
Approach		282	32.2	0.348	8.5	LOS A	1.2	37.0	0.18	0.50	28.0
All Vehicles		657	28.5	0.348	7.0	LOS A	1.2	37.0	0.16	0.59	27.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: 2025 Brannigan PM

Option 1
Brannigan at Transwestern
2025 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	347	35.0	0.288	7.5	LOS A	1.1	30.7	0.18	0.67	26.1
18	R	146	2.0	0.288	7.0	LOS A	1.1	30.7	0.18	0.50	28.6
Approach		493	25.2	0.288	7.4	LOS A	1.1	30.7	0.18	0.62	26.7
East: Brannigan											
1	L	57	2.0	0.086	5.4	LOS A	0.2	5.5	0.36	0.80	27.2
6	T	12	2.0	0.086	5.4	LOS A	0.2	5.5	0.36	0.55	30.2
Approach		69	2.0	0.086	5.4	LOS A	0.2	5.5	0.36	0.76	27.6
West: EB I-10 Off											
2	T	53	2.0	0.356	8.5	LOS A	1.3	38.6	0.20	0.41	28.6
12	R	241	35.0	0.356	8.5	LOS A	1.3	38.6	0.20	0.51	27.9
Approach		295	29.0	0.356	8.5	LOS A	1.3	38.6	0.20	0.50	28.0
All Vehicles		856	24.7	0.356	7.6	LOS A	1.3	38.6	0.20	0.59	27.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: 2035 Brannigan AM

Option 1
Brannigan at Transwestern
2035 AM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	200	35.0	0.138	5.6	LOS A	0.4	12.5	0.07	0.68	27.0
18	R	38	2.0	0.138	5.4	LOS A	0.4	12.5	0.07	0.49	29.6
Approach		238	29.8	0.138	5.6	LOS A	0.4	12.5	0.07	0.65	27.3
East: Brannigan											
1	L	274	2.0	0.340	7.6	LOS A	1.1	28.1	0.34	0.78	26.0
6	T	38	2.0	0.340	7.6	LOS A	1.1	28.1	0.34	0.53	28.7
Approach		312	2.0	0.340	7.6	LOS A	1.1	28.1	0.34	0.75	26.3
West: EB I-10 Off											
2	T	13	2.0	0.520	14.2	LOS B	2.0	62.4	0.49	0.65	25.4
12	R	319	35.0	0.520	14.2	LOS B	2.0	62.4	0.49	0.71	25.0
Approach		332	33.7	0.520	14.2	LOS B	2.0	62.4	0.49	0.71	25.0
All Vehicles		881	21.4	0.520	9.5	LOS A	2.0	62.4	0.33	0.71	26.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2035 Brannigan MD

Option 1
Brannigan at Transwestern
2035 MD Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	327	35.0	0.221	6.6	LOS A	0.7	21.4	0.10	0.67	26.5
18	R	45	2.0	0.221	6.4	LOS A	0.7	21.4	0.10	0.48	28.9
Approach		372	31.0	0.221	6.6	LOS A	0.7	21.4	0.10	0.65	26.7
East: Brannigan											
1	L	56	2.0	0.098	5.4	LOS A	0.3	6.4	0.35	0.82	27.2
6	T	24	2.0	0.098	5.4	LOS A	0.3	6.4	0.35	0.55	30.2
Approach		80	2.0	0.098	5.4	LOS A	0.3	6.4	0.35	0.74	28.0
West: EB I-10 Off											
2	T	24	2.0	0.422	9.8	LOS A	1.5	48.2	0.21	0.41	27.8
12	R	316	35.0	0.422	9.8	LOS A	1.5	48.2	0.21	0.51	27.2
Approach		340	32.7	0.422	9.8	LOS A	1.5	48.2	0.21	0.50	27.2
All Vehicles		792	28.8	0.422	7.9	LOS A	1.5	48.2	0.17	0.60	27.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2035 Brannigan PM

Option 1
Brannigan at Transwestern
2035 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	424	35.0	0.353	8.5	LOS A	1.4	40.0	0.22	0.67	25.6
18	R	171	2.0	0.353	7.9	LOS A	1.4	40.0	0.22	0.51	28.0
Approach		594	25.5	0.353	8.4	LOS A	1.4	40.0	0.22	0.63	26.2
East: Brannigan											
1	L	68	2.0	0.116	6.1	LOS A	0.3	7.6	0.40	0.85	26.8
6	T	18	2.0	0.116	6.1	LOS A	0.3	7.6	0.40	0.61	29.7
Approach		86	2.0	0.116	6.1	LOS A	0.3	7.6	0.40	0.80	27.3
West: EB I-10 Off											
2	T	67	2.0	0.441	10.0	LOS B	1.7	51.9	0.24	0.42	27.7
12	R	294	35.0	0.441	10.0	LOS B	1.7	51.9	0.24	0.52	27.1
Approach		361	28.9	0.441	10.0	LOS B	1.7	51.9	0.24	0.50	27.2
All Vehicles		1041	24.7	0.441	8.8	LOS A	1.7	51.9	0.24	0.60	26.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

APPENDIX FR-8

Concept 2 Traffic Analysis

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	50	0	110	5	55	0	0	330	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	72	0	138	10	71	0	0	418	96

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	557	604	71	513	0	0	71	0	0
Stage 1	91	91	-	-	-	-	-	-	-
Stage 2	466	513	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	6.59	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	3.651	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	490	355	897	847	-	-	1529	-	-
Stage 1	930	735	-	-	-	-	-	-	-
Stage 2	630	465	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	484	0	897	847	-	-	1529	-	-
Mov Cap-2 Maneuver	484	0	-	-	-	-	-	-	-
Stage 1	919	0	-	-	-	-	-	-	-
Stage 2	630	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	1.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	847	-	-	484	897	1529	-	-
HCM Lane V/C Ratio	0.012	-	-	0.15	0.153	-	-	-
HCM Control Delay (s)	9.3	0	-	13.7	9.7	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.5	0	-	-

Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	50	0	10	0	0	0	0	10	20	315	65	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	65	0	23	0	0	0	0	20	27	399	89	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	920	934	89	89	0	0	47	0	0
Stage 1	887	887	-	-	-	-	-	-	-
Stage 2	33	47	-	-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34	4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426	2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	246	268	937	1506	-	-	1493	-	-
Stage 1	331	365	-	-	-	-	-	-	-
Stage 2	875	860	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	177	0	937	1506	-	-	1493	-	-
Mov Cap-2 Maneuver	177	0	-	-	-	-	-	-	-
Stage 1	238	0	-	-	-	-	-	-	-
Stage 2	875	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	29.5	0	6.8
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1506	-	-	177	937	1493	-	-
HCM Lane V/C Ratio	-	-	-	0.367	0.024	0.267	-	-
HCM Control Delay (s)	0	-	-	36.7	8.9	8.3	0	-
HCM Lane LOS	A	-	-	E	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.6	0.1	1.1	-	-

MOVEMENT SUMMARY

Site: 2025 AM Brannigan

Option 2
Brannigan and Transwestern
2025 AM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	94	2.0	0.237	7.0	LOS A	0.7	22.8	0.07	0.80	26.3
8	T	68	100.0	0.237	7.0	LOS A	0.7	22.8	0.07	0.35	29.1
18	R	31	2.0	0.237	7.0	LOS A	0.7	22.8	0.07	0.49	28.8
Approach		194	36.5	0.237	7.0	LOS A	0.7	22.8	0.07	0.59	27.7
East: Brannigan											
1	L	232	2.0	0.299	7.3	LOS A	1.3	32.2	0.41	0.76	26.2
6	T	31	2.0	0.299	7.3	LOS A	1.3	32.2	0.41	0.53	28.9
Approach		263	2.0	0.299	7.3	LOS A	1.3	32.2	0.41	0.73	26.4
West: Brannigan											
2	T	13	2.0	0.403	11.0	LOS B	1.3	41.7	0.42	0.56	27.0
12	R	256	35.0	0.403	11.0	LOS B	1.3	41.7	0.42	0.64	26.6
Approach		270	33.4	0.403	11.0	LOS B	1.3	41.7	0.42	0.64	26.6
All Vehicles		726	22.8	0.403	8.6	LOS A	1.3	41.7	0.33	0.66	26.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	35	0	145	20	110	0	0	180	90
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	96	58	77	92	92	73	87
Heavy Vehicles, %	2	2	2	29	2	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	47	0	151	34	143	0	0	247	103

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	510	562	143	350	0	0	143	0	0
Stage 1	212	212	-	-	-	-	-	-	-
Stage 2	298	350	-	-	-	-	-	-	-
Critical Hdwy	6.69	6.52	6.53	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.018	3.597	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	479	436	829	1043	-	-	1440	-	-
Stage 1	763	727	-	-	-	-	-	-	-
Stage 2	695	633	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	462	0	829	1043	-	-	1440	-	-
Mov Cap-2 Maneuver	462	0	-	-	-	-	-	-	-
Stage 1	736	0	-	-	-	-	-	-	-
Stage 2	695	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	1.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1043	-	-	462	829	1440	-	-
HCM Lane V/C Ratio	0.033	-	-	0.101	0.182	-	-	-
HCM Control Delay (s)	8.6	0	-	13.7	10.3	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.7	0	-	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	60	0	5	0	0	0	0	70	35	135	80	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	50	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	50	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	78	0	15	0	0	0	0	115	64	169	116	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	600	631	116				116	0	0	178	0	0
Stage 1	453	453	-				-	-	-	-	-	-
Stage 2	147	178	-				-	-	-	-	-	-
Critical Hdwy	6.91	7	6.45				4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	6	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	6	-				-	-	-	-	-	-
Follow-up Hdwy	3.959	4.45	3.525				2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	393	342	878				1473	-	-	1260	-	-
Stage 1	549	497	-				-	-	-	-	-	-
Stage 2	774	670	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	337	0	878				1473	-	-	1260	-	-
Mov Cap-2 Maneuver	337	0	-				-	-	-	-	-	-
Stage 1	470	0	-				-	-	-	-	-	-
Stage 2	774	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.3	0	4.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1473	-	-	337	878	1260	-	-
HCM Lane V/C Ratio	-	-	-	0.231	0.017	0.134	-	-
HCM Control Delay (s)	0	-	-	18.9	9.2	8.3	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.1	0.5	-	-

MOVEMENT SUMMARY

Site: 2025 MD Brannigan

Option 2
Brannigan and Transwestern
2025 MD Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	190	2.0	0.346	8.0	LOS A	1.3	38.1	0.12	0.75	25.8
8	T	74	100.0	0.346	8.0	LOS A	1.3	38.1	0.12	0.35	28.5
18	R	38	2.0	0.346	8.0	LOS A	1.3	38.1	0.12	0.47	28.2
Approach		303	25.9	0.346	8.0	LOS A	1.3	38.1	0.12	0.62	26.8
East: Brannigan											
1	L	51	2.0	0.087	5.4	LOS A	0.3	7.5	0.41	0.79	27.1
6	T	18	2.0	0.087	5.4	LOS A	0.3	7.5	0.41	0.54	30.1
Approach		68	2.0	0.087	5.4	LOS A	0.3	7.5	0.41	0.73	27.8
West: Brannigan											
2	T	24	2.0	0.348	8.5	LOS A	1.2	37.0	0.18	0.40	28.6
12	R	259	35.0	0.348	8.5	LOS A	1.2	37.0	0.18	0.51	27.9
Approach		282	32.2	0.348	8.5	LOS A	1.2	37.0	0.18	0.50	28.0
All Vehicles		653	26.1	0.348	8.0	LOS A	1.3	38.1	0.18	0.58	27.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	25	0	310	20	100	0	0	160	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	83	75	92
Heavy Vehicles, %	2	2	2	17	2	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	39	0	369	40	123	0	0	213	109

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	471	525	123	322	0	0	123	0	0
Stage 1	203	203	-	-	-	-	-	-	-
Stage 2	268	322	-	-	-	-	-	-	-
Critical Hdwy	6.57	6.52	6.39	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1	5.57	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.57	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.653	4.018	3.471	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver	525	458	884	1143	-	-	1464	-	-
Stage 1	797	733	-	-	-	-	-	-	-
Stage 2	744	651	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	505	0	884	1143	-	-	1464	-	-
Mov Cap-2 Maneuver	505	0	-	-	-	-	-	-	-
Stage 1	767	0	-	-	-	-	-	-	-
Stage 2	744	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.1	2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1143	-	-	505	884	1464	-	-
HCM Lane V/C Ratio	0.035	-	-	0.077	0.417	-	-	-
HCM Control Delay (s)	8.3	0	-	12.7	12	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	2.1	0	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	65	0	10	0	0	0	0	55	125	155	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	92	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	82	0	20	0	0	0	0	76	227	209	43	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	652	766	43	43	0	0	304	0	0
Stage 1	462	462	-	-	-	-	-	-	-
Stage 2	190	304	-	-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37	4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453	2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	382	335	986	1566	-	-	1132	-	-
Stage 1	567	568	-	-	-	-	-	-	-
Stage 2	765	667	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	310	0	986	1566	-	-	1132	-	-
Mov Cap-2 Maneuver	310	0	-	-	-	-	-	-	-
Stage 1	460	0	-	-	-	-	-	-	-
Stage 2	765	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.4	0	7.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1566	-	-	310	986	1132	-	-
HCM Lane V/C Ratio	-	-	-	0.265	0.02	0.185	-	-
HCM Control Delay (s)	0	-	-	20.8	8.7	8.9	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	0.1	0.7	-	-

MOVEMENT SUMMARY

Site: 2025 PM Brannigan

Option 2
Brannigan and Transwestern
2025 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	259	2.0	0.545	11.5	LOS B	2.7	77.7	0.28	0.73	24.4
8	T	82	100.0	0.545	11.5	LOS B	2.7	77.7	0.28	0.40	26.6
18	R	146	2.0	0.545	11.5	LOS B	2.7	77.7	0.28	0.50	26.2
Approach		486	18.4	0.545	11.5	LOS B	2.7	77.7	0.28	0.61	25.3
East: Brannigan											
1	L	57	2.0	0.095	6.0	LOS A	0.3	8.2	0.46	0.81	26.8
6	T	12	2.0	0.095	6.0	LOS A	0.3	8.2	0.46	0.59	29.7
Approach		69	2.0	0.095	6.0	LOS A	0.3	8.2	0.46	0.77	27.3
West: Brannigan											
2	T	67	2.0	0.369	8.7	LOS A	1.3	40.7	0.20	0.41	28.5
12	R	241	35.0	0.369	8.7	LOS A	1.3	40.7	0.20	0.52	27.8
Approach		308	27.9	0.369	8.7	LOS A	1.3	40.7	0.20	0.49	28.0
All Vehicles		862	20.5	0.545	10.0	LOS B	2.7	77.7	0.27	0.58	26.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	60	0	135	5	65	0	0	405	75
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	87	0	169	10	84	0	0	513	110

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	672	727	84	623	0	0	84	0	0
Stage 1	104	104	-	-	-	-	-	-	-
Stage 2	568	623	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	6.59	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	3.651	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	420	298	882	764	-	-	1513	-	-
Stage 1	918	725	-	-	-	-	-	-	-
Stage 2	565	411	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	414	0	882	764	-	-	1513	-	-
Mov Cap-2 Maneuver	414	0	-	-	-	-	-	-	-
Stage 1	905	0	-	-	-	-	-	-	-
Stage 2	565	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	764	-	-	414	882	1513	-	-
HCM Lane V/C Ratio	0.013	-	-	0.21	0.191	-	-	-
HCM Control Delay (s)	9.8	0	-	16	10	0	-	-
HCM Lane LOS	A	A	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.7	0	-	-

Intersection	
Int Delay, s/veh	14

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	60	0	15	0	0	0	0	10	25	385	80	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	78	0	34	0	0	0	0	20	33	487	110	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1121	1137	110	110	0	0	53	0	0
Stage 1	1084	1084	-	-	-	-	-	-	-
Stage 2	37	53	-	-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34	4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426	2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	183	203	912	1480	-	-	1485	-	-
Stage 1	262	296	-	-	-	-	-	-	-
Stage 2	871	855	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	119	0	912	1480	-	-	1485	-	-
Mov Cap-2 Maneuver	119	0	-	-	-	-	-	-	-
Stage 1	171	0	-	-	-	-	-	-	-
Stage 2	871	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	58.3	0	7
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1480	-	-	119	912	1485	-	-
HCM Lane V/C Ratio	-	-	-	0.655	0.037	0.328	-	-
HCM Control Delay (s)	0	-	-	79.8	9.1	8.6	0	-
HCM Lane LOS	A	-	-	F	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	3.4	0.1	1.4	-	-

MOVEMENT SUMMARY

Site: 2035 AM Brannigan

Option 2
Brannigan and Transwestern
2035 AM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	118	2.0	0.285	7.5	LOS A	0.9	28.7	0.08	0.79	26.1
8	T	80	100.0	0.285	7.5	LOS A	0.9	28.7	0.08	0.35	28.8
18	R	38	2.0	0.285	7.5	LOS A	0.9	28.7	0.08	0.48	28.5
Approach		235	35.2	0.285	7.5	LOS A	0.9	28.7	0.08	0.59	27.4
East: Brannigan											
1	L	274	2.0	0.372	8.7	LOS A	1.7	42.3	0.48	0.80	25.6
6	T	38	2.0	0.372	8.7	LOS A	1.7	42.3	0.48	0.59	28.0
Approach		312	2.0	0.372	8.7	LOS A	1.7	42.3	0.48	0.77	25.8
West: Brannigan											
2	T	13	2.0	0.520	14.2	LOS B	2.0	62.4	0.49	0.65	25.4
12	R	319	35.0	0.520	14.2	LOS B	2.0	62.4	0.49	0.71	25.0
Approach		332	33.7	0.520	14.2	LOS B	2.0	62.4	0.49	0.71	25.0
All Vehicles		879	22.8	0.520	10.4	LOS B	2.0	62.4	0.38	0.70	25.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	40	0	180	25	130	0	0	215	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	96	58	77	92	92	73	87
Heavy Vehicles, %	2	2	2	29	2	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	53	0	188	43	169	0	0	295	126

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	613	676	169	421	0	0	169	0	0
Stage 1	255	255	-	-	-	-	-	-	-
Stage 2	358	421	-	-	-	-	-	-	-
Critical Hdwy	6.69	6.52	6.53	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.018	3.597	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	415	375	801	978	-	-	1409	-	-
Stage 1	729	696	-	-	-	-	-	-	-
Stage 2	652	589	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	395	0	801	978	-	-	1409	-	-
Mov Cap-2 Maneuver	395	0	-	-	-	-	-	-	-
Stage 1	693	0	-	-	-	-	-	-	-
Stage 2	652	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.9	1.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	978	-	-	395	801	1409	-	-
HCM Lane V/C Ratio	0.044	-	-	0.135	0.234	-	-	-
HCM Control Delay (s)	8.9	0	-	15.5	10.9	0	-	-
HCM Lane LOS	A	A	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.9	0	-	-

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	0	10	0	0	0	0	80	40	160	95	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	50	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	50	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	97	0	30	0	0	0	0	131	73	200	138	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	706	742	138	138	0	0	204	0	0
Stage 1	538	538	-	-	-	-	-	-	-
Stage 2	168	204	-	-	-	-	-	-	-
Critical Hdwy	6.91	7	6.45	4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.959	4.45	3.525	2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	337	292	853	1446	-	-	1232	-	-
Stage 1	498	452	-	-	-	-	-	-	-
Stage 2	756	651	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	278	0	853	1446	-	-	1232	-	-
Mov Cap-2 Maneuver	278	0	-	-	-	-	-	-	-
Stage 1	410	0	-	-	-	-	-	-	-
Stage 2	756	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.1	0	5
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1446	-	-	278	853	1232	-	-
HCM Lane V/C Ratio	-	-	-	0.35	0.036	0.162	-	-
HCM Control Delay (s)	0	-	-	24.8	9.4	8.5	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.5	0.1	0.6	-	-

MOVEMENT SUMMARY

Site: 2035 MD Brannigan

Option 2
Brannigan and Transwestern
2035 MD Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	238	2.0	0.416	9.0	LOS A	1.7	49.9	0.13	0.74	25.4
8	T	85	100.0	0.416	9.0	LOS A	1.7	49.9	0.13	0.35	28.0
18	R	45	2.0	0.416	9.0	LOS A	1.7	49.9	0.13	0.47	27.6
Approach		368	24.7	0.416	9.0	LOS A	1.7	49.9	0.13	0.62	26.2
East: Brannigan											
1	L	56	2.0	0.109	6.1	LOS A	0.4	9.5	0.45	0.83	26.9
6	T	24	2.0	0.109	6.1	LOS A	0.4	9.5	0.45	0.59	29.7
Approach		80	2.0	0.109	6.1	LOS A	0.4	9.5	0.45	0.76	27.6
West: Brannigan											
2	T	24	2.0	0.422	9.8	LOS A	1.5	48.2	0.21	0.41	27.8
12	R	316	35.0	0.422	9.8	LOS A	1.5	48.2	0.21	0.51	27.2
Approach		340	32.7	0.422	9.8	LOS A	1.5	48.2	0.21	0.50	27.2
All Vehicles		788	25.9	0.422	9.1	LOS A	1.7	49.9	0.20	0.58	26.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	30	0	380	20	115	0	0	195	115
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	83	75	92
Heavy Vehicles, %	2	2	2	17	2	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	47	0	452	40	142	0	0	260	125

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	545	607	142	385	0	0	142	0	0
Stage 1	222	222	-	-	-	-	-	-	-
Stage 2	323	385	-	-	-	-	-	-	-
Critical Hdwy	6.57	6.52	6.39	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1	5.57	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.57	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.653	4.018	3.471	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver	475	411	863	1082	-	-	1441	-	-
Stage 1	781	720	-	-	-	-	-	-	-
Stage 2	701	611	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	456	0	863	1082	-	-	1441	-	-
Mov Cap-2 Maneuver	456	0	-	-	-	-	-	-	-
Stage 1	750	0	-	-	-	-	-	-	-
Stage 2	701	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	1.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1082	-	-	456	863	1441	-	-
HCM Lane V/C Ratio	0.037	-	-	0.103	0.524	-	-	-
HCM Control Delay (s)	8.5	0	-	13.8	13.7	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	3.1	0	-	-

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	0	15	0	0	0	0	60	150	190	35	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	92	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	95	0	30	0	0	0	0	83	273	257	50	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	784	920	50				50	0	0	356	0	0
Stage 1	564	564	-				-	-	-	-	-	-
Stage 2	220	356	-				-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37				4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453				2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	317	273	977				1557	-	-	1081	-	-
Stage 1	506	512	-				-	-	-	-	-	-
Stage 2	740	633	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	239	0	977				1557	-	-	1081	-	-
Mov Cap-2 Maneuver	239	0	-				-	-	-	-	-	-
Stage 1	382	0	-				-	-	-	-	-	-
Stage 2	740	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.7	0	7.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1557	-	-	239	977	1081	-	-
HCM Lane V/C Ratio	-	-	-	0.397	0.031	0.238	-	-
HCM Control Delay (s)	0	-	-	29.7	8.8	9.4	0	-
HCM Lane LOS	A	-	-	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.8	0.1	0.9	-	-

MOVEMENT SUMMARY

Site: 2035 PM Brannigan

Option 2
Brannigan and Transwestern
2035 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	318	2.0	0.657	14.7	LOS B	3.9	111.1	0.33	0.72	23.2
8	T	98	100.0	0.657	14.7	LOS B	3.9	111.1	0.33	0.41	25.2
18	R	171	2.0	0.657	14.7	LOS B	3.9	111.1	0.33	0.51	24.7
Approach		586	18.3	0.657	14.7	LOS B	3.9	111.1	0.33	0.60	23.9
East: Brannigan											
1	L	68	2.0	0.130	6.9	LOS A	0.4	11.3	0.51	0.86	26.4
6	T	18	2.0	0.130	6.9	LOS A	0.4	11.3	0.51	0.66	29.0
Approach		86	2.0	0.130	6.9	LOS A	0.4	11.3	0.51	0.82	26.9
West: Brannigan											
2	T	67	2.0	0.441	10.0	LOS B	1.7	51.9	0.24	0.42	27.7
12	R	294	35.0	0.441	10.0	LOS B	1.7	51.9	0.24	0.52	27.1
Approach		361	28.9	0.441	10.0	LOS B	1.7	51.9	0.24	0.50	27.2
All Vehicles		1033	20.7	0.657	12.4	LOS B	3.9	111.1	0.31	0.59	25.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

APPENDIX FR-9

Concept 3 Traffic Analysis

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	50	0	110	5	55	0	0	330	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	72	0	138	10	71	0	0	418	96

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	557	604	-	513	0	0	71	0	0
Stage 1	91	91	-	-	-	-	-	-	-
Stage 2	466	513	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	-	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	-	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	490	355	0	847	-	-	1529	-	-
Stage 1	930	735	0	-	-	-	-	-	-
Stage 2	630	465	0	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	484	0	-	847	-	-	1529	-	-
Mov Cap-2 Maneuver	484	0	-	-	-	-	-	-	-
Stage 1	919	0	-	-	-	-	-	-	-
Stage 2	630	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	1.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	847	-	-	484	-	1529	-	-
HCM Lane V/C Ratio	0.012	-	-	0.15	-	-	-	-
HCM Control Delay (s)	9.3	0	-	13.7	0	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	-	0	-	-

Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	50	0	10	0	0	0	0	10	20	315	65	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	65	0	23	0	0	0	0	20	27	399	89	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	920	934	89	89	0	0	47	0	0
Stage 1	887	887	-	-	-	-	-	-	-
Stage 2	33	47	-	-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34	4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426	2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	246	268	937	1506	-	-	1493	-	-
Stage 1	331	365	-	-	-	-	-	-	-
Stage 2	875	860	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	177	0	937	1506	-	-	1493	-	-
Mov Cap-2 Maneuver	177	0	-	-	-	-	-	-	-
Stage 1	238	0	-	-	-	-	-	-	-
Stage 2	875	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	29.5	0	6.8
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1506	-	-	177	937	1493	-	-
HCM Lane V/C Ratio	-	-	-	0.367	0.024	0.267	-	-
HCM Control Delay (s)	0	-	-	36.7	8.9	8.3	0	-
HCM Lane LOS	A	-	-	E	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.6	0.1	1.1	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.3	0.0	0.2	0.2
Total Delay (hr)	0.1	0.5	0.1	0.1	0.8
Total Del/Veh (s)	3.4	6.8	2.0	6.0	4.8
Stop Delay (hr)	0.1	0.3	0.0	0.0	0.4
Stop Del/Veh (s)	2.9	3.3	0.0	3.4	2.2

MOVEMENT SUMMARY

Site: 2025 U-Turn AM

Option 3
Brannigan U-Turn
2025 AM Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	253	2.0	0.272	6.7	LOS A	0.8	21.0	0.31	0.54	29.8
Approach		253	2.0	0.272	6.7	LOS A	0.8	21.0	0.31	0.54	29.8
West: Brannigan											
5	L	100	14.0	0.101	4.5	LOS A	0.0	0.0	0.00	0.75	29.0
2	T	68	100.0	0.157	7.0	LOS A	0.0	0.0	0.00	0.78	29.2
12	R	40	2.0	0.157	7.0	LOS A	0.0	0.0	0.00	0.37	34.9
Approach		208	39.9	0.157	5.8	LOS A	0.0	0.0	0.00	0.68	29.9
All Vehicles		461	19.1	0.272	6.3	LOS A	0.8	21.0	0.17	0.61	29.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	35	0	145	20	110	0	0	180	90
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	92	58	77	92	68	73	87
Heavy Vehicles, %	2	2	2	29	50	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	47	0	158	34	143	0	0	247	103

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	510	562	-	350	0	0	143	0	0
Stage 1	212	212	-	-	-	-	-	-	-
Stage 2	298	350	-	-	-	-	-	-	-
Critical Hdwy	6.69	7	-	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.45	-	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	479	376	0	1043	-	-	1440	-	-
Stage 1	763	646	0	-	-	-	-	-	-
Stage 2	695	556	0	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	462	0	-	1043	-	-	1440	-	-
Mov Cap-2 Maneuver	462	0	-	-	-	-	-	-	-
Stage 1	736	0	-	-	-	-	-	-	-
Stage 2	695	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	1.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1043	-	-	462	-	1440	-	-
HCM Lane V/C Ratio	0.033	-	-	0.101	-	-	-	-
HCM Control Delay (s)	8.6	0	-	13.7	0	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	-	0	-	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	60	0	5	0	0	0	0	70	35	135	80	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	0	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	78	0	15	0	0	0	0	115	64	169	116	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	600	631	116	116	0	0	178	0	0
Stage 1	453	453	-	-	-	-	-	-	-
Stage 2	147	178	-	-	-	-	-	-	-
Critical Hdwy	6.91	6.5	6.45	4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.959	4	3.525	2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	393	401	878	1473	-	-	1260	-	-
Stage 1	549	573	-	-	-	-	-	-	-
Stage 2	774	756	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	337	0	878	1473	-	-	1260	-	-
Mov Cap-2 Maneuver	337	0	-	-	-	-	-	-	-
Stage 1	470	0	-	-	-	-	-	-	-
Stage 2	774	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.3	0	4.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1473	-	-	337	878	1260	-	-
HCM Lane V/C Ratio	-	-	-	0.231	0.017	0.134	-	-
HCM Control Delay (s)	0	-	-	18.9	9.2	8.3	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.1	0.5	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.0	0.2	0.1
Total Delay (hr)	0.0	0.4	0.2	0.1	0.6
Total Del/Veh (s)	2.5	6.3	1.9	5.8	3.9
Stop Delay (hr)	0.0	0.2	0.0	0.0	0.2
Stop Del/Veh (s)	2.6	3.1	0.0	3.2	1.5

MOVEMENT SUMMARY

Site: 2025 U-Turn MD

Option 3
Brannigan U-Turn
2025 MD Peak
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	71	2.0	0.083	5.0	LOS A	0.2	5.3	0.31	0.55	30.9
Approach		71	2.0	0.083	5.0	LOS A	0.2	5.3	0.31	0.55	30.9
West: Brannigan											
5	L	205	8.0	0.196	5.3	LOS A	0.0	0.0	0.00	0.75	29.0
2	T	74	100.0	0.191	7.0	LOS A	0.0	0.0	0.00	0.81	29.2
12	R	67	2.0	0.191	7.0	LOS A	0.0	0.0	0.00	0.38	34.9
Approach		346	26.5	0.196	6.0	LOS A	0.0	0.0	0.00	0.69	29.9
All Vehicles		416	22.3	0.196	5.8	LOS A	0.2	5.3	0.05	0.67	30.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	25	0	310	20	100	0	0	160	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	68	75	92
Heavy Vehicles, %	2	2	2	17	50	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	39	0	369	40	123	0	0	213	109

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	471	525	-	322	0	0	123	0	0
Stage 1	203	203	-	-	-	-	-	-	-
Stage 2	268	322	-	-	-	-	-	-	-
Critical Hdwy	6.57	7	-	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1	5.57	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.57	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.653	4.45	-	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver	525	396	0	1143	-	-	1464	-	-
Stage 1	797	652	0	-	-	-	-	-	-
Stage 2	744	573	0	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	505	0	-	1143	-	-	1464	-	-
Mov Cap-2 Maneuver	505	0	-	-	-	-	-	-	-
Stage 1	767	0	-	-	-	-	-	-	-
Stage 2	744	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1143	-	-	505	-	1464	-	-
HCM Lane V/C Ratio	0.035	-	-	0.077	-	-	-	-
HCM Control Delay (s)	8.3	0	-	12.7	0	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	-	0	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	65	0	10	0	0	0	0	55	125	155	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	25	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	82	0	20	0	0	0	0	76	227	209	43	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	652	766	43	43	0	0	304	0	0
Stage 1	462	462	-	-	-	-	-	-	-
Stage 2	190	304	-	-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37	4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453	2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	382	335	986	1566	-	-	1132	-	-
Stage 1	567	568	-	-	-	-	-	-	-
Stage 2	765	667	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	310	0	986	1566	-	-	1132	-	-
Mov Cap-2 Maneuver	310	0	-	-	-	-	-	-	-
Stage 1	460	0	-	-	-	-	-	-	-
Stage 2	765	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.4	0	7.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1566	-	-	310	986	1132	-	-
HCM Lane V/C Ratio	-	-	-	0.265	0.02	0.185	-	-
HCM Control Delay (s)	0	-	-	20.8	8.7	8.9	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	0.1	0.7	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.3	0.0	0.1	0.1
Total Delay (hr)	0.0	0.5	0.3	0.1	0.9
Total Del/Veh (s)	3.2	7.2	2.4	5.6	4.2
Stop Delay (hr)	0.0	0.2	0.0	0.0	0.3
Stop Del/Veh (s)	2.6	3.1	0.0	3.0	1.4

MOVEMENT SUMMARY

Site: 2025 U-Turn PM

Option 3
Brannigan U-Turn
2025 PM Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	71	2.0	0.077	4.6	LOS A	0.2	4.9	0.26	0.51	31.2
Approach		71	2.0	0.077	4.6	LOS A	0.2	4.9	0.26	0.51	31.2
West: Brannigan											
5	L	100	5.0	0.093	4.2	LOS A	0.0	0.0	0.00	0.75	29.0
2	T	82	100.0	0.321	7.7	LOS A	0.0	0.0	0.00	0.88	29.2
12	R	196	2.0	0.321	7.7	LOS A	0.0	0.0	0.00	0.40	34.9
Approach		378	23.9	0.321	6.8	LOS A	0.0	0.0	0.00	0.60	31.6
All Vehicles		448	20.5	0.321	6.4	LOS A	0.2	4.9	0.04	0.58	31.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	60	0	135	5	65	0	0	405	75
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	87	0	169	10	84	0	0	513	110

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	672	727	-	623	0	0	84	0	0
Stage 1	104	104	-	-	-	-	-	-	-
Stage 2	568	623	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	-	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	-	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	420	298	0	764	-	-	1513	-	-
Stage 1	918	725	0	-	-	-	-	-	-
Stage 2	565	411	0	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	414	0	-	764	-	-	1513	-	-
Mov Cap-2 Maneuver	414	0	-	-	-	-	-	-	-
Stage 1	905	0	-	-	-	-	-	-	-
Stage 2	565	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	764	-	-	414	-	1513	-	-
HCM Lane V/C Ratio	0.013	-	-	0.21	-	-	-	-
HCM Control Delay (s)	9.8	0	-	16	0	0	-	-
HCM Lane LOS	A	A	-	C	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	-	0	-	-

Intersection	
Int Delay, s/veh	14

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	60	0	15	0	0	0	0	10	25	385	80	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	78	0	34	0	0	0	0	20	33	487	110	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	1121	1137	110				110	0	0	53	0	0
Stage 1	1084	1084	-				-	-	-	-	-	-
Stage 2	37	53	-				-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34				4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426				2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	183	203	912				1480	-	-	1485	-	-
Stage 1	262	296	-				-	-	-	-	-	-
Stage 2	871	855	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	119	0	912				1480	-	-	1485	-	-
Mov Cap-2 Maneuver	119	0	-				-	-	-	-	-	-
Stage 1	171	0	-				-	-	-	-	-	-
Stage 2	871	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	58.3	0	7
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1480	-	-	119	912	1485	-	-
HCM Lane V/C Ratio	-	-	-	0.655	0.037	0.328	-	-
HCM Control Delay (s)	0	-	-	79.8	9.1	8.6	0	-
HCM Lane LOS	A	-	-	F	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	3.4	0.1	1.4	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.3	0.0	0.2	0.2
Total Delay (hr)	0.1	0.8	0.1	0.1	1.1
Total Del/Veh (s)	4.2	8.2	2.0	6.7	5.7
Stop Delay (hr)	0.1	0.4	0.0	0.1	0.6
Stop Del/Veh (s)	3.6	4.4	0.0	4.1	2.9

MOVEMENT SUMMARY

Site: 2035 U-Turn AM

Option 3
Brannigan U-Turn
2035 AM Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	300	2.0	0.336	7.7	LOS A	1.1	27.5	0.37	0.59	29.1
Approach		300	2.0	0.336	7.7	LOS A	1.1	27.5	0.37	0.59	29.1
West: Brannigan											
5	L	131	14.0	0.132	4.8	LOS A	0.0	0.0	0.00	0.75	29.0
2	T	80	100.0	0.189	7.3	LOS A	0.0	0.0	0.00	0.79	29.2
12	R	53	2.0	0.189	7.3	LOS A	0.0	0.0	0.00	0.38	34.9
Approach		264	37.5	0.189	6.1	LOS A	0.0	0.0	0.00	0.68	30.0
All Vehicles		564	18.6	0.336	7.0	LOS A	1.1	27.5	0.19	0.63	29.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	40	0	180	25	130	0	0	215	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	92	58	77	92	68	73	87
Heavy Vehicles, %	2	2	2	29	50	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	53	0	196	43	169	0	0	295	126

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				613	676	-	421	0	0	169	0	0
Stage 1				255	255	-	-	-	-	-	-	-
Stage 2				358	421	-	-	-	-	-	-	-
Critical Hdwy				6.69	7	-	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1				5.69	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.69	6	-	-	-	-	-	-	-
Follow-up Hdwy				3.761	4.45	-	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver				415	321	0	978	-	-	1409	-	-
Stage 1				729	617	0	-	-	-	-	-	-
Stage 2				652	514	0	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver				395	0	-	978	-	-	1409	-	-
Mov Cap-2 Maneuver				395	0	-	-	-	-	-	-	-
Stage 1				693	0	-	-	-	-	-	-	-
Stage 2				652	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.5	1.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	978	-	-	395	-	1409	-	-
HCM Lane V/C Ratio	0.044	-	-	0.135	-	-	-	-
HCM Control Delay (s)	8.9	0	-	15.5	0	0	-	-
HCM Lane LOS	A	A	-	C	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	-	0	-	-

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	0	10	0	0	0	0	80	40	160	95	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	0	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	97	0	30	0	0	0	0	131	73	200	138	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	706	742	138	138	0	0	204	0	0
Stage 1	538	538	-	-	-	-	-	-	-
Stage 2	168	204	-	-	-	-	-	-	-
Critical Hdwy	6.91	6.5	6.45	4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.959	4	3.525	2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	337	346	853	1446	-	-	1232	-	-
Stage 1	498	526	-	-	-	-	-	-	-
Stage 2	756	737	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	278	0	853	1446	-	-	1232	-	-
Mov Cap-2 Maneuver	278	0	-	-	-	-	-	-	-
Stage 1	410	0	-	-	-	-	-	-	-
Stage 2	756	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.1	0	5
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1446	-	-	278	853	1232	-	-
HCM Lane V/C Ratio	-	-	-	0.35	0.036	0.162	-	-
HCM Control Delay (s)	0	-	-	24.8	9.4	8.5	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.5	0.1	0.6	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.0	0.3	0.1
Total Delay (hr)	0.0	0.5	0.2	0.1	0.8
Total Del/Veh (s)	2.6	6.9	2.1	6.1	4.2
Stop Delay (hr)	0.0	0.2	0.0	0.1	0.3
Stop Del/Veh (s)	2.8	3.2	0.0	3.5	1.7

MOVEMENT SUMMARY

Site: 2035 U-Turn MD

Option 3
Brannigan U-Turn
2035 MD Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	82	2.0	0.102	5.5	LOS A	0.3	6.6	0.35	0.59	30.6
Approach		82	2.0	0.102	5.5	LOS A	0.3	6.6	0.35	0.59	30.6
West: Brannigan											
5	L	256	8.0	0.245	5.8	LOS A	0.0	0.0	0.00	0.75	29.0
2	T	85	100.0	0.217	7.4	LOS A	0.0	0.0	0.00	0.80	29.2
12	R	73	2.0	0.217	7.4	LOS A	0.0	0.0	0.00	0.38	34.9
Approach		415	25.8	0.245	6.4	LOS A	0.0	0.0	0.00	0.69	29.8
All Vehicles		497	21.9	0.245	6.2	LOS A	0.3	6.6	0.06	0.68	29.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	30	0	380	20	115	0	0	195	115
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	68	75	92
Heavy Vehicles, %	2	2	2	17	50	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	47	0	452	40	142	0	0	260	125

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	545	607	-	385	0	0	142	0	0
Stage 1	222	222	-	-	-	-	-	-	-
Stage 2	323	385	-	-	-	-	-	-	-
Critical Hdwy	6.57	7	-	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1	5.57	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.57	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.653	4.45	-	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver	475	353	0	1082	-	-	1441	-	-
Stage 1	781	639	0	-	-	-	-	-	-
Stage 2	701	535	0	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	456	0	-	1082	-	-	1441	-	-
Mov Cap-2 Maneuver	456	0	-	-	-	-	-	-	-
Stage 1	750	0	-	-	-	-	-	-	-
Stage 2	701	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.8	1.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1082	-	-	456	-	1441	-	-
HCM Lane V/C Ratio	0.037	-	-	0.103	-	-	-	-
HCM Control Delay (s)	8.5	0	-	13.8	0	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	-	0	-	-

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	0	15	0	0	0	0	60	150	190	35	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	25	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	95	0	30	0	0	0	0	83	273	257	50	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	784	920	50	50	0	0	356	0	0
Stage 1	564	564	-	-	-	-	-	-	-
Stage 2	220	356	-	-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37	4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453	2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	317	273	977	1557	-	-	1081	-	-
Stage 1	506	512	-	-	-	-	-	-	-
Stage 2	740	633	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	239	0	977	1557	-	-	1081	-	-
Mov Cap-2 Maneuver	239	0	-	-	-	-	-	-	-
Stage 1	382	0	-	-	-	-	-	-	-
Stage 2	740	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.7	0	7.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1557	-	-	239	977	1081	-	-
HCM Lane V/C Ratio	-	-	-	0.397	0.031	0.238	-	-
HCM Control Delay (s)	0	-	-	29.7	8.8	9.4	0	-
HCM Lane LOS	A	-	-	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.8	0.1	0.9	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.4	0.0	0.2	0.1
Total Delay (hr)	0.1	0.7	0.3	0.1	1.2
Total Del/Veh (s)	3.4	8.2	2.5	6.2	4.6
Stop Delay (hr)	0.1	0.3	0.0	0.1	0.4
Stop Del/Veh (s)	2.7	3.9	0.0	3.5	1.7

MOVEMENT SUMMARY

Site: 2035 U-Turn PM

Option 3
Brannigan U-Turn
2035 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	88	2.0	0.117	6.0	LOS A	0.3	7.7	0.39	0.64	30.2
Approach		88	2.0	0.117	6.0	LOS A	0.3	7.7	0.39	0.64	30.2
West: Brannigan											
5	L	338	5.0	0.314	6.4	LOS A	0.0	0.0	0.00	0.75	29.0
2	T	98	100.0	0.385	8.7	LOS A	0.0	0.0	0.00	0.88	29.2
12	R	234	2.0	0.385	8.7	LOS A	0.0	0.0	0.00	0.40	34.9
Approach		670	17.8	0.385	7.5	LOS A	0.0	0.0	0.00	0.65	30.7
All Vehicles		758	16.0	0.385	7.4	LOS A	0.3	7.7	0.05	0.64	30.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

APPENDIX FR-10

Concept 4 Traffic Analysis

BURGESS & NIPLE

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	50	0	110	5	55	0	0	330	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	72	0	138	10	71	0	0	418	96

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	557	604	71	513	0	0	71	0	0
Stage 1	91	91	-	-	-	-	-	-	-
Stage 2	466	513	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	6.59	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	3.651	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	490	355	897	847	-	-	1529	-	-
Stage 1	930	735	-	-	-	-	-	-	-
Stage 2	630	465	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	484	0	897	847	-	-	1529	-	-
Mov Cap-2 Maneuver	484	0	-	-	-	-	-	-	-
Stage 1	919	0	-	-	-	-	-	-	-
Stage 2	630	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	1.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	847	-	-	484	897	1529	-	-
HCM Lane V/C Ratio	0.012	-	-	0.15	0.153	-	-	-
HCM Control Delay (s)	9.3	0	-	13.7	9.7	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.5	0	-	-

Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	50	0	10	0	0	0	0	10	20	315	65	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	65	0	23	0	0	0	0	20	27	399	89	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	920	934	89				89	0	0	47	0	0
Stage 1	887	887	-				-	-	-	-	-	-
Stage 2	33	47	-				-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34				4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426				2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	246	268	937				1506	-	-	1493	-	-
Stage 1	331	365	-				-	-	-	-	-	-
Stage 2	875	860	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	177	0	937				1506	-	-	1493	-	-
Mov Cap-2 Maneuver	177	0	-				-	-	-	-	-	-
Stage 1	238	0	-				-	-	-	-	-	-
Stage 2	875	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	29.5	0	6.8
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1506	-	-	177	937	1493	-	-
HCM Lane V/C Ratio	-	-	-	0.367	0.024	0.267	-	-
HCM Control Delay (s)	0	-	-	36.7	8.9	8.3	0	-
HCM Lane LOS	A	-	-	E	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.6	0.1	1.1	-	-

MOVEMENT SUMMARY

Site: 2025 Brannigan AM

Option 4
Brannigan at Transwestern
2025 AM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	165	35.0	0.114	5.3	LOS A	0.3	10.1	0.07	0.68	27.1
18	R	31	2.0	0.114	5.1	LOS A	0.3	10.1	0.07	0.49	29.8
Approach		196	29.7	0.114	5.3	LOS A	0.3	10.1	0.07	0.65	27.5
East: Brannigan											
1	L	232	2.0	0.277	6.6	LOS A	0.9	21.6	0.29	0.75	26.5
6	T	31	2.0	0.277	6.6	LOS A	0.9	21.6	0.29	0.48	29.4
Approach		263	2.0	0.277	6.6	LOS A	0.9	21.6	0.29	0.72	26.8
West: Brannigan											
2	T	13	2.0	0.403	11.0	LOS B	1.3	41.7	0.42	0.56	27.0
12	R	256	35.0	0.403	11.0	LOS B	1.3	41.7	0.42	0.64	26.6
Approach		270	33.4	0.403	11.0	LOS B	1.3	41.7	0.42	0.64	26.6
All Vehicles		728	21.1	0.403	7.9	LOS A	1.3	41.7	0.28	0.67	26.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	35	0	145	20	110	0	0	180	90
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	96	58	77	92	92	73	87
Heavy Vehicles, %	2	2	2	29	2	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	47	0	151	34	143	0	0	247	103

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	510	562	143	350	0	0	143	0	0
Stage 1	212	212	-	-	-	-	-	-	-
Stage 2	298	350	-	-	-	-	-	-	-
Critical Hdwy	6.69	6.52	6.53	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.018	3.597	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	479	436	829	1043	-	-	1440	-	-
Stage 1	763	727	-	-	-	-	-	-	-
Stage 2	695	633	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	462	0	829	1043	-	-	1440	-	-
Mov Cap-2 Maneuver	462	0	-	-	-	-	-	-	-
Stage 1	736	0	-	-	-	-	-	-	-
Stage 2	695	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	1.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1043	-	-	462	829	1440	-	-
HCM Lane V/C Ratio	0.033	-	-	0.101	0.182	-	-	-
HCM Control Delay (s)	8.6	0	-	13.7	10.3	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.7	0	-	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	60	0	5	0	0	0	0	70	35	135	80	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	50	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	50	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	78	0	15	0	0	0	0	115	64	169	116	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	600	631	116	116	0	0	178	0	0
Stage 1	453	453	-	-	-	-	-	-	-
Stage 2	147	178	-	-	-	-	-	-	-
Critical Hdwy	6.91	7	6.45	4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.959	4.45	3.525	2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	393	342	878	1473	-	-	1260	-	-
Stage 1	549	497	-	-	-	-	-	-	-
Stage 2	774	670	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	337	0	878	1473	-	-	1260	-	-
Mov Cap-2 Maneuver	337	0	-	-	-	-	-	-	-
Stage 1	470	0	-	-	-	-	-	-	-
Stage 2	774	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.3	0	4.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1473	-	-	337	878	1260	-	-
HCM Lane V/C Ratio	-	-	-	0.231	0.017	0.134	-	-
HCM Control Delay (s)	0	-	-	18.9	9.2	8.3	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.1	0.5	-	-

MOVEMENT SUMMARY

Option 4
Brannigan at Transwestern
2025 MD Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	268	35.0	0.182	6.1	LOS A	0.6	17.0	0.10	0.67	26.7
18	R	38	2.0	0.182	6.0	LOS A	0.6	17.0	0.10	0.48	29.2
Approach		306	30.9	0.182	6.1	LOS A	0.6	17.0	0.10	0.65	27.0
East: Brannigan											
1	L	51	2.0	0.079	4.9	LOS A	0.2	5.1	0.31	0.79	27.4
6	T	18	2.0	0.079	4.9	LOS A	0.2	5.1	0.31	0.51	30.5
Approach		68	2.0	0.079	4.9	LOS A	0.2	5.1	0.31	0.72	28.1
West: Brannigan											
2	T	24	2.0	0.348	8.5	LOS A	1.2	37.0	0.18	0.40	28.6
12	R	259	35.0	0.348	8.5	LOS A	1.2	37.0	0.18	0.51	27.9
Approach		282	32.2	0.348	8.5	LOS A	1.2	37.0	0.18	0.50	28.0
All Vehicles		657	28.5	0.348	7.0	LOS A	1.2	37.0	0.16	0.59	27.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	25	0	310	20	100	0	0	160	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	83	75	92
Heavy Vehicles, %	2	2	2	17	2	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	39	0	369	40	123	0	0	213	109

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	471	525	123	322	0	0	123	0	0
Stage 1	203	203	-	-	-	-	-	-	-
Stage 2	268	322	-	-	-	-	-	-	-
Critical Hdwy	6.57	6.52	6.39	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1	5.57	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.57	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.653	4.018	3.471	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver	525	458	884	1143	-	-	1464	-	-
Stage 1	797	733	-	-	-	-	-	-	-
Stage 2	744	651	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	505	0	884	1143	-	-	1464	-	-
Mov Cap-2 Maneuver	505	0	-	-	-	-	-	-	-
Stage 1	767	0	-	-	-	-	-	-	-
Stage 2	744	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.1	2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1143	-	-	505	884	1464	-	-
HCM Lane V/C Ratio	0.035	-	-	0.077	0.417	-	-	-
HCM Control Delay (s)	8.3	0	-	12.7	12	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	2.1	0	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	65	0	10	0	0	0	0	55	125	155	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	92	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	82	0	20	0	0	0	0	76	227	209	43	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	652	766	43	43	0	0	304	0	0
Stage 1	462	462	-	-	-	-	-	-	-
Stage 2	190	304	-	-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37	4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453	2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	382	335	986	1566	-	-	1132	-	-
Stage 1	567	568	-	-	-	-	-	-	-
Stage 2	765	667	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	310	0	986	1566	-	-	1132	-	-
Mov Cap-2 Maneuver	310	0	-	-	-	-	-	-	-
Stage 1	460	0	-	-	-	-	-	-	-
Stage 2	765	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.4	0	7.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1566	-	-	310	986	1132	-	-
HCM Lane V/C Ratio	-	-	-	0.265	0.02	0.185	-	-
HCM Control Delay (s)	0	-	-	20.8	8.7	8.9	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	0.1	0.7	-	-

MOVEMENT SUMMARY

Site: 2025 Brannigan PM

Option 4
Brannigan at Transwestern
2025 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	347	35.0	0.288	7.5	LOS A	1.1	30.7	0.18	0.67	26.1
18	R	146	2.0	0.288	7.0	LOS A	1.1	30.7	0.18	0.50	28.6
Approach		493	25.2	0.288	7.4	LOS A	1.1	30.7	0.18	0.62	26.7
East: Brannigan											
1	L	57	2.0	0.086	5.4	LOS A	0.2	5.5	0.36	0.80	27.2
6	T	12	2.0	0.086	5.4	LOS A	0.2	5.5	0.36	0.55	30.2
Approach		69	2.0	0.086	5.4	LOS A	0.2	5.5	0.36	0.76	27.6
West: Brannigan											
2	T	53	2.0	0.356	8.5	LOS A	1.3	38.6	0.20	0.41	28.6
12	R	241	35.0	0.356	8.5	LOS A	1.3	38.6	0.20	0.51	27.9
Approach		295	29.0	0.356	8.5	LOS A	1.3	38.6	0.20	0.50	28.0
All Vehicles		856	24.7	0.356	7.6	LOS A	1.3	38.6	0.20	0.59	27.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	60	0	135	5	65	0	0	405	75
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	87	0	169	10	84	0	0	513	110

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	672	727	84	623	0	0	84	0	0
Stage 1	104	104	-	-	-	-	-	-	-
Stage 2	568	623	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	6.59	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	3.651	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	420	298	882	764	-	-	1513	-	-
Stage 1	918	725	-	-	-	-	-	-	-
Stage 2	565	411	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	414	0	882	764	-	-	1513	-	-
Mov Cap-2 Maneuver	414	0	-	-	-	-	-	-	-
Stage 1	905	0	-	-	-	-	-	-	-
Stage 2	565	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	764	-	-	414	882	1513	-	-
HCM Lane V/C Ratio	0.013	-	-	0.21	0.191	-	-	-
HCM Control Delay (s)	9.8	0	-	16	10	0	-	-
HCM Lane LOS	A	A	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.7	0	-	-

Intersection	
Int Delay, s/veh	14

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	60	0	15	0	0	0	0	10	25	385	80	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	78	0	34	0	0	0	0	20	33	487	110	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1121	1137	110	110	0	0	53	0	0
Stage 1	1084	1084	-	-	-	-	-	-	-
Stage 2	37	53	-	-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34	4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426	2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	183	203	912	1480	-	-	1485	-	-
Stage 1	262	296	-	-	-	-	-	-	-
Stage 2	871	855	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	119	0	912	1480	-	-	1485	-	-
Mov Cap-2 Maneuver	119	0	-	-	-	-	-	-	-
Stage 1	171	0	-	-	-	-	-	-	-
Stage 2	871	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	58.3	0	7
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1480	-	-	119	912	1485	-	-
HCM Lane V/C Ratio	-	-	-	0.655	0.037	0.328	-	-
HCM Control Delay (s)	0	-	-	79.8	9.1	8.6	0	-
HCM Lane LOS	A	-	-	F	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	3.4	0.1	1.4	-	-

MOVEMENT SUMMARY

Site: 2035 Brannigan AM

Option 4
Brannigan at Transwestern
2035 AM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	200	35.0	0.138	5.6	LOS A	0.4	12.5	0.07	0.68	27.0
18	R	38	2.0	0.138	5.4	LOS A	0.4	12.5	0.07	0.49	29.6
Approach		238	29.8	0.138	5.6	LOS A	0.4	12.5	0.07	0.65	27.3
East: Brannigan											
1	L	274	2.0	0.340	7.6	LOS A	1.1	28.1	0.34	0.78	26.0
6	T	38	2.0	0.340	7.6	LOS A	1.1	28.1	0.34	0.53	28.7
Approach		312	2.0	0.340	7.6	LOS A	1.1	28.1	0.34	0.75	26.3
West: Brannigan											
2	T	13	2.0	0.520	14.2	LOS B	2.0	62.4	0.49	0.65	25.4
12	R	319	35.0	0.520	14.2	LOS B	2.0	62.4	0.49	0.71	25.0
Approach		332	33.7	0.520	14.2	LOS B	2.0	62.4	0.49	0.71	25.0
All Vehicles		881	21.4	0.520	9.5	LOS A	2.0	62.4	0.33	0.71	26.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	40	0	180	25	130	0	0	215	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	96	58	77	92	92	73	87
Heavy Vehicles, %	2	2	2	29	2	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	53	0	188	43	169	0	0	295	126

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	613	676	169	421	0	0	169	0	0
Stage 1	255	255	-	-	-	-	-	-	-
Stage 2	358	421	-	-	-	-	-	-	-
Critical Hdwy	6.69	6.52	6.53	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.018	3.597	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	415	375	801	978	-	-	1409	-	-
Stage 1	729	696	-	-	-	-	-	-	-
Stage 2	652	589	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	395	0	801	978	-	-	1409	-	-
Mov Cap-2 Maneuver	395	0	-	-	-	-	-	-	-
Stage 1	693	0	-	-	-	-	-	-	-
Stage 2	652	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.9	1.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	978	-	-	395	801	1409	-	-
HCM Lane V/C Ratio	0.044	-	-	0.135	0.234	-	-	-
HCM Control Delay (s)	8.9	0	-	15.5	10.9	0	-	-
HCM Lane LOS	A	A	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.9	0	-	-

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	0	10	0	0	0	0	80	40	160	95	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	50	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	50	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	97	0	30	0	0	0	0	131	73	200	138	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	706	742	138	138	0	0	204	0	0
Stage 1	538	538	-	-	-	-	-	-	-
Stage 2	168	204	-	-	-	-	-	-	-
Critical Hdwy	6.91	7	6.45	4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.959	4.45	3.525	2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	337	292	853	1446	-	-	1232	-	-
Stage 1	498	452	-	-	-	-	-	-	-
Stage 2	756	651	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	278	0	853	1446	-	-	1232	-	-
Mov Cap-2 Maneuver	278	0	-	-	-	-	-	-	-
Stage 1	410	0	-	-	-	-	-	-	-
Stage 2	756	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.1	0	5
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1446	-	-	278	853	1232	-	-
HCM Lane V/C Ratio	-	-	-	0.35	0.036	0.162	-	-
HCM Control Delay (s)	0	-	-	24.8	9.4	8.5	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.5	0.1	0.6	-	-

MOVEMENT SUMMARY

Option 4
Brannigan at Transwestern
2035 MD Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	327	35.0	0.221	6.6	LOS A	0.7	21.4	0.10	0.67	26.5
18	R	45	2.0	0.221	6.4	LOS A	0.7	21.4	0.10	0.48	28.9
Approach		372	31.0	0.221	6.6	LOS A	0.7	21.4	0.10	0.65	26.7
East: Brannigan											
1	L	56	2.0	0.098	5.4	LOS A	0.3	6.4	0.35	0.82	27.2
6	T	24	2.0	0.098	5.4	LOS A	0.3	6.4	0.35	0.55	30.2
Approach		80	2.0	0.098	5.4	LOS A	0.3	6.4	0.35	0.74	28.0
West: Brannigan											
2	T	24	2.0	0.422	9.8	LOS A	1.5	48.2	0.21	0.41	27.8
12	R	316	35.0	0.422	9.8	LOS A	1.5	48.2	0.21	0.51	27.2
Approach		340	32.7	0.422	9.8	LOS A	1.5	48.2	0.21	0.50	27.2
All Vehicles		792	28.8	0.422	7.9	LOS A	1.5	48.2	0.17	0.60	27.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	30	0	380	20	115	0	0	195	115
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	83	75	92
Heavy Vehicles, %	2	2	2	17	2	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	47	0	452	40	142	0	0	260	125

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				545	607	142	385	0	0	142	0	0
Stage 1				222	222	-	-	-	-	-	-	-
Stage 2				323	385	-	-	-	-	-	-	-
Critical Hdwy				6.57	6.52	6.39	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1				5.57	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.57	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.653	4.018	3.471	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver				475	411	863	1082	-	-	1441	-	-
Stage 1				781	720	-	-	-	-	-	-	-
Stage 2				701	611	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver				456	0	863	1082	-	-	1441	-	-
Mov Cap-2 Maneuver				456	0	-	-	-	-	-	-	-
Stage 1				750	0	-	-	-	-	-	-	-
Stage 2				701	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	1.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1082	-	-	456	863	1441	-	-
HCM Lane V/C Ratio	0.037	-	-	0.103	0.524	-	-	-
HCM Control Delay (s)	8.5	0	-	13.8	13.7	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	3.1	0	-	-

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	0	15	0	0	0	0	60	150	190	35	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	92	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	95	0	30	0	0	0	0	83	273	257	50	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	784	920	50	50	0	0	356	0	0
Stage 1	564	564	-	-	-	-	-	-	-
Stage 2	220	356	-	-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37	4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453	2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	317	273	977	1557	-	-	1081	-	-
Stage 1	506	512	-	-	-	-	-	-	-
Stage 2	740	633	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	239	0	977	1557	-	-	1081	-	-
Mov Cap-2 Maneuver	239	0	-	-	-	-	-	-	-
Stage 1	382	0	-	-	-	-	-	-	-
Stage 2	740	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.7	0	7.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1557	-	-	239	977	1081	-	-
HCM Lane V/C Ratio	-	-	-	0.397	0.031	0.238	-	-
HCM Control Delay (s)	0	-	-	29.7	8.8	9.4	0	-
HCM Lane LOS	A	-	-	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.8	0.1	0.9	-	-

MOVEMENT SUMMARY

Option 4
Brannigan at Transwestern
2035 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Transwestern											
3	L	424	35.0	0.353	8.5	LOS A	1.4	40.0	0.22	0.67	25.6
18	R	171	2.0	0.353	7.9	LOS A	1.4	40.0	0.22	0.51	28.0
Approach		594	25.5	0.353	8.4	LOS A	1.4	40.0	0.22	0.63	26.2
East: Brannigan											
1	L	68	2.0	0.116	6.1	LOS A	0.3	7.6	0.40	0.85	26.8
6	T	18	2.0	0.116	6.1	LOS A	0.3	7.6	0.40	0.61	29.7
Approach		86	2.0	0.116	6.1	LOS A	0.3	7.6	0.40	0.80	27.3
West: Brannigan											
2	T	67	2.0	0.441	10.0	LOS B	1.7	51.9	0.24	0.42	27.7
12	R	294	35.0	0.441	10.0	LOS B	1.7	51.9	0.24	0.52	27.1
Approach		361	28.9	0.441	10.0	LOS B	1.7	51.9	0.24	0.50	27.2
All Vehicles		1041	24.7	0.441	8.8	LOS A	1.7	51.9	0.24	0.60	26.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

APPENDIX FR-11

Concept 5 Traffic Analysis

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	50	0	110	5	55	0	0	330	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	72	0	138	10	71	0	0	418	96

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	557	604	71	513	0	0	71	0	0
Stage 1	91	91	-	-	-	-	-	-	-
Stage 2	466	513	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	6.59	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	3.651	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	490	355	897	847	-	-	1529	-	-
Stage 1	930	735	-	-	-	-	-	-	-
Stage 2	630	465	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	484	0	897	847	-	-	1529	-	-
Mov Cap-2 Maneuver	484	0	-	-	-	-	-	-	-
Stage 1	919	0	-	-	-	-	-	-	-
Stage 2	630	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	1.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	847	-	-	484	897	1529	-	-
HCM Lane V/C Ratio	0.012	-	-	0.15	0.153	-	-	-
HCM Control Delay (s)	9.3	0	-	13.7	9.7	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.5	0	-	-

Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	50	0	10	0	0	0	0	10	20	315	65	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	65	0	23	0	0	0	0	20	27	399	89	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	920	934	89	89	0	0	47	0	0
Stage 1	887	887	-	-	-	-	-	-	-
Stage 2	33	47	-	-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34	4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426	2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	246	268	937	1506	-	-	1493	-	-
Stage 1	331	365	-	-	-	-	-	-	-
Stage 2	875	860	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	177	0	937	1506	-	-	1493	-	-
Mov Cap-2 Maneuver	177	0	-	-	-	-	-	-	-
Stage 1	238	0	-	-	-	-	-	-	-
Stage 2	875	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	29.5	0	6.8
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1506	-	-	177	937	1493	-	-
HCM Lane V/C Ratio	-	-	-	0.367	0.024	0.267	-	-
HCM Control Delay (s)	0	-	-	36.7	8.9	8.3	0	-
HCM Lane LOS	A	-	-	E	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.6	0.1	1.1	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.3	0.0	0.2	0.2
Total Delay (hr)	0.1	0.6	0.1	0.1	0.8
Total Del/Veh (s)	3.7	6.2	1.6	6.0	4.6
Stop Delay (hr)	0.1	0.3	0.0	0.1	0.4
Stop Del/Veh (s)	3.0	3.2	0.3	3.4	2.4

MOVEMENT SUMMARY

Site: 2025 U-Turn AM

Option 5
Brannigan U-Turn
2025 AM Peak
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	300	2.0	0.319	7.2	LOS A	1.0	26.0	0.31	0.55	29.4
Approach		300	2.0	0.319	7.2	LOS A	1.0	26.0	0.31	0.55	29.4
West: Brannigan											
5	L	175	35.0	0.126	5.4	LOS A	0.0	0.0	0.00	0.79	29.0
2	T	47	2.0	0.126	5.1	LOS A	0.0	0.0	0.00	0.38	34.9
Approach		222	28.1	0.126	5.3	LOS A	0.0	0.0	0.00	0.70	29.9
All Vehicles		522	13.1	0.319	6.4	LOS A	1.0	26.0	0.18	0.61	29.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	35	0	145	20	110	0	0	180	90
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	92	58	77	92	68	73	87
Heavy Vehicles, %	2	2	2	29	50	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	47	0	158	34	143	0	0	247	103

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	510	562	143	350	0	0	143	0	0
Stage 1	212	212	-	-	-	-	-	-	-
Stage 2	298	350	-	-	-	-	-	-	-
Critical Hdwy	6.69	7	6.53	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.45	3.597	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	479	376	829	1043	-	-	1440	-	-
Stage 1	763	646	-	-	-	-	-	-	-
Stage 2	695	556	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	462	0	829	1043	-	-	1440	-	-
Mov Cap-2 Maneuver	462	0	-	-	-	-	-	-	-
Stage 1	736	0	-	-	-	-	-	-	-
Stage 2	695	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	1.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1043	-	-	462	829	1440	-	-
HCM Lane V/C Ratio	0.033	-	-	0.101	0.19	-	-	-
HCM Control Delay (s)	8.6	0	-	13.7	10.4	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.7	0	-	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	60	0	5	0	0	0	0	70	35	135	80	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	0	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	78	0	15	0	0	0	0	115	64	169	116	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	600	631	116	116	0	0	178	0	0
Stage 1	453	453	-	-	-	-	-	-	-
Stage 2	147	178	-	-	-	-	-	-	-
Critical Hdwy	6.91	6.5	6.45	4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.959	4	3.525	2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	393	401	878	1473	-	-	1260	-	-
Stage 1	549	573	-	-	-	-	-	-	-
Stage 2	774	756	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	337	0	878	1473	-	-	1260	-	-
Mov Cap-2 Maneuver	337	0	-	-	-	-	-	-	-
Stage 1	470	0	-	-	-	-	-	-	-
Stage 2	774	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.3	0	4.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1473	-	-	337	878	1260	-	-
HCM Lane V/C Ratio	-	-	-	0.231	0.017	0.134	-	-
HCM Control Delay (s)	0	-	-	18.9	9.2	8.3	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.1	0.5	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.1	0.2	0.1
Total Delay (hr)	0.0	0.4	0.1	0.1	0.6
Total Del/Veh (s)	2.4	5.2	1.8	6.0	3.6
Stop Delay (hr)	0.0	0.2	0.0	0.0	0.3
Stop Del/Veh (s)	2.5	2.7	0.3	3.4	1.7

MOVEMENT SUMMARY

Site: 2025 U-Turn MD

Option 5
Brannigan U-Turn
2025 MD Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	71	2.0	0.084	5.1	LOS A	0.2	5.4	0.32	0.56	30.8
Approach		71	2.0	0.084	5.1	LOS A	0.2	5.4	0.32	0.56	30.8
West: Brannigan											
5	L	288	35.0	0.202	6.2	LOS A	0.0	0.0	0.00	0.79	29.0
2	T	67	2.0	0.202	5.9	LOS A	0.0	0.0	0.00	0.37	34.9
Approach		355	28.8	0.202	6.2	LOS A	0.0	0.0	0.00	0.71	29.8
All Vehicles		426	24.4	0.202	6.0	LOS A	0.2	5.4	0.05	0.68	30.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	25	0	310	20	100	0	0	160	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	68	75	92
Heavy Vehicles, %	2	2	2	17	50	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	39	0	369	40	123	0	0	213	109

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	471	525	123	322	0	0	123	0	0
Stage 1	203	203	-	-	-	-	-	-	-
Stage 2	268	322	-	-	-	-	-	-	-
Critical Hdwy	6.57	7	6.39	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1	5.57	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.57	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.653	4.45	3.471	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver	525	396	884	1143	-	-	1464	-	-
Stage 1	797	652	-	-	-	-	-	-	-
Stage 2	744	573	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	505	0	884	1143	-	-	1464	-	-
Mov Cap-2 Maneuver	505	0	-	-	-	-	-	-	-
Stage 1	767	0	-	-	-	-	-	-	-
Stage 2	744	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.1	2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1143	-	-	505	884	1464	-	-
HCM Lane V/C Ratio	0.035	-	-	0.077	0.417	-	-	-
HCM Control Delay (s)	8.3	0	-	12.7	12	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	2.1	0	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	65	0	10	0	0	0	0	55	125	155	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	25	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	82	0	20	0	0	0	0	76	227	209	43	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	652	766	43				43	0	0	304	0	0
Stage 1	462	462	-				-	-	-	-	-	-
Stage 2	190	304	-				-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37				4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453				2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	382	335	986				1566	-	-	1132	-	-
Stage 1	567	568	-				-	-	-	-	-	-
Stage 2	765	667	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	310	0	986				1566	-	-	1132	-	-
Mov Cap-2 Maneuver	310	0	-				-	-	-	-	-	-
Stage 1	460	0	-				-	-	-	-	-	-
Stage 2	765	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.4	0	7.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1566	-	-	310	986	1132	-	-
HCM Lane V/C Ratio	-	-	-	0.265	0.02	0.185	-	-
HCM Control Delay (s)	0	-	-	20.8	8.7	8.9	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	0.1	0.7	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.3	0.1	0.1	0.1
Total Delay (hr)	0.0	0.5	0.2	0.1	0.9
Total Del/Veh (s)	3.2	6.0	2.1	5.8	3.8
Stop Delay (hr)	0.0	0.3	0.0	0.1	0.4
Stop Del/Veh (s)	2.6	2.9	0.4	3.1	1.6

MOVEMENT SUMMARY

Site: 2025 U-Turn PM

Option 5
Brannigan U-Turn
2025 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	71	2.0	0.090	5.5	LOS A	0.2	5.8	0.37	0.61	30.5
Approach		71	2.0	0.090	5.5	LOS A	0.2	5.8	0.37	0.61	30.5
West: Brannigan											
5	L	369	35.0	0.309	7.5	LOS A	0.0	0.0	0.00	0.80	29.0
2	T	196	2.0	0.309	6.8	LOS A	0.0	0.0	0.00	0.39	34.9
Approach		565	23.5	0.309	7.2	LOS A	0.0	0.0	0.00	0.66	30.6
All Vehicles		636	21.1	0.309	7.0	LOS A	0.2	5.8	0.04	0.65	30.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	60	0	135	5	65	0	0	405	75
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	69	50	80	50	77	92	68	79	68
Heavy Vehicles, %	2	2	2	3	50	39	50	50	2	2	14	52
Mvmt Flow	0	0	0	87	0	169	10	84	0	0	513	110

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	672	727	84	623	0	0	84	0	0
Stage 1	104	104	-	-	-	-	-	-	-
Stage 2	568	623	-	-	-	-	-	-	-
Critical Hdwy	6.43	7	6.59	4.6	-	-	4.12	-	-
Critical Hdwy Stg 1	5.43	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.45	3.651	2.65	-	-	2.218	-	-
Pot Cap-1 Maneuver	420	298	882	764	-	-	1513	-	-
Stage 1	918	725	-	-	-	-	-	-	-
Stage 2	565	411	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	414	0	882	764	-	-	1513	-	-
Mov Cap-2 Maneuver	414	0	-	-	-	-	-	-	-
Stage 1	905	0	-	-	-	-	-	-	-
Stage 2	565	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	764	-	-	414	882	1513	-	-
HCM Lane V/C Ratio	0.013	-	-	0.21	0.191	-	-	-
HCM Control Delay (s)	9.8	0	-	16	10	0	-	-
HCM Lane LOS	A	A	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.7	0	-	-

Intersection	
Int Delay, s/veh	14

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	60	0	15	0	0	0	0	10	25	385	80	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	44	92	92	92	92	50	75	79	73	92
Heavy Vehicles, %	52	0	14	2	2	2	2	33	13	13	9	2
Mvmt Flow	78	0	34	0	0	0	0	20	33	487	110	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	1121	1137	110				110	0	0	53	0	0
Stage 1	1084	1084	-				-	-	-	-	-	-
Stage 2	37	53	-				-	-	-	-	-	-
Critical Hdwy	6.92	6.5	6.34				4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	5.92	5.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.92	5.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.968	4	3.426				2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	183	203	912				1480	-	-	1485	-	-
Stage 1	262	296	-				-	-	-	-	-	-
Stage 2	871	855	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	119	0	912				1480	-	-	1485	-	-
Mov Cap-2 Maneuver	119	0	-				-	-	-	-	-	-
Stage 1	171	0	-				-	-	-	-	-	-
Stage 2	871	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	58.3	0	7
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1480	-	-	119	912	1485	-	-
HCM Lane V/C Ratio	-	-	-	0.655	0.037	0.328	-	-
HCM Control Delay (s)	0	-	-	79.8	9.1	8.6	0	-
HCM Lane LOS	A	-	-	F	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	3.4	0.1	1.4	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.3	0.0	0.2	0.2
Total Delay (hr)	0.1	0.8	0.1	0.1	1.1
Total Del/Veh (s)	3.8	6.9	1.6	6.6	5.0
Stop Delay (hr)	0.1	0.4	0.0	0.1	0.6
Stop Del/Veh (s)	3.1	3.7	0.4	4.0	2.7

MOVEMENT SUMMARY

Site: 2035 U-Turn AM

Option 5
Brannigan U-Turn
2035 AM Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	300	2.0	0.333	7.6	LOS A	1.1	27.2	0.36	0.59	29.2
Approach		300	2.0	0.333	7.6	LOS A	1.1	27.2	0.36	0.59	29.2
West: Brannigan											
5	L	219	35.0	0.155	5.7	LOS A	0.0	0.0	0.00	0.79	29.0
2	T	53	2.0	0.155	5.4	LOS A	0.0	0.0	0.00	0.37	34.9
Approach		272	28.5	0.155	5.6	LOS A	0.0	0.0	0.00	0.71	29.9
All Vehicles		572	14.6	0.333	6.7	LOS A	1.1	27.2	0.19	0.64	29.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	40	0	180	25	130	0	0	215	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	75	92	92	58	77	92	68	73	87
Heavy Vehicles, %	2	2	2	29	50	33	36	28	2	2	19	39
Mvmt Flow	0	0	0	53	0	196	43	169	0	0	295	126

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	613	676	169	421	0	0	169	0	0
Stage 1	255	255	-	-	-	-	-	-	-
Stage 2	358	421	-	-	-	-	-	-	-
Critical Hdwy	6.69	7	6.53	4.46	-	-	4.12	-	-
Critical Hdwy Stg 1	5.69	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.69	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.761	4.45	3.597	2.524	-	-	2.218	-	-
Pot Cap-1 Maneuver	415	321	801	978	-	-	1409	-	-
Stage 1	729	617	-	-	-	-	-	-	-
Stage 2	652	514	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	395	0	801	978	-	-	1409	-	-
Mov Cap-2 Maneuver	395	0	-	-	-	-	-	-	-
Stage 1	693	0	-	-	-	-	-	-	-
Stage 2	652	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.9	1.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	978	-	-	395	801	1409	-	-
HCM Lane V/C Ratio	0.044	-	-	0.135	0.244	-	-	-
HCM Control Delay (s)	8.9	0	-	15.5	10.9	0	-	-
HCM Lane LOS	A	A	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	1	0	-	-

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	0	10	0	0	0	0	80	40	160	95	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	25	33	92	92	92	92	61	55	80	69	92
Heavy Vehicles, %	51	0	25	2	2	2	2	10	25	27	16	2
Mvmt Flow	97	0	30	0	0	0	0	131	73	200	138	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	706	742	138	138	0	0	204	0	0
Stage 1	538	538	-	-	-	-	-	-	-
Stage 2	168	204	-	-	-	-	-	-	-
Critical Hdwy	6.91	6.5	6.45	4.12	-	-	4.37	-	-
Critical Hdwy Stg 1	5.91	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.91	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.959	4	3.525	2.218	-	-	2.443	-	-
Pot Cap-1 Maneuver	337	346	853	1446	-	-	1232	-	-
Stage 1	498	526	-	-	-	-	-	-	-
Stage 2	756	737	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	278	0	853	1446	-	-	1232	-	-
Mov Cap-2 Maneuver	278	0	-	-	-	-	-	-	-
Stage 1	410	0	-	-	-	-	-	-	-
Stage 2	756	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.1	0	5
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1446	-	-	278	853	1232	-	-
HCM Lane V/C Ratio	-	-	-	0.35	0.036	0.162	-	-
HCM Control Delay (s)	0	-	-	24.8	9.4	8.5	0	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.5	0.1	0.6	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.1	0.2	0.2
Total Delay (hr)	0.0	0.5	0.2	0.1	0.8
Total Del/Veh (s)	3.0	5.8	1.9	5.7	3.9
Stop Delay (hr)	0.0	0.3	0.0	0.1	0.4
Stop Del/Veh (s)	3.0	3.0	0.3	3.2	1.8

MOVEMENT SUMMARY

Site: 2035 U-Turn MD

Option 5
Brannigan U-Turn
2035 MD Peak
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	82	2.0	0.104	5.6	LOS A	0.3	6.8	0.36	0.60	30.5
Approach		82	2.0	0.104	5.6	LOS A	0.3	6.8	0.36	0.60	30.5
West: Brannigan											
5	L	353	35.0	0.244	6.7	LOS A	0.0	0.0	0.00	0.78	29.0
2	T	73	2.0	0.244	6.4	LOS A	0.0	0.0	0.00	0.37	34.9
Approach		426	29.3	0.244	6.7	LOS A	0.0	0.0	0.00	0.71	29.8
All Vehicles		508	24.9	0.244	6.5	LOS A	0.3	6.8	0.06	0.69	29.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	30	0	380	20	115	0	0	195	115
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	250	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	64	92	84	50	81	92	68	75	92
Heavy Vehicles, %	2	2	2	17	50	19	20	35	2	2	31	33
Mvmt Flow	0	0	0	47	0	452	40	142	0	0	260	125

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	545	607	142	385	0	0	142	0	0
Stage 1	222	222	-	-	-	-	-	-	-
Stage 2	323	385	-	-	-	-	-	-	-
Critical Hdwy	6.57	7	6.39	4.3	-	-	4.12	-	-
Critical Hdwy Stg 1	5.57	6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.57	6	-	-	-	-	-	-	-
Follow-up Hdwy	3.653	4.45	3.471	2.38	-	-	2.218	-	-
Pot Cap-1 Maneuver	475	353	863	1082	-	-	1441	-	-
Stage 1	781	639	-	-	-	-	-	-	-
Stage 2	701	535	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	456	0	863	1082	-	-	1441	-	-
Mov Cap-2 Maneuver	456	0	-	-	-	-	-	-	-
Stage 1	750	0	-	-	-	-	-	-	-
Stage 2	701	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	1.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1082	-	-	456	863	1441	-	-
HCM Lane V/C Ratio	0.037	-	-	0.103	0.524	-	-	-
HCM Control Delay (s)	8.5	0	-	13.8	13.7	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	3.1	0	-	-

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	0	15	0	0	0	0	60	150	190	35	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	150	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	25	50	92	92	92	92	72	55	74	70	92
Heavy Vehicles, %	37	0	17	2	2	2	2	17	20	26	25	2
Mvmt Flow	95	0	30	0	0	0	0	83	273	257	50	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	784	920	50				50	0	0	356	0	0
Stage 1	564	564	-				-	-	-	-	-	-
Stage 2	220	356	-				-	-	-	-	-	-
Critical Hdwy	6.77	6.5	6.37				4.12	-	-	4.36	-	-
Critical Hdwy Stg 1	5.77	5.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.77	5.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.833	4	3.453				2.218	-	-	2.434	-	-
Pot Cap-1 Maneuver	317	273	977				1557	-	-	1081	-	-
Stage 1	506	512	-				-	-	-	-	-	-
Stage 2	740	633	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	239	0	977				1557	-	-	1081	-	-
Mov Cap-2 Maneuver	239	0	-				-	-	-	-	-	-
Stage 1	382	0	-				-	-	-	-	-	-
Stage 2	740	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.7	0	7.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	SBL	SBT	SBR
Capacity (veh/h)	1557	-	-	239	977	1081	-	-
HCM Lane V/C Ratio	-	-	-	0.397	0.031	0.238	-	-
HCM Control Delay (s)	0	-	-	29.7	8.8	9.4	0	-
HCM Lane LOS	A	-	-	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.8	0.1	0.9	-	-

8: Hughes Avenue/Pilot West Driveway & Brannigan Park Road Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.1	0.3	0.1	0.2	0.2
Total Delay (hr)	0.1	0.7	0.3	0.1	1.2
Total Del/Veh (s)	3.5	6.8	2.1	5.9	4.2
Stop Delay (hr)	0.1	0.3	0.1	0.1	0.5
Stop Del/Veh (s)	2.9	3.3	0.4	3.3	1.8

MOVEMENT SUMMARY

Site: 2035 U-Turn PM

Option 5
Brannigan U-Turn
2035 PM Peak
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Brannigan											
6	T	88	2.0	0.122	6.3	LOS A	0.3	8.0	0.41	0.66	30.0
Approach		88	2.0	0.122	6.3	LOS A	0.3	8.0	0.41	0.66	30.0
West: Brannigan											
5	L	450	35.0	0.374	8.4	LOS A	0.0	0.0	0.00	0.80	29.0
2	T	234	2.0	0.374	7.7	LOS A	0.0	0.0	0.00	0.39	34.9
Approach		684	23.7	0.374	8.2	LOS A	0.0	0.0	0.00	0.66	30.6
All Vehicles		772	21.2	0.374	7.9	LOS A	0.3	8.0	0.05	0.66	30.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

APPENDIX FR-12

Phase I Engagement Summary

Bellemont Access Management & Multi-Modal Transportation Study

ADOT Task Assignment MPD 012-15

Phase I Engagement Summary

Prepared for:

ADOT

AND

COCONINO
COUNTY ARIZONA

Prepared by:

BURGESS & NIPLE

In association with:
Partners for Strategic Action, Inc.

May 2015

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Figures

Appendices

1.0 Introduction

The Bellemont Access Management & Multi-Modal Transportation Study is being conducted by the Arizona Department of Transportation (ADOT) for Coconino County through the Planning Assistance for Rural Areas (PARA) program. The project includes two phases of public and stakeholder engagement; this first phase was facilitated to receive input regarding transportation issues and opportunities for future improvements in the study area.

1.1. Phase I Public and Stakeholder Engagement Details

Two specific activities were facilitated to inform this phase:

- Held the first public meeting.
- Conducted on-site interviews with Pilot Travel Center customers.

1.2. Phase I Public and Stakeholder Communication Tactics

A variety of methods were utilized to communicate about the project and inform stakeholders and the public about the public meeting. In February, a project web page was developed (www.azdot.gov/Bellemont) to accommodate project information, reports and documents, and announce engagement opportunities. Soon after, a project fact sheet, which is included as ***Appendix ES1-1***, was developed and used to communicate the March 25, 2015 public meeting. The flier was distributed to Technical Advisory Committee members and their agencies, delivered to businesses within and adjacent to the study area, and posted at the Pilot Travel Center. Working with the Flagstaff Meadows property management associations (Sterling Real Estate Management and HOAMCO), the fact sheet was distributed to the homeowner associations boards of directors, posted to the Flagstaff Meadows Facebook page, and emailed to residents. Coconino County District 3 Supervisor Matt Ryan included a notice of the meeting within his newsletter, which was distributed to residents the week of March 16, 2015.

Because the Pilot Travel Center is a critical stakeholder, specific outreach to its management staff was conducted. While managers did not express any questions or concerns at this early stage of the study, the team indicated future follow-up would occur as alternatives are developed. Management was notified that the study team also intended to interview semi- and heavy-truck customers on March 25, 2015, prior to the public meeting.

2.0 Public Meeting

A public meeting was held in an open house format from 5 to 7 p.m. on Wednesday, March 25, 2015 at the Ponderosa Fire District Station 82 in Bellemont. Coconino County Supervisor Matt Ryan offered a brief welcome to those in attendance at the beginning of the event. Participants were encouraged to view an automated presentation, which is included in ***Appendix ES1-2***, providing study background and details prior discussing the project with the study team. Three display boards, which are included in ***Appendix ES1-3***, and study area roll plots were used to capture observations, ideas and concerns.

2.1. Attendees

The following individuals signed-in at the public meeting.

James Brown
Rosanne Brown
Brad Clark
Patrick Conley
Chuck Crockat
Lindsay Daley
Dave Diever
Terry Fallon
Holly Fasld
William Forbes
Allison Hughes
Keith Johnson
Duke MacArthur
Virgil Macklin
Erik Nielsen
Lerry Oldaker
Amy Paul
John Riordan
Patrick Thiel
Rick VanDeWater, Camp Navajo
Christine Wenstrom

Sign-in at public meetings is completely voluntary.

2.2. Input Received

While participants were offered a comment form, which is included in ***Appendix ES1-4***, participants elected to provide input on two roll plots of the study area. One roll plot portrayed the entire study area and the other was a focused area near the I-40/Bellemont traffic interchange. The following graphics summarize the comments that were received.

Participants provide input by marking on roll plots of the study area.

Figure 1 – Focused Study Area Input

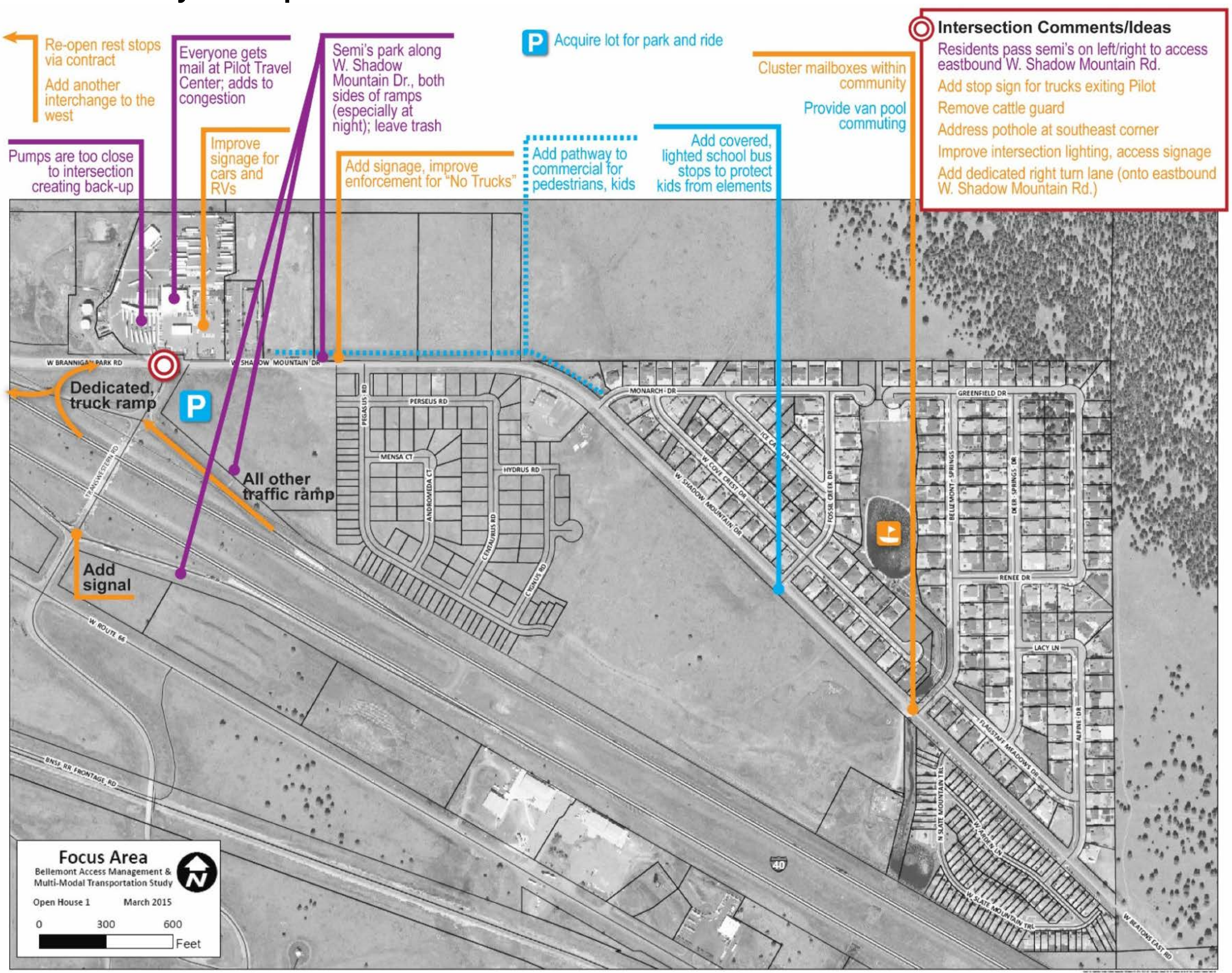
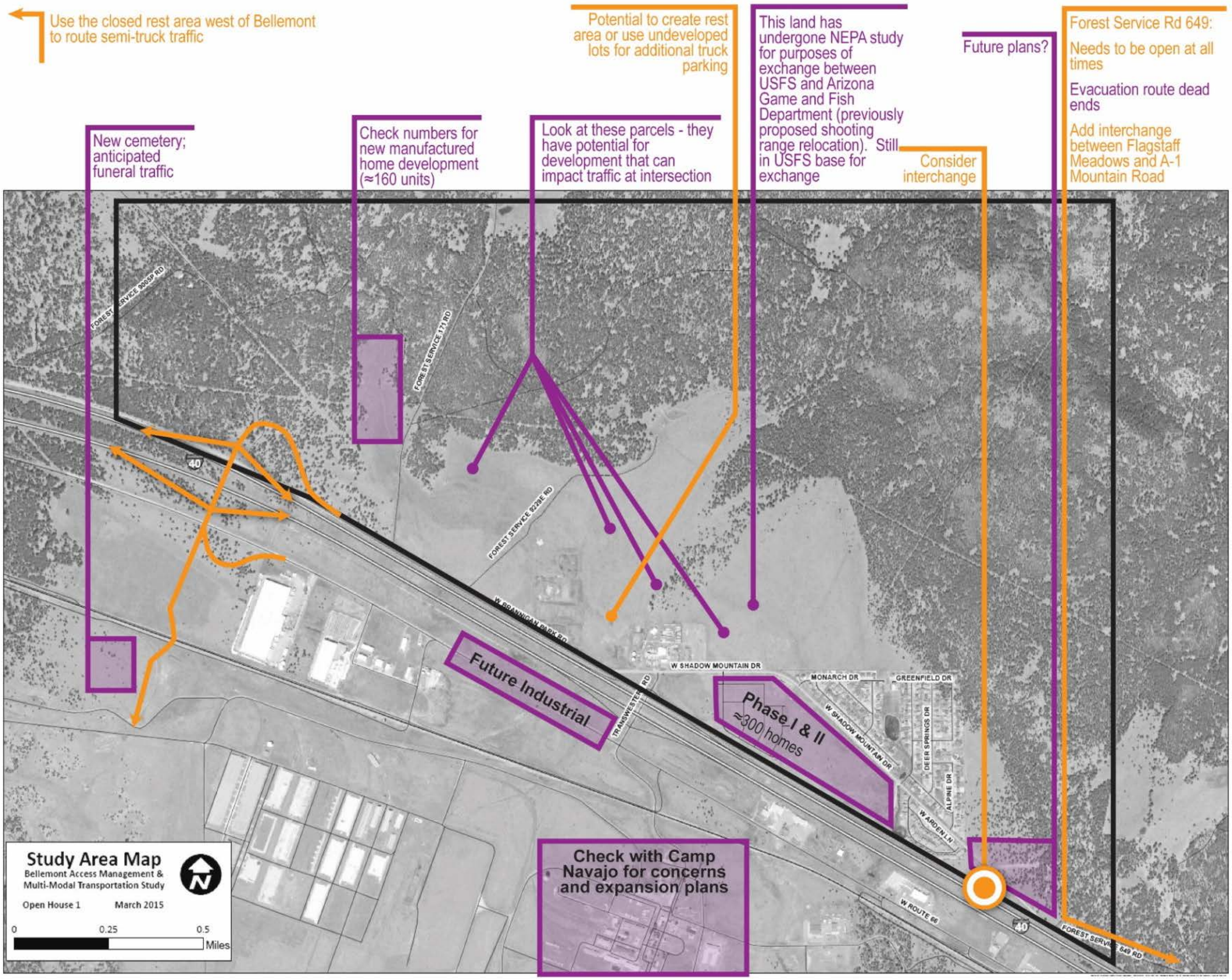


Figure 2 – Study Area Input

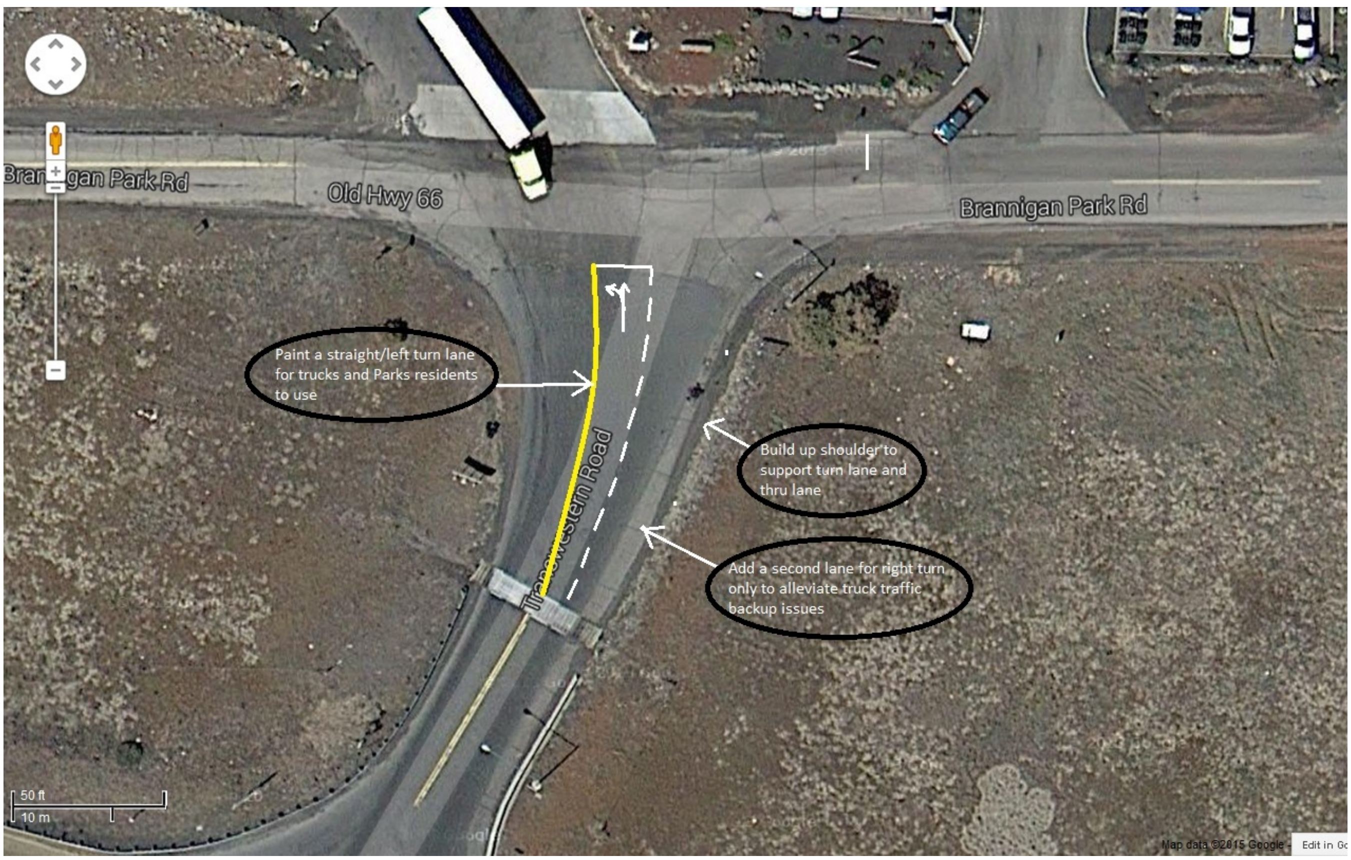


2.3. Post-Public Meeting Input

One individual submitted input during the comment period (through April 8, 2015).

What opportunities, constraints or observations do you have regarding alleviating congestion and improving or managing access to businesses and residential areas along Brannigan Park Road and Shadows Mountain Drive and Transwestern Road?

I have seen very high truck traffic congest the exit 185 area to the point where I was delayed or prevented getting to my home in Bellemont. This is increased during high traffic periods, high wind, and/or inclement weather. *One simple solution is to (re)paint traffic lanes between the westbound exit off ramp and the Pilot parking lot, allowing for a turn lane for truck and a trough lane for cars* [illustrated in graphic, below]. Another solution is to install a second access ramp somewhere accessible by Bellemont residents and businesses. I realize that this can be a high level of financial investment, but short of paving the forest service roads, I believe it is required to have two methods of egress from the residential dwellings, which is not currently true since the [forest service] road is not accessible year-round.



Do you have any suggestions or ideas to improve multi-modal travel (e.g., pedestrian or bike paths, future transit options)?

- Paint a bike lane along Shadow Mountain road.
- Add a gate in the fence along Shadow Mountain road at the viaduct under I-40 (about a mile past the Bellemont homes). Often cyclists will hop/crawl under the fence to bike to Flagstaff. I have seen this fence damaged and repaired numerous times and a simple gate would relieve that issue and make this route [friendlier] to cyclists and runners.

Do you have any other comments regarding this project?

- The repair job on I-40 outer lanes between Bellemont and Flagstaff (done around 2009?) was a complete failure and the contractor should be made to repair the shoddy work they did.
- The developer should not have been allowed to build without two modes of egress.
- Whomever is responsible for snow removal should be encouraged to complete it in a timely manner as it seems that we are last to be plowed or forgotten altogether.

3.0 Pilot Travel Center On-Site Interviews

Congestion and access issues often occur at the Pilot Travel Center driveways, which are located in and near the intersection of Brannigan Park Road and Shadow Mountain Drive. Therefore, the study team interviewed several semi- and heavy truck customers on March 25, 2015. Interviews with 13 customers were completed using the Truck Interview Questionnaire included in ***Appendix ES1-5***. Each interview included specific questions, which are summarized in Sections 3.1 through 3.5.

3.1. Observations regarding access into and out of this Pilot Travel Center

While many respondents indicated they have had no issues accessing the Pilot Travel Center, several remarked that the facility was small, particularly for its high use, and that access could be improved particularly for trucks exiting the facility.

Specific observations included the following:

- It is difficult to look right (west) when exiting.
- Many different traffic movements occur where Brannigan Park Road, Transwestern Road, and Pilot Travel Center access meet.
- Access is constrained, particularly at night; the location lacks the opportunity to park, stop, or rest.
- Brannigan Park Road traffic sometimes assumes traffic on Transwestern Road, which enters Pilot Travel Center, has a stop sign.
- The location succumbs to bottlenecking.

3.2. Suggestions or ideas to improve access into/out of this Pilot Travel Center or to this interchange area

Many drivers remarked at the ease of exiting I-40 and directly accessing the Pilot Travel Center via Transwestern Road. However, because of the short distance from Brannigan Park Road to the fuel pumps, there is little space for trucks to stage or queue; one driver remarked that customers need to pick a lane/pump quickly because there is so little room to line-up and wait, and one cannot easily back-up or change course. Improvements to assist trucks exiting the Pilot Travel Center were often suggested.

Specific ideas included the following:

- Provide more truck parking.
- Open the location to provide more staging of trucks in fuel lanes; this is an important stop for many drivers.
- Consider alternative ingress/egress; currently, there is only one access point for trucks to enter and exit.

3.3. Other comments or observations regarding traffic movements at this location?

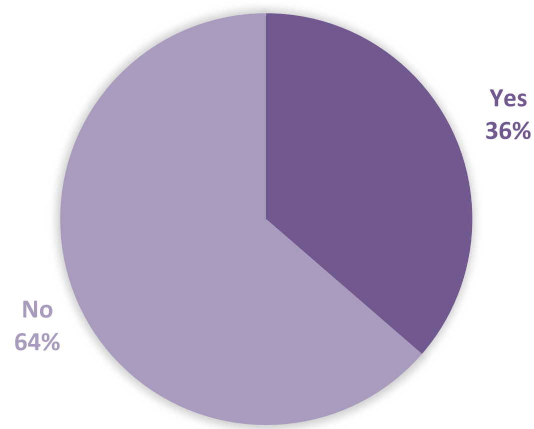
Many drivers remarked that this location was often very busy, but because of the large fuel capacity of trucks (e.g., two 135 gallon tanks), most drivers only stop when they need to stop. They deal with whatever consequences await.

One driver observed the addition of the tire repair shop behind/north of the fueling pumps added substantial congestion at the location.

3.4. Business impacts

Study team members asked drivers if they had ever intended to visit this Pilot Travel Center, but changed their minds because of poor access to the site or congestion. Many drivers interviewed indicated they have never experienced congestion that deterred them from visiting the location; however, some drivers indicated times where they have elected to try the next fueling station, or in the case of one driver, attempt to avoid this location entirely.

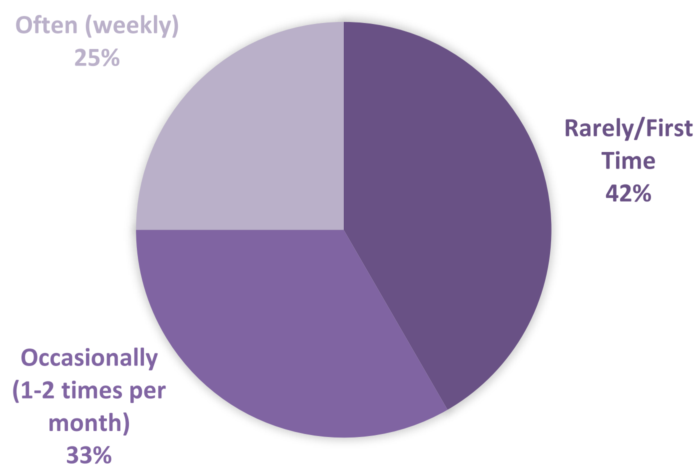
Figure 3 – Drivers that Elected not to use Pilot Travel Center due to Access or Congestion Issues



3.5. Frequency of visiting Pilot Travel Center

Interviewees reported a range of frequency in visiting the Pilot Travel Center, with those that visit frequently noting the importance of this location regionally or in terms of their typical route.

Figure 4 – Frequency of Bellemont Pilot Travel Center Use



3.6. Other input

One interviewee expressed his deep concern for the condition of I-40, west of Bellemont, and underscored the need to repair the paving service of this important corridor.

APPENDIX ES1-1

Fact Sheet

BURGESS & NIPLE

Bellemont Access Management & Multi-Modal Transportation Study
A Planning Assistance for Rural Areas Study

FEBRUARY 2015

STUDY OVERVIEW

The Arizona Department of Transportation, through its Multimodal Planning Division, is collaborating with Coconino County to conduct a transportation study at Bellemont.

Bellemont is a rural, unincorporated community with a population of approximately 1,000 residents in Coconino County that has become a suburb of Flagstaff, where residents commute to work. Three roads, Interstate 40 (I-40), Brannigan Park Road, and Shadow Mountain Drive are used to access virtually all the private land north of I-40 at Bellemont. Frequent congestion from heavy truck volumes and subdivision traffic causes traffic delays and creates concern for safety and timely emergency response.

The access management and multi-modal transportation study, which is funded through the Planning Assistance for Rural Areas (PARA) program, will provide a comprehensive review of the Bellemont area transportation system and provide guidance for determining priority needs for future improvements north of I-40, including alleviating congestion and improving/managing access, and improving and evaluating multi-modal access to businesses from residential areas.

WE WANT TO HEAR FROM YOU

Join us on **Wednesday, March 25, 2015, from 5 to 7 p.m.** at a public open house to learn more about the study and to share your ideas.

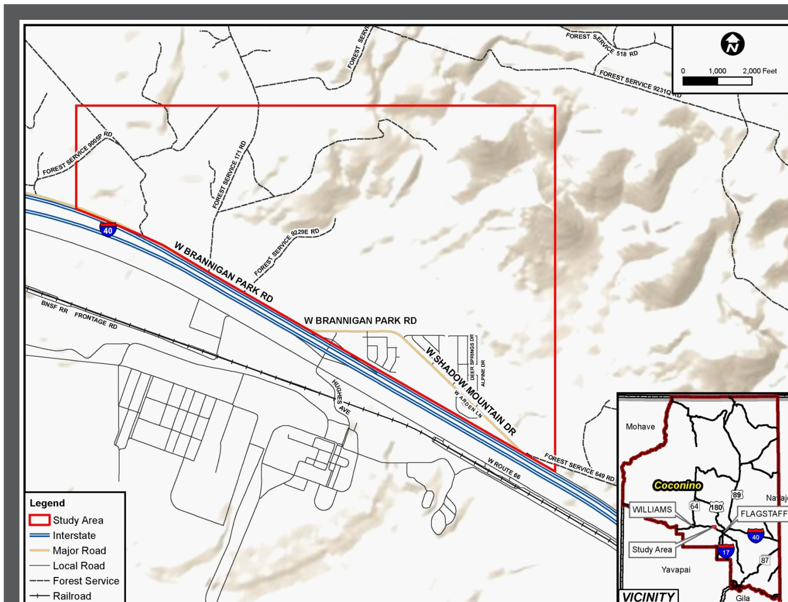
Ponderosa Fire District Station 82
11951 W. Shadow Mountain Dr.
Bellemont, AZ 86015

STUDY TIMELINE

Spring 2015: Existing and future conditions

Summer 2015: Recommended improvements and implementation plan

Fall 2015: Final report



STUDY CONTACT

Heidi Yaqub
Project Manager
Arizona Department of Transportation
Phone: 602-712-7644
E-mail: hyaqub@azdot.gov

APPENDIX ES1-2

Presentation

ADOT COCONINO COUNTY ARIZONA

Bellemont Access Management & Multi-Modal Transportation Study

Public Open House

March 25, 2015

BURGESS & NIPLE
Engineers ■ Planners

ADOT COCONINO COUNTY ARIZONA

PROJECT BACKGROUND

BURGESS & NIPLE

Study Partners

ADOT
COCONINO COUNTY ARIZONA

Coconino County is partnering with **ADOT** through its Planning Assistance for Rural Areas (PARA) program to complete this access management and multi-modal transportation study.

Project Background
Open House Format
Next Steps

BURGESS & NIPLE

Study Purpose

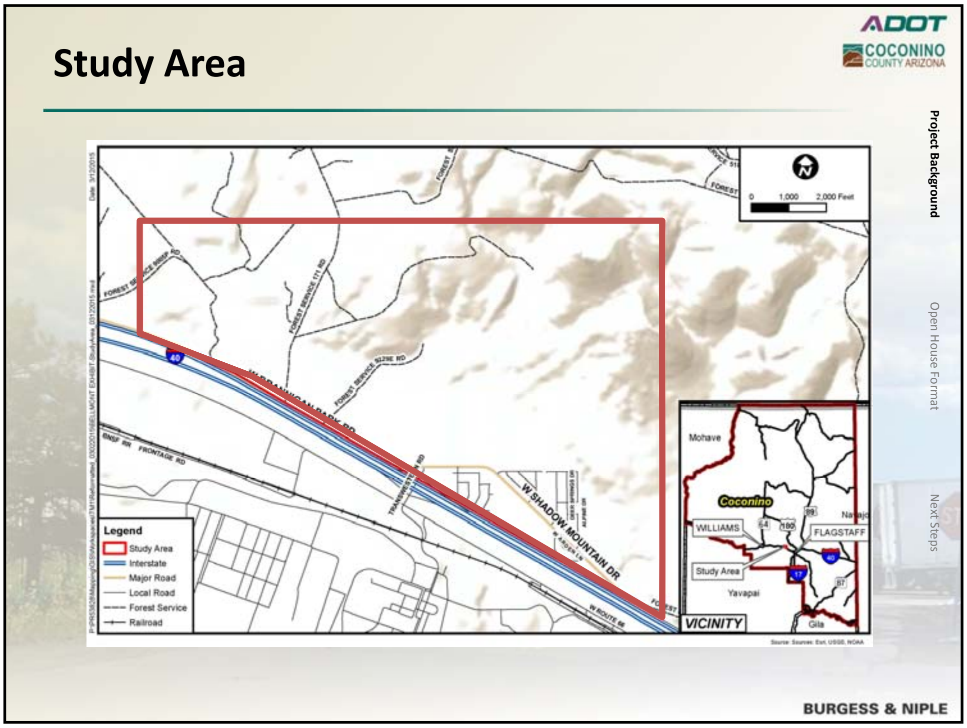
ADOT
COCONINO COUNTY ARIZONA

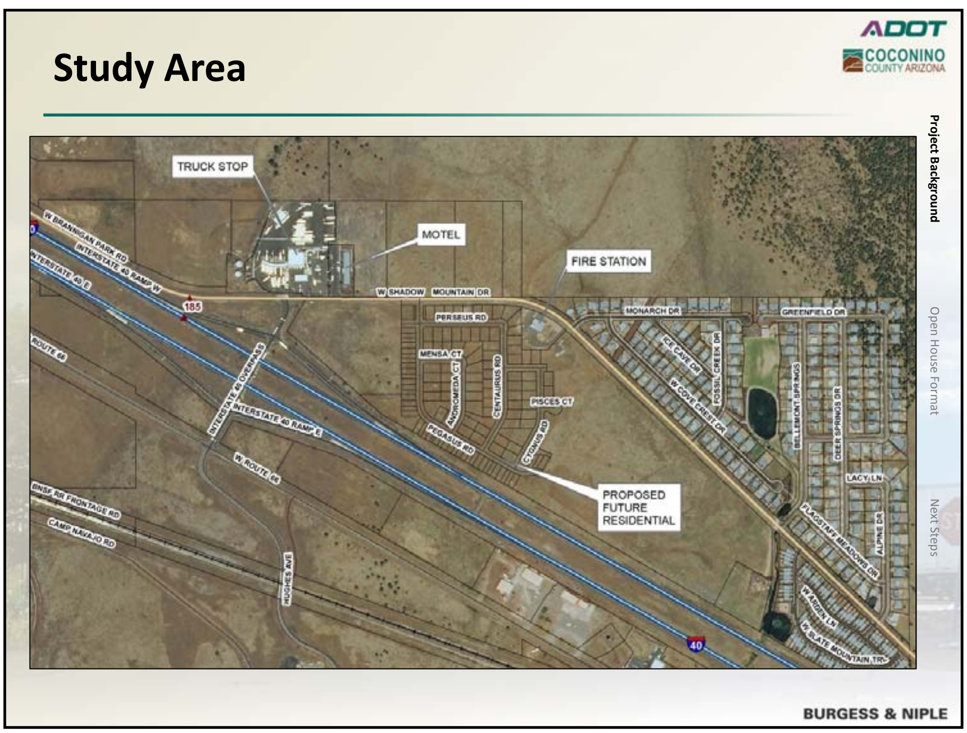
The study will provide guidance for **determining priority needs for future improvements north of I-40**, including how to:

- **Alleviate congestion** and improve/manage access
- **Improve multi-modal access** to businesses from residential areas

Project Background
Open House Format
Next Steps

BURGESS & NIPLE


Study Area
ADOT
COCONINO COUNTY ARIZONA
Project Background
Open House Format
Next Steps
Legend
Study Area
Interstate
Major Road
Local Road
Forest Service
Railroad
W BRANNIGAN PARK RD
W SHADOW MOUNTAIN DR
BNSF RR FRONTAGE RD
W ROUTE 66
0 1,000 2,000 Feet
Mohave
Coconino
WILLIAMS
FLAGSTAFF
Study Area
Yavapai
Navajo
Gila
VICINITY
BURGESS & NIPLE


Study Area
ADOT
COCONINO COUNTY ARIZONA
Project Background
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TRUCK STOP
MOTEL
FIRE STATION
W SHADOW MOUNTAIN DR
W BRANNIGAN PARK RD
INTERSTATE 40 RAMP W
INTERSTATE 40 E
ROUTE 66
PERSEUS RD
MENSA CT
ANDROMEDA CT
CENTAURUS RD
PISCES CT
PEGASUS RD
CYGNUS RD
MONARCH DR
GREENFIELD DR
ICE CAVE DR
FOSSIL CREEK DR
W COVE CREST DR
BELLEMONT SPRINGS
DEER SPRINGS DR
LACY LN
FLAGSTAFF MEADOWS DR
ALPINE DR
W AARON LN
W SLATE MOUNTAIN TRL
INTERSTATE 40 OVERPASS
INTERSTATE 40 RAMP E
W ROUTE 66
BNSF RR FRONTAGE RD
CAMP NAVAJO RD
HUGHES AVE
PROPOSED FUTURE RESIDENTIAL
BURGESS & NIPLE

ADOT
COCONINO COUNTY ARIZONA

Study Product

The study will deliver to Coconino County an access management and multi-modal **transportation plan to implement in the Bellemont area over the next 5, 10 and 20 years**.

It's important to note:

- This is a **study** to inform future decisions.
- Recommendations **will take time and money to implement**.

Project Background
Open House Format
Next Steps

BURGESS & NIPLE

ADOT
COCONINO COUNTY ARIZONA

What is Access Management?

- Systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway
- Benefits include:
  - Safety
  - Traffic operations
  - Environment
  - Economic development

Project Background
Open House Format
Next Steps

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COCONINO COUNTY ARIZONA

OPEN HOUSE FORMAT

BURGESS & NIPLE

ADOT
COCONINO COUNTY ARIZONA

Provide Your Input!

Please provide input tonight on issues, ideas and opportunities for the study team to consider!

- **Review study boards** and post comments
- **Talk** with a member of our study team
- Provide input on a **comment form**
- **Submit comments online**: azdot.gov/Bellemont

Project Background

Open House Format

Next Steps

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COCONINO COUNTY ARIZONA

NEXT STEPS

BURGESS & NIPLE

ADOT

COCONINO COUNTY ARIZONA

Next Steps

Tentative Schedule

- **April:** Working Paper #1, Summary of Existing and Future Conditions
- **June**: Working Paper #2, Recommended Improvements and Implementation Program; **Public Open House**
- **July**: Draft Final Report
- **August-September**: Final Report; Presentation to Board of Supervisors

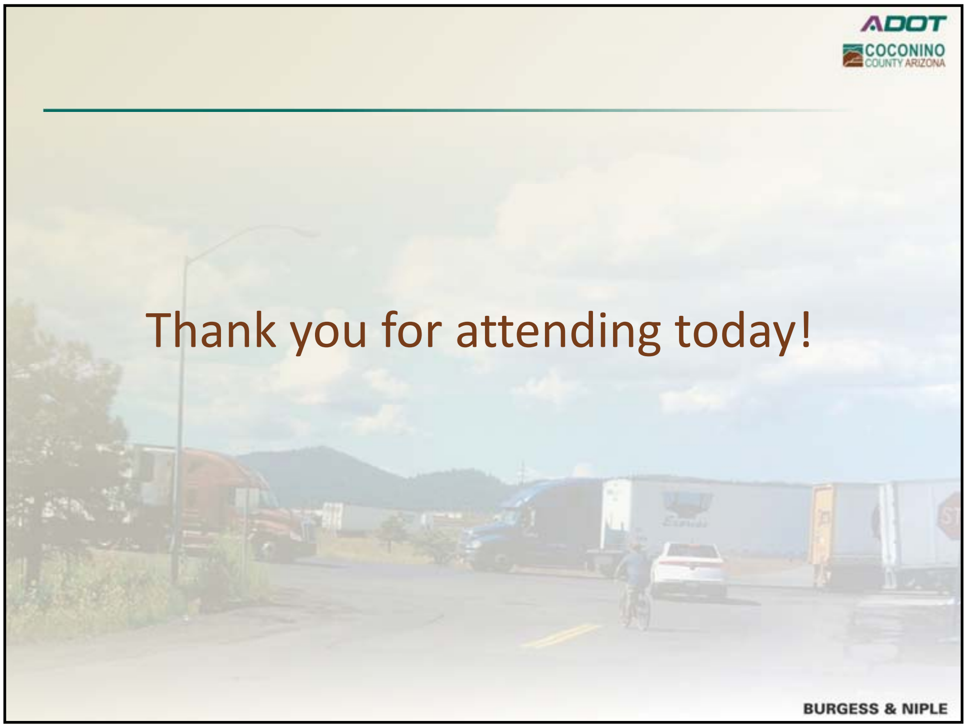
Documents available online at: azdot.gov/Bellemont

Project Background

Open House Format

Next Steps

BURGESS & NIPLE


ADOT
COCONINO
COUNTY ARIZONA
Thank you for attending today!
BURGESS & NIPLE

APPENDIX ES1-3

Display Boards

Study Area Transportation Issues and Needs

- **Address congestion and safety at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive:**
  - **Driveways are located within the intersection and affect traffic operations.**
  - **Trucks heading into the Pilot Travel Center sometimes block the intersection and traffic gets backed up to the I-40 off ramps.**
- **Provide guidance for the management of access (driveways) to public roadways.**
  - **ADOT prepared Access Management Guidelines that are in draft form.**
  - **Coconino County has limited access management standards.**
- **Address the gaps in the bicycle/pedestrian network.**
  - **There are limited paths and walkways within the Study Area.**
  - **Existing paths and walkways do not provide connectivity within the Study Area.**
  - **The Study Area is not connected to neighboring areas.**
- **Address public transit.**
  - **Previous studies have identified the need for transit service.**
  - **Adequate funding has not been identified.**

Potential Improvements from Previous Plans and Studies

- **Reconstruct the I-40/Bellemont Interchange.**
- **Improve the Transwestern Road, Brannigan Park Road and Shadow Mountain Drive intersection.**
- **Accommodate new local roads from future phases of Flagstaff Meadows.**
- **Provide basic commuter/transit service along I-40, including a Park-and-Ride lot in Bellemont.**

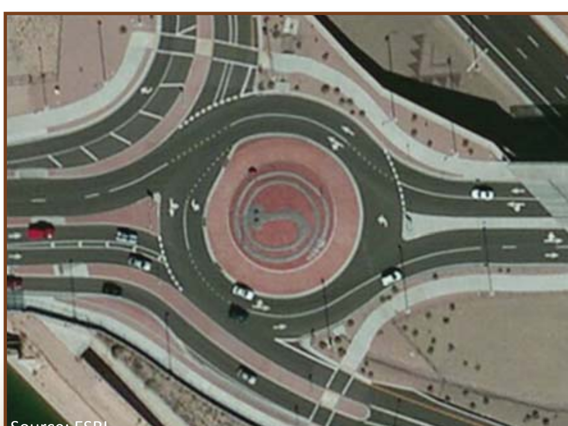
Bellemont Access Management & Multi-Modal Transportation Study

ADOT
COCONINO COUNTY ARIZONA

Potential Interchange Concept from Previous Study

Rendering based on prior study and was prepared for illustrative purposes only.

Example Roundabout



Mesa, AZ

APPENDIX ES1-4

Comment Form

Bellemont Access Management & Multi-Modal Transportation Study

A Planning Assistance for Rural Areas Study

Feedback Form — March 25, 2015

Coconino County and ADOT appreciate your participation tonight. Your input is important to us. If you would like to submit comments in writing, you may do so using this form. Comments must be received by April 8, 2015 in order to be part of the project record. You may leave this form with us tonight or submit comments to Heidi Yaqub (hyaqub@azdot.gov) or online at: azdot.gov/Bellemont.

What opportunities, constraints or observations do you have regarding alleviating congestion and improving or managing access to businesses and residential areas along Brannigan Park Road and Shadows Mountain Drive and Transwestern Road?

Do you have any suggestions or ideas to improve multi-modal travel (e.g., pedestrian or bike paths, future transit options)?

- *Between businesses and residential areas?*
- *To areas beyond the study area?*

Do you have any other comments regarding this project? Use back of form if you need additional space.

Contact Information (Optional*)

Name: ______________________________

Address: ______________________________

Email address: ______________________________

** Completion of this comment form is completely voluntary. Under state law, any identifying information provided will become part of the public record, and as such, must be released to any individual upon request.*

APPENDIX ES1-5

Truck Interview Questionnaire

Bellemont Access Management & Multi-Modal Transportation Study

A Planning Assistance for Rural Areas Study

Truck Interview Questionnaire

March 25, 2015

Coconino County and ADOT are facilitating an access management and multi-modal transportation study at Bellemont. The results of this study will provide guidance for determining improvements to alleviate congestion and improve access to businesses. As a semi- or heavy truck customer of the Pilot Travel Center, we'd like to ask you a few short questions about access to this location and other observations you might have of this interchange.

1. What are your observations regarding access into and out of this Pilot Travel Center?

2. Do you have any suggestions or ideas to improve access into/out of this Pilot Travel Center or to this interchange area?

3. Do you have any other comments or observations regarding traffic movements at this location?

4. Have you ever intended to visit this Pilot Travel Center, but changed your mind because of poor access to or congestion at the Pilot Travel Center? ☐ Yes ☐ No *If yes, please explain.*

5. How often do you visit this Pilot Travel Center?

☐ Rarely/First Time ☐ Occasionally (1-2 times per month) ☐ Often (weekly)

APPENDIX FR-13

Phase II Engagement Summary

Bellemont Access Management & Multi-Modal Transportation Study

ADOT Task Assignment MPD 012-15

Phase II Engagement Summary

Prepared for:

ADOT

AND

COCONINO COUNTY ARIZONA

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Appendices

1.0 Introduction

The Bellemont Access Management & Multi-Modal Transportation Study is being conducted by the Arizona Department of Transportation (ADOT) for Coconino County through the Planning Assistance for Rural Areas (PARA) program. The project includes two phases of public and stakeholder engagement; this second phase was facilitated to receive input regarding potential improvement concepts in the study area.

1.1. Phase II Public and Stakeholder Engagement Details

Two specific activities were facilitated to inform this phase:

- Held the second public meeting.
- Conducted discussions with local Pilot Travel Center management.

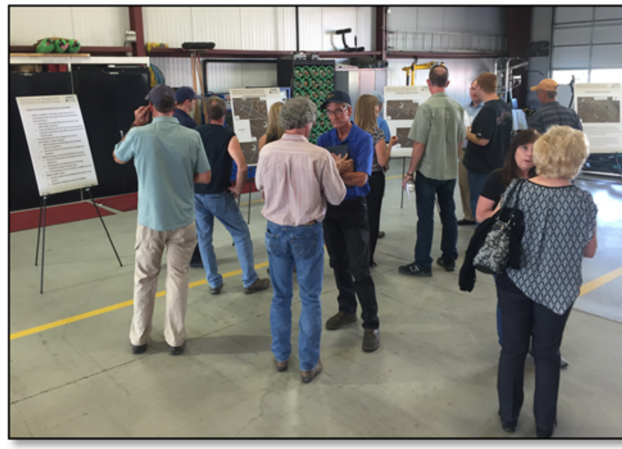
1.2. Phase II Public and Stakeholder Communication Tactics

A variety of methods were utilized to communicate about the project and inform stakeholders and the public about the public meeting. The project web page was updated with public meeting information (www.azdot.gov/Bellemont). An open house flier, which is included as ***Appendix ES2-1***, was developed and used to communicate the August 5, 2015 public meeting. The flier was distributed delivered to businesses within and adjacent to the study area and posted at the Pilot Travel Center. Working with the Flagstaff Meadows property management associations (Sterling Real Estate Management and HOAMCO), the fact sheet was distributed to the homeowner associations boards of directors, posted on the associations' websites, posted to the Flagstaff Meadows Facebook page, and emailed to residents. Coconino County also stationed a Variable Message Sign (VMS) on July 29, 2015 communicating the public meeting.

VMS board in Bellemont advertising the public meeting.

2.0 Public Meeting

A public meeting was held in an open house format from 5 to 7 p.m. on Wednesday, August 5, 2015 at the Ponderosa Fire District Station 82 in Bellemont. Participants were encouraged to review a detailed study bi-fold, which is included in ***Appendix ES2-2***, providing the study background and details prior to discussing the project with the study team. Display boards, which are included in ***Appendix ES2-3***, were used to convey the concepts and solicit observations, ideas and concerns.



Participants review and discuss concepts with study team.

2.1. Attendees

The following individuals signed-in at the public meeting.

- Horst Bauer
- Matthew Bavuso
- Erika Brayton
- James H Brown
- Rosanne Brown
- Gary Bucecher
- Patrick Conley
- Megan Courtney
- Lindsay Daley, Coconino County
- Dave Diener
- Helga Dinwiddle
- Ronald Dinwiddle
- James Guidotti, Coconino County
- Sharon Javegers
- Mike Nesbitt, Jonesco Trucking
- Jennifer Noenickx
- David Prizio
- Marshall Randall
- John Riordan
- Kathleen Scheller
- Rick Scheller
- Lindsey Steinhoff
- Matthew Steinhoff
- Patrick Thiel
- Steeve Vallee, IML Containers
- Scott Kudi Weger
- Christie Wenstrom

Sign-in at public meetings is completely voluntary.

2.2. Input Received

Participants were offered a comment form, which is included in ***Appendix ES2-4***. The following summarizes the comments that were received at the public meeting and through the comment period, which concluded August 28, 2015.

What are your comments regarding the various traffic interchange improvements?

- Great ideas. Hope #2 is the interim solution.
- I am happy to see the traffic issues are being addressed. The sooner the better.

- I appreciation the attention to our neighborhood. My two main concerns are emergency exit and semi trucks maneuvering through roundabouts. Current we do not have an emergency exit, and need one desperately. If this is an improvement to the existing forest road/frontage or a new on ramp/off ramp, something needs to change. Also as it is the intersection at Transwestern is an issue during high traffic or snowstorm. This will become a larger concern w/ roundabouts. I like the feature on #3 & #2 for the rear access to the Pilot parking area. I do not like the teardrop intersection, as it does not allow for free-flow traffic. The raindrop will not help traffic in & out of residential, its success is determined by semis not blocking the interchange which they will.
- We would like to see concept #1, but also aware of money shortage.
- Concept 3 will reduce truck traffic congestion the most. Consider bicycle/pedestrian lane this allows us to pick up our mail (from the Pilot Station) without using our cars
- They all seem good – EXCEPT – round abouts. With winter weather, I feel round abouts will be very unsafe.
- As a resident and an ex-trucker (20 years over the road) concept #2 + #3 are the most practical for both the truckers and the residents.
- Whatever concept is decided upon – it must be implemented immediately!
- Need concept #3 with added auto only right to west Shadow Mountain Rd. Trucks only allowed on left.
- This is a big issue that needs to be addressed sooner than later. I would like #4 only if residents have their own road. [Dedicated truck road; dedicated car/residential road]
- I have a hard time seeing a semi make a 270°
- #1 great but expensive. #2 best interim (see below) *note: Roundabout has more room (esp. for trucks) than the teardrop.
- There are no perfect and economic option other than to get Pilot to move the gas tank further in their property. Like the world gravitates around Pilot…It might be cheaper to help them out financially to achieve such thing…they are the problem, and must be part of the solution…But I understand that someone in the past approved their layout…
- 1. Due to traffic volume, type (lots of semis), age & construction, the I-40 overpass must eventually be replaced (Option 1) 2. In the interim, I urge the agencies to combine the following projects: either option 3 or 5 modified with a large (overbuilt for semis) 2-lane roundabout (instead of the teardrop). At the same time, please widen the shoulders of Shadow Mtn. Dr. for bikes & ped's & stripe a bike lane. (At the same time as the traffic interchange construction creates efficiencies & lowers total costs.)
- Clear and precise signage is also important, such as "yield" signs at each of the three traffic circle entrances, and "Pilot Truck Access Only" at the North access road. Upon the completion of the project, it would be helpful to have a Sheriff's Department presence to educate and provide warnings for improper or illegal operations during the transition. I believe that, prior to the implementation of the project, it would be helpful to send out a mailing to all the residents and businesses of Bellemont with a brief explanation of the regulations and proper techniques for negotiating a roundabout. I have shared the Concepts brochure with five of my neighbors who were not in attendance at the August 5th meeting. They are unanimous in their support of the designated northbound truck access road as being the only viable solution to the current traffic issues. They are equally in agreement that using Shadow Mountain Road as a waiting area for trucks would only make the situation worse.

- Of the concepts listed, I like concept 3 the best because of the dual-lane right turn to Eastbound Shadow Mountain and the Northbound local-access for truck traffic. I would like to see the 1-lane, one-way local access road changed to a 2-lane, one-way local access road to allow more trucks to accumulate. My biggest concerns are snow removal and traffic control. Concept 1 would work better if it had the 2-lane local access road to the North that I recommended above. I don't believe concept 1 would work without the 2-lane local access.
- Concept 1. would be the most ideal concept IF the plan included the alternate path for truck drivers where they access the Pilot property from the north side as in concept 2 and concept 3. If there is not an alternate path that diverts truck driver traffic to the north, the residents of the community could potentially experience long delays when attempting to access either the Pilot or the interstate. These delays will be a direct result of the combined travel of any and all vehicles that are using the roundabout to gain access to Brannigan Park, the Pilot, or the interstate. Concept 1 allows accommodates more traffic and easier travel with the addition of the extra lanes.
- Like Concept 1 but it's costly.

Considering Concept 1 depicts ADOT's long-term design, which concept would you most prefer as an interim improvement? Why?

- (2) More fun to drive, long swooping curves. Allows truck traffic to loop thru back of Pilot smoother, more efficient.
- (2) Like the roundabout over the teardrop (2 vs. 3 *note: Roundabout has more room (esp. for trucks) than the teardrop.) Also like the trucks going to the back of the Pilot. 4 & 5 not feasible for trucks esp with doubles or 53' trailers and would have trouble making the full circle, either causing damage or causing just as much or more traffic congestion.
- (2) (3) I would like number two. An additional improvement to the plan would be to add a second lane on the Pilot bound round
- (2) (3) Having the trucks approach the pumps at Pilot from the north will reduce most of the traffic and safety problems.
- (2) (3) I support Option 2. If the land east of Transwestern Road and north of I-40 cannot be obtained, I would support Option 3 (WITH A MODIFICATION). The primary factor for my position is the new one lane, one way local access road for the truck line up. Any proposal involving lining up trucks along Shadow Mountain road would only make the current situation worse, and would create a dangerous situation to traffic in the area. There is insufficient space between the Pilot station and residential areas to accommodate the number of trucks waiting to enter the fueling area. If only one truck too many were to be lined up waiting, that would block off any roundabout and stop traffic in all directions. In addition, the presence of trucks along Shadow Mountain drive to the east of the Motel and Pilot station would impede the vision of any west bound vehicles for anyone exiting the motel or station. This would result in vehicles having to edge out onto the road in order to see if there was any west bound traffic approaching, adding to the possibility of traffic accidents. Only Options 2 and 3 include the designated truck corridor which would be advantageous to both the truckers and the local traffic. They would both solve the problem which currently exists. As I stated, I prefer Option 2 due to the roundabout. If the necessary land cannot be obtained, Option 3 would be an acceptable alternative, but the "raindrop" roundabout should be made a traditional roundabout.

With either option, the roundabout needs to be sufficiently large to accommodate large trucks, including the double trailered trucks. Standard sized roundabouts, such as those in the Sedona and Cottonwood areas, would not suffice.

- (2) (3) Blend concepts; separate the neighborhood traffic from truck traffic because truckers bully the cars and are sometimes tired and careless. Prefers Option 2 for neighborhood traffic, but use existing Transwestern Road for trucks only…and taking them around the back of the Pilot on the west side of Pilot, not through the roundabout mixed with cars. This is primarily a safety issue. Pilot should have to pay for a portion of improvements because they're causing the issues.
- (3) With amendments or #1.
- (3) It's simpler. It take expansions into account.
- (3) #3 brings the truck traffic to the back of Pilot – this is a good concept – the trucks must be kept in the left lane while the local residents has the right lane to pass the trucks.
- (3) Leading trucks to rear of station for fueling.
- (3) I like that the trucks have a place to wait that should not interfere with the traffic for residents getting off the highway.
- (3) I believe it's the easiest
- (3) With a 2-lane roundabout instead of the "tear drop". I don't like 2 & 4 – the curvy road takes up that whole land parcel. The turn radius on the "tear drop" is too steep for semis/increases risk of slide-offs & jackknifes in the winter.
- (3) (see above: "Concept 1. would be the most ideal concept IF the plan included the alternate path for truck drivers where they access the Pilot property from the north side as in concept 2 and concept 3. If there is not an alternate path that diverts truck driver traffic to the north, the residents of the community could potentially experience long delays when attempting to access either the Pilot or the interstate. These delays will be a direct result of the combined travel of any and all vehicles that are using the roundabout to gain access to Brannigan Park, the Pilot, or the interstate. Concept 1 allows accommodates more traffic and easier travel with the addition of the extra lanes.")
- (3) Three would allow for an easier transition to Concept 1.
- (3)
- (3)
- (4) (5) #4 needs more length for semis or Pilot customers to back up at their roundabout and keep free access traffic to FLG meadows. #5 By far most less compromising and best concept.
- (5) Clearer access to Pilot.

What are your comments regarding other potential improvements (i.e., paved shoulder on Shadow Mountain Drive, commuter express transit service, park-and-ride lot)?

- All would be awesome
- Any & all would be appreciated (within $ reason)
- Would love to see transit system.
- Like to see the park + ride system
- Is there any improvements planned for the bridge?
- Paved should on Shadow Mountain is most practical.
- [Paved shoulder] good!

- Home owners must have priority
- I really like the idea of a paved shoulder as I feel this road is dangerous for bikes and pedestrians as it is now. The commuter express would be good for Bellemont residents and help the environment. The Park & Ride would be nice for those who commute from Parks & Williams.
- Paved shoulders a must especially for bikers and dog walkers trying to get to the Pilot/mailboxes (a rea safety issue). Park & Ride a good idea espec if NAU supports & will subsidize (partially or full) as it reduces traffic/cars on campus and would encourage use by employee's/students?
- 1st side walk and bike lane from meadows to Pilot. 2nd fix North Alpine Dr!!! Yes, really. 3rd Highway 40 is in a "attempt" for repair. Hope county didn't pay anything yet because it's worse than it was before…pathetic work! Between Bellemont and FLG. 4th the semis still park on down camp eastbound despite no parking signs…+ and need bus services!!!
- Not if HAO's have to pay—
- See above—please construct wider shoulders on Shadow Mtn. & stripe a bike lane <u>at the same time</u> as the interchange project.
- I like these ideas in concept. I would need to see actual concepts in writing and drawings before I could make an informed decision.
- The paved shoulder on Shadow Mountain would allow for safer travel for walkers, bikers, and runners to travel. The park-and-ride lot could also help commuters and the environment.

3.0 Pilot Travel Center Discussions

Congestion and access issues often occur at the Pilot Travel Center driveways, which are located in and near the intersection of Brannigan Park Road and Shadow Mountain Drive. On August 5, 2015, the study team met with Travel Center management, providing them a review of initial study findings and proposed improvement concepts.

3.1. Observations regarding access into and out of this Pilot Travel Center

The following observations were offered by the Pilot Travel Center management team:

- Acknowledgement that Pilot Travel Center site is small and problematic.
- Acknowledgement that addressing intersection congestion and truck storage is a long-standing issue; Pilot Travel Center currently dedicates one full-time employee to directing traffic on-site.
- Acknowledgement that rectifying congestion issues would benefit the Pilot Travel Center.
- Observation that originally, truck traffic was routed around and to the back of the site, a route that worked well in the past and would be a favorable future solution.
- Inquiry as to whether pumps would need to be "flipped" (i.e., Diesel Exhaust Fluid/DEF diesel pumps in particular) to accommodate a southbound fueling pattern.

APPENDIX ES2-1

Fact Sheet

Bellemont Access Management & Multi-Modal Transportation Study
A Planning Assistance for Rural Areas Study

JULY 2015

STUDY OVERVIEW

The Arizona Department of Transportation, through its Multimodal Planning Division, is collaborating with Coconino County to conduct a transportation study at Bellemont.

Bellemont is a rural, unincorporated community with a population of approximately 1,000 residents in Coconino County that has become a suburb of Flagstaff, where residents commute to work. Three roads, Interstate 40 (I-40), Brannigan Park Road, and Shadow Mountain Drive are used to access virtually all the private land north of I-40 at Bellemont. Frequent congestion from heavy truck volumes and subdivision traffic causes traffic delays and creates concern for safety and timely emergency response.

The access management and multi-modal transportation study, which is funded through the Planning Assistance for Rural Areas (PARA) program, will provide a comprehensive review of the Bellemont area transportation system and provide guidance for determining priority needs for future improvements north of I-40, including alleviating congestion and improving/managing access, and improving and evaluating multi-modal access to businesses from residential areas.

STUDY PROGRESS

Based on input provided by the public at the March 25, 2015 open house, as well as agency and stakeholder representatives, the study team has drafted several potential improvement concepts to: 1) reduce congestion and improve safety at the intersection of Transwestern Road with Brannigan Park Road and Shadow Mountain Drive; and 2) enhance multimodal travel in the study area.

WE WANT TO HEAR FROM YOU

Join us on **Wednesday, August 5, 2015, from 5 to 7 p.m.** at a public open house to review potential improvement concepts. Interested individuals can attend anytime between 5 and 7 p.m. to meet with the study team, learn more about the potential alternatives and provide feedback.

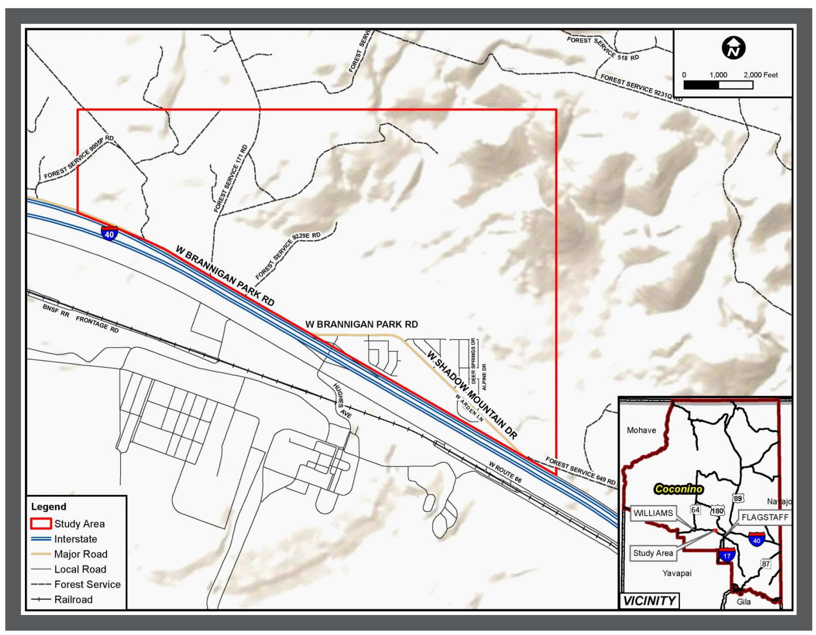
Ponderosa Fire District Station 82
11951 W. Shadow Mountain Dr.
Bellemont, AZ 86015

STUDY TIMELINE

Spring 2015: Existing and future conditions

Summer 2015: Recommended improvements and implementation plan

Fall 2015: Final report



STUDY CONTACT

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APPENDIX ES2-2

Bi-Fold

Bellemont Access Management & Multi-Modal Transportation Study

A Planning Assistance for Rural Areas Study

August 2015

OTHER POTENTIAL IMPROVEMENTS

- **Pedestrian and Bicycle Travel** Provide paved, wide shoulders on Shadow Mountain Drive to provide linkage for non-motorized travel between residential areas and Pilot Travel Center and associated commercial areas.
- **Commuter Express Service** Provide regional commuter express transit service.
- **Park-and-Ride Lot** Provide a new park-and-ride lot at the Bellemont traffic interchange.

NEXT STEPS

The study will deliver to Coconino County an access management and multi-modal transportation plan to implement in the Bellemont area over the next 5, 10 and 20 years. The final report will be presented to the Board of Supervisors later this fall.

It is important to note that this is a ***study to inform future decisions and recommendations will take time and money to implement***.

WE WANT TO HEAR FROM YOU

- **Talk** with a member of our study team
- Provide input on a **comment form**
- **Submit comments online**: azdot.gov/Bellemont

*Comments must be received by **August 28, 2015** in order to be part of the project record.*

For more information

Heidi Yaqub
Project Manager
Arizona Department of Transportation
Phone: 602-712-7644
E-mail: hyaqub@azdot.gov

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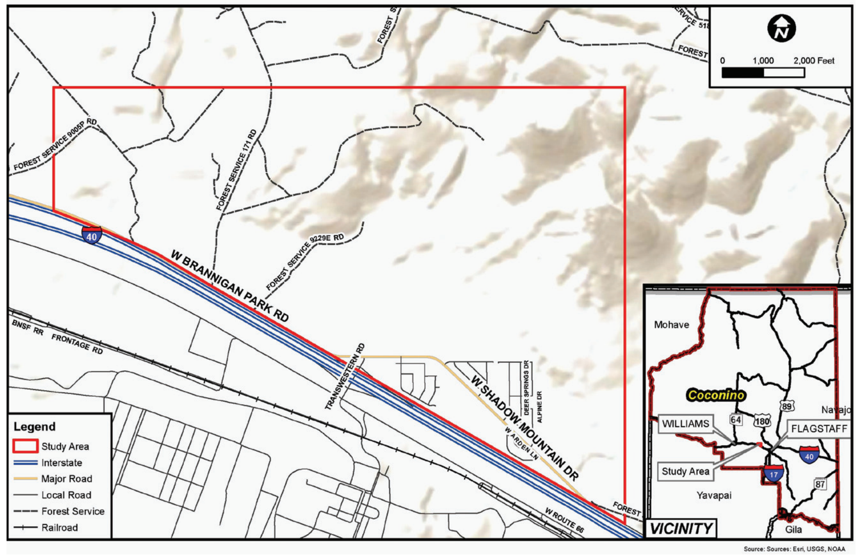
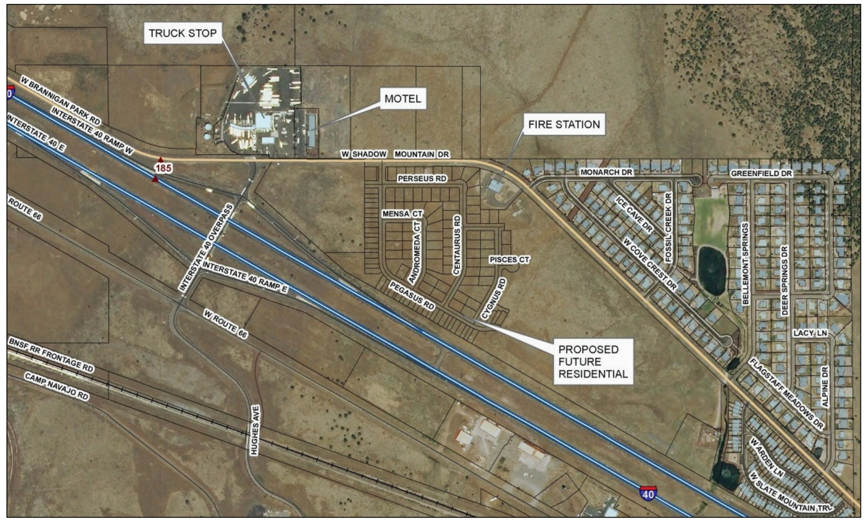
STUDY AREA

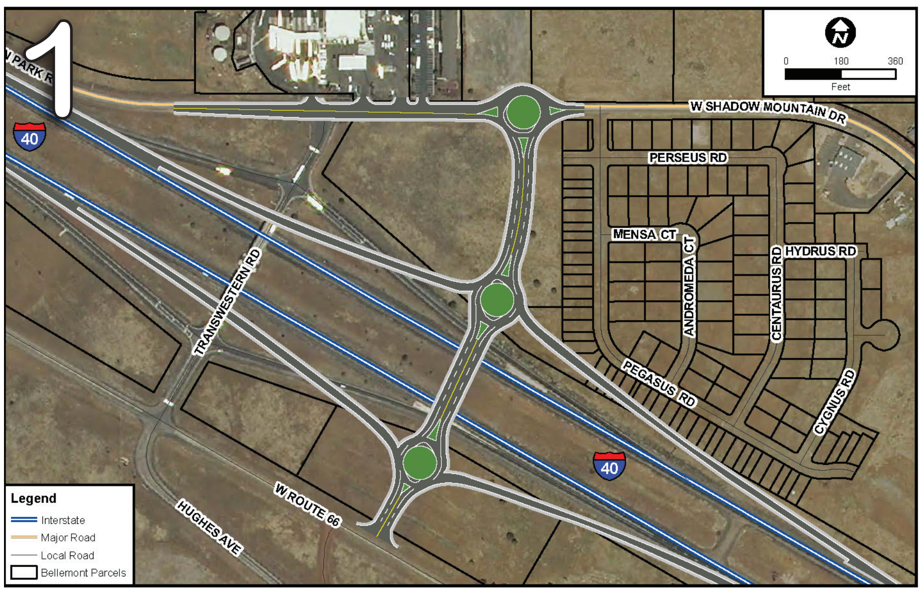




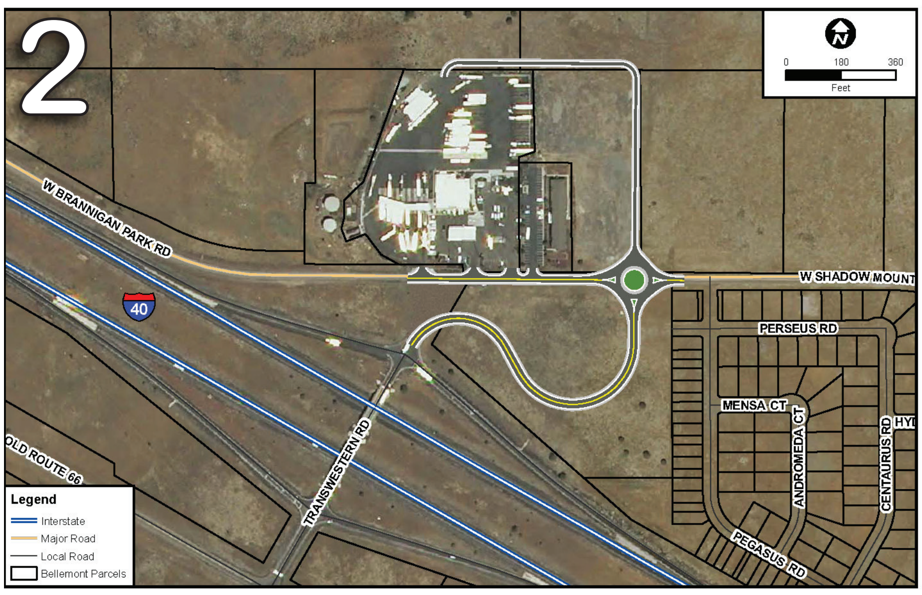
POTENTIAL CONCEPTS

Input provided by the public at the March 25, 2015 open house as well as agency and stakeholder representatives was used to develop several potential improvement concepts. Compatibility with the recommended improvements from the I-40 Bellemont to Winona Initial Design Concept Report (2011) are noted for each concept.

For informational purposes; details subject to change

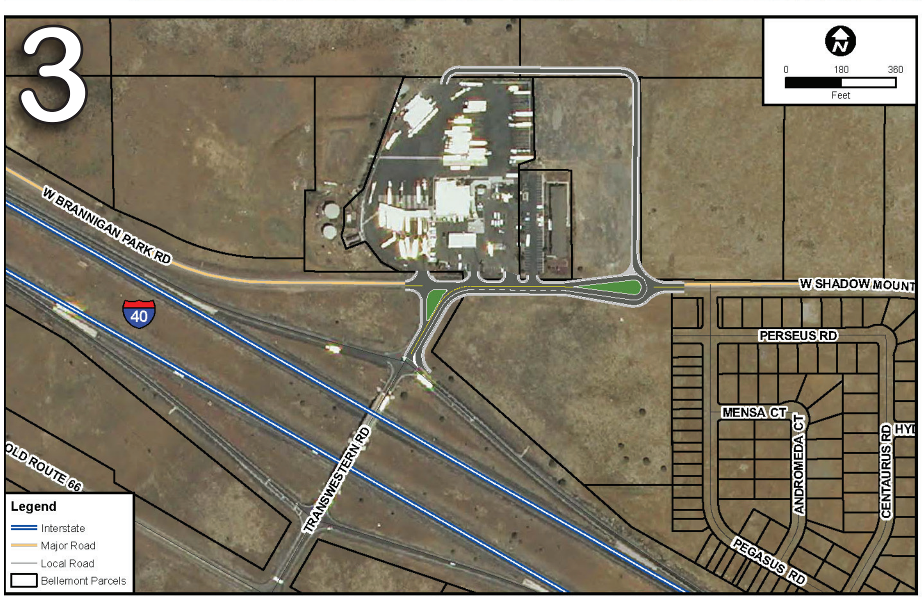


Concept 1: Reconstruct the Bellemont traffic interchange approximately 800 feet to the east of the existing Bellemont traffic interchange with three, two-lane roundabouts per the I-40 Bellemont to Winona Initial Design Concept Report.



Concept 2: Realign Transwestern Road to the east. Construct a one-lane roundabout on Shadow Mountain Drive at the approximate location of the roundabout proposed in the I-40 Bellemont to Winona Initial Design Concept Report (Concept 1).

Provide a new one-lane, one-way local access road along the parcel boundary on the north side of the new roundabout for truck traffic.

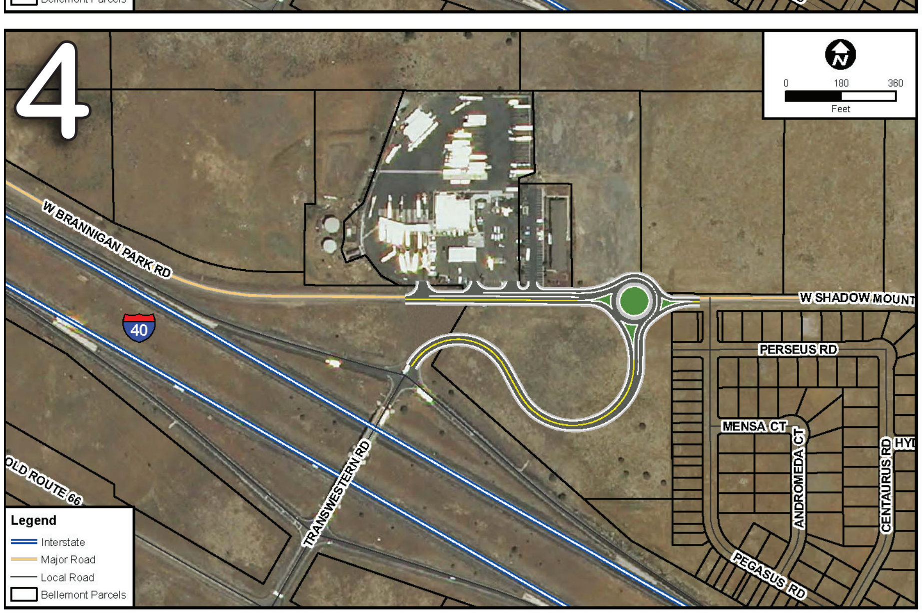


Concept 3: Widen Transwestern Road by one northbound lane, creating a dual-lane right-turn to eastbound Shadow Mountain Drive. Construct a new "raindrop" roundabout on Shadow Mountain Drive at the approximate location of the roundabout proposed in the I-40 Bellemont to Winona Initial Design Concept Report (Concept 1).

Provide a new one-lane, one-way local access road along the parcel boundary on the north side of the new roundabout for truck traffic.

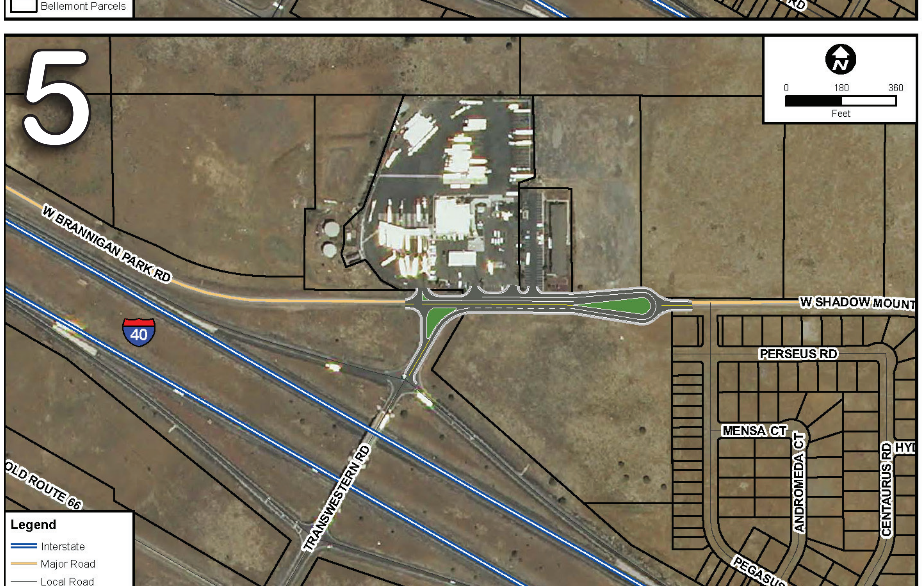
Add a median island "pork chop" at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive to relocate the Transwestern Road northbound to westbound left-turn traffic movement to the "raindrop" roundabout.

For informational purposes; details subject to change



Concept 4: Realign Transwestern Road to the east and construct a two-lane roundabout on Shadow Mountain Drive at the approximate location of the roundabout proposed in the I-40 Bellemont to Winona Initial Design Concept Report (Concept 1).

Add two dedicated right-turn lanes on westbound Brannigan Park Road; one to accommodate truck traffic to the Pilot Travel Center fuel station and one for passenger cars. A third westbound lane is provided for through traffic.



Concept 5: Widen eastbound Shadow Mountain Drive by one lane. Construct a new "raindrop" roundabout on Shadow Mountain Drive at the approximate location of the roundabout proposed in the I-40 Bellemont to Winona Initial Design Concept Report (Concept 1).

Add a median island "pork chop" at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive to relocate the Transwestern Road northbound to westbound left-turn traffic movement to the "raindrop" roundabout.

Add two dedicated right-turn lanes on westbound Brannigan Park Road; one to accommodate truck traffic to the Pilot Travel Center fueling station and one for passenger cars. A third westbound lane is provided for through traffic.

APPENDIX ES2-3

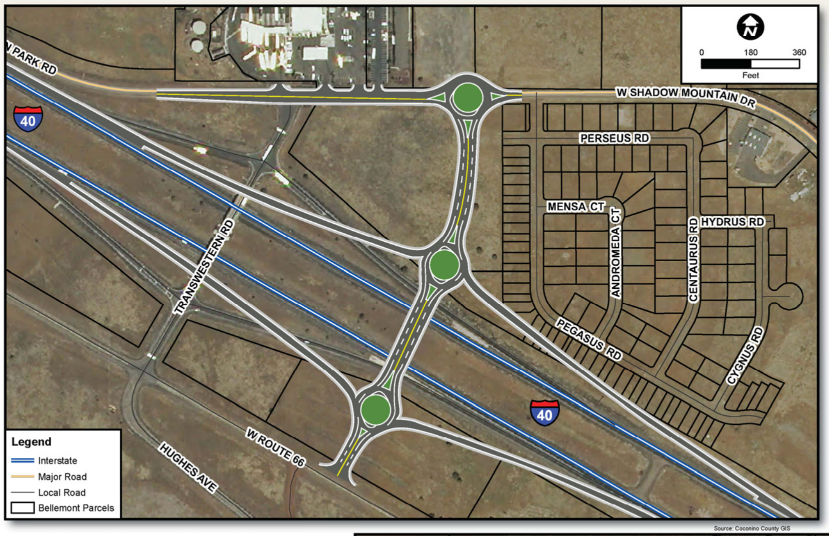
Display Boards

Study Area Transportation Issues and Needs

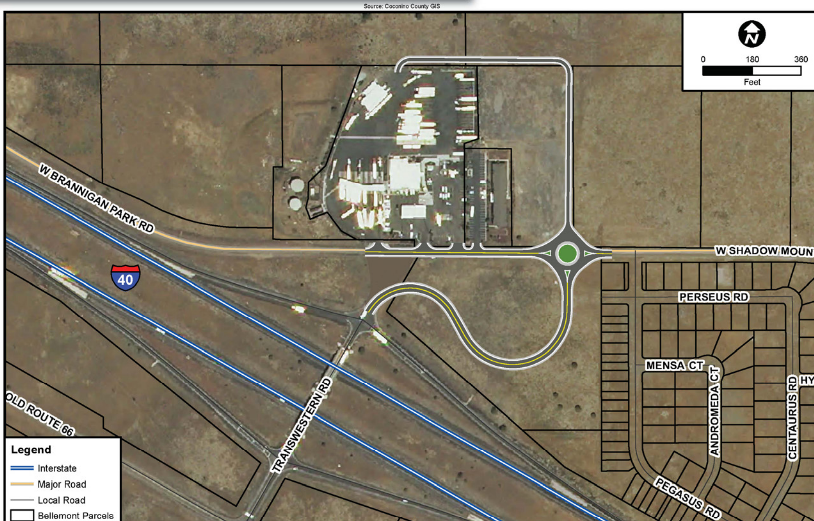
- Address congestion and safety at the intersection of Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive:
    - Driveways are located within the intersection and affect traffic operations.
    - Trucks heading into the Pilot Travel Center sometimes block the intersection and traffic gets backed up to the I-40 off ramps.
- Provide guidance for the management of access (driveways) to public roadways.
    - ADOT prepared Access Management Guidelines that are in draft form.
    - Coconino County has limited access management standards.
- Address the gaps in the bicycle/pedestrian network.
    - There are limited paths and walkways within the Study Area.
    - Existing paths and walkways do not provide connectivity within the Study Area.
    - The Study Area is not connected to neighboring areas.
- Address public transit.
    - Previous studies have identified the need for transit service.
    - Adequate funding has not been identified.

Bellemont Access Management & Multi-Modal Transportation Study

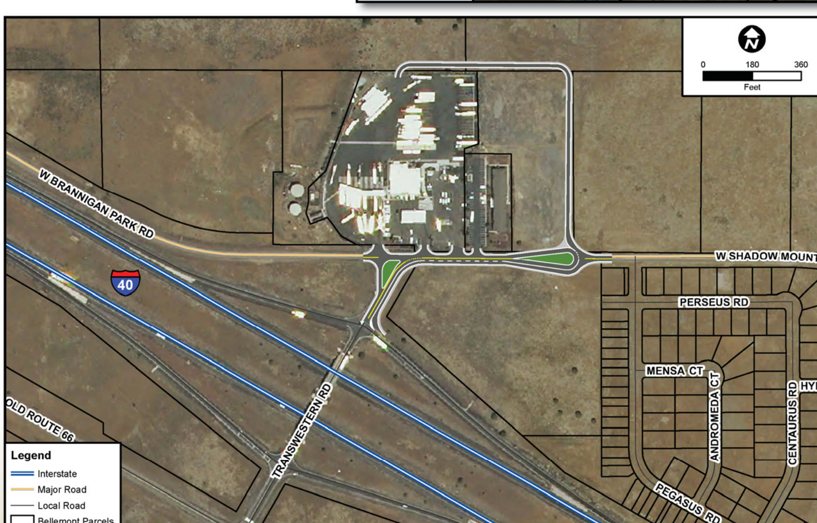
5 Roadway Project Concepts



Concept 1 (Long Term)



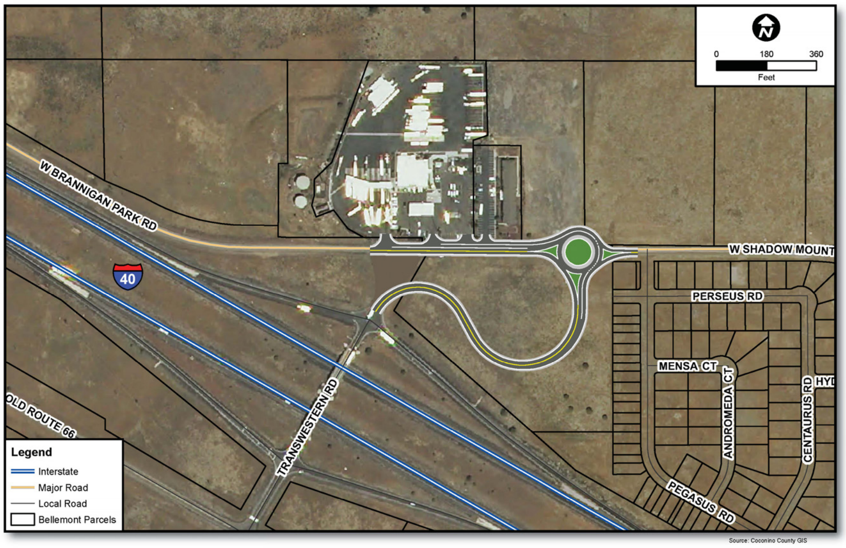
Concept 2



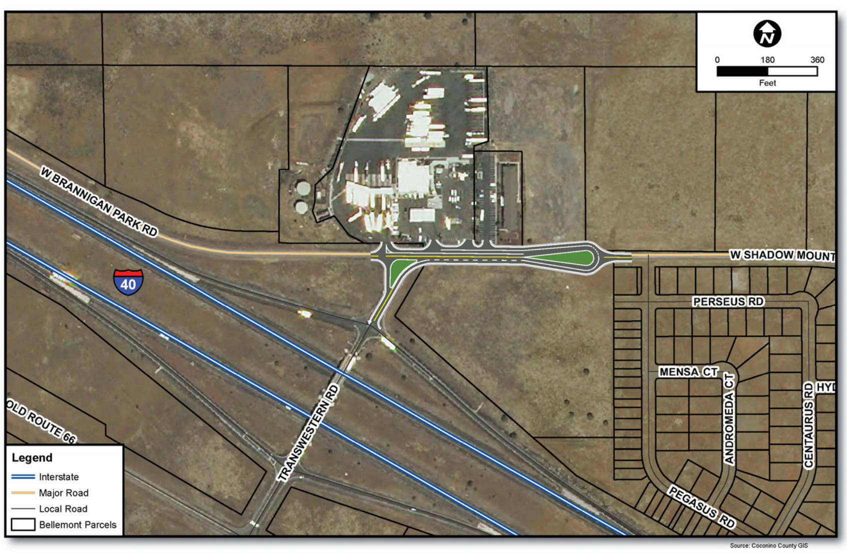
Concept 3

Bellemont Access Management & Multi-Modal Transportation Study

5 Roadway Project Concepts

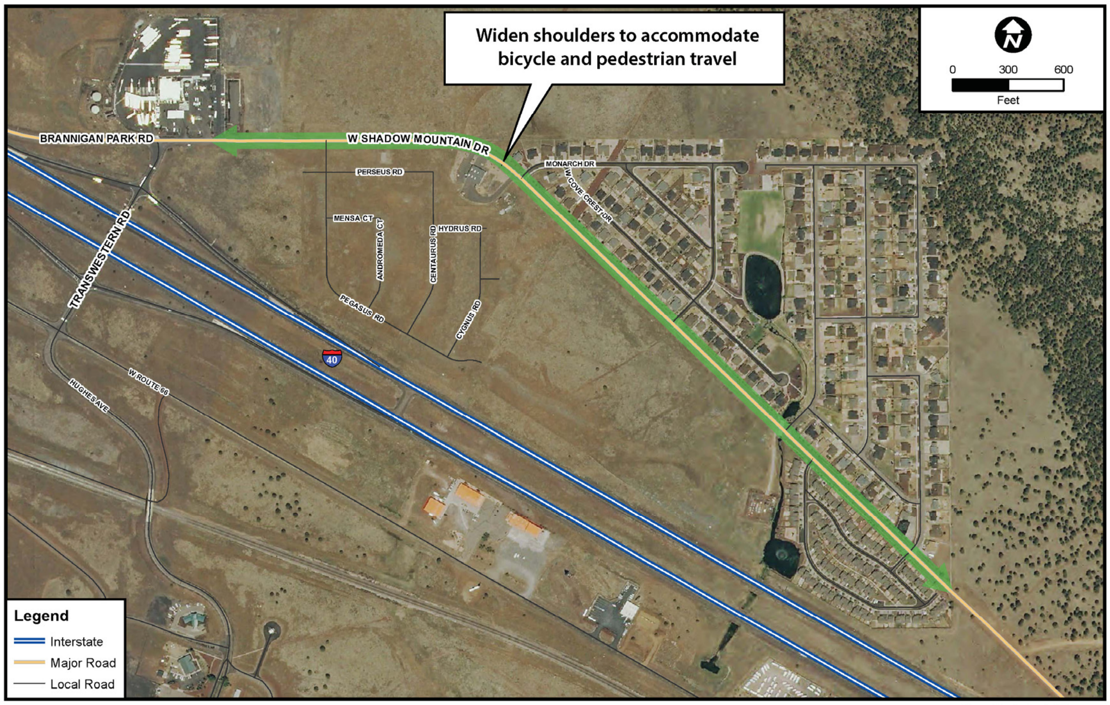


Concept 4



Concept 5

Non-Roadway Project Concepts



Source: Coconino County GIS

- ***Commuter Express Service* –** To provide regional services, the *Flagstaff Regional Five-year and Long Ranch Transit Plan (May 2013*) includes the potential for commuter express service to the Study Area if funding is identified.

- ***Park-and-ride Lot* –** To support the implementation of the service plan from *A Coordinated Transit Plan for ECoNA in Northern Arizona (January 2014)*, the study recommended a new park-and-ride lot at the Bellemont TI.

Preliminary Qualitative Project Evaluation

	Mobility	Consistency w/Planned Improvements	Safety Impact	Property Impacts	Environmental Compatibility	Public Input*	Cost** ($ million)	Funding Availability
Roadway Network Improvements								
Concept 1	○	+	○	−	○		$25.8	−
Concept 2	+	+	+	−	○		$1.9	+
Concept 3	+	+	+	+	○		$1.5	+
Concept 4	○	+	○	−	○		$1.7	+
Concept 5	○	+	○	+	○		$1.2	+
Bicycle and Pedestrian Network Improvements								
Wide shoulders	+	○	+	○	○		$0.8	+

* Public Input will be completed following Phase 2 stakeholder and public engagement activities.
** Potential right-of-way costs are not included.

Advantage + **Neutral** ○ **Disadvantage** −

APPENDIX ES2-4

Comment Form

COCONINO COUNTY ARIZONA
ADOT

Bellemont Access Management & Multi-Modal Transportation Study

A Planning Assistance for Rural Areas Study

Feedback Form

August 5, 2015

Coconino County and ADOT appreciate your participation tonight. Your input is important to us. If you would like to submit comments in writing, you may do so using this form. Comments must be received by August 28, 2015 in order to be part of the project record. You may leave this form with us tonight or submit comments to Heidi Yaqub (hyaqub@azdot.gov) or online at: azdot.gov/Bellemont.

What are your comments regarding the various traffic interchange improvement concepts?

Considering Concept 1 depicts ADOT's long-term design, which concept would you most prefer as an interim improvement? ☐ 2 ☐ 3 ☐ 4 ☐ 5

Why?

What are your comments regarding other potential improvements (i.e., paved shoulder on Shadow Mountain Drive, commuter express transit service, park-and-ride lot)?

Contact Information (Optional*)

Name: ______________________________

Address: ______________________________

Email address: ______________________________

** Completion of this comment form is completely voluntary. Under state law, any identifying information provided will become part of the public record, and as such, must be released to any individual upon request.*

APPENDIX FR-14

Planning/Environmental Linkages Questionnaire

BURGESS & NIPLE

Questionnaire for Transportation Planners – Part 1

This part of the questionnaire should be completed by transportation planners at the beginning of the transportation planning study. Please note that planners should also review the second part of the questionnaire to understand what additional issues will need to be considered and documented as the study progresses.

Project identification
What is the name of the study? What cities and region does it cover? What major streets are covered? For corridor studies, what are the intended termini?
The Bellemont Access Management & Multi-modal Transportation Study investigates an area that is entirely within Coconino County, and involves the unincorporated community of Bellemont located 9 miles west of the City of Flagstaff. The study area resides within the Flagstaff Metropolitan Planning Organization planning area. The primary roads within the study area are I-40, Transwestern Road, Brannigan Park Road, and Shadow Mountain Drive.
Who is the study sponsor?
The project is being conducted under the Planning Assistance for Rural Areas (PARA) program, funded by the Arizona Department of Transportation and Federal Highway Administration. Coconino County is the local agency and applicant.
Briefly describe the study and its purpose.
This access management and multi-modal transportation study will provide a comprehensive review of the Bellemont area transportation system and provide guidance for determining priority needs for future improvements north of I-40, including: 1) Alleviate congestion and improve/manage access; and 2) Improve and evaluate multi-modal access to businesses from residential areas.
Who are the primary study team members (include name, title, organization name, and contact information)?
The primary study team members are: Heidi Yaqub, Project Manager, ADOT, Email: HYaqub@azdot.gov P: 602.712.7644 Tim Dalegowski, Transportation Planner, Coconino County, Email: timdalegowski@coconino.az.gov P: 928.679.8344 Jason Pagnard, PE, Burgess & Niple, Inc., Email: jason.pagnard@burgessniple.com P: 602.244.8100.
Does the team include advisory groups such as a technical advisory committee, steering committee, or other? If so, include roster(s) as attachment(s).
The team includes a technical advisory committee. The roster is attached.
Have previous transportation planning studies been conducted for this region? If so, provide a brief chronology, including the years the studies were completed. Provide contact names and locations of the studies and study websites.
Previous transportation planning studies in the region include: ▪ Coconino County Roads Capital Improvement Plan in 2014 (No contact, Coconino County) http://www.coconino.az.gov/index.aspx?NID=1324) ▪ Coordinated Public Transit Human Services Transportation Plan in 2014 (No contact, City of Flagstaff) http://www.flagstaff.az.gov/index.aspx?nid=1871 ▪ Flagstaff Regional Plan 2030 in 2014 (No contact, City of Flagstaff) http://www.flagstaff.az.gov/index.aspx?nid=2936 ▪ A Coordinated Transit Plan for ECONA in Northern Arizona in 2014 (Erika Mazza, NAIPTA, No website) ▪ Flagstaff Regional Five-Year and Long Range Transit Plan in 2013 (No contact, Northern Arizona) http://azdot.gov/planning/CurrentStudies/PARAStudies/flagstaff-regional-five-year-and-long-range-transit-plan ▪ Mountain Mobility Business Plan 2015-2019, September 2013 (Erika Mazza, NAIPTA, No website) ▪ ADOT Statewide Bicycle and Pedestrian Plan Update in 2013 (No contact, Arizona) http://azbikeped.org/ ▪ Initial Design Concept Report, I-40 Bellemont to Winona in 2011 (No contact, Arizona) http://www.azdot.gov/projects/north-central/i-40-from-bellemont-to-winona/documents) ▪ Flagstaff Pathways 2030 Regional Transportation Plan in 2009 (No contact, City of Flagstaff) http://www.flagstaff.az.gov/ArchiveCenter/ViewFile/Item/1177 ▪ Coconino County Comprehensive Plan in 2003 (No contact, Coconino County) http://coconino.az.gov/index.aspx?NID=1111) ▪ Bellemont Area Plan in 1985 (No contact, Bellemont) http://www.coconino.az.gov/DocumentCenter/View/81

What current or near-future planning (or other) studies in the vicinity are underway or will be undertaken? What is the relationship of this study to those studies? Provide contact names and locations of the studies and study websites.

Current or near-future planning studies in the vicinity include:

- I-40 Corridor Profile Study which will identify cost-effective solutions for corridor deficiencies (Heidi Yaqub, California to Flagstaff) http://azdot.gov/planning/CurrentStudies/corridor-profile-studies/i-40-(california-border-to-i17
- AASHTO U.S. Bicycle Route System which will include a preferred bicycle route through Bellemont (No contact, United States) http://route.transportation.org/Pages/USBicycleRoutes.aspx

Study objectives

What are your desired outcomes for this study? (Mark all that apply.)

- ☐ Stakeholder identification
- ☐ Stakeholder roles/responsibilities definition
- ☐ Travel study area definition
- ☐ Performance measures development
- ☐ Development of purpose and need goals and other objectives
- ☒ Alternative evaluation and screening
- ☐ Alternative travel modes definition
- ☒ Scheduling of infrastructure improvements over short-, mid-, and long-range time frames
- ☐ Environmental impacts
- ☐ Mitigation identification
- ☐ Don't know
- ☒ Other access management and multimodal connections_

Have system improvements and additions that address your transportation need been identified in a fiscally constrained regional transportation plan?

Recommendations for this PARA were made with fiscal constraints considered; however, the I-40 Bellemont to Winona Design Concept Report includes a recommendation for a new Bellemont traffic interchange. It has not been adopted in a regional transportation plan.

Will a purpose and need statement[1] be prepared as part of this effort? If so, what steps will need to be taken during the NEPA process to make this a project-level purpose and need statement?

A formal purpose and need statement is not anticipated at this time. A generalized description of the project purpose and need was identified by Coconino County for the PARA application.

Establishment of organizational relationships

Is a partnering agreement in place? If so, who are signatories (for example, affected agencies, stakeholders, organizations)? Attach the partnering agreement(s).

No known formal partnering agreement exists. Coconino County and ADOT are conducting this study in a partnership via the PARA program.

What are the key coordination points in the decision-making process?

The Project Management Team (PMT), comprised of ADOT, Coconino County and consultant staff, reviews project documents prior to review by the Technical Advisory Committee (TAC) and public. Documents are presented to the TAC and the public through three TAC meetings and two public Open Houses. Additional review time and coordination are performed electronically with the TAC as needed. The public comment periods are provided to allow ample opportunity for comment.

Planning assumptions and analytical methods

Is the time horizon of the study sufficiently long to consider long-term (20 years or more from completion of the study) effects of potential scenarios?

Yes. The study investigates short and long-term solutions. The long-term solutions are based on a 20-year planning horizon.

[1] For an explanation of purpose and need in environmental documents, please see the Federal Highway Administration's (FHWA's) "NEPA and Transportation Decisionmaking: The Importance of Purpose and Need in Environmental Documents," <Purpose and Need>. This website provides links to five additional resources and guidance from FHWA that should be helpful in understanding the relationship between goals and objectives in transportation planning studies and purpose and need statements of NEPA documents.

What method will be used for forecasting traffic volumes (for example, traffic modeling or growth projections)? What are the sources of data being used? Has USDOT validated their use?
A global growth factor was determined to be the appropriate method for forecasting traffic volumes. The factor was determined using historic traffic counts for I-40, new traffic counts on major study area roads, and the growth in residential housing units and commercial land use between existing year and future year. USDOT did not validate their use.
Will the study use FHWA's Guide on the Consistent Application of Traffic Analysis Tools and Methods[2]*? If not, why not? How will traffic volumes from the travel demand model be incorporated, if necessary, into finer-scale applications such as a corridor study?*
Yes it will follow the FHWA guide. The ADOT travel demand model volumes are not applicable. The main traffic generator in the study area is a truck stop. The travel demand model is not accurately predicting the number of trips at this location. The TDM predicts about 100 daily trips for the truck stop site. Recent traffic count shows approximately 3600 daily trips for the truck stop site.
Do the travel demand models base their projections on differentiations between vehicles?
The travel demand model differentiates vehicle types.
Data, information, and tools
Is there a centralized database or website that all State resource agencies may use to share resource data during the study?
Yes, www.azdov.gov/Bellemont

Questionnaire for Transportation Planners – Part 2

This part of the questionnaire should be completed by transportation planners at the end of the transportation planning study. This completed document should become an appendix to the study's final report to document how the study meets the requirements of 23 Code of Federal Regulations § 450.212 or § 450.318.

Purpose and need for this study
How did the study process define and clarify corridor-level or subarea-level goals (if applicable) that influenced modal infrastructure improvements and/or the range of reasonable alternatives?
Coconino County identified purpose, need and goals as part of the PARA application process. These were carried forward and provided the framework, along with further input from the PMT and TAC, for the development of multimodal infrastructure improvement alternatives and final recommendations.
What were the key steps and coordination points in the decision-making process? Who were the decision-makers and who else participated in those key steps?
A process was developed and followed that included the engagement of the PMT, TAC and public at key decision-making steps in the process. TAC meeting summaries and public engagement summaries were prepared to document these activities. In addition to reviewing work products, the TAC was engaged at the study outset to guide efforts and identify needs, develop alternatives and evaluation criteria, and evaluate the study findings.
How should this study information be presented in future NEPA document(s), if applicable? Are relevant findings documented in a format and at a level of detail that will facilitate reference to and/or inclusion in subsequent NEPA document(s)?[3]
Local funding has been identified and therefore NEPA documentation is not anticipated. However, the study recommended improvements adjacent to the I-40/Bellemont interchange, which will require coordination with ADOT and potentially FHWA and could potentially result in triggering NEPA. Final project scoping will conclude whether NEPA is ultimately needed. A high-level environmental overview was conducted to identify potential red flags.
Were the study's findings and recommendations documented in such a way as to facilitate an FHWA or Federal Transit Administration decision regarding acceptability for application in the NEPA process? Does the study have logical points where decisions were made and where concurrence from resource or regulatory agencies, stakeholders, and the public was sought? If so, provide a list of those points.

[2] FHWA November 2011 publication: <Traffic Analysis Tools and Methods>

[3] For an explanation of the types of documents needed under the NEPA process and the nature of the content of those documents, please see "NEPA Documentation: Improving the Quality of Environmental Documents,"<Documentation>.

Purpose and need for this study
The study findings and recommendations were presented to facilitate FHWA acceptance. Concurrence was sought from the TAC and the public as part of this study. Recommendations and decisions are summarized in the working papers and final report. A summary of interactions with stakeholders and members of the public is provided in the attached public and stakeholder engagement matrix.

Establishment of organizational relationships – tribes and agencies[4]			
Tribe or agency	Date(s) contacted	Describe level of participation	Describe the agency's primary concerns and the steps needed to coordinate with the agency during NEPA scoping.[5]
Tribal			
N/A			
Federal			
N/A			
State			
Arizona Department of Transportation	Ongoing Dec. 2014-Oct. 2015	Project Management and TAC participation	
Arizona Department of Public Safety	Ongoing Dec. 2014-Oct. 2015	TAC participation	
County			
Coconino County Community Development	Ongoing Dec. 2014-Oct. 2015	TAC participation	
Coconino County Public Works	Ongoing Dec. 2014-Oct. 2015	Project Management and TAC participation	
Coconino County Sheriff's Office	Ongoing Dec. 2014-Oct. 2015	TAC participation	
Local			
Ponderosa Fire Department	Ongoing Dec. 2014-Oct. 2015	TAC participation	
Transportation agencies			
Flagstaff Metropolitan Planning Organization	Ongoing Dec. 2014-Oct. 2015	TAC participation	
Northern Arizona Intergovernmental Public Transportation Authority	Ongoing Dec. 2014-Oct. 2015	TAC participation	

Establishment of organizational relationships – stakeholders and members of the public[6]			
Public and stakeholders	Date(s) contacted	Describe level of participation	Describe the primary concerns expressed by members of the public and stakeholders.
Public			
See attached public and stakeholder engagement matrix.			

[4] Users may add rows to this table to accommodate additional tribes and agencies. Unused rows may be deleted.

[5] If the transportation planning study final report does not adequately document interactions (for example, meeting minutes, resolutions, letters) with the relevant agencies, append such information to the end of this questionnaire and checklist.

[6] Users may add rows to this table to accommodate additional stakeholders.

Establishment of organizational relationships – stakeholders and members of the public[6]			
Public and stakeholders	Date(s) contacted	Describe level of participation	Describe the primary concerns expressed by members of the public and stakeholders.
Stakeholders –			
See attached public and stakeholder engagement matrix.			

Planning assumptions and analytical methods
Did the study provide regional development and growth assumptions and analyses? If so, what were the sources of the demographic and employment trends and forecasts?
The study provided regional development and growth assumption based on the ADOT Travel Demand Model Land Use and Census data, refined with Coconino County and Flagstaff Metropolitan Planning Organization information regarding development timing.
What were the future-year policy and/or data assumptions used in the transportation planning process related to land use, economic development, transportation costs, and network expansion?
The study coordinated with Coconino County, FMPO and ADOT for land use, economic development, transportation costs, and network expansion. New development/growth is anticipated and coordinated with the Coconino County, FMPO and ADOT. This primarily includes new residential within the study area and limited commercial development in the Camp Navajo Industrial Park adjacent to, but outside the study area. Existing documentation was sourced for potential network expansion, which none with committed funding was identified within the study area beyond new roads to within expanded subdivisions.
Were the planning assumptions and the corridor vision/purpose and need statement consistent with each other and with the long-range transportation plan? Are the assumptions still valid?
The planning assumptions and corridor vision/purpose and need were consistent with each other and the long-range transportation plan. These assumptions are still valid.
Data, information, and tools
Are the relevant data used in the study available in a compatible format that is readily usable? Are they available through a centralized web portal?
Yes. Reference data is included in a summary table in the Appendix for Working Paper 1, which is currently available at azdot.gov/Bellemont TDM results are documented in the working papers and Final Report. ADOT maintains the TDM. *Synchro* and *SimTraffic* results are included in the working papers and Final Report.
Are the completeness and quality of the data consistent with the quality (not scale or detail) of inputs needed for a NEPA project-level analysis[7]?
The data used in this study is consistent with NEPA project-level analysis.
Are the data used in the study regularly updated and augmented? If regularly updated, provide schedule and accessibility information.
The AZTDM2 is updated by ADOT; other information used in this study was obtained and referenced.
Have the environmental data been mapped at scales that facilitate comparison of effects across different resources and at sufficient resolution to guide initial NEPA issue definition? If not, what data collection and/or manipulation would likely be needed for application to the NEPA scoping process?
A high-level environmental overview was prepared to serve as a red flag review. A more thorough review will be necessary should the NEPA process be determined necessary. However, the NEPA process is not anticipated.

[7] For an explanation of the types of information needed to evaluate impacts in environmental documents, please see FHWA's "NEPA and Transportation Decisionmaking: Impacts,"<Analysis of Impacts>. This website provides links to six additional resources and guidance that should be helpful in understanding the types of impacts that need to be assessed, their context, and their intensity.

Examine the Checklist for Environmental Planners, at the back of this document, for more detail about potential impacts that could be mapped. Below is an abbreviated list of resources that could occur in the study area and may be knowable at this time and at the study's various analytical scales:

Resource or issue	Is the resource or issue present in the area?	Would any future transportation policies or projects involve the issue? Would there be impacts on the resource?
Sensitive biological resources	☒ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Wildlife corridors	☒ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Wetland areas	☐ Yes ☐ No ☒ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Riparian areas	☐ Yes ☐ No ☒ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☒ Not applicable
100-year floodplain	☒ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☒ No ☐ Unknown ☐ Not applicable
Prime or unique farmland or farmland of statewide or local importance	☐ Yes ☐ No ☒ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Visual resources	☐ Yes ☐ No ☒ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Designated scenic road/byway	☐ Yes ☒ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☒ Not applicable
Archaeological resources	☐ Yes ☐ No ☒ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Historical resources	☐ Yes ☐ No ☒ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable

Resource or issue	Is the resource or issue present in the area?	Would any future transportation policies or projects involve the issue? Would there be impacts on the resource?
Section 4(f)[8] wildlife and/or waterfowl refuge, historic site, recreational site, park	☒ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Section 6(f)[9] resource	☐ Yes ☐ No ☒ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Existing development	☒ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Planned development	☒ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Title VI/ Environmental justice populations[10]	☐ Yes ☒ No ☐ Unknown ☐ Not applicable	☐ Yes ☒ No ☐ Unknown ☐ Not applicable
Utilities	☒ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Hazardous materials	☐ Yes ☐ No ☒ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Sensitive noise receivers[11]	☒ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Air quality	☐ Yes ☐ No ☒ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable
Other (list) 10J area for California Condor	☒ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☒ Unknown ☐ Not applicable

[8] Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 U.S. Code § 303, as amended); see <Section 4(f)>.

[9] Section 6(f) of the Land and Water Conservation Fund Act

[10] refers to Title VI of the 1964 Civil Rights Act and 1994 Executive Order 12898 on environmental justice

[11] under FHWA's Noise Abatement Criterion B: picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals

Did the study incorporate models of, for example, species/habitat locations (predictive range maps), future land use, population dynamics, stormwater runoff, or travel demand? What models were used? Did the study adequately document what models were used, who was responsible for their use, and how they were used (with respect to, for example, calibration, replicability, contingencies, and exogenous factors)?
The AZTDM2 was used for travel demand and future land use, updated with guidance from Coconino County, FMPO and consultant experience. Study working papers detail their use and assumptions.
In scoping, conducting, and documenting the planning study, participants have come across documents and leads from agency staff and other sources that the environmental planners may be able to use in conducting their studies. List any applicable memoranda of understanding, cost-share arrangements, programmatic agreements, or technical studies that are underway but whose findings are not yet published, etc.
The I-40 corridor profile study, ADOT access management guidelines, and FMPO access management guidelines are underway but not complete. Potential cost-share arrangements between Coconino County and Pilot Travel Centers are being investigated/finalized.
Development of alternatives
Were resource agencies, stakeholders, and members of the public engaged in the process of identifying, evaluating, and screening out modes, corridors, a range of alternatives,[12] or a preferred alternative (if one was identified—the latter two refer to corridor plans)? If so, how? Did these groups review the recommendation of a preferred mode(s), corridor(s), range of alternatives (including the no-build alternative), or an alternative? Were the participation and inputs of these groups at a level acceptable for use in purpose and need statements or alternatives development sections in NEPA documents? If not, why not?
The TAC and the public were engaged during alternatives development and evaluation process. The TAC provided input on potential improvements and also approved the list of potential improvements for further investigation prior to evaluation. The public provided input on the development of potential improvements and on the alternatives analysis. Through a collaborative process, the potential improvement strategies were screened based upon a variety of factors, such as safety impact, mobility, public input, funding availability, and cost. The input from these groups was at an acceptable level.
Describe the process of outreach to resource agencies, the public, and other stakeholders. Describe the documentation of this process and of the responses to their comments. Is this documentation adequate in breadth and detail for use in NEPA documents?
Outreach was conducted via e-mail, telephone, websites, and in-person meetings. A TAC was formed to guide the study process. The public was engaged at key decision points of the study via open house meetings. Individual meetings were conducted with key stakeholders. Meeting summaries and public engagement summaries were prepared. The documentation is adequate.
If the study was a corridor study, describe the range of alternatives considered (if any), screening process, and screening criteria. Include what types of alternatives were considered (including the no-build alternative) and how the screening criteria were selected. Was a preferred alternative selected as best addressing the identified transportation issue? Are alternatives' locations and design features specified?
The study was not a corridor study.
Also regarding whether the study was a corridor study, for alternatives that were screened out, summarize the reasons for their rejection. Are defensible, credible rationale articulated for their being screened out? Did the study team take into account legal standards[13] needed in the NEPA process for such decisions? Did the study team have adequate information for screening out the alternatives?
The study was not a corridor study.
What issues, if any, remain unresolved with the public, stakeholders, and/or resource agencies?
Finalize the agreement/negotiation with the Pilot Travel Centers for the back access road in the recommended alternative.

[12] For an explanation of the development of alternatives in environmental documents, please see FHWA's "NEPA and Transportation Decisionmaking: Development and Evaluation of Alternatives,"<Alternatives>.

[13] 23 Code of Federal Regulations (CFR) § 771.123(c), 23 CFR § 771.111(d), 40 CFR § 1502.14(a), 40 CFR § 1502.14(b) and (d), 23 CFR § 771.125(a)(1); see FHWA Technical Advisory T 6640.8A, October 30, 1987, <FHWA Technical Advisory T 6640.8A>.

Formally joining PEL with the NEPA process

Lead federal agencies proposing a project that will undergo the NEPA process will want to most effectively leverage the transportation planning study's efforts and results. How could a Notice of Intent (for an environmental impact statement[14]) refer to the study's findings with respect to preliminary purpose and need and/or the range of alternatives to be studied?

The study provides information that could be used to seed the NEPA process. However, the NEPA process is not anticipated. If the NEPA process were to commence, an EIS would not be the anticipated level of documentation.

Could a Notice of Intent in the NEPA process clearly state that the lead federal agency or agencies will use analyses from prior, specific planning studies that are referenced in the transportation planning study final report? Does the report provide the name and source of the planning studies and explain where the studies are publicly available? If not, how could such relevant information come to the environmental planners' attention and be made available to them in a timely way?

Yes.

List how the study's proposed transportation system would support adopted land use plans and growth objectives.

The study's recommended improvements were developed to complement the adopted land use plans and growth objectives.

What modifications are needed in the goals and objectives as defined in the transportation study process to increase their efficient and timely application in the NEPA process?

None are anticipated.

Jurisdictional delineations of waters of the United States frequently change. Housing and commercial developments can alter landscapes dramatically and can be constructed quickly. Noise and air quality regulations can change relatively rapidly. Resource agencies frequently alter habitat delineations to protect sensitive species. Will the study data's currency, relevance, and quality still be acceptable to agencies, stakeholders, and members of the public for use in the NEPA process? If not, what will be done to rectify this problem? Who will be responsible for any needed updating?

Yes, this is anticipated. However, the NEPA process is not anticipated. Ultimately, the scale/nature of unforeseen changes will dictate. Coconino County should be the responsible party for making sure the study elements remain current.

Other issues

Are there any other issues a future NEPA study team should be aware of (mark all that apply)? In the space below the check boxes, explain the nature and location of any issue(s) checked.

- ☒ Public and/or stakeholders have expressed specific concerns
- ☐ Utility problems
- ☒ Access or right-of-way issues
- ☐ Encroachments into right-of-way
- ☒ Need to engage—and be perceived as engaging—specific landowners, citizens, citizen groups, or other stakeholders
- ☐ Contact information for stakeholders
- ☐ Special or unique resources in the area
- ☐ Federal regulations that are undergoing initial promulgation or revision
- ☐ Other ______________________________

The Pilot Travel Center and Ponderosa Fire Department are key stakeholders. Right-of-way acquisition will be likely. Cost sharing is anticipated to implement the recommendations, including Pilot Travel Center. Transwestern Road is the only ingress/egress to the area, which is critical for emergency responders, residents, and others. Local residents were active participants, as well as the County Board of Supervisors representative.

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[14] While Notices of Intent are required by some federal agencies for environmental assessments, they are optional for FHWA. Please see "3.3.2 Using the Notice of Intent to Link Planning and NEPA," in *Guidance on Using Corridor and Subarea Planning to Inform NEPA* (Federal Highway Administration, April 5, 2011), <Notice of Intent>.

Concurrence

By signature, we concur that the transportation planning document meets or exceeds the following criteria in terms of acceptability for application in NEPA projects:

- ☐ Public involvement (outreach and level of participation)
- ☐ Stakeholder involvement (outreach and level of participation)
- ☐ Resource agencies' involvement and participation
- ☐ Documentation of the above efforts
- ☐ Applicability of the general findings and conclusions for use, by reference, in NEPA documents

Approved by: ________________________________ Date: ______________

DALLAS HAMMIT

State Engineer

Arizona Department of Transportation

Approved by: ________________________________ Date: ______________

MICHAEL KIES

Director

Multimodal Planning Division, Arizona Department of Transportation

Approved by: ________________________________ Date: _______________

KARLA PETTY

Division Administrator

Federal Highway Administration

Checklist for Environmental Planners – Part 3

By completing this checklist, environmental planners will be able to systematically evaluate the transportation planning study with regard to environmental resources and issues. It provides a framework for future NEPA studies by identifying those resources and issues that have already been evaluated, and those that have not. The role of environmental planners during the study's various stages is laid out in the flowchart on page 3. This role includes timely advocacy for resources and issues that will later be integral to NEPA processes.

Checklist for environmental planners

Resource or issue	Is the resource or issue present in the area?	Are impacts to the resource or issue involvement possible?	Are the impacts mitigable?	Discuss the level of review and method of review for this resource or issue and provide the name and location of any study or other information cited in the planning document where it is described in detail. Describe how the planning data may need to be supplemented during NEPA.
Natural environment				
Sensitive biological resources	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Wildlife corridors	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Invasive species	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Wetland areas	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Riparian areas	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
100-year floodplain	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Clean Water Act Sections 404/401 waters of the United States	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Prime or unique farmland	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Farmland of statewide or local importance	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	

Checklist for environmental planners

Resource or issue	Is the resource or issue present in the area?	Are impacts to the resource or issue involvement possible?	Are the impacts mitigable?	Discuss the level of review and method of review for this resource or issue and provide the name and location of any study or other information cited in the planning document where it is described in detail. Describe how the planning data may need to be supplemented during NEPA.
Sole-source aquifers	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Wild and scenic rivers	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Visual resources	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Designated scenic road/byway	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Cultural resources				
Archaeological resources	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Historical resources	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Section 4(f) and Section 6(f) resources				
Section 4(f) wildlife and/or waterfowl refuge	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Section 4(f) historic site	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Section 4(f) recreational site	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Section 4(f) park	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Section 6(f) resource	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	

Checklist for environmental planners

Resource or issue	Is the resource or issue present in the area?	Are impacts to the resource or issue involvement possible?	Are the impacts mitigable?	Discuss the level of review and method of review for this resource or issue and provide the name and location of any study or other information cited in the planning document where it is described in detail. Describe how the planning data may need to be supplemented during NEPA.
Human environment				
Existing development	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Planned development	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Displacements	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Access restriction	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Neighborhood continuity	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Community cohesion	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Title VI/Environmental justice populations	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Physical environment				
Utilities	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Hazardous materials	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Sensitive noise receivers	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Air quality	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	
Other (list)	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	☐ Yes ☐ No ☐ Unknown ☐ Not applicable	

Identification of potential environmental mitigation activities
Could the transportation planning process be integrated with other planning activities, such as land use or resource management plans? If so, could this integrated planning effort be used to develop a more strategic approach to environmental mitigation measures?
With respect to potential environmental mitigation opportunities at the PEL level, who should ADOT consult with among federal, State, and local agencies and tribes and how formally and frequently should such consultation be undertaken?
Off-site and compensatory mitigation areas are often creatively negotiated to advance multiagency objectives or multiple objectives within one agency. Who determined what specific geographic areas or types of areas were appropriate for environmental mitigation activities? How were these determinations made?
To address potential impacts on the human environment, what mitigation measures or activities were considered and how were they developed and documented?

Prepared by: _________________________________ Date: ______________

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Environmental Planning Group, Arizona Department of Transportation

Bellemont Access Management & Multi-Modal Transportation Study

Technical Advisory Committee

First Name	Last Name	Agency
Richard	Berry	ADPS
Gerrit	Boeck	Coconino County Sheriff's Office
John	Dalby	ADOT
Tim	Dalegowski	Coconino County
Dan	Gabiou	ADOT
Erika	Mazza	NAIPTA
Audra	Merrick	ADOT
Nate	Reisner	ADOT
Marc Della	Rocca	Coconino County
Mark	Sachara	Ponderosa Fire Department
Brian	Tozer	Coconino County Sheriff's Office
Jeanne	Trupiano	Coconino County
Dave	Wessel	FMPO
Heidi	Yaqub	ADOT

Consulting Team

First Name	Last Name	Organization
Dana	Biscan	Burgess & Niple
Jason	Pagnard	Burgess & Niple
Audra	Koester Thomas	Partners for Strategic Action, Inc.

Public, Stakeholder engagement matrix (AKT) – As of October 27, 2015

Establishment of organizational relationships – stakeholders and members of the public[1]			
Public and stakeholders	Date(s) contacted	Describe level of participation	Describe the primary concerns expressed by members of the public and stakeholders.
Flagstaff Meadows (HOA, single-family residential management association, Sterling)	February 26, 2015 March 5, 2015 March 24, 2015 July 15, 2015 July 29, 2015 August 4, 2015	Phone conversation, e-mail	Affirmation of congestion concerns with residential/truck traffic. Appreciation for study. Assisted in open house communication.
Flagstaff Meadows (POA, townhome management association, Hoamco)	March 5, 2015 March 24, 2015 July 15, 2015 July 29, 2015 August 4, 2015	Phone conversation, e-mail	Appreciation for study. Assisted in open house communication.
Coconino County: Supervisor Matt Ryan's Office	March 11, 2015 March 24, 2015 July 15, 2015 July 20, 2015 July 22, 2015 July 29, 2015 August 4, 2015	Phone conversation, e-mail	Affirmation of congestion concerns with residential/truck traffic. Appreciation for study. Assisted in open house communication.
Pilot Travel Center	March 20, 2015 July 22, 2015 August 5, 2015 October 9, 2015	Phone conversation, in-person meeting	Acknowledgement of study. See Pilot Stakeholder Meeting Summaries (attachment)
Pilot Travel Center, truck customers	March 25, 2015	On-site interviews	See Phase I Engagement Summary (attachment)
Public	March 25, 2015 (comment period through April 8, 2015)	Open House	See Phase I Engagement Summary (attachment)
Public	August 5, 2015 (comment period through August 28, 2015)	Open House	See Phase II Engagement Summary (attachment)

[1] Users may add rows to this table to accommodate additional stakeholders.