Traffic Impact Study for Proposed ARCO Gas Station in Grass Valley, California

Final Report

Prepared for:
The City of Grass Valley

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October 13, 2017

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INTRODUCTION AND EXECUTIVE SUMMARY

INTRODUCTION

The purpose of this traffic impact study is to evaluate potential impacts of the proposed Arco Gas Station in Grass Valley, California. The proposed site is located at 821 S. Auburn Street on a 0.88 acre vacant lot at the northeast corner of E. McKnight Way and S. Auburn Street. The proposed project consists of a gas and diesel fuel station with 16 fueling positions, a car wash, and a 3,180 square feet (sf) convenience store.

SUMMARY

Based on the results of the analysis, the following is a summary of our findings:

Existing Condition

Based on discussions with City staff, five study intersections were selected for analysis.

- All the intersections operate at acceptable Level of Service (LOS) D or better, except McKnight Way / S. Auburn Street intersection under stop control. However, this intersection is planned for improvement to a roundabout and would operate at acceptable LOS as a roundabout.
- The 95th percentile queue lengths are contained within the existing turn bays.
- The McKnight Way roadway has a low operating speed under existing conditions, likely due to the closely spaced intersections.

Existing plus Project

- The proposed ARCO gas station with convenience store and car wash is estimated to generate approximately 190 new trips during the AM peak hour and 222 new trips during the PM peak hour. However, after accounting for pass-by trips, the project is expected to contribute just 72 new trips and 98 new trips to the transportation network during the AM and PM peak hours, respectively.
- Similar to the Existing Conditions, all the intersections operate at acceptable LOS D or better, except McKnight Way / S. Auburn Street intersection under stop control. This represents a **significant impact**.
- Similar to existing conditions, the non-mitigated 95th percentile queue lengths are contained within the existing turn bays.
- The McKnight Way roadway is expected to have a low operating speed, likely due to the closely spaced intersections.
- There are two proposed driveways for this project, one on McKnight Way and one on Auburn Street.
- If circulation issues within the site occurred, they would have the potential to induce queuing on McKnight Way. Under serious circumstances this could lead to a queue spill back into the McKnight Way/Auburn Street roundabout.

- The driveway on Auburn Street is located close to the planned roundabout. Left turning traffic from this driveway could potentially create a safety hazard as vehicles are exiting the roundabout. Stantec recommends considering restricting exiting traffic to right-turn only.
- **Mitigations:**
  - For the near-term, the McKnight Way / S. Auburn Street intersection would operate at acceptable LOS with all-way stop control operations. However, the 95th percentile queue for the eastbound approach is expected to exceed storage for this mitigation, which is not acceptable.
  - The McKnight Way / S. Auburn Street intersection is planned for improvement to a roundabout in the future and would operate at acceptable LOS as a roundabout. **Roundabout control is an appropriate mitigation** to reach a level of insignificant impact.

Cumulative Year

- The future year traffic volumes were estimated using a 1% assumed growth rate.
- All the intersections operate at acceptable LOS D or better, except:
  - McKnight Way / S. Auburn Street intersection under stop control. However, this intersection is planned for improvement to a roundabout and would operate at acceptable LOS as a roundabout.
  - McKnight Way / Freeman Lane intersection which is currently all-way stop-controlled. If signalized the intersection would operate at acceptable LOS.
- The 95th percentile queue lengths are contained within the existing turn bays.
- The McKnight Way roadway is expected to have a low operating speed, likely due to the closely spaced intersections.

Cumulative Plus Project

- All the intersections operate at acceptable LOS D or better, except:
  - McKnight Way / S. Auburn Street intersection under stop control, representing a **significant impact**.
  - McKnight Way / Freeman Lane intersection which is currently all-way stop-controlled, representing a **significant impact**.
- The unmitigated 95th percentile queue lengths are contained within the existing turn bays.
- The McKnight Way roadway is expected to have a low operating speed, likely due to the closely spaced intersections.
- **Mitigations:**
  - The McKnight Way / S. Auburn Street intersection is planned for improvement to a roundabout in the future and would operate at acceptable LOS as a roundabout. **Roundabout control is an appropriate mitigation** to reach a level of insignificant impact.
  - The McKnight Way & Freeman Lane intersection would operate at acceptable LOS if signalized. Signalization is **an appropriate mitigation** to reach a level of insignificant impact in the future when traffic volumes reach a level warranting a signal.

PURPOSE OF PROJECT AND STUDY APPROACH

PROJECT OBJECTIVES

The purpose of this traffic impact study is to evaluate potential traffic impacts of the proposed Arco Gas Station project. The proposed site, shown in **Figure 1,** is located at 821 S. Auburn Street on a 0.88 acre vacant lot at the northeast corner of E. McKnight Way and S. Auburn Street. The Project would consist of a gas and diesel fuel station with 16 fueling positions, a car wash, and a 3,180 square feet (sf) convenience store. The site plan is shown in **Figure 2**.

STUDY APPROACH

The following are key steps of the study approach:

- Conduct traffic counts to establish baseline traffic conditions
- Conduct trip generation and distribution of project trips
- Determine the Existing plus Project traffic condition
- Determine the Cumulative year traffic condition
- Determine the Cumulative plus Project traffic condition
- Determine impact of project trips based on established Significance Criteria

SETTING

The following section describes the existing transportation conditions in the vicinity of the study area, including descriptions of the existing street system and intersection operating conditions.

EXISTING STREET SYSTEM

California 49 (CA-49) is a four-lane freeway near Grass Valley. Per the 2015 traffic counts obtained from the Caltrans website, CA-49 carries approximately 24,000 vehicles per day (vpd) in the vicinity of the project site. For regional travel to the north and south, residents rely primarily on CA-49, the major north-south freeway that travels through the heart of Grass Valley. CA-49 connects to Interstate 80 (I-80), approximately 20 miles to the south of Grass Valley. CA-49 and I-80 provide access to regional employment centers in the Sacramento area.

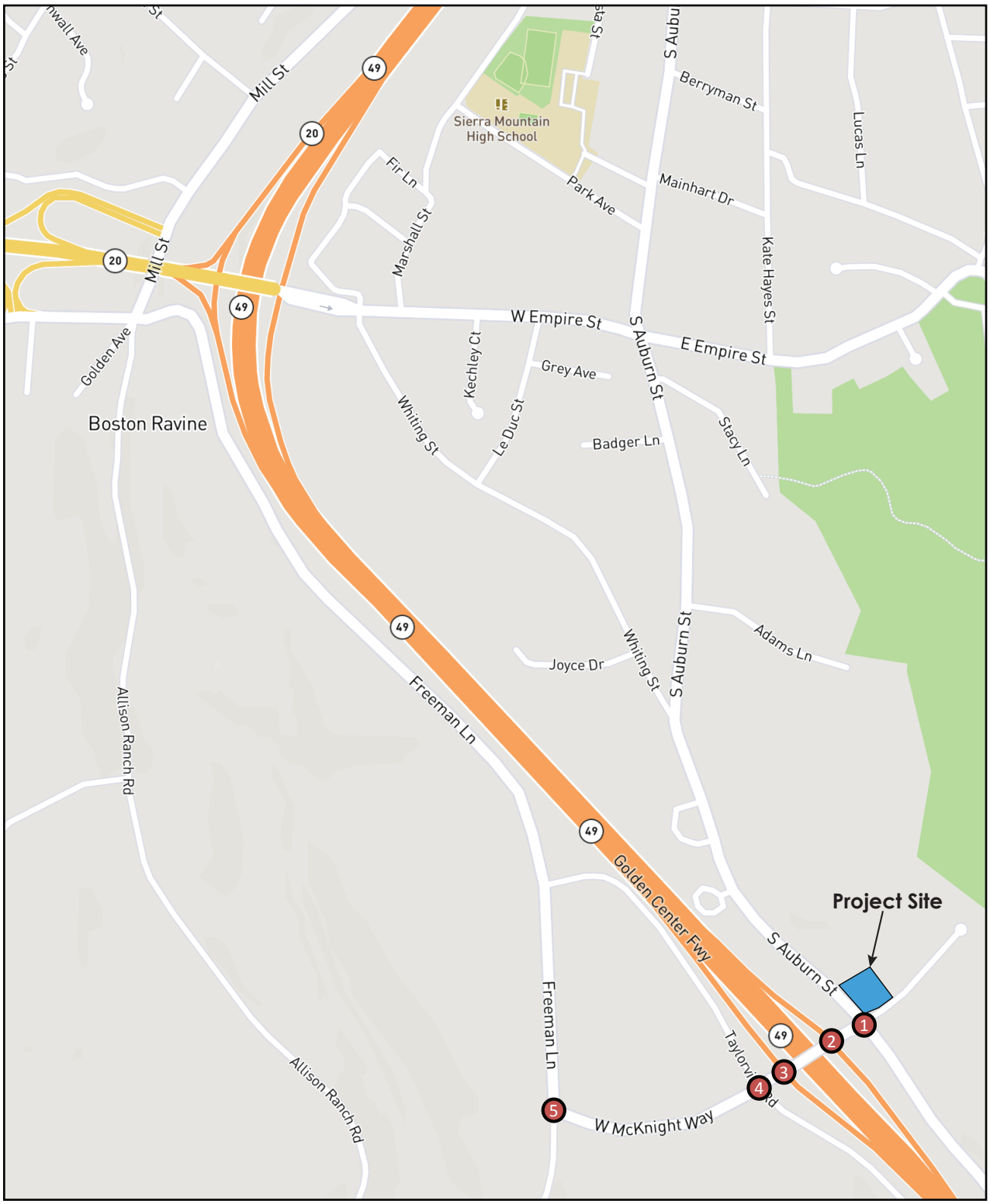
The interchange of CA-49/McKnight Way is a tight diamond with a bridge overpass road (McKnight Way) and a steep drop in grade next to the on- and off-ramps. All ramps have one lane in each direction, and the off-ramps have supplementary right turn bays.

South Auburn Street is a two-lane north-south arterial that connects Main Street in downtown Grass Valley to the north and McKnight Way to the south. This roadway provides primary north-south access from the center of Grass Valley to residences and businesses in the southern part of Grass Valley.

Traffic Impact Study for Proposed Arco Station in Grass Valley, CA

Figure 1

Vicinity Map and Study Intersections



Legend:

X Study Intersection

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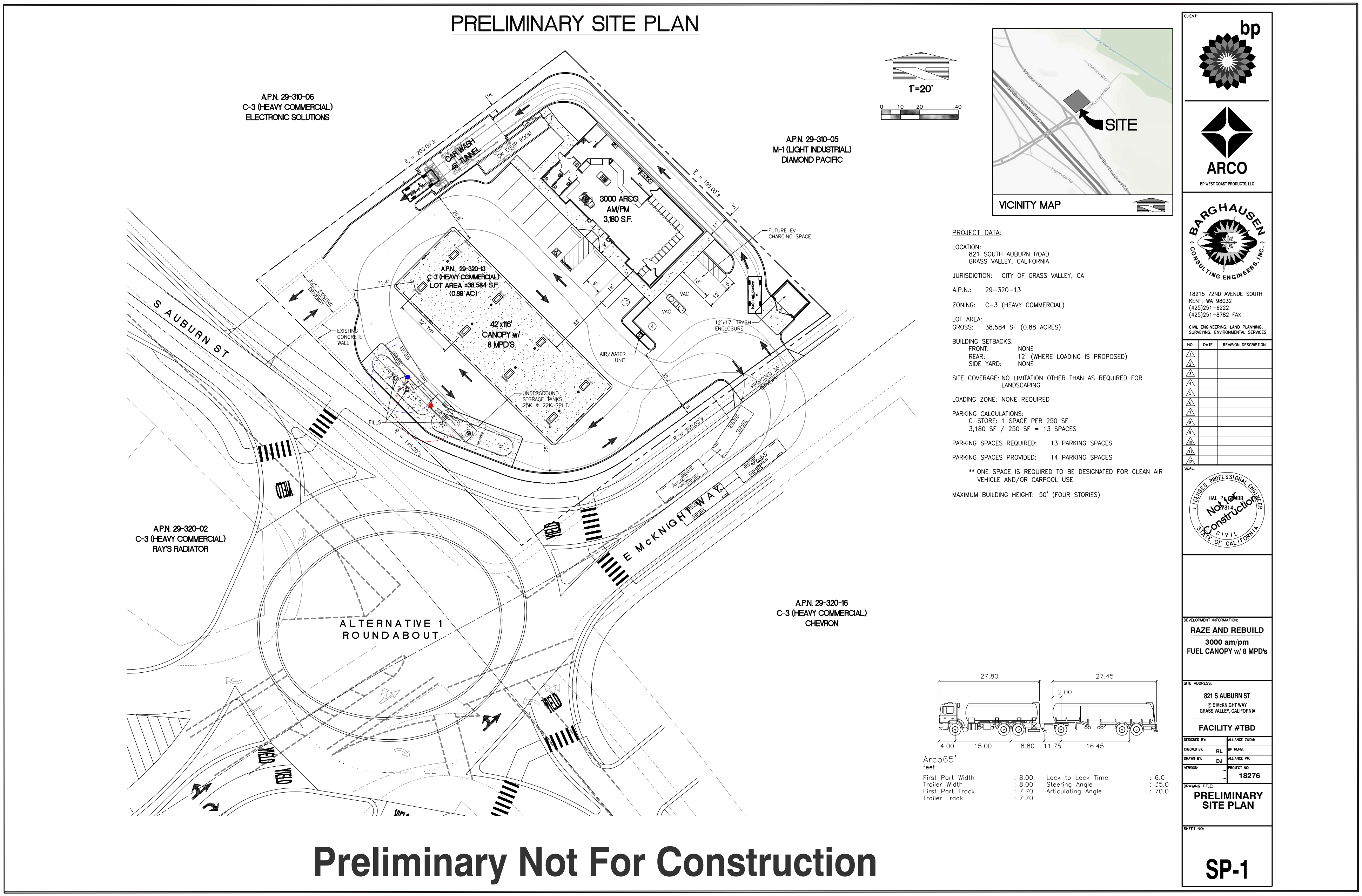
Proposed Project Site Plan



Source: Barghausen Consulting Engineers, Inc., 5/25/2017

La Barr Meadows Road is a two-lane north-south arterial that connects McKnight Way to the north and Dog Bar Road and Welsh Lane in the south. This roadway provides primary north-south access to CA-49 and Grass Valley to residences south of the City.

McKnight Way is a two- to four-lane collector road that connects Freeman Lane to the west and Auburn Street/La Barr Meadows Road to the east. It also provides connection between CA-49 and the businesses in the area of Grass Valley near the proposed project. McKnight way has an ADT of approximately 13,000 vpd.

Freeman Lane is a two-lane north-south collector road that connects McCourtney Road in the north to the residential area south of McKnight Way. Freeman Lane ends in a cul-de-sac 0.4 miles south of Mcknight Way. This roadway provides access to the Pine Creek Shopping Center. The ADT is approximately 7,000 vpd between McKnight Way and the JCPenney driveway.

Taylorville Road is a two-lane north-south collector roadway that connects Freeman Lane in the north to McKnight Way and the business and residences south of McKnight Way. Taylorville Road dead-ends approximately 0.35 miles south of McKnight Way.

ROADWAY AND INTERSECTION OPERATING CONDITIONS

This section summarizes existing roadway and intersection operating conditions.

Traffic Data Collection

Based on discussions with City staff[1], the following five study intersections were selected for analysis (shown in **Figure 1**):

1. E. McKnight Way / S. Auburn Street
2. E. McKnight Way / Hwy 49 NB ramps
3. E. McKnight Way / Hwy 49 SB ramps
4. E. McKnight Way / Taylorville Road
5. E. McKnight Way / Freeman Lane

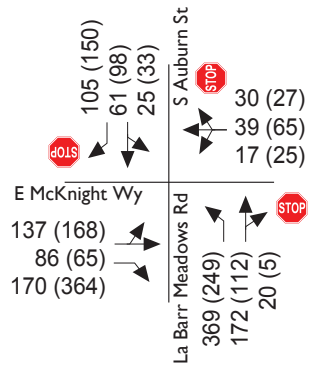
Stantec collected the AM and PM peak hour intersection turning movement counts in September 2017 for the five study intersections. **Figure 3** shows the turning movement volumes and lane configuration at each study intersection. Intersection turning movement counts and ADT count collected by Stantec are included in **Appendix A**.

[1] *Discussions with City of Grass Valley staff, August 2017*

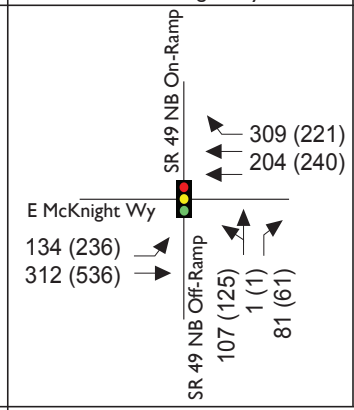
Traffic Impact Study for Proposed Arco Station in Grass Valley, CA
Existing Peak Hour Turning Movement Volumes, Lane Geometry & Controls

Figure 3

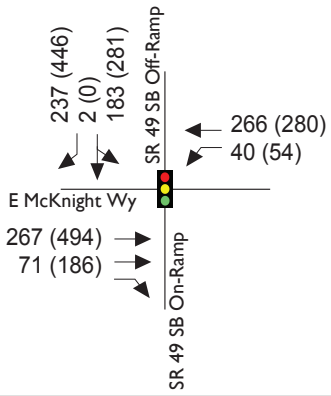
Intersection #1: S Auburn St-La Barr Meadows Rd & E McKnight Wy



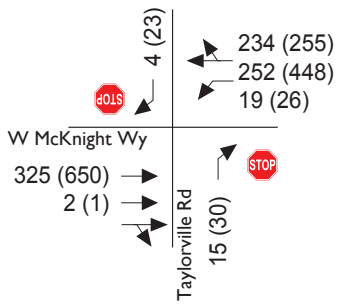
Intersection #2: SR 49 NB Ramps & E McKnight Wy



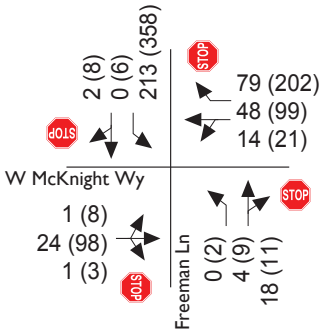
Intersection #3: SR 49 SB Ramps & E McKnight Wy



Intersection #4: Taylorville Rd & W McKnight Wy



Intersection #5: Freeman Ln & W McKnight Wy



Legend:

- Study Intersection
- Signal Control
- Stop Control
- XX (XX) AM (PM) Peak Hour Vehicle Volumes

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LEVEL OF SERVICE METHODOLOGY

Level of Service is a qualitative index of the performance of an element of the transportation system. Level of Service (LOS) is a rating scale running from A to F, with A indicating no congestion of any kind, and F indicating intolerable congestion and delays.

The 2000 Highway Capacity Manual (HCM) is the standard reference published by the Transportation Research Board, and contains the specific criteria and methods to be used in assessing LOS. There are several software packages that have been developed to implement HCM. In this study, Synchro and Sidra software were used to calculate the LOS at the study intersections.

Signalized Intersections

The relationship between average control delay, driver's perception of traffic, and LOS for signalized intersections is summarized in **Table 1**.

Table 1: Signalized Intersection LOS Criteria

LOS	Driver's Perception and Traffic Operation Description	Delay in Seconds
A	Operations with very low delay occurring with favorable Progression and/or short cycle length.	< 10
B	Operations with low delay occurring with good progression and/or short cycle lengths.	> 10 – 20
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	> 20 - 35
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	> 35 – 55
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	> 55 - 80
F	Operation with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	> 80

Unsignalized Intersections

Two-Way STOP-Control

The method of two-way stop control intersection capacity analysis used in this study is from Chapter 19, "TWSC Intersections" of the Highway Capacity Manual, Transportation Research Board, published December 2010. This method applies to two-way STOP sign or YIELD sign controlled intersections (or one-way STOP sign or YIELD sign controlled intersections at three-way intersections). At such intersections, drivers on the minor street are forced to use judgment when selecting gaps in the major flow through which to execute crossings or turning maneuvers. Thus, the capacity of the controlled legs of an intersection is based on three factors:

1. The distribution of gaps in the major street traffic stream.
2. Driver judgment in selecting gaps through which to execute their desired maneuvers.
3. Follow-up time required to move into the front-of-queue position.

The level of service criterion for two-way STOP controlled intersections is somewhat different from the criterion used for signalized intersections. The primary reason for this is the difference that

drivers expect a signalized intersection to carry higher traffic volumes than unsignalized intersections. Additionally, several driver behavior conditions combine to make delays at signalized intersections less onerous than at unsignalized intersections.

The LOS is reported for the minor approach. Depending on the availability of gaps, the minor approach might be operating at LOS D, E, or F while the overall intersection operates at LOS C or better. A minor approach that operates at LOS D, E, or F does not automatically translate into a need for a traffic signal. A signal warrant would still need to be met. There are many instances where only a few vehicles are experiencing LOS D, E, or F on the minor approach while the whole intersection operates at an acceptable LOS. A signal is usually not warranted under such conditions.

Table 2 summarizes the relationship between delay and LOS for unsignalized intersections. At side-street stop-controlled intersections, the delay is calculated for each stop-controlled movement, the left-turn movement from the major street, as well as the intersection average. The intersection average delay and highest movement/approach delay are reported for side street stop-controlled intersections.

Table 2: Unsignalized Intersection LOS Criteria

LOS	Driver's Perception and Traffic Operation Description	Delay in Seconds
A	Little or no delays	< 10
B	Short traffic delays	> 10 – 15
C	Average traffic delays	> 15 - 25
D	Long traffic delays	> 25 - 35
E	Very long traffic delays	> 35 – 50
F	Extreme traffic delays with intersection capacity exceeded	> 50

All-Way STOP Control

The method of All-Way Stop Control intersection capacity analysis used in this study is from Chapter 20, "AWSC Intersections" of the Highway Capacity Manual, Transportation Research Board, published December 2010. At all-way stop controlled intersections, all drivers must stop at the intersection use judgment about proceeding through the intersection based on the traffic on other approaches. Thus, the delay experienced by vehicles at this type of intersection is a function of the traffic volumes on each approach, which impact the flow rate at which vehicles can be served on each approach. The LOS is reported for the intersection as a whole.

Roundabouts

The Federal Highway Administration (FHWA) published the first informational guide for roundabouts in 2000. At that time, there were only 38 roundabouts in the U.S. Currently there are more than 2,500 roundabouts in the U.S. For this analysis, the Highway Capacity Manual (HCM) 2010 model was used in Sidra, a roundabout analysis model, which estimates the circulating flow and capacity based on gap-acceptance theory. Performance was assessed based on the average delay using the unsignalized intersection LOS criteria shown in **Table 2.**

Arterial Segments

Arterial LOS is calculated based on the Arterial Class and the speed travelled. Arterial Class is identified based on the segment posted speed and the segment length. The LOS for arterials reflects the extent to which users must reduce their speed (or which their travel time is increased) based on delays incurred in the network. It should be noted that for short segments, research done by the FHWA has shown increased travel time as compared to longer segments. Intersection LOS and arterial LOS metrics are auto-centric and provide insight into network operations and impacts for automobile users only.

Queuing Analysis

The queuing analysis serves as another method for assessing transportation network operation. Increased traffic from projects can increase queue lengths to a point where turning traffic "spills" from a turning bay and blocks the through traffic, negatively impacting intersection operations. The 95th percentile queue length during the peak hour is used to analyze potential project impacts on queuing and to determine whether the turn bay length is sufficient for the traffic demand. The 95th percentile queue length is typically used for determining the lengths of turning lanes so that traffic does not overflow to block the through lane. Reference to the 95th percentile of queue length means that this queue length should not be exceeded in 95% of all signal cycles. In other words, there is less than a 5% chance in a cycle that the queue length is larger. This is typically the standard used for evaluation by agencies.

SIGNIFICANCE CRITERIA

City Standards

The City of Grass Valley Design Standards for Traffic Studies generally defines acceptable citywide intersection operations as LOS D (35 seconds of delay per vehicle) or better during the morning and evening peak periods. If a project would cause the operation of an intersection to worsen from an acceptable LOS to an unacceptable LOS or if a project would distribute traffic to an intersection operating at an unacceptable LOS, the project is considered to have a significant impact.

Caltrans Standards

Facilities under the jurisdiction of Caltrans include freeway segments, ramps, ramp terminals, and arterials. Although Caltrans has not designated a LOS standard, Caltrans' Guide for the Preparation of Traffic Impact Studies (December 2002) indicates attempts to maintain LOS of a State highway facility between the LOS "C/D" threshold. When existing State highway facilities are operating at higher levels of service than noted above, 20-year forecasts or general plan build-out analysis for the facility should be considered to establish equitable project contributions to local development impact fee programs that address cumulative traffic impacts.

EXISTING TRAFFIC CONDITION

This section presents the assessment of traffic conditions without the proposed project.

INTERSECTION LEVEL OF SERVICE

To accurately model the traffic condition, Stantec created a Synchro traffic analysis model to determine the intersection LOS. The Existing Conditions traffic operations were evaluated based on levels of service criteria using Synchro. The macroscopic simulation model, Synchro, was used to evaluate several measures (such as lane geometries, signal optimization, signal phasing and traffic control) at the study intersections. For comparison purposes, the Sidra model was also used to evaluate the performance of the planned roundabout at the intersection of McKnight Way and Auburn Street.

The results of the LOS analysis for the existing intersections are shown in **Table 3**. All the intersections operate at acceptable LOS D or better, except the intersection of McKnight Way and Auburn Street, which currently operates at LOS F as a stop-controlled intersection. However, this intersection is planned for improvement to a roundabout (not yet funded), and is expected to operate at acceptable LOS as a roundabout. Detailed LOS worksheets are provided in **Appendix B**.

Table 3: Existing LOS of Study Intersections

ID	Intersection	Existing Control	AM		PM	
			Delay	LOS	Delay	LOS
1	E. McKnight Way / S. Auburn Street	Roundabout[1]	12.9	B	10.3	B
		TWSC[2]	**>120**	**F**	**>120**	**F**
2	E. McKnight Way / Hwy 49 NB ramps	Signal	14.1	B	17.2	B
3	E. McKnight Way / Hwy 49 SB ramps	Signal	12.8	B	14.3	B
4	E. McKnight Way / Taylorville Road	TWSC	11.0	B	12.7	B
5	E. McKnight Way / Freeman Lane	AWSC	10.4	B	19.7	C

***Note: TWSC** is Two Way Stop Controlled, **AWSC** is All Way Stop Controlled*
1.Roundabout is not existing, but shown for comparison purposes. 2.Intersection is three-way stop controlled but modeled as TWSC, which is a conservative assumption.
Source: Stantec, October 2017

QUEUING ANALYSIS

As the project is expected to generate left-turning traffic at several of the study intersections, a supplemental queuing analysis was carried out. The micro-simulation model, SimTraffic, was used to determine where traffic congestion was occurring and to identify potential queuing.

Under Existing Conditions, the analysis shows sufficient turn bay lengths for all intersections as shown in **Table 4**.

Table 4: Existing Queuing Analysis

ID	Intersection	Turning Movement	Existing Storage Length	Existing Conditions	
				AM	PM
2	E. McKnight Way / Hwy 49 NB ramps	EBL	240'	100'	154'
3	E. McKnight Way / Hwy 49 SB ramps	WBL	240'	50'	56'
4	E. McKnight Way / Taylorville Road	WBL	50'	17'	20'
5	E. McKnight Way / Freeman Lane	SBL	215'	58'	127'

SEGMENT LOS

The Segment LOS was calculated for each segment bounded by a signalized intersection on McKnight Way. As shown in **Table 5**, the segments are expected to operate at a poor LOS under existing conditions as arterial segment LOS is estimated based on speed and this corridor is expected to have low speeds. This is most likely due to the nature of McKnight Way as it is a short roadway (0.3 miles long) and it has closely spaced intersections. It is not intended to have high speeds and the short segment length results in low traveled speed, which is reflected as poor LOS.

Table 5: Existing Segment LOS

Direction	Intersection	AM		PM	
		Arterial Speed (mph)	LOS	Arterial Speed (mph)	LOS
EB	E. McKnight Way / Hwy 49 SB ramps	18.5	C	17.8	D
EB	E. McKnight Way / Hwy 49 NB ramps	10.6	E	8.9	F
WB	E. McKnight Way / Hwy 49 NB ramps	7.4	E	7.2	E
WB	E. McKnight Way / Hwy 49 SB ramps	8.0	E	8.6	E

SAFETY

Stantec reviewed the collision data for Grass Valley obtained from the Statewide Integrated Traffic Records System (SWITRS) database. Over the past seven years, there have been a total of 20 recorded collisions at intersections on McKnight Way between Freeman Lane and Auburn Street. The most common collision types are broadside collisions followed by rear end, sideswipe, and head-on. The most common collision factors are traffic signs violations and right-of-way violations. **Appendix C** contains the collision summaries as well as the diagrams for each intersection.

TRIP GENERATION AND DISTRIBUTION METHODOLOGY

The purpose of this traffic impact study is to evaluate potential impacts of the proposed Arco Gas Station in Grass Valley, California. The proposed site is located at 821 S. Auburn Street on a 0.88 acre vacant lot at the northeast corner of E. McKnight Way and S. Auburn Street. The proposed project consists of a gas and diesel fuel station with 16 fueling positions, a car wash, and a 3,180 square feet (sf) convenience store. **Figure 2** shows the proposed project site plan.

TRIP GENERATION

Trip generation is defined as the number of "vehicle trips" produced by a particular land use or project. A trip is defined as a one-direction vehicle movement. The total number of trips generated by each land use includes the inbound and outbound trips.

The trip generation estimates for a Gas Station with Market and Car Wash were calculated using the standard reference Trip Generation, 9th Edition, published by the Institute of Transportation Engineers (ITE). The estimated potential trip generation of the proposed project is shown in **Table 6**. It is estimated that the project will generate approximately 190 and 222 total trips during the AM and PM peak hours, respectively.

Table 6: Proposed Project Trip Generation

Land Use	ITE Code	Size		AM Peak				PM Peak			
				Rate	In	Out	Total	Rate	In	Out	Total
Gasoline Station, Conv. Market & Car Wash	946	16	fueling positions	11.84	97	93	190	13.86	113	109	222
Pass-By Trips [A]					60	58	118		63	31	124
Total New Trips					***37***	***35***	***72***		***50***	***48***	***98***

Note:
A - Pass-by trips for gasoline station estimated at 62 % and 56 %
ITE Source: ITE Trip Generation Manual 9th Edition, 2012

As the ARCO would be situated on South Auburn Street/McKnight Way, pass-by trip reduction was also applied. These trips, known as Pass-By trips, do not result in a route deviation for the existing vehicles as these vehicles are already traveling on a route that provides direct access to the project site. Therefore, these trips result in increased driveway traffic for the project site but do not result in an increase of traffic traveling through the network. Without applying the Pass-By reduction, the trip estimation would effectively double count trips which are attributed to these vehicles. The ITE estimates Pass-By trips to be approximately 62%[1] during the a.m. peak hour and 52% during the p.m. peak hour for this land use.

[1] *Pass-by trips for gasoline station estimated at 62 % and 56 %, respectively for the AM peak and the PM peak hour based on ITE Trip Generation Manual.*

It is estimated that the ARCO will generate approximately 72 new trips during the AM peak hour and 98 new trips during the PM peak hour after pass-by trips have been accounted for.

TRIP DISTRIBUTION

Trip distribution is a process that determines in what proportion vehicles would be expected to travel between a project site and various destinations outside the project study area. The process of trip assignment determines the various routes that vehicles would take from the project site to each destination using the estimated trip distribution.

The project is expected to "generate" and "attract" trips throughout the City and from other locations throughout the area. Directional trip distribution for project generated trips was estimated based upon existing traffic flow patterns, geographic location of the project site, and location of other similar destinations. The estimated trip distribution patterns and project only trips are shown on **Figure 4.**

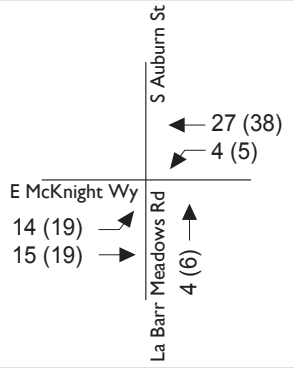
Based on input from City staff, the weekday AM and PM peak hour traffic conditions for the following scenarios were analyzed:

- Existing Traffic Condition
- Existing plus Project Traffic Condition
- Cumulative Traffic Condition
- Cumulative plus Project Traffic Condition

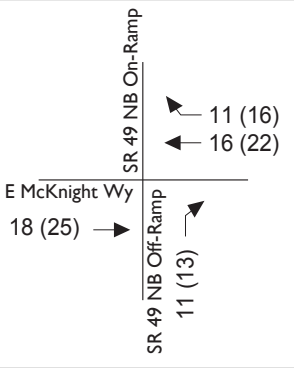
Traffic Impact Study for Proposed Arco Station in Grass Valley, CA
Project Trip Distribution and Assignment

Figure 4

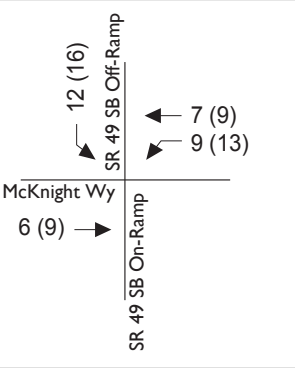
Intersection #1: S Auburn St-La Barr Meadows Rd & E McKnight Wy



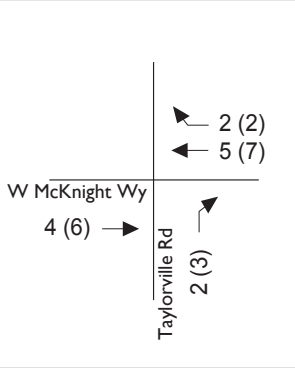
Intersection #2: SR 49 NB Ramps & E McKnight Wy



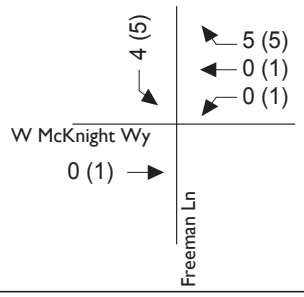
Intersection #3: SR 49 SB Ramps & E McKnight Wy

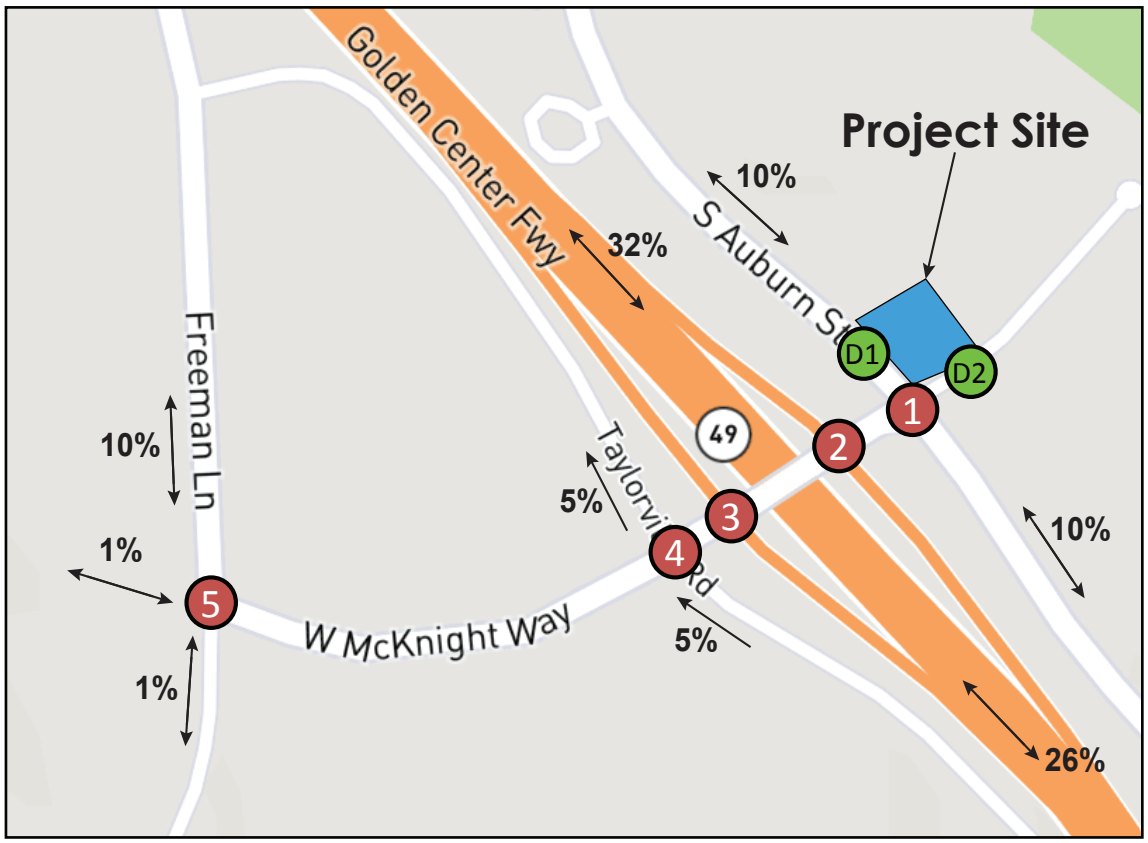


Intersection #4: Taylorville Rd & W McKnight Wy



Intersection #5: Freeman Ln & W McKnight Wy





Legend:

- X — Study Intersection
- DX — Project Driveway
- XX (XX) — AM (PM) Project Only Volumes
- XX% — Project Trip Distribution

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EXISTING PLUS PROJECT TRAFFIC CONDITION

This section presents the assessment of potential transportation impacts of the proposed ARCO.

INTERSECTION LEVEL OF SERVICE ANALYSIS

Figure 5 shows the Existing plus Project Conditions peak hour turning movement volumes and lane geometry. Detailed level of service worksheets are provided in **Appendix D**.

Table 7 shows the LOS under Existing plus Project Conditions. All intersections operate at acceptable LOS D or better, except the intersection of McKnight Way and Auburn Street, which currently operates at LOS F as a stop-controlled intersection. Under the Existing plus Project scenario, project traffic would use the intersection. The intersection would continue to operate at LOS F, which is considered a **significant impact**.

Mitigation

To mitigate potentially significant impacts in the near term with minor intersection modifications, Stantec investigated the expected operations under all-way stop control. If a stop sign were added to the eastbound approach to make the intersection all-way stop controlled, the LOS would be expected to improve to acceptable operations. This control change would introduce the potential for increased queuing on McKnight Way. See the Queuing Analysis section for the queuing discussion.

In the future, the McKnight Way/Auburn Street intersection is planned for improvement to a roundabout. Under roundabout control it is expected to operate at acceptable LOS for Plus Project conditions. The roundabout control would represent an **acceptable mitigation** measure.

Table 7: Existing plus Project Intersection LOS

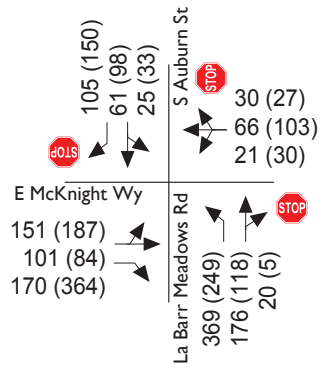
			Existing plus Project Condition				Project Trips	
	Intersection	Existing Control	AM		PM		AM	PM
			Delay	LOS	Delay	LOS		
1	E. McKnight Way / S. Auburn Street	Roundabout[1]	14.1	B	11.2	B	60	87
		AWSC[1]	24.5	C	26	D		
		TWSC[2]	**>120**	**F**	**>120**	**F**		
2	E. McKnight Way / Hwy 49 NB ramps	Signal	14.1	B	17.4	B	56	76
3	E. McKnight Way / Hwy 49 SB ramps	Signal	13.0	B	14.7	B	34	47
4	E. McKnight Way / Taylorville Road	TWSC	11.1	B	12.8	B	13	18
5	E. McKnight Way / Freeman Lane	AWSC	10.4	B	20.5	C	9	12

***Note: TWSC** is Two Way Stop Controlled, **AWSC** is All Way Stop Controlled*
1.Roundabout and AWSC are not existing, but shown for comparison purposes. 2.Intersection is three-way stop controlled but modeled as TWSC, which is a conservative assumption.
Source: Stantec, October 2017

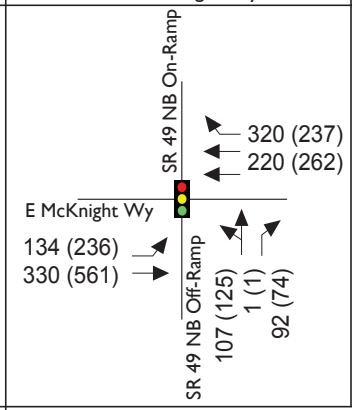
Traffic Impact Study for Proposed Arco Station in Grass Valley, CA
Existing plus Project Peak Hour Turning Movement Volumes

Figure 5

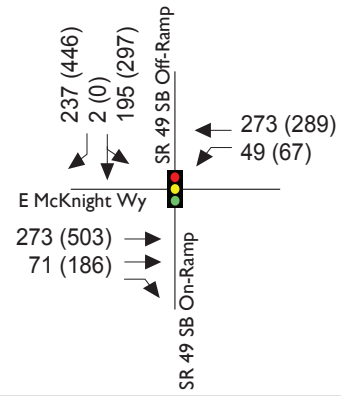
Intersection #1: S Auburn St-La Barr Meadows Rd & E McKnight Wy



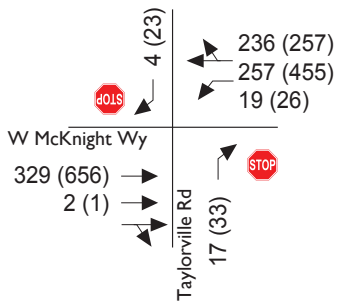
Intersection #2: SR 49 NB Ramps & E McKnight Wy



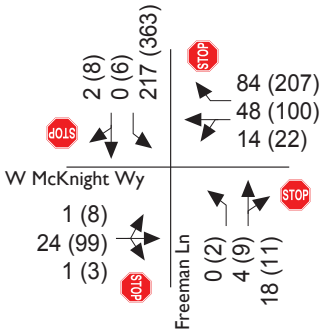
Intersection #3: SR 49 SB Ramps & E McKnight Wy



Intersection #4: Taylorville Rd & W McKnight Wy



Intersection #5: Freeman Ln & W McKnight Wy



Legend:

- Study Intersection
- Signal Control
- Stop Control
- XX (XX) AM (PM) Peak Hour Vehicle Volumes

N

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QUEUING ANALYSIS

As the project is expected to generate left-turning traffic at several of the study intersections, a supplemental queuing analysis was carried out. The 95th percentile queue length is typically used for determining the lengths of turning lanes so that traffic does not overflow to block the through lane. The 95th percentile of queue lengths represents the length of queue that should not be exceeded in 95% of all signal cycles (for a signalized intersection) or 95% of the time for an unsignalized intersection. In other words, there is less than a 5% chance in any cycle that the queue length is larger.

Under Existing plus Project Conditions (unmitigated), the analysis shows sufficient turn bay lengths for all intersections as shown in **Table 8**.

Mitigation

Under the mitigated all-way stop control operations, a stop sign would be installed on the eastbound approach of the McKnight Way and Auburn Street intersection. The eastbound approach under existing conditions currently operates without stop control and therefore queues are not expected to form eastbound on McKnight Way. Under the mitigated control, the expected 95% queue would exceed the storage available, possibly resulting in vehicles spilling back into the McKnight Way/CA-49 ramp intersection. This could block vehicles from entering or exiting the ramps and could result in impacts to the McKnight Way corridor operations. This queue represents a potentially significant impact.

The roundabout control represents the appropriate mitigation to address the potential operational issues this intersection may experience under the Plus Project conditions.

Table 8: Existing Plus Project Queuing Analysis

ID	Intersection	Turning Movement	Existing Storage Length	Existing Plus Project Conditions	
				AM	PM
2	E. McKnight Way / Hwy 49 NB ramps	EBL	240'	90'	195'
3	E. McKnight Way / Hwy 49 SB ramps	WBL	240'	56'	86'
4	E. McKnight Way / Taylorville Road	WBL	50'	0'	25'
5	E. McKnight Way / Freeman Lane	SBL	215'	52'	127'
1	**Mitigated** - E. McKnight Way / S. Auburn Street (AWSC option)[1]	EB	100'	94'	**115'**

1. Eastbound queuing shown for the AWSC option only. Under current operations eastbound approach traffic does not stop, and does not form a queue. Worst queue reported (left/through or right lane).
Source: Stantec, October 2017

SEGMENT LOS

The Segment LOS was calculated for each segment bounded by a signalized intersection on McKnight Way. As shown in **Table 9**, the segments are expected to operate at a poor LOS under Existing plus Project conditions, much like under Existing Conditions. This is most likely due to the nature of McKnight Way as it is a short roadway (0.3 miles long) and it has closely spaced intersections. It is not intended to have high speeds and the short segment length results in low traveled speed, which is reflected as poor LOS. Under the Plus Project scenario, travelled speed is expected to slightly reduce on some segments but the project is not expected to significantly reduce travelled speed.

Table 9: Existing plus Project Segment LOS

Direction	Intersection	AM		PM	
		Arterial Speed (mph)	LOS	Arterial Speed (mph)	LOS
EB	E. McKnight Way / Hwy 49 SB ramps	18.5	C	17.8	D
EB	E. McKnight Way / Hwy 49 NB ramps	10.4	E	8.7	F
WB	E. McKnight Way / Hwy 49 NB ramps	7.4	E	7.2	E
WB	E. McKnight Way / Hwy 49 SB ramps	7.9	E	8.6	E

CIRCULATION

The Proposed Project site is located at 821 S. Auburn Street on a 0.88 acre vacant lot at the northeast corner of E. McKnight Way and S. Auburn Street as shown in the site plan in **Figure 2**. There are two proposed driveways for this project, one on McKnight Way and one on Auburn Street. Both driveways are set back about 100 feet from the planned roundabout.

The driveway on McKnight Way would serve as a primary ingress route and would likely serve as the major egress route as drivers may avoid a left turn onto Auburn Street from the other driveway. As such, there is potential for congestion at this driveway during busy times and circulation issues within the site near the driveway could temporarily prevent vehicles from entering the site as they arrive. In this case, vehicles would queue on McKnight Way as they wait to turn left into the project site. There appears to be space for approximately four vehicles to queue on street before backing into the roundabout space.

As it is located close to the planned roundabout, left turning traffic from the driveway on Auburn Street could potentially create a safety hazard as they may conflict with vehicles exiting the roundabout travelling northbound. Stantec recommends considering restricting exiting traffic to right-turn only from this driveway.

CUMULATIVE TRAFFIC CONDITION

This section presents the assessment of traffic conditions without the proposed project for the Cumulative year (2040) traffic conditions.

INTERSECTION LEVEL OF SERVICE ANALYSIS

Stantec applied a growth rate of 1% per year to the existing traffic volumes to obtain the estimate of the Cumulative year 2040 traffic volumes. **Figure 6** shows the Cumulative year peak hour turning movement volumes and lane geometry. As shown, roundabout control is planned for the intersection of McKnight Way and Auburn Street. Detailed level of service worksheets are provided in **Appendix E**.

Table 10 shows the LOS under Cumulative traffic conditions. For the McKnight Way/Auburn Street intersection, both roundabout and stop-controlled operations are shown for comparison purposes. All intersections operate at acceptable LOS D or better, except the following intersections:

- McKnight Way & Freeman Lane during the PM peak hour. If signalized, the intersection would be expected to operate at an acceptable LOS.
- McKnight Way & Auburn Street under stop-controlled operation. However, because the intersection is expected to be operating under roundabout control in the future, operations are expected to be acceptable.

Table 10: Cumulative Intersection LOS

	Intersection	Existing Control	Cumulative Condition			
			AM		PM	
			Delay	LOS	Delay	LOS
1	E. McKnight Way / S. Auburn Street	Roundabout[1]	30.1	D	15.7	C
		TWSC[2]	**>120**	**F**	**>120**	**F**
2	E. McKnight Way / Hwy 49 NB ramps	Signal	15.4	B	18.5	B
3	E. McKnight Way / Hwy 49 SB ramps	Signal	13.4	B	15.6	B
4	E. McKnight Way / Taylorville Road	TWSC	12.0	B	14.8	B
5	E. McKnight Way / Freeman Lane	AWSC	12.0	B	**46.7**	**E**
		Signal	-	-	13.5	B

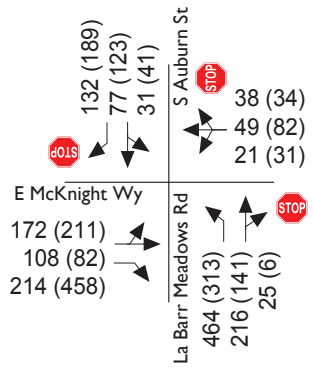
***Note: TWSC** is Two Way Stop Controlled, **AWSC** is All Way Stop Controlled*
1.Roundabout is planned for the future; both roundabout and TWSC shown for comparison purposes.
2.Intersection is three-way stop controlled but modeled as TWSC, which is a conservative assumption.
Source: Stantec, October 2017

Traffic Impact Study for Proposed Arco Station in Grass Valley, CA

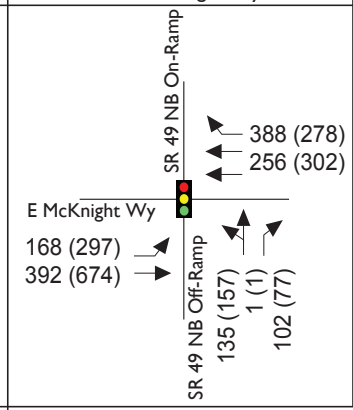
Cumulative (2040) Peak Hour Turning Movement Volumes

Figure 6

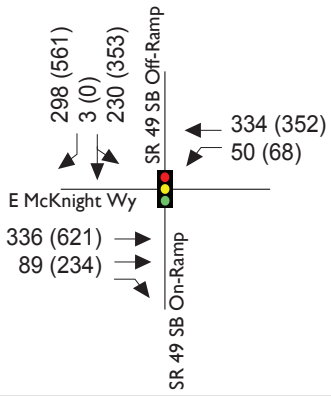
Intersection #1: S Auburn St-La Barr Meadows Rd & E McKnight Wy



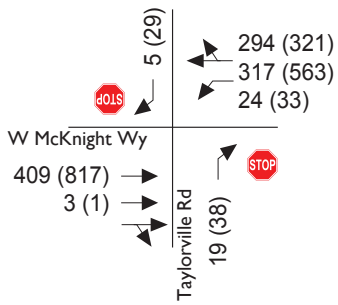
Intersection #2: SR 49 NB Ramps & E McKnight Wy



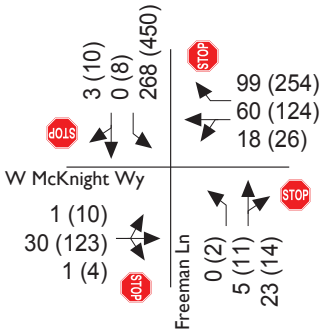
Intersection #3: SR 49 SB Ramps & E McKnight Wy



Intersection #4: Taylorville Rd & W McKnight Wy



Intersection #5: Freeman Ln & W McKnight Wy



Legend:

- Study Intersection
- Signal Control
- Stop Control
- XX (XX) AM (PM) Peak Hour Vehicle Volumes

N

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QUEUING ANALYSIS

As the project is expected to generate left-turning traffic at several of the study intersections, a supplemental queuing analysis was carried out. The 95th percentile queue length is typically used for determining the lengths of turning lanes so that traffic does not overflow to block the through lane. The 95th percentile of queue lengths represents the length of queue that should not be exceeded in 95% of all signal cycles (for a signalized intersection) or 95% of the time for an unsignalized intersection. In other words, there is less than a 5% chance in any cycle that the queue length is larger.

Under Cumulative Conditions, the analysis shows sufficient turn bay lengths for all locations as shown in **Table 11.**

Table 11: Cumulative Queuing Analysis

ID	Intersection	Turning Movement	Existing Storage Length	Cumulative Conditions	
				AM	PM
2	E. McKnight Way / Hwy 49 NB ramps	EBL	240'	165'	211'
3	E. McKnight Way / Hwy 49 SB ramps	WBL	240'	54'	59'
4	E. McKnight Way / Taylorville Road	WBL	50'	23'	29'
5	E. McKnight Way / Freeman Lane	SBL	215'	66'	142'

SEGMENT LOS

The Segment LOS was calculated for each segment bounded by a signalized intersection on McKnight Way. As shown in **Table 12**, the segments are expected to operate at a poor LOS under Cumulative conditions. This is most likely due to the nature of McKnight Way as it is a short roadway (0.3 miles long) and it has closely spaced intersections. It is not intended to have high speeds and the short segment length results in low traveled speed, which is reflected as poor LOS.

Table 12: Cumulative Segment LOS

Direction	Intersection	AM		PM	
		Arterial Speed (mph)	LOS	Arterial Speed (mph)	LOS
EB	E. McKnight Way / Hwy 49 SB ramps	18.0	D	17.5	D
EB	E. McKnight Way / Hwy 49 NB ramps	9.9	F	8.1	F
WB	E. McKnight Way / Hwy 49 NB ramps	7.2	E	6.6	F
WB	E. McKnight Way / Hwy 49 SB ramps	7.8	E	8.3	E

CUMULATIVE PLUS PROJECT TRAFFIC CONDITION

This section presents the assessment of potential transportation impacts of the proposed ARCO under the cumulative year (2040) scenario.

INTERSECTION LEVEL OF SERVICE ANALYSIS

Figure 7 shows the Cumulative plus Project Conditions peak hour turning movement volumes and lane geometry. Detailed level of service worksheets are provided in **Appendix F**.

Table 13 shows the LOS under Cumulative plus Project traffic conditions. All intersections operate at acceptable LOS D or better, except the following intersections:

- McKnight Way & Freeman Lane during the PM peak hour.
- McKnight Way & Auburn Street under stop-controlled operation.

As the project would be expected to increase delay at intersections operating below the acceptable standard LOS D, the project would cause a **significant impact** unless mitigated.

Table 13: Cumulative plus Project Intersection LOS

			Cumulative plus Project Condition				Project Trips	
	Intersection	Existing Control	AM		PM		AM	PM
			Delay	LOS	Delay	LOS		
1	E. McKnight Way / S. Auburn Street	Roundabout[1]	34.8	D	17.7	C	60	87
		TWSC[2]	**>120**	**F**	**>120**	**F**		
2	E. McKnight Way / Hwy 49 NB ramps	Signal	15.4	B	18.9	B	56	76
3	E. McKnight Way / Hwy 49 SB ramps	Signal	13.6	B	16.2	B	34	47
4	E. McKnight Way / Taylorville Road	TWSC	12.1	B	14.9	B	13	18
5	E. McKnight Way / Freeman Lane	AWSC	12.1	B	**49.1**	**E**	9	12
		Signal	-	-	13.2	B	-	-

***Note: TWSC** is Two Way Stop Controlled, **AWSC** is All Way Stop Controlled*
1.Roundabout is not existing, but shown for comparison purposes. 2.Intersection is three-way stop controlled but modeled as TWSC, which is a conservative assumption.
Source: Stantec, October 2017

Mitigation

McKnight Way & Freeman Lane

Stantec evaluated the operation of the McKnight Way & Freeman Lane intersection under signalized control as a potential mitigation option. Under signalized control, this intersection is expected to operate at LOS B during the PM peak period, as shown in the table. If in the future this intersection were to operate poorly and meet signal warrants, a signal would represent a potential **mitigation measure**.

McKnight Way & Auburn Street

The intersection of McKnight Way & Auburn Street was evaluated for roundabout control as this is a planned (not yet funded) improvement. Under roundabout control, operations are expected to be acceptable. Therefore, a roundabout represents an acceptable **mitigation measure.**

The sponsor of the ARCO Gas Station at 821 Auburn Street would be expected to contribute a fair share to improvements required for acceptable operation at the study intersections.

QUEUING ANALYSIS

As the project is expected to generate left-turning traffic at several of the study intersections, a supplemental queuing analysis was carried out. The 95th percentile queue length is typically used for determining the lengths of turning lanes so that traffic does not overflow to block the through lane. The 95th percentile of queue lengths represents the length of queue that should not be exceeded in 95% of all signal cycles (for a signalized intersection) or 95% of the time for an unsignalized intersection. In other words, there is less than a 5% chance in any cycle that the queue length is larger.

Under Cumulative plus Project Conditions, the analysis shows sufficient turn bay lengths for all locations as shown in **Table 14**.

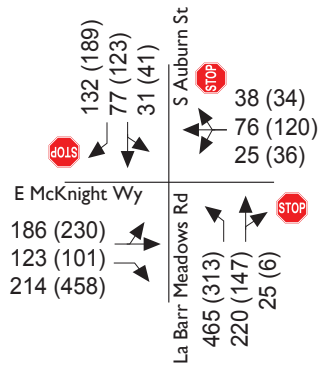
Table 14: Cumulative Plus Project Queuing Analysis

ID	Intersection	Turning Movement	Existing Storage Length	Cumulative plus Project Conditions	
				AM	PM
2	E. McKnight Way / Hwy 49 NB ramps	EBL	240'	119'	199'
3	E. McKnight Way / Hwy 49 SB ramps	WBL	240'	59'	77'
4	E. McKnight Way / Taylorville Road	WBL	50'	18'	17'
5	E. McKnight Way / Freeman Lane	SBL	215'	67'	128'

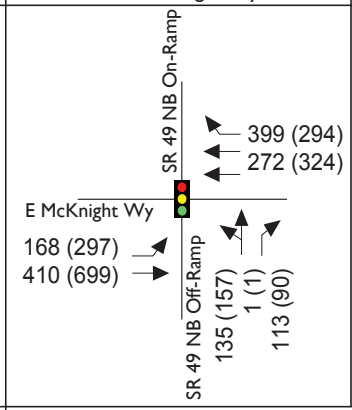
Traffic Impact Study for Proposed Arco Station in Grass Valley, CA
Cumulative (2040) plus Project Peak Hour Turning Movement Volumes

Figure 7

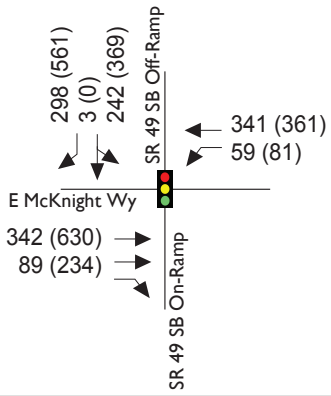
Intersection #1: S Auburn St-La Barr Meadows Rd & E McKnight Wy



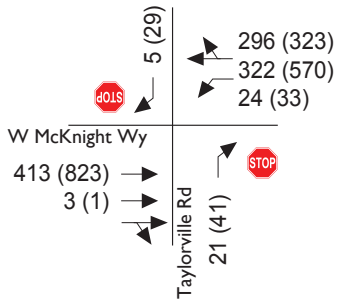
Intersection #2: SR 49 NB Ramps & E McKnight Wy



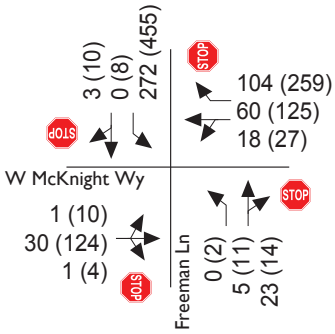
Intersection #3: SR 49 SB Ramps & E McKnight Wy



Intersection #4: Taylorville Rd & W McKnight Wy



Intersection #5: Freeman Ln & W McKnight Wy



Legend:

- Study Intersection
- Signal Control
- Stop Control
- XX (XX) AM (PM) Peak Hour Vehicle Volumes

N

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SEGMENT LOS

The Segment LOS was calculated for each segment bounded by a signalized intersection on McKnight Way. As shown in **Table 15**, the segments are expected to operate at a poor LOS under Cumulative plus Project conditions, much like under Cumulative conditions without the project. This is most likely due to the nature of McKnight Way as it is a short roadway (0.3 miles long) and it has closely spaced intersections. It is not intended to have high speeds and the short segment length results in low traveled speed, which is reflected as poor LOS. Although the analysis shows that some segments have slightly lower speeds under the plus project condition, the project is not expected to result in a significant reduction in travelled speed.

Table 15: Cumulative Plus Project Segment LOS

Direction	Intersection	AM		PM	
		Arterial Speed (mph)	LOS	Arterial Speed (mph)	LOS
EB	E. McKnight Way / Hwy 49 SB ramps	18.0	D	17.0	D
EB	E. McKnight Way / Hwy 49 NB ramps	9.8	F	7.9	F
WB	E. McKnight Way / Hwy 49 NB ramps	7.2	E	6.6	F
WB	E. McKnight Way / Hwy 49 SB ramps	7.8	E	8.5	E

CONCLUSION

Based on the results of the analysis, the following is a summary of our findings:

Existing Condition

Based on discussions with City staff, five study intersections were selected for analysis.

- All the intersections operate at acceptable Level of Service (LOS) D or better, except McKnight Way / S. Auburn Street intersection under stop control. However, this intersection is planned for improvement to a roundabout and would operate at acceptable LOS as a roundabout.
- The 95th percentile queue lengths are contained within the existing turn bays.
- The McKnight Way roadway has a low operating speed under existing conditions, likely due to the closely spaced intersections.

Existing plus Project

- The proposed ARCO gas station with convenience store and car wash is estimated to generate approximately 190 new trips during the AM peak hour and 222 new trips during the PM peak hour. However, after accounting for pass-by trips, the project is expected to contribute just 72 new trips and 98 new trips to the transportation network during the AM and PM peak hours, respectively.
- Similar to the Existing Conditions, all the intersections operate at acceptable LOS D or better, except McKnight Way / S. Auburn Street intersection under stop control. This represents a **significant impact**.
- Similar to existing conditions, the non-mitigated 95th percentile queue lengths are contained within the existing turn bays.
- The McKnight Way roadway is expected to have a low operating speed, likely due to the closely spaced intersections.
- There are two proposed driveways for this project, one on McKnight Way and one on Auburn Street.
- If circulation issues within the site occurred, they would have the potential to induce queuing on McKnight Way. Under serious circumstances this could lead to a queue spill back into the McKnight Way/Auburn Street roundabout.
- The driveway on Auburn Street is located close to the planned roundabout. Left turning traffic from this driveway could potentially create a safety hazard as vehicles are exiting the roundabout. Stantec recommends considering restricting exiting traffic to right-turn only.
- **Mitigations:**
  - For the near-term, the McKnight Way / S. Auburn Street intersection would operate at acceptable LOS with all-way stop control operations. However, the 95th percentile queue for the eastbound approach is expected to exceed storage for this mitigation, which is not acceptable.
  - The McKnight Way / S. Auburn Street intersection is planned for improvement to a roundabout in the future and would operate at acceptable LOS as a roundabout. **Roundabout control is an appropriate mitigation** to reach a level of insignificant impact.

Cumulative Year

- The future year traffic volumes were estimated using a 1% assumed growth rate.
- All the intersections operate at acceptable LOS D or better, except:
  - McKnight Way / S. Auburn Street intersection under stop control. However, this intersection is planned for improvement to a roundabout and would operate at acceptable LOS as a roundabout.
  - McKnight Way / Freeman Lane intersection which is currently all-way stop-controlled. If signalized the intersection would operate at acceptable LOS.
- The 95th percentile queue lengths are contained within the existing turn bays.
- The McKnight Way roadway is expected to have a low operating speed, likely due to the closely spaced intersections.

Cumulative Plus Project

- All the intersections operate at acceptable LOS D or better, except:
  - McKnight Way / S. Auburn Street intersection under stop control, representing a **significant impact**.
  - McKnight Way / Freeman Lane intersection which is currently all-way stop-controlled, representing a **significant impact**.
- The unmitigated 95th percentile queue lengths are contained within the existing turn bays.
- The McKnight Way roadway is expected to have a low operating speed, likely due to the closely spaced intersections.
- **Mitigations:**
  - The McKnight Way / S. Auburn Street intersection is planned for improvement to a roundabout in the future and would operate at acceptable LOS as a roundabout. **Roundabout control is an appropriate mitigation** to reach a level of insignificant impact.
  - The McKnight Way & Freeman Lane intersection would operate at acceptable LOS if signalized. Signalization is **an appropriate mitigation** to reach a level of insignificant impact in the future when traffic volumes reach a level warranting a signal.

Stantec Transportation Consultants

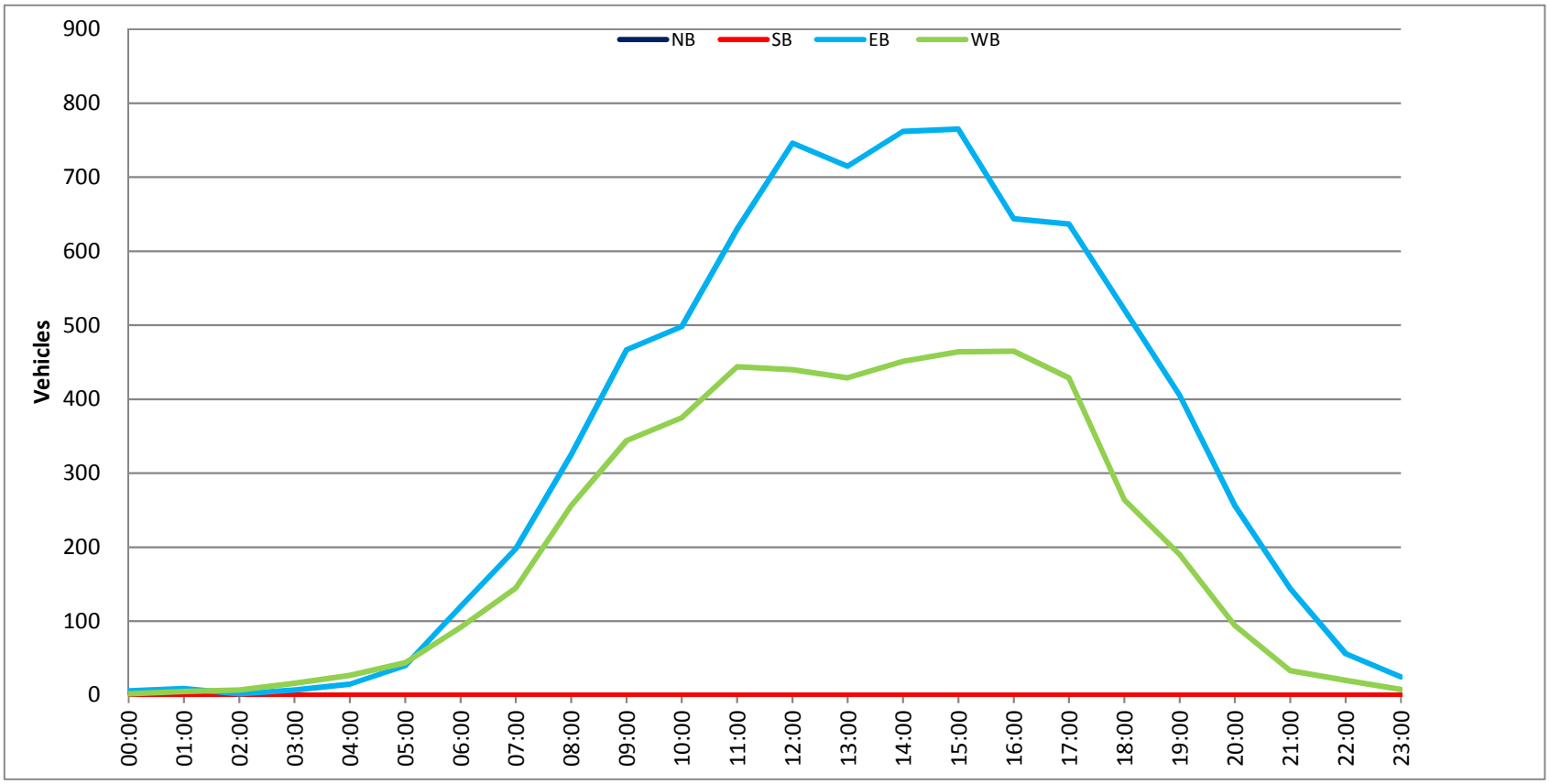
Joy Bhattacharya, PE, PTOE
Maria Tribelhorn, EIT

Appendix A TRAFFIC VOLUME COUNTS

Prepared by NDS/ATD

Project #: CA17_7715_001 **City:** Grass Valley

Location: W. McKnight Way W/O Taylorville Rd **Date:** 9/14/2017



Prepared by NDS/ATD

VOLUME

W. McKnight Way W/O Taylorville Rd

Day: Thursday
Date: 9/14/2017

City: Grass Valley
Project #: CA17_7715_001

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	7,993	5,044	13,037

AM Period	NB	SB	EB		WB		TOTAL		PM Period	NB	SB	EB		WB		TOTAL	
00:00			1		0		1		12:00			203		111		314	
00:15			0		2		2		12:15			179		116		295	
00:30			2		0		2		12:30			171		107		278	
00:45			3	6	0	2	3	8	12:45			193	746	106	440	299	1186
01:00			2		0		2		13:00			179		105		284	
01:15			3		1		4		13:15			180		109		289	
01:30			0		1		1		13:30			180		109		289	
01:45			4	9	3	5	7	14	13:45			176	715	106	429	282	1144
02:00			1		0		1		14:00			207		109		316	
02:15			1		0		1		14:15			208		115		323	
02:30			0		1		1		14:30			175		116		291	
02:45			0	2	6	7	6	9	14:45			172	762	111	451	283	1213
03:00			0		1		1		15:00			201		104		305	
03:15			0		4		4		15:15			165		116		281	
03:30			2		2		4		15:30			201		117		318	
03:45			5	7	9	16	14	23	15:45			198	765	127	464	325	1229
04:00			0		1		1		16:00			174		114		288	
04:15			3		5		8		16:15			152		125		277	
04:30			8		9		17		16:30			154		120		274	
04:45			4	15	12	27	16	42	16:45			164	644	106	465	270	1109
05:00			5		6		11		17:00			160		124		284	
05:15			7		4		11		17:15			170		121		291	
05:30			14		12		26		17:30			145		93		238	
05:45			14	40	22	44	36	84	17:45			162	637	91	429	253	1066
06:00			16		16		32		18:00			144		73		217	
06:15			26		20		46		18:15			133		67		200	
06:30			39		22		61		18:30			122		63		185	
06:45			39	120	34	92	73	212	18:45			122	521	61	264	183	785
07:00			26		28		54		19:00			108		55		163	
07:15			58		22		80		19:15			101		52		153	
07:30			43		48		91		19:30			96		44		140	
07:45			71	198	47	145	118	343	19:45			100	405	39	190	139	595
08:00			64		49		113		20:00			87		22		109	
08:15			73		47		120		20:15			62		38		100	
08:30			85		79		164		20:30			64		18		82	
08:45			103	325	81	256	184	581	20:45			43	256	16	94	59	350
09:00			107		65		172		21:00			45		9		54	
09:15			107		86		193		21:15			36		11		47	
09:30			127		90		217		21:30			28		9		37	
09:45			126	467	103	344	229	811	21:45			35	144	4	33	39	177
10:00			102		98		200		22:00			26		6		32	
10:15			124		87		211		22:15			12		8		20	
10:30			151		88		239		22:30			7		4		11	
10:45			121	498	102	375	223	873	22:45			11	56	2	20	13	76
11:00			150		98		248		23:00			9		3		12	
11:15			155		119		274		23:15			2		0		2	
11:30			152		125		277		23:30			7		3		10	
11:45			173	630	102	444	275	1074	23:45			7	25	2	8	9	33
TOTALS				2317		1757		4074	TOTALS				5676		3287		8963
SPLIT %				56.9%		43.1%		31.2%	SPLIT %				63.3%		36.7%		68.8%

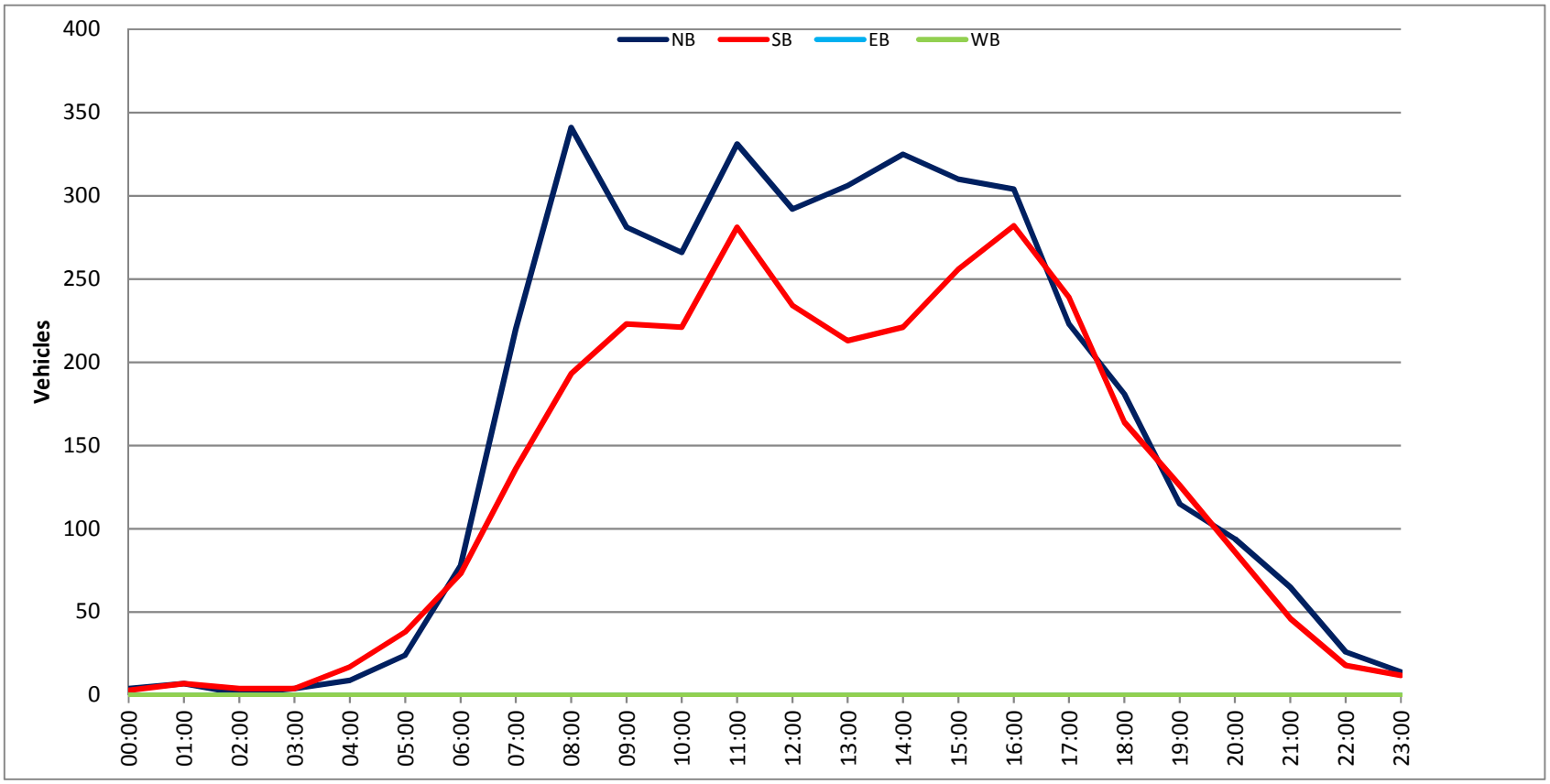
DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	7,993	5,044	13,037

AM Peak Hour			11:45	11:15	11:45	PM Peak Hour			13:30	15:45	15:00
AM Pk Volume			726	457	1162	PM Pk Volume			771	486	1229
Pk Hr Factor			0.894	0.914	0.925	Pk Hr Factor			0.927	0.957	0.945
7 - 9 Volume	0	0	523	401	924	4 - 6 Volume	0	0	1281	894	2175
7 - 9 Peak Hour			08:00	08:00	08:00	4 - 6 Peak Hour			16:30	16:15	16:30
7 - 9 Pk Volume	0	0	325	256	581	4 - 6 Pk Volume	0	0	648	475	1119
Pk Hr Factor	0.000	0.000	0.789	0.790	0.789	Pk Hr Factor	0.000	0.000	0.953	0.950	0.961

Prepared by NDS/ATD

Project #: CA17_7715_002 **City:** Grass Valley

Location: S. Auburn St N/O E. McKnight Way **Date:** 9/14/2017



Prepared by NDS/ATD

VOLUME

S. Auburn St N/O E. McKnight Way

Day: Thursday
Date: 9/14/2017

City: Grass Valley
Project #: CA17_7715_002

DAILY TOTALS	NB	SB	EB	WB	Total
	3,821	3,097	0	0	6,918

AM Period	NB		SB		EB	WB	TOTAL		PM Period	NB		SB		EB	WB	TOTAL	
00:00	0		3				3		12:00	77		56				133	
00:15	0		0				0		12:15	64		61				125	
00:30	2		0				2		12:30	68		62				130	
00:45	2	4	0	3			2	7	12:45	83	292	55	234			138	526
01:00	1		4				5		13:00	80		54				134	
01:15	1		1				2		13:15	73		49				122	
01:30	0		0				0		13:30	64		56				120	
01:45	5	7	2	7			7	14	13:45	89	306	54	213			143	519
02:00	1		2				3		14:00	71		44				115	
02:15	0		1				1		14:15	85		54				139	
02:30	0		1				1		14:30	75		67				142	
02:45	0	1	0	4			0	5	14:45	94	325	56	221			150	546
03:00	0		0				0		15:00	59		65				124	
03:15	1		0				1		15:15	80		64				144	
03:30	1		1				2		15:30	81		72				153	
03:45	2	4	3	4			5	8	15:45	90	310	55	256			145	566
04:00	1		1				2		16:00	77		65				142	
04:15	2		2				4		16:15	83		80				163	
04:30	2		8				10		16:30	68		83				151	
04:45	4	9	6	17			10	26	16:45	76	304	54	282			130	586
05:00	1		7				8		17:00	55		76				131	
05:15	3		6				9		17:15	67		57				124	
05:30	10		15				25		17:30	46		59				105	
05:45	10	24	10	38			20	62	17:45	55	223	47	239			102	462
06:00	15		11				26		18:00	54		47				101	
06:15	19		18				37		18:15	42		36				78	
06:30	18		19				37		18:30	48		44				92	
06:45	26	78	25	73			51	151	18:45	37	181	37	164			74	345
07:00	28		26				54		19:00	39		45				84	
07:15	47		31				78		19:15	26		38				64	
07:30	46		40				86		19:30	27		23				50	
07:45	99	220	39	136			138	356	19:45	23	115	20	126			43	241
08:00	83		30				113		20:00	27		24				51	
08:15	81		36				117		20:15	20		25				45	
08:30	80		68				148		20:30	26		18				44	
08:45	97	341	59	193			156	534	20:45	21	94	19	86			40	180
09:00	64		53				117		21:00	21		18				39	
09:15	67		56				123		21:15	19		11				30	
09:30	63		61				124		21:30	12		9				21	
09:45	87	281	53	223			140	504	21:45	13	65	8	46			21	111
10:00	68		53				121		22:00	9		8				17	
10:15	61		52				113		22:15	10		6				16	
10:30	65		54				119		22:30	3		3				6	
10:45	72	266	62	221			134	487	22:45	4	26	1	18			5	44
11:00	76		57				133		23:00	5		3				8	
11:15	88		82				170		23:15	4		4				8	
11:30	74		67				141		23:30	2		2				4	
11:45	93	331	75	281			168	612	23:45	3	14	3	12			6	26
TOTALS		1566		1200				**2766**	**TOTALS**		2255		1897				**4152**
SPLIT %		56.6%		43.4%				**40.0%**	**SPLIT %**		54.3%		45.7%				**60.0%**

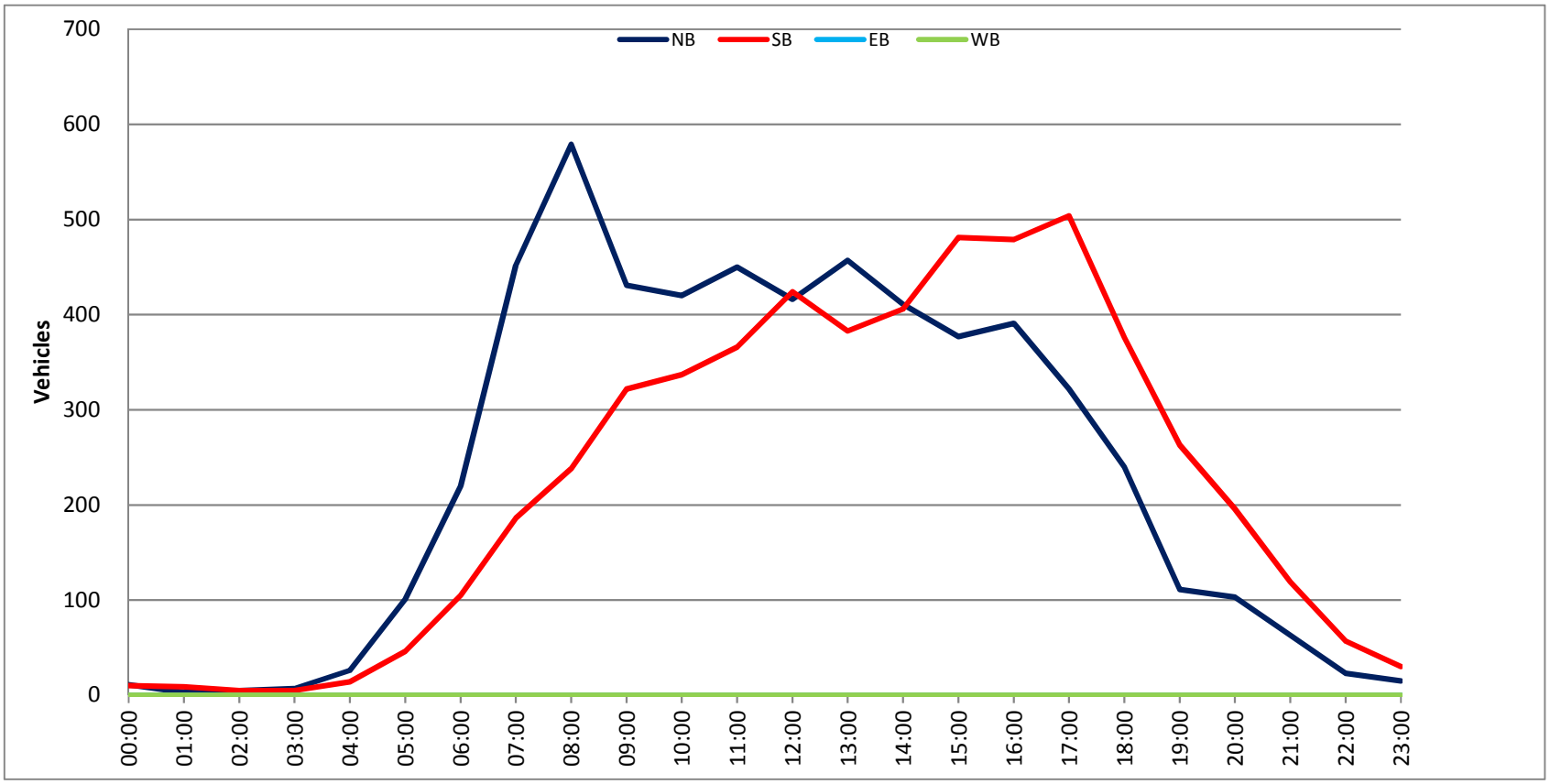
DAILY TOTALS	NB	SB	EB	WB	Total
	3,821	3,097	0	0	6,918

AM Peak Hour	07:45	11:00			**11:00**	**PM Peak Hour**	15:30	16:15			**15:30**
AM Pk Volume	343	281			**612**	**PM Pk Volume**	331	293			**603**
Pk Hr Factor	0.866	0.857			**0.900**	**Pk Hr Factor**	0.919	0.883			**0.925**
7 - 9 Volume	561	329	0	0	**890**	**4 - 6 Volume**	527	521	0	0	**1048**
7 - 9 Peak Hour	07:45	08:00			**08:00**	**4 - 6 Peak Hour**	16:00	16:15			**16:00**
7 - 9 Pk Volume	343	193	0	0	**534**	**4 - 6 Pk Volume**	304	293	0	0	**586**
Pk Hr Factor	0.866	0.710	0.000	0.000	**0.856**	**Pk Hr Factor**	0.916	0.883	0.000	0.000	**0.899**

Prepared by NDS/ATD

Project #: CA17_7715_003 **City:** Grass Valley

Location: La Barr Meadows Rd S/O Century 21 Dwy **Date:** 9/14/2017



Prepared by NDS/ATD

VOLUME

La Barr Meadows Rd S/O Century 21 Dwy

Day: Thursday
Date: 9/14/2017

City: Grass Valley
Project #: CA17_7715_003

DAILY TOTALS	NB	SB	EB	WB	Total
	5,634	5,361	0	0	10,995

AM Period	NB		SB		EB	WB	TOTAL		PM Period	NB		SB		EB	WB	TOTAL	
00:00	5		4				9		12:00	108		99				207	
00:15	0		1				1		12:15	92		110				202	
00:30	2		4				6		12:30	125		111				236	
00:45	4	11	1	10			5	21	12:45	91	416	104	424			195	840
01:00	1		5				6		13:00	100		87				187	
01:15	0		2				2		13:15	124		91				215	
01:30	0		0				0		13:30	104		102				206	
01:45	2	3	2	9			4	12	13:45	129	457	103	383			232	840
02:00	1		3				4		14:00	98		90				188	
02:15	0		1				1		14:15	112		118				230	
02:30	2		1				3		14:30	96		89				185	
02:45	2	5	0	5			2	10	14:45	105	411	109	406			214	817
03:00	1		2				3		15:00	81		118				199	
03:15	1		0				1		15:15	93		105				198	
03:30	1		1				2		15:30	103		131				234	
03:45	4	7	2	5			6	12	15:45	100	377	127	481			227	858
04:00	3		1				4		16:00	111		113				224	
04:15	4		3				7		16:15	90		140				230	
04:30	7		5				12		16:30	94		117				211	
04:45	12	26	5	14			17	40	16:45	96	391	109	479			205	870
05:00	10		8				18		17:00	83		145				228	
05:15	23		11				34		17:15	81		137				218	
05:30	27		16				43		17:30	78		112				190	
05:45	41	101	11	46			52	147	17:45	80	322	110	504			190	826
06:00	29		20				49		18:00	66		115				181	
06:15	47		38				85		18:15	51		98				149	
06:30	65		17				82		18:30	65		77				142	
06:45	79	220	30	105			109	325	18:45	58	240	86	376			144	616
07:00	65		22				87		19:00	30		84				114	
07:15	105		42				147		19:15	36		72				108	
07:30	130		64				194		19:30	22		53				75	
07:45	152	452	58	186			210	638	19:45	23	111	54	263			77	374
08:00	168		56				224		20:00	27		63				90	
08:15	147		63				210		20:15	28		52				80	
08:30	123		42				165		20:30	25		43				68	
08:45	141	579	77	238			218	817	20:45	23	103	38	196			61	299
09:00	86		85				171		21:00	25		42				67	
09:15	119		95				214		21:15	12		28				40	
09:30	112		73				185		21:30	12		34				46	
09:45	114	431	69	322			183	753	21:45	14	63	15	119			29	182
10:00	92		69				161		22:00	6		20				26	
10:15	102		78				180		22:15	7		15				22	
10:30	107		93				200		22:30	5		12				17	
10:45	119	420	97	337			216	757	22:45	5	23	10	57			15	80
11:00	107		75				182		23:00	7		9				16	
11:15	131		97				228		23:15	4		10				14	
11:30	99		105				204		23:30	1		5				6	
11:45	113	450	89	366			202	816	23:45	3	15	6	30			9	45
TOTALS		2705		1643				**4348**	**TOTALS**		2929		3718				**6647**
SPLIT %		62.2%		37.8%				**39.5%**	**SPLIT %**		44.1%		55.9%				**60.5%**

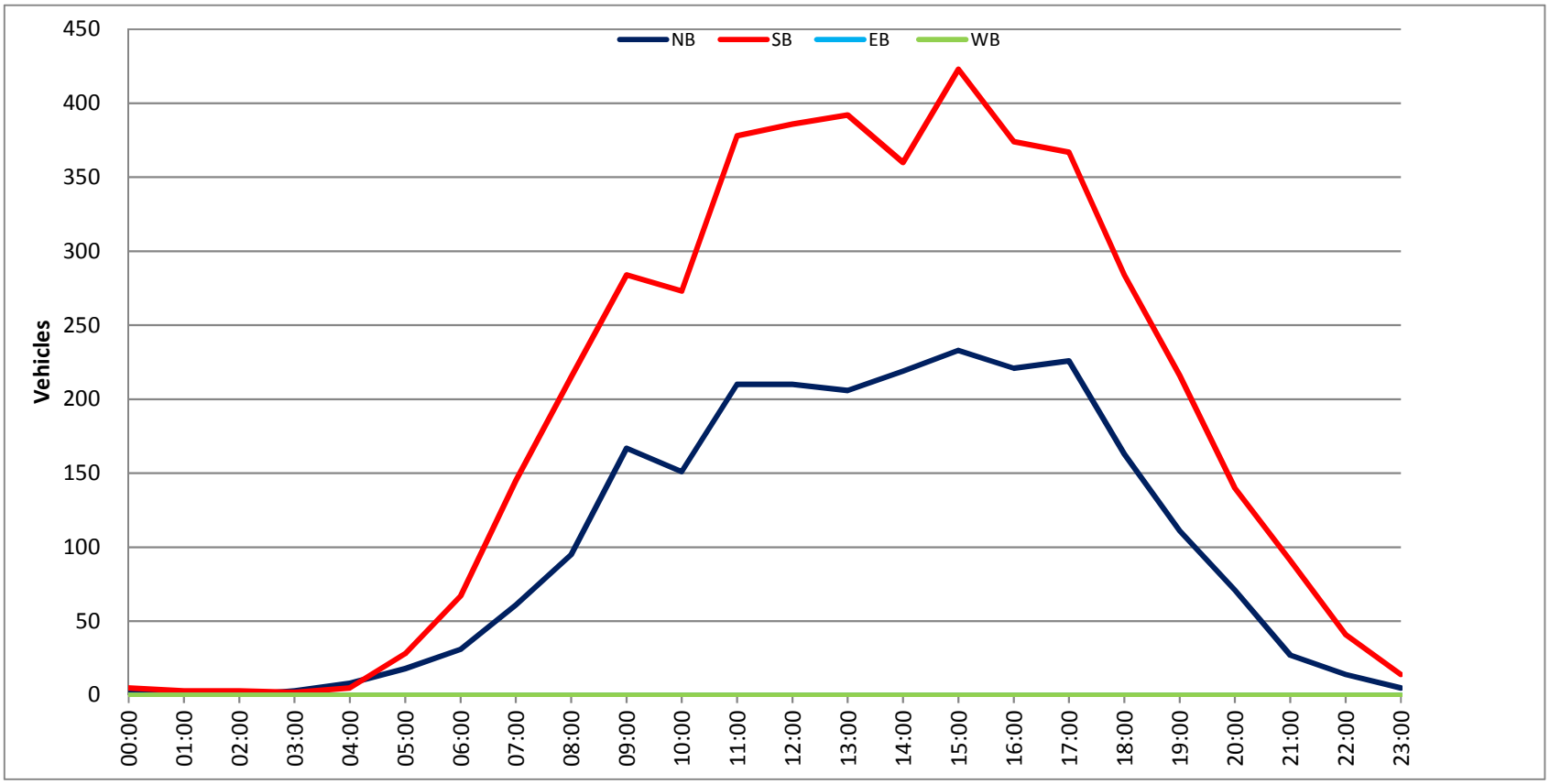
DAILY TOTALS	NB	SB	EB	WB	Total
	5,634	5,361	0	0	10,995

AM Peak Hour	07:30	11:45			**11:45**	**PM Peak Hour**	13:00	15:30			**15:30**
AM Pk Volume	597	409			**847**	**PM Pk Volume**	457	511			**915**
Pk Hr Factor	0.888	0.921			**0.897**	**Pk Hr Factor**	0.886	0.913			**0.978**
7 - 9 Volume	1031	424	0	0	**1455**	**4 - 6 Volume**	713	983	0	0	**1696**
7 - 9 Peak Hour	07:30	07:30			**07:30**	**4 - 6 Peak Hour**	16:00	16:15			**16:15**
7 - 9 Pk Volume	597	241	0	0	**838**	**4 - 6 Pk Volume**	391	511	0	0	**874**
Pk Hr Factor	0.888	0.941	0.000	0.000	**0.935**	**Pk Hr Factor**	0.881	0.881	0.000	0.000	**0.950**

Prepared by NDS/ATD

Project #: CA17_7715_004 **City:** Grass Valley

Location: Freeman Ln Bet. W. McKnight Way & **Date:** 9/14/2017



Prepared by NDS/ATD

VOLUME

Freeman Ln Bet. W. McKnight Way & JCPenney Dwy

Day: Thursday
Date: 9/14/2017

City: Grass Valley
Project #: CA17_7715_004

DAILY TOTALS	NB	SB	EB	WB	Total
	2,453	4,496	0	0	6,949

AM Period	NB		SB		EB	WB	TOTAL		PM Period	NB		SB		EB	WB	TOTAL	
00:00	1		1				2		12:00	54		117				171	
00:15	1		0				1		12:15	53		85				138	
00:30	0		0				0		12:30	53		87				140	
00:45	0	2	4	5			4	7	12:45	50	210	97	386			147	596
01:00	0		0				0		13:00	56		104				160	
01:15	0		3				3		13:15	49		104				153	
01:30	1		0				1		13:30	47		88				135	
01:45	0	1	0	3			0	4	13:45	54	206	96	392			150	598
02:00	0		1				1		14:00	49		93				142	
02:15	0		1				1		14:15	63		105				168	
02:30	0		1				1		14:30	66		80				146	
02:45	0		0	3			0	3	14:45	41	219	82	360			123	579
03:00	1		0				1		15:00	58		124				182	
03:15	1		0				1		15:15	62		99				161	
03:30	0		0				0		15:30	62		102				164	
03:45	1	3	2	2			3	5	15:45	51	233	98	423			149	656
04:00	0		0				0		16:00	64		88				152	
04:15	0		0				0		16:15	47		113				160	
04:30	4		3				7		16:30	55		82				137	
04:45	4	8	2	5			6	13	16:45	55	221	91	374			146	595
05:00	2		2				4		17:00	58		93				151	
05:15	1		6				7		17:15	62		97				159	
05:30	4		10				14		17:30	52		79				131	
05:45	11	18	10	28			21	46	17:45	54	226	98	367			152	593
06:00	6		9				15		18:00	50		85				135	
06:15	8		15				23		18:15	32		61				93	
06:30	11		24				35		18:30	46		70				116	
06:45	6	31	19	67			25	98	18:45	35	163	68	284			103	447
07:00	8		21				29		19:00	32		63				95	
07:15	12		44				56		19:15	30		61				91	
07:30	24		28				52		19:30	18		42				60	
07:45	17	61	52	145			69	206	19:45	31	111	50	216			81	327
08:00	20		42				62		20:00	18		43				61	
08:15	14		49				63		20:15	18		37				55	
08:30	30		51				81		20:30	19		34				53	
08:45	31	95	73	215			104	310	20:45	16	71	26	140			42	211
09:00	43		70				113		21:00	10		32				42	
09:15	49		72				121		21:15	7		27				34	
09:30	36		62				98		21:30	7		18				25	
09:45	39	167	80	284			119	451	21:45	3	27	14	91			17	118
10:00	37		47				84		22:00	8		16				24	
10:15	35		78				113		22:15	3		6				9	
10:30	32		76				108		22:30	3		8				11	
10:45	47	151	72	273			119	424	22:45	0	14	11	41			11	55
11:00	42		95				137		23:00	2		5				7	
11:15	46		82				128		23:15	2		2				4	
11:30	77		92				169		23:30	0		5				5	
11:45	45	210	109	378			154	588	23:45	1	5	2	14			3	19
TOTALS		747		1408				2155	TOTALS		1706		3088				4794
SPLIT %		34.7%		65.3%				31.0%	SPLIT %		35.6%		64.4%				69.0%

DAILY TOTALS	NB	SB	EB	WB	Total
	2,453	4,496	0	0	6,949

AM Peak Hour	11:30	11:30			11:30	PM Peak Hour	15:15	15:00			15:00
AM Pk Volume	229	403			632	PM Pk Volume	239	423			656
Pk Hr Factor	0.744	0.861			0.924	Pk Hr Factor	0.934	0.853			0.901
7 - 9 Volume	156	360	0	0	516	4 - 6 Volume	447	741	0	0	1188
7 - 9 Peak Hour	08:00	08:00			08:00	4 - 6 Peak Hour	16:30	16:15			16:00
7 - 9 Pk Volume	95	215	0	0	310	4 - 6 Pk Volume	230	379	0	0	595
Pk Hr Factor	0.766	0.736	0.000	0.000	0.745	Pk Hr Factor	0.927	0.838	0.000	0.000	0.930

Prepared by National Data & Surveying Services

S. Auburn St & E. McKnight Way

Peak Hour Turning Movement Count

ID: 17-7714-001
City: Grass Valley

Day: Thursday
Date: 09/14/2017

PEAK HOURS

AM: 08:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 05:00 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

S. Auburn St — SOUTHBOUND

AM	105	61	25	0	339	AM
NOON	0	0	0	0	0	NOON
PM	150	98	33	0	307	PM

E. McKnight Way — EASTBOUND

AM	NOON	PM	
513	0	464	
0	0	0	0
137	0	168	0
86	0	65	0
170	0	364	0
AM	NOON	PM	

E. McKnight Way — WESTBOUND

PM	NOON	AM	
27	0	30	0
65	0	39	0
25	0	17	0
0	0	0	0
103	0	131	
PM	NOON	AM	

CONTROL

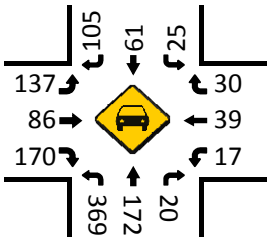
0

TEV	1232 AM	0 NOON	1361 PM
PHF	0.91		0.92

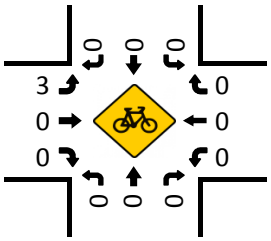
S. Auburn St — NORTHBOUND

PM	487	0	249	112	5	PM
NOON	0	0	0	0	0	NOON
AM	249	1	369	172	20	AM

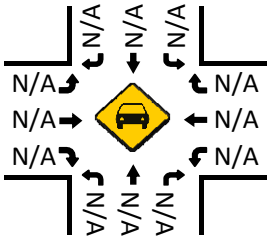
Total Vehicles (AM)



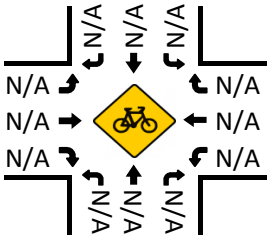
Bikes (AM)



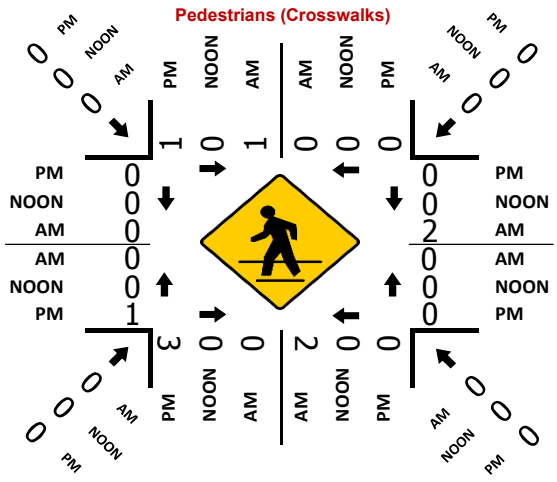
Total Vehicles (NOON)



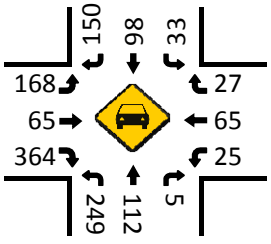
Bikes (NOON)



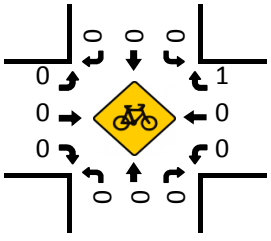
Pedestrians (Crosswalks)



Total Vehicles (PM)



Bikes (PM)



ALL TRAFFIC DATA

(916) 771-8700
orders@atdtraffic.com

File Name : 17-7714-001
Date : 09/14/2017

Unshifted Count = All Vehicles & Uturns

	S. Auburn St Southbound					E. McKnight Way Westbound					S. Auburn St Northbound					E. McKnight Way Eastbound						
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total	Uturns Total
7:00	8	4	15	0	27	3	8	6	0	17	63	15	1	0	79	9	10	15	1	35	158	1
7:15	5	10	12	0	27	6	7	2	0	15	75	29	3	0	107	11	13	33	0	57	206	0
7:30	9	13	19	0	41	4	22	3	0	29	89	27	3	0	119	21	22	39	0	82	271	0
7:45	6	7	27	0	40	4	17	7	0	28	120	53	0	0	173	31	23	42	0	96	337	0
Total	28	34	73	0	135	17	54	18	0	89	347	124	7	0	478	72	68	129	1	270	972	1
8:00	7	9	13	0	29	6	8	9	0	23	98	36	4	1	139	38	22	48	0	108	299	1
8:15	4	13	22	0	39	5	12	14	0	31	91	42	4	0	137	32	14	44	0	90	297	0
8:30	10	18	33	0	61	2	12	4	0	18	91	37	3	0	131	28	28	31	0	87	297	0
8:45	4	21	37	0	62	4	7	3	0	14	89	57	9	0	155	39	22	47	0	108	339	0
Total	25	61	105	0	191	17	39	30	0	86	369	172	20	1	562	137	86	170	0	393	1232	1
16:00	5	25	30	0	60	4	16	6	0	26	54	30	0	0	84	51	17	100	0	168	338	0
16:15	10	33	46	0	89	7	14	5	0	26	63	28	2	0	93	43	15	102	0	160	368	0
16:30	13	21	39	0	73	9	20	9	0	38	56	25	0	0	81	40	19	80	0	139	331	0
16:45	5	19	35	0	59	5	15	7	0	27	76	29	3	0	108	34	14	82	0	130	324	0
Total	33	98	150	0	281	25	65	27	0	117	249	112	5	0	366	168	65	364	0	597	1361	0
17:00	5	25	36	0	66	1	8	1	0	10	54	19	0	0	73	42	18	106	0	166	315	0
17:15	5	22	36	0	63	7	14	6	0	27	59	23	1	0	83	33	19	100	0	152	325	0
17:30	8	17	34	0	59	5	17	4	0	26	55	12	1	0	68	25	15	78	0	118	271	0
17:45	4	13	26	0	43	6	13	3	0	22	61	20	0	0	81	43	17	90	0	150	296	0
Total	22	77	132	0	231	19	52	14	0	85	229	74	2	0	305	143	69	374	0	586	1207	0
Grand Total	108	270	460	0	838	78	210	89	0	377	1194	482	34	1	1711	520	288	1037	1	1846	4772	2
Apprch %	12.9%	32.2%	54.9%	0.0%		20.7%	55.7%	23.6%	0.0%		69.8%	28.2%	2.0%	0.1%		28.2%	15.6%	56.2%	0.1%			
Total %	2.3%	5.7%	9.6%	0.0%	17.6%	1.6%	4.4%	1.9%	0.0%	7.9%	25.0%	10.1%	0.7%	0.0%	35.9%	10.9%	6.0%	21.7%	0.0%	38.7%	100.0%	

AM PEAK HOUR	S. Auburn St Southbound					E. McKnight Way Westbound					S. Auburn St Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 08:00 to 09:00																					
Peak Hour For Entire Intersection Begins at 08:00																					
8:00	7	9	13	0	29	6	8	9	0	23	98	36	4	1	139	38	22	48	0	108	299
8:15	4	13	22	0	39	5	12	14	0	31	91	42	4	0	137	32	14	44	0	90	297
8:30	10	18	33	0	61	2	12	4	0	18	91	37	3	0	131	28	28	31	0	87	297
8:45	4	21	37	0	62	4	7	3	0	14	89	57	9	0	155	39	22	47	0	108	339
Total Volume	25	61	105	0	191	17	39	30	0	86	369	172	20	1	562	137	86	170	0	393	1232
% App Total	13.1%	31.9%	55.0%	0.0%		19.8%	45.3%	34.9%	0.0%		65.7%	30.6%	3.6%	0.2%		34.9%	21.9%	43.3%	0.0%		
PHF	.625	.726	.709	.000	.770	.708	.813	.536	.000	.694	.941	.754	.556	.250	.906	.878	.768	.885	.000	.910	.909

PM PEAK HOUR	S. Auburn St Southbound					E. McKnight Way Westbound					S. Auburn St Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 16:00 to 17:00																					
Peak Hour For Entire Intersection Begins at 16:00																					
16:00	5	25	30	0	60	4	16	6	0	26	54	30	0	0	84	51	17	100	0	168	338
16:15	10	33	46	0	89	7	14	5	0	26	63	28	2	0	93	43	15	102	0	160	368
16:30	13	21	39	0	73	9	20	9	0	38	56	25	0	0	81	40	19	80	0	139	331
16:45	5	19	35	0	59	5	15	7	0	27	76	29	3	0	108	34	14	82	0	130	324
Total Volume	33	98	150	0	281	25	65	27	0	117	249	112	5	0	366	168	65	364	0	597	1361
% App Total	11.7%	34.9%	53.4%	0.0%		21.4%	55.6%	23.1%	0.0%		68.0%	30.6%	1.4%	0.0%		28.1%	10.9%	61.0%	0.0%		
PHF	.635	.742	.815	.000	.789	.694	.813	.750	.000	.770	.819	.933	.417	.000	.847	.824	.855	.892	.000	.888	.925

Prepared by National Data & Surveying Services

Hwy 49 NB Ramps & E. McKnight Way

Peak Hour Turning Movement Count

ID: 17-7714-002
City: Grass Valley

Day: Thursday
Date: 09/14/2017

PEAK HOURS

AM: 08:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 05:00 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

Hwy 49 NB Ramps — SOUTHBOUND

AM	0	0	0	0	444	AM
NOON	0	0	0	0	0	NOON
PM	0	0	0	0	458	PM

E. McKnight Way — EASTBOUND

AM	NOON	PM	
311	0	365	⇦
0	0	0	↶ 0
134	0	236	↱ 0
312	0	536	→ 0
0	0	0	↷ 0
AM	NOON	PM	

E. McKnight Way — WESTBOUND

PM	NOON	AM	
221	0	309	0 ↰
240	0	204	0 ←
0	0	0	0 ↶
0	0	0	0 ↷
597	0	393	⇨
PM	NOON	AM	

CONTROL

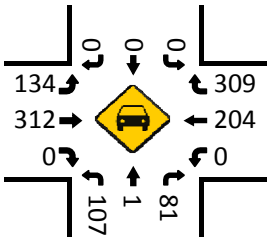
0

TEV	1148	0	1420
	AM	NOON	PM
PHF	0.95		0.95

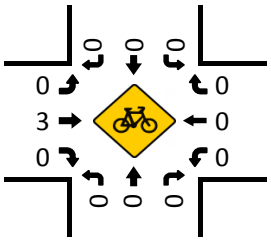
Hwy 49 NB Ramps — NORTHBOUND

PM	0	0	125	1	61	PM
NOON	0	0	0	0	0	NOON
AM	0	0	107	1	81	AM

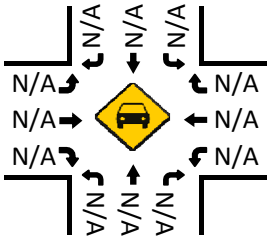
Total Vehicles (AM)



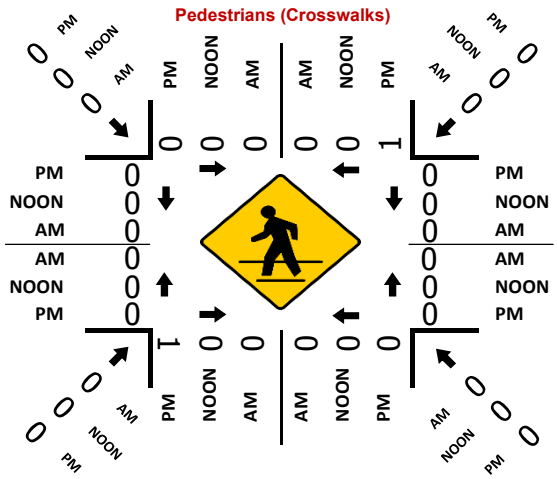
Bikes (AM)



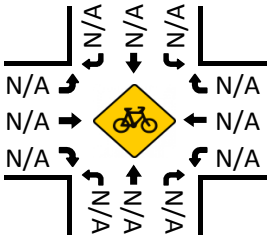
Total Vehicles (NOON)



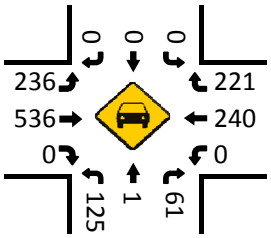
Pedestrians (Crosswalks)



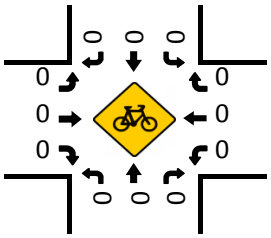
Bikes (NOON)



Total Vehicles (PM)



Bikes (PM)



ALL TRAFFIC DATA

(916) 771-8700
orders@atdtraffic.com

File Name : 17-7714-002
Date : 09/14/2017

Unshifted Count = All Vehicles & Uturns

	Hwy 49 NB Ramps Southbound					E. McKnight Way Westbound					Hwy 49 NB Ramps Northbound					E. McKnight Way Eastbound						
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total	Uturns Total
7:00	0	0	0	0	0	0	37	49	0	86	14	0	7	0	21	16	27	0	1	44	151	1
7:15	0	0	0	0	0	0	34	62	0	96	18	0	10	0	28	22	47	0	0	69	193	0
7:30	0	0	0	0	0	0	46	84	0	130	13	0	19	0	32	28	64	0	0	92	254	0
7:45	0	0	0	0	0	0	53	110	0	163	17	0	18	0	35	26	76	0	0	102	300	0
Total	0	0	0	0	0	0	170	305	0	475	62	0	54	0	116	92	214	0	1	307	898	1
8:00	0	0	0	0	0	0	35	85	0	120	27	0	27	0	54	31	81	0	0	112	286	0
8:15	0	0	0	0	0	0	44	77	0	121	24	0	18	0	42	26	74	0	0	100	263	0
8:30	0	0	0	0	0	0	64	78	0	142	31	0	14	0	45	40	71	0	0	111	298	0
8:45	0	0	0	0	0	0	61	69	0	130	25	1	22	0	48	37	86	0	0	123	301	0
Total	0	0	0	0	0	0	204	309	0	513	107	1	81	0	189	134	312	0	0	446	1148	0
16:00	0	0	0	0	0	0	54	47	0	101	31	0	19	0	50	63	149	0	0	212	363	0
16:15	0	0	0	0	0	0	66	57	0	123	37	0	18	0	55	52	142	0	0	194	372	0
16:30	0	0	0	0	0	0	57	54	0	111	26	1	15	0	42	56	126	0	0	182	335	0
16:45	0	0	0	0	0	0	63	63	0	126	31	0	9	0	40	65	119	0	0	184	350	0
Total	0	0	0	0	0	0	240	221	0	461	125	1	61	0	187	236	536	0	0	772	1420	0
17:00	0	0	0	0	0	0	48	48	0	96	16	0	15	0	31	59	153	0	0	212	339	0
17:15	0	0	0	0	0	0	60	47	0	107	33	0	14	0	47	58	135	0	0	193	347	0
17:30	0	0	0	0	0	0	62	46	0	108	18	0	5	0	23	57	116	0	0	173	304	0
17:45	0	0	0	0	0	0	56	45	0	101	24	0	13	0	37	51	135	0	0	186	324	0
Total	0	0	0	0	0	0	226	186	0	412	91	0	47	0	138	225	539	0	0	764	1314	0
Grand Total	0	0	0	0	0	0	840	1021	0	1861	385	2	243	0	630	687	1601	0	1	2289	4780	1
Apprch %	0.0%	0.0%	0.0%	0.0%		0.0%	45.1%	54.9%	0.0%		61.1%	0.3%	38.6%	0.0%		30.0%	69.9%	0.0%	0.0%			
Total %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	17.6%	21.4%	0.0%	38.9%	8.1%	0.0%	5.1%	0.0%	13.2%	14.4%	33.5%	0.0%	0.0%	47.9%	100.0%	

AM PEAK HOUR	Hwy 49 NB Ramps Southbound					E. McKnight Way Westbound					Hwy 49 NB Ramps Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 08:00 to 09:00																					
Peak Hour For Entire Intersection Begins at 08:00																					
8:00	0	0	0	0	0	0	35	85	0	120	27	0	27	0	54	31	81	0	0	112	286
8:15	0	0	0	0	0	0	44	77	0	121	24	0	18	0	42	26	74	0	0	100	263
8:30	0	0	0	0	0	0	64	78	0	142	31	0	14	0	45	40	71	0	0	111	298
8:45	0	0	0	0	0	0	61	69	0	130	25	1	22	0	48	37	86	0	0	123	301
Total Volume	0	0	0	0	0	0	204	309	0	513	107	1	81	0	189	134	312	0	0	446	1148
% App Total	0.0%	0.0%	0.0%	0.0%		0.0%	39.8%	60.2%	0.0%		56.6%	0.5%	42.9%	0.0%		30.0%	70.0%	0.0%	0.0%		
PHF	.000	.000	.000	.000	.000	.000	.797	.909	.000	.903	.863	.250	.750	.000	.875	.838	.907	.000	.000	.907	.953

PM PEAK HOUR	Hwy 49 NB Ramps Southbound					E. McKnight Way Westbound					Hwy 49 NB Ramps Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 16:00 to 17:00																					
Peak Hour For Entire Intersection Begins at 16:00																					
16:00	0	0	0	0	0	0	54	47	0	101	31	0	19	0	50	63	149	0	0	212	363
16:15	0	0	0	0	0	0	66	57	0	123	37	0	18	0	55	52	142	0	0	194	372
16:30	0	0	0	0	0	0	57	54	0	111	26	1	15	0	42	56	126	0	0	182	335
16:45	0	0	0	0	0	0	63	63	0	126	31	0	9	0	40	65	119	0	0	184	350
Total Volume	0	0	0	0	0	0	240	221	0	461	125	1	61	0	187	236	536	0	0	772	1420
% App Total	0.0%	0.0%	0.0%	0.0%		0.0%	52.1%	47.9%	0.0%		66.8%	0.5%	32.6%	0.0%		30.6%	69.4%	0.0%	0.0%		
PHF	.000	.000	.000	.000	.000	.000	.909	.877	.000	.915	.845	.250	.803	.000	.850	.908	.899	.000	.000	.910	.954

Prepared by National Data & Surveying Services

Hwy 49 SB Ramps & E. McKnight Way

Peak Hour Turning Movement Count

ID: 17-7714-003
City: Grass Valley

Day: Thursday
Date: 09/14/2017

PEAK HOURS

AM: 08:00 AM - 09:00 AM
NOON: NONE
PM: 04:30 PM - 05:30 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

Hwy 49 SB Ramps — SOUTHBOUND

AM	237	2	183	0	0	AM
NOON	0	0	0	0	0	NOON
PM	446	0	281	0	0	PM

E. McKnight Way — EASTBOUND

AM	NOON	PM	
503	0	726	
0	0	0	0
0	0	0	0
267	0	494	0
71	0	186	0
AM	NOON	PM	

CONTROL

0

TEV	1066 AM	0 NOON	1741 PM
PHF	0.90		0.96

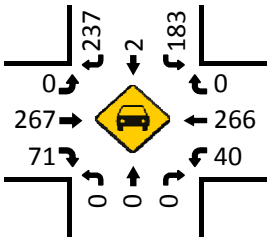
E. McKnight Way — WESTBOUND

PM	NOON	AM	
0	0	0	0
280	0	266	0
54	0	40	0
0	0	0	0
775	0	450	
PM	NOON	AM	

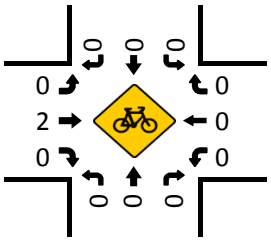
Hwy 49 SB Ramps — NORTHBOUND

PM	240	0	0	0	0	PM
NOON	0	0	0	0	0	NOON
AM	113	0	0	0	0	AM

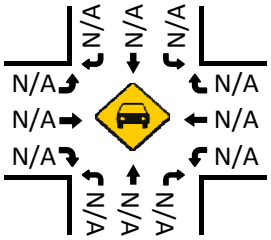
Total Vehicles (AM)



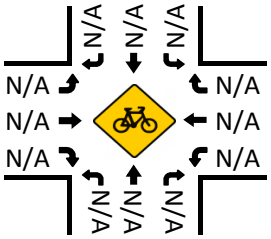
Bikes (AM)



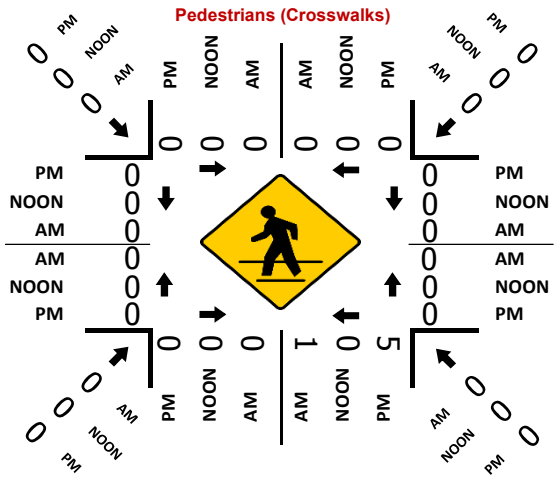
Total Vehicles (NOON)



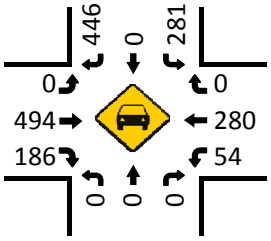
Bikes (NOON)



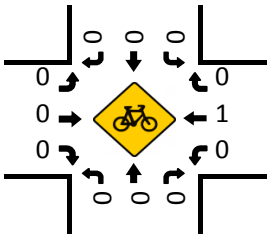
Pedestrians (Crosswalks)



Total Vehicles (PM)



Bikes (PM)



ALL TRAFFIC DATA

(916) 771-8700
orders@atdtraffic.com

File Name : 17-7714-003
Date : 09/14/2017

Unshifted Count = All Vehicles & Uturns

	Hwy 49 SB Ramps Southbound					E. McKnight Way Westbound					Hwy 49 SB Ramps Northbound					E. McKnight Way Eastbound						
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total	Uturns Total
7:00	16	0	19	0	35	8	44	0	0	52	0	0	0	0	0	0	27	16	0	43	130	0
7:15	30	0	21	0	51	7	45	0	0	52	0	0	0	0	0	0	40	14	0	54	157	0
7:30	45	0	43	0	88	9	45	0	0	54	0	0	0	0	0	0	44	8	0	52	194	0
7:45	46	0	44	0	90	9	66	0	0	75	0	0	0	0	0	0	56	14	0	70	235	0
Total	137	0	127	0	264	33	200	0	0	233	0	0	0	0	0	0	167	52	0	219	716	0
8:00	59	1	41	0	101	7	49	0	0	56	0	0	0	0	0	0	58	16	0	74	231	0
8:15	44	0	61	0	105	11	61	0	0	72	0	0	0	0	0	0	54	20	0	74	251	0
8:30	34	0	76	0	110	15	75	0	0	90	0	0	0	0	0	0	80	15	0	95	295	0
8:45	46	1	59	0	106	7	81	0	0	88	0	0	0	0	0	0	75	20	0	95	289	0
Total	183	2	237	0	422	40	266	0	0	306	0	0	0	0	0	0	267	71	0	338	1066	0
16:00	74	1	99	0	174	15	70	0	0	85	0	0	0	0	0	0	136	54	0	190	449	0
16:15	90	1	113	0	204	14	87	0	0	101	0	0	0	0	0	0	109	32	0	141	446	0
16:30	63	0	101	0	164	17	70	0	0	87	0	0	0	0	0	0	114	52	0	166	417	0
16:45	60	0	101	0	161	11	80	0	0	91	0	0	0	0	0	0	131	34	0	165	417	0
Total	287	2	414	0	703	57	307	0	0	364	0	0	0	0	0	0	490	172	0	662	1729	0
17:00	72	0	136	0	208	11	56	0	0	67	0	0	0	0	0	0	133	45	0	178	453	0
17:15	86	0	108	0	194	15	74	0	0	89	0	0	0	0	0	0	116	55	0	171	454	0
17:30	62	0	105	0	167	12	72	0	0	84	0	0	0	0	0	0	101	54	0	155	406	0
17:45	71	0	69	0	140	9	68	0	0	77	0	0	0	0	0	0	125	31	0	156	373	0
Total	291	0	418	0	709	47	270	0	0	317	0	0	0	0	0	0	475	185	0	660	1686	0
Grand Total	898	4	1196	0	2098	177	1043	0	0	1220	0	0	0	0	0	0	1399	480	0	1879	5197	0
Apprch %	42.8%	0.2%	57.0%	0.0%		14.5%	85.5%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%		0.0%	74.5%	25.5%	0.0%			
Total %	17.3%	0.1%	23.0%	0.0%	40.4%	3.4%	20.1%	0.0%	0.0%	23.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	26.9%	9.2%	0.0%	36.2%	100.0%	

AM PEAK HOUR	Hwy 49 SB Ramps Southbound					E. McKnight Way Westbound					Hwy 49 SB Ramps Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 08:00 to 09:00																					
Peak Hour For Entire Intersection Begins at 08:00																					
8:00	59	1	41	0	101	7	49	0	0	56	0	0	0	0	0	0	58	16	0	74	231
8:15	44	0	61	0	105	11	61	0	0	72	0	0	0	0	0	0	54	20	0	74	251
8:30	34	0	76	0	110	15	75	0	0	90	0	0	0	0	0	0	80	15	0	95	295
8:45	46	1	59	0	106	7	81	0	0	88	0	0	0	0	0	0	75	20	0	95	289
Total Volume	183	2	237	0	422	40	266	0	0	306	0	0	0	0	0	0	267	71	0	338	1066
% App Total	43.4%	0.5%	56.2%	0.0%		13.1%	86.9%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%		0.0%	79.0%	21.0%	0.0%		
PHF	.775	.500	.780	.000	.959	.667	.821	.000	.000	.850	.000	.000	.000	.000	.000	.000	.834	.888	.000	.889	.903

PM PEAK HOUR	Hwy 49 SB Ramps Southbound					E. McKnight Way Westbound					Hwy 49 SB Ramps Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 16:30 to 17:30																					
Peak Hour For Entire Intersection Begins at 16:30																					
16:30	63	0	101	0	164	17	70	0	0	87	0	0	0	0	0	0	114	52	0	166	417
16:45	60	0	101	0	161	11	80	0	0	91	0	0	0	0	0	0	131	34	0	165	417
17:00	72	0	136	0	208	11	56	0	0	67	0	0	0	0	0	0	133	45	0	178	453
17:15	86	0	108	0	194	15	74	0	0	89	0	0	0	0	0	0	116	55	0	171	454
Total Volume	281	0	446	0	727	54	280	0	0	334	0	0	0	0	0	0	494	186	0	680	1741
% App Total	38.7%	0.0%	61.3%	0.0%		16.2%	83.8%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%		0.0%	72.6%	27.4%	0.0%		
PHF	.817	.000	.820	.000	.874	.794	.875	.000	.000	.918	.000	.000	.000	.000	.000	.000	.929	.845	.000	.955	.959

Prepared by National Data & Surveying Services

Taylorville Rd & E. McKnight Way

Peak Hour Turning Movement Count

ID: 17-7714-004
City: Grass Valley

Day: Thursday
Date: 09/14/2017

	PEAK HOURS	COUNT PERIODS
AM	08:00 AM - 09:00 AM	07:00 AM - 09:00 AM
NOON	NONE	NONE
PM	04:30 PM - 05:30 PM	04:00 PM - 06:00 PM

Taylorville Rd — SOUTHBOUND

	Right	Thru	Left	U-Turn	Departing (NB)
AM	4	0	0	0	235
NOON	0	0	0	0	0
PM	22	1	0	0	255
	0	0	0	0	

E. McKnight Way — EASTBOUND

	AM	NOON	PM	
Departing (WB)	256	0	470	
U-Turn	0	0	0	0
Left	1	0	0	0
Thru	324	0	650	0
Right	2	0	1	0

E. McKnight Way — WESTBOUND

		PM	NOON	AM
Right	0	255	0	234
Thru	0	448	0	252
Left	0	26	0	19
U-Turn	0	0	0	0
Departing (EB)		680	0	339

Taylorville Rd — NORTHBOUND

	Departing (SB)	U-Turn	Left	Thru	Right
		0	0	0	0
PM	28	0	0	0	30
NOON	0	0	0	0	0
AM	21	0	0	0	15

CONTROL

0

	AM	NOON	PM
TEV	851	0	1433
PHF	0.86		0.96

Total Vehicles (AM)

Approach	Left	Thru	Right
Southbound	0	0	4
Eastbound	1	324	2
Westbound	19	252	234
Northbound	0	0	15

Southbound U-turn: 0; Northbound U-turn: 0

Total Vehicles (NOON)

All movements: N/A

Total Vehicles (PM)

Approach	Left	Thru	Right
Southbound	0	1	22
Eastbound	0	650	1
Westbound	26	448	255
Northbound	0	0	30

Northbound U-turn: 0

Bikes (AM)

Approach	Left	Thru	Right
Southbound	0	0	0
Eastbound	0	2	0
Westbound	0	0	0
Northbound	0	0	0

Bikes (NOON)

All movements: N/A

Bikes (PM)

Approach	Left	Thru	Right
Southbound	0	0	0
Eastbound	0	0	0
Westbound	0	0	0
Northbound	0	0	0

Pedestrians (Crosswalks)

Crosswalk	Direction	AM	NOON	PM
North	Eastbound	0	0	0
North	Westbound	0	0	0
West	Southbound	0	0	0
West	Northbound	0	0	0
East	Southbound	0	0	0
East	Northbound	0	0	0
South	Eastbound	1	0	0
South	Westbound	2	0	6
NW diagonal		0	0	0
NE diagonal		0	0	0
SW diagonal		0	0	0
SE diagonal		0	0	0

ALL TRAFFIC DATA

(916) 771-8700
orders@atdtraffic.com

File Name : 17-7714-004
Date : 09/14/2017

Unshifted Count = All Vehicles & Uturns

	Taylorville Rd Southbound					E. McKnight Way Westbound					Taylorville Rd Northbound					E. McKnight Way Eastbound						
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total	Uturns Total
7:00	0	0	0	0	0	0	25	36	0	61	0	0	3	0	3	0	38	1	0	39	103	0
7:15	0	0	0	0	0	1	25	41	0	67	0	0	1	0	1	0	53	1	0	54	122	0
7:30	0	0	2	0	2	2	40	47	0	89	0	0	3	0	3	0	50	2	0	52	146	0
7:45	0	0	0	0	0	6	53	51	0	110	0	0	5	0	5	0	63	2	0	65	180	0
Total	0	0	2	0	2	9	143	175	0	327	0	0	12	0	12	0	204	6	0	210	551	0
8:00	0	0	1	0	1	3	47	40	0	90	0	0	2	0	2	0	73	0	0	73	166	0
8:15	0	0	2	0	2	5	45	71	0	121	0	0	5	0	5	0	68	1	0	69	197	0
8:30	0	0	0	0	0	4	81	69	0	154	0	0	4	0	4	0	89	1	0	90	248	0
8:45	0	0	1	0	1	7	79	54	0	140	0	0	4	0	4	1	94	0	0	95	240	0
Total	0	0	4	0	4	19	252	234	0	505	0	0	15	0	15	1	324	2	0	327	851	0
16:00	0	0	6	0	6	5	103	63	0	171	0	0	7	0	7	0	183	1	0	184	368	0
16:15	0	1	4	0	5	6	132	61	0	199	0	0	4	0	4	0	141	1	0	142	350	0
16:30	0	0	3	0	3	4	110	60	0	174	0	0	4	0	4	0	159	1	0	160	341	0
16:45	0	0	6	0	6	7	109	65	0	181	0	0	8	0	8	0	158	0	0	158	353	0
Total	0	1	19	0	20	22	454	249	0	725	0	0	23	0	23	0	641	3	0	644	1412	0
17:00	0	1	5	0	6	9	116	65	0	190	0	0	8	0	8	0	169	0	0	169	373	0
17:15	0	0	8	0	8	6	113	65	0	184	0	0	10	0	10	0	164	0	0	164	366	0
17:30	0	0	4	0	4	4	99	71	0	174	0	0	2	0	2	0	151	0	0	151	331	0
17:45	0	0	1	0	1	6	84	49	0	139	0	0	3	0	3	1	153	1	0	155	298	0
Total	0	1	18	0	19	25	412	250	0	687	0	0	23	0	23	1	637	1	0	639	1368	0
Grand Total	0	2	43	0	45	75	1261	908	0	2244	0	0	73	0	73	2	1806	12	0	1820	4182	0
Apprch %	0.0%	4.4%	95.6%	0.0%		3.3%	56.2%	40.5%	0.0%		0.0%	0.0%	100.0%	0.0%		0.1%	99.2%	0.7%	0.0%			
Total %	0.0%	0.0%	1.0%	0.0%	1.1%	1.8%	30.2%	21.7%	0.0%	53.7%	0.0%	0.0%	1.7%	0.0%	1.7%	0.0%	43.2%	0.3%	0.0%	43.5%	100.0%	

AM PEAK HOUR	Taylorville Rd Southbound					E. McKnight Way Westbound					Taylorville Rd Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 08:00 to 09:00																					
Peak Hour For Entire Intersection Begins at 08:00																					
8:00	0	0	1	0	1	3	47	40	0	90	0	0	2	0	2	0	73	0	0	73	166
8:15	0	0	2	0	2	5	45	71	0	121	0	0	5	0	5	0	68	1	0	69	197
8:30	0	0	0	0	0	4	81	69	0	154	0	0	4	0	4	0	89	1	0	90	248
8:45	0	0	1	0	1	7	79	54	0	140	0	0	4	0	4	1	94	0	0	95	240
Total Volume	0	0	4	0	4	19	252	234	0	505	0	0	15	0	15	1	324	2	0	327	851
% App Total	0.0%	0.0%	100.0%	0.0%		3.8%	49.9%	46.3%	0.0%		0.0%	0.0%	100.0%	0.0%		0.3%	99.1%	0.6%	0.0%		
PHF	.000	.000	.500	.000	.500	.679	.778	.824	.000	.820	.000	.000	.750	.000	.750	.250	.862	.500	.000	.861	.858

PM PEAK HOUR	Taylorville Rd Southbound					E. McKnight Way Westbound					Taylorville Rd Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 16:30 to 17:30																					
Peak Hour For Entire Intersection Begins at 16:30																					
16:30	0	0	3	0	3	4	110	60	0	174	0	0	4	0	4	0	159	1	0	160	341
16:45	0	0	6	0	6	7	109	65	0	181	0	0	8	0	8	0	158	0	0	158	353
17:00	0	1	5	0	6	9	116	65	0	190	0	0	8	0	8	0	169	0	0	169	373
17:15	0	0	8	0	8	6	113	65	0	184	0	0	10	0	10	0	164	0	0	164	366
Total Volume	0	1	22	0	23	26	448	255	0	729	0	0	30	0	30	0	650	1	0	651	1433
% App Total	0.0%	4.3%	95.7%	0.0%		3.6%	61.5%	35.0%	0.0%		0.0%	0.0%	100.0%	0.0%		0.0%	99.8%	0.2%	0.0%		
PHF	.000	.250	.688	.000	.719	.722	.966	.981	.000	.959	.000	.000	.750	.000	.750	.000	.962	.250	.000	.963	.960

Prepared by National Data & Surveying Services

Freeman Ln & E. McKnight Way

Peak Hour Turning Movement Count

ID: 17-7714-005
City: Grass Valley

Day: Thursday
Date: 09/14/2017

	PEAK HOURS	COUNT PERIODS
AM	08:00 AM - 09:00 AM	07:00 AM - 09:00 AM
NOON	NONE	NONE
PM	04:15 PM - 05:15 PM	04:00 PM - 06:00 PM

Freeman Ln — SOUTHBOUND

	Right	Thru	Left	U-Turn	Departing
AM	2	0	213	0	84
NOON	0	0	0	0	0
PM	8	6	358	0	219
	0	0	0	0	

E. McKnight Way — WESTBOUND

		PM	NOON	AM
Left	0	202	0	79
Thru	0	99	0	48
Right	0	21	0	14
U-Turn	0	0	0	0
Departing		467	0	255

E. McKnight Way — EASTBOUND

	AM	NOON	PM	
Departing	51	0	109	
U-Turn	1	0	0	0
Left	1	0	8	0
Thru	24	0	98	0
Right	1	0	3	0

Freeman Ln — NORTHBOUND

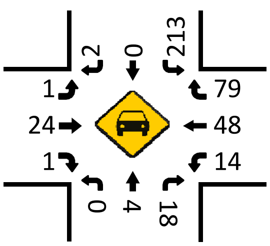
	Departing	U-Turn	Left	Thru	Right
		0	0	0	0
PM	30	0	2	9	11
NOON	0	0	0	0	0
AM	15	0	0	4	18

CONTROL

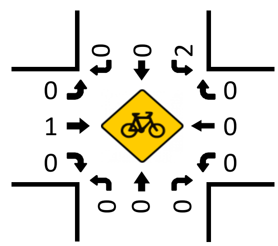
0

	AM	NOON	PM
TEV	405	0	825
PHF	0.77		0.86

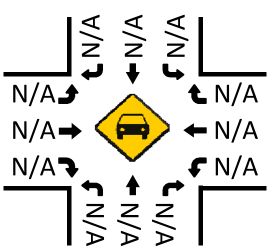
Total Vehicles (AM)



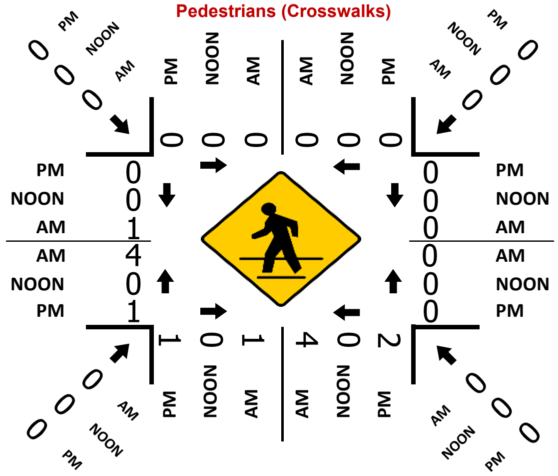
Bikes (AM)



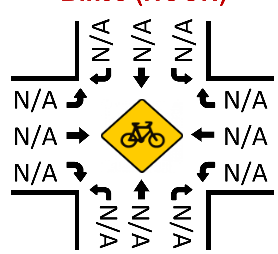
Total Vehicles (NOON)



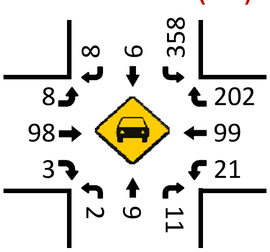
Pedestrians (Crosswalks)



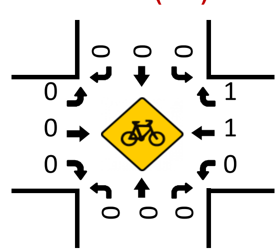
Bikes (NOON)



Total Vehicles (PM)



Bikes (PM)



ALL TRAFFIC DATA

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File Name : 17-7714-005
Date : 09/14/2017

Unshifted Count = All Vehicles & Uturns

	Freeman Ln Southbound					E. McKnight Way Westbound					Freeman Ln Northbound					E. McKnight Way Eastbound						
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total	Uturns Total
7:00	24	1	0	0	25	1	0	6	0	7	0	0	5	0	5	0	3	0	0	3	40	0
7:15	36	0	0	0	36	0	3	16	0	19	0	1	4	0	5	0	5	0	0	5	65	0
7:30	35	0	0	0	35	0	3	21	0	24	1	0	2	0	3	0	3	0	0	3	65	0
7:45	42	1	0	0	43	4	5	22	0	31	0	0	4	0	4	0	5	0	0	5	83	0
Total	137	2	0	0	139	5	11	65	0	81	1	1	15	0	17	0	16	0	0	16	253	0
8:00	50	0	1	0	51	2	8	11	0	21	0	0	3	0	3	0	4	0	0	4	79	0
8:15	39	0	0	0	39	2	9	15	0	26	0	0	5	0	5	0	3	0	0	3	73	0
8:30	64	0	0	0	64	3	13	25	0	41	0	2	7	0	9	0	7	0	1	8	122	1
8:45	60	0	1	0	61	7	18	28	0	53	0	2	3	0	5	1	10	1	0	12	131	0
Total	213	0	2	0	215	14	48	79	0	141	0	4	18	0	22	1	24	1	1	27	405	1
16:00	96	1	1	0	98	5	24	52	0	81	0	1	5	0	6	1	36	2	0	39	224	0
16:15	89	1	2	0	92	5	26	50	0	81	1	0	1	0	2	3	18	1	0	22	197	0
16:30	91	1	1	0	93	4	21	47	0	72	0	2	3	0	5	2	26	0	0	28	198	0
16:45	68	2	2	0	72	3	27	55	0	85	1	3	2	0	6	0	26	1	0	27	190	0
Total	344	5	6	0	355	17	98	204	0	319	2	6	11	0	19	6	106	4	0	116	809	0
17:00	110	2	3	0	115	9	25	50	0	84	0	4	5	0	9	3	28	1	0	32	240	0
17:15	74	0	1	0	75	7	12	56	0	75	2	0	4	0	6	2	27	3	0	32	188	0
17:30	100	2	1	0	103	4	22	51	0	77	1	2	1	0	4	1	21	0	0	22	206	0
17:45	90	1	1	0	92	4	14	48	0	66	0	0	7	0	7	0	19	1	0	20	185	0
Total	374	5	6	0	385	24	73	205	0	302	3	6	17	0	26	6	95	5	0	106	819	0
Grand Total	1068	12	14	0	1094	60	230	553	0	843	6	17	61	0	84	13	241	10	1	265	2286	1
Apprch %	97.6%	1.1%	1.3%	0.0%		7.1%	27.3%	65.6%	0.0%		7.1%	20.2%	72.6%	0.0%		4.9%	90.9%	3.8%	0.4%			
Total %	46.7%	0.5%	0.6%	0.0%	47.9%	2.6%	10.1%	24.2%	0.0%	36.9%	0.3%	0.7%	2.7%	0.0%	3.7%	0.6%	10.5%	0.4%	0.0%	11.6%	100.0%	

AM PEAK HOUR	Freeman Ln Southbound					E. McKnight Way Westbound					Freeman Ln Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 08:00 to 09:00																					
Peak Hour For Entire Intersection Begins at 08:00																					
8:00	50	0	1	0	51	2	8	11	0	21	0	0	3	0	3	0	4	0	0	4	79
8:15	39	0	0	0	39	2	9	15	0	26	0	0	5	0	5	0	3	0	0	3	73
8:30	64	0	0	0	64	3	13	25	0	41	0	2	7	0	9	0	7	0	1	8	122
8:45	60	0	1	0	61	7	18	28	0	53	0	2	3	0	5	1	10	1	0	12	131
Total Volume	213	0	2	0	215	14	48	79	0	141	0	4	18	0	22	1	24	1	1	27	405
% App Total	99.1%	0.0%	0.9%	0.0%		9.9%	34.0%	56.0%	0.0%		0.0%	18.2%	81.8%	0.0%		3.7%	88.9%	3.7%	3.7%		
PHF	.832	.000	.500	.000	.840	.500	.667	.705	.000	.665	.000	.500	.643	.000	.611	.250	.600	.250	.250	.563	.773

PM PEAK HOUR	Freeman Ln Southbound					E. McKnight Way Westbound					Freeman Ln Northbound					E. McKnight Way Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 16:15 to 17:15																					
Peak Hour For Entire Intersection Begins at 16:15																					
16:15	89	1	2	0	92	5	26	50	0	81	1	0	1	0	2	3	18	1	0	22	197
16:30	91	1	1	0	93	4	21	47	0	72	0	2	3	0	5	2	26	0	0	28	198
16:45	68	2	2	0	72	3	27	55	0	85	1	3	2	0	6	0	26	1	0	27	190
17:00	110	2	3	0	115	9	25	50	0	84	0	4	5	0	9	3	28	1	0	32	240
Total Volume	358	6	8	0	372	21	99	202	0	322	2	9	11	0	22	8	98	3	0	109	825
% App Total	96.2%	1.6%	2.2%	0.0%		6.5%	30.7%	62.7%	0.0%		9.1%	40.9%	50.0%	0.0%		7.3%	89.9%	2.8%	0.0%		
PHF	.814	.750	.667	.000	.809	.583	.917	.918	.000	.947	.500	.563	.550	.000	.611	.667	.875	.750	.000	.852	.859

Appendix B EXISTING CONDITIONS LOS CALCULATION SHEETS

Arterial Level of Service: EB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 SB On-Ramp	III	30	26.7	14.2	40.9	0.21	18.5	C
SR 49 NB Off-Ramp	III	30	8.7	10.3	19.0	0.06	10.6	E
Total	III		35.4	24.5	59.9	0.27	16.0	D

Arterial Level of Service: WB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 NB On-Ramp	IV	30	15.8	17.8	33.6	0.07	7.4	E
SR 49 SB Off-Ramp	IV	30	12.7	12.6	25.3	0.06	8.0	E
Total	IV		28.5	30.4	58.9	0.13	7.7	E

Arterial Level of Service: EB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 SB On-Ramp	III	30	26.7	15.8	42.5	0.21	17.8	D
SR 49 NB Off-Ramp	III	30	8.7	13.9	22.6	0.06	8.9	F
Total	III		35.4	29.7	65.1	0.27	14.7	D

Arterial Level of Service: WB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 NB On-Ramp	IV	30	15.8	19.1	34.9	0.07	7.2	E
SR 49 SB Off-Ramp	IV	30	12.7	10.7	23.4	0.06	8.6	E
Total	IV		28.5	29.8	58.3	0.13	7.7	E

Intersection	
Int Delay, s/veh	77.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	137	86	170	17	39	30	369	172	20	25	61	105
Future Vol, veh/h	137	86	170	17	39	30	369	172	20	25	61	105
Conflicting Peds, #/hr	1	0	2	2	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	0	-	-	-	215	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	69	69	69	91	91	91	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	151	95	187	25	57	43	405	189	22	32	79	136

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	101	0	0	97	0	0	565	548	99	632	527	79
Stage 1	-	-	-	-	-	-	398	398	-	129	129	-
Stage 2	-	-	-	-	-	-	167	150	-	503	398	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1491	-	-	1496	-	-	436	444	957	393	456	981
Stage 1	-	-	-	-	-	-	628	603	-	875	789	-
Stage 2	-	-	-	-	-	-	835	773	-	551	603	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1491	-	-	1493	-	-	~ 284	381	953	211	392	980
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 284	381	-	211	392	-
Stage 1	-	-	-	-	-	-	550	528	-	767	774	-
Stage 2	-	-	-	-	-	-	634	758	-	303	528	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.7	1.5	169.6	15.3
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	284	406	1491	-	-	1493	-	-	314	980
HCM Lane V/C Ratio	1.428	0.52	0.101	-	-	0.017	-	-	0.356	0.139
HCM Control Delay (s)	245.9	23.1	7.7	0	-	7.5	0	-	22.7	9.3
HCM Lane LOS	F	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	22.1	2.9	0.3	-	-	0.1	-	-	1.6	0.5

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	134	312	0	0	204	309	107	1	81	0	0	0
Future Volume (veh/h)	134	312	0	0	204	309	107	1	81	0	0	0
Number	7	4	14	3	8	18	5	2	12			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1863	1863	0	0	1863	1863	1900	1863	1863			
Adj Flow Rate, veh/h	147	343	0	0	227	0	122	1	92			
Adj No. of Lanes	1	1	0	0	2	1	0	1	1			
Peak Hour Factor	0.91	0.91	0.91	0.90	0.90	0.90	0.88	0.88	0.88			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	191	778	0	0	742	332	671	5	603			
Arrive On Green	0.11	0.42	0.00	0.00	0.21	0.00	0.38	0.38	0.38			
Sat Flow, veh/h	1774	1863	0	0	3632	1583	1760	14	1583			
Grp Volume(v), veh/h	147	343	0	0	227	0	123	0	92			
Grp Sat Flow(s),veh/h/ln	1774	1863	0	0	1770	1583	1775	0	1583			
Q Serve(g_s), s	3.8	6.1	0.0	0.0	2.5	0.0	2.2	0.0	1.8			
Cycle Q Clear(g_c), s	3.8	6.1	0.0	0.0	2.5	0.0	2.2	0.0	1.8			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	191	778	0	0	742	332	676	0	603			
V/C Ratio(X)	0.77	0.44	0.00	0.00	0.31	0.00	0.18	0.00	0.15			
Avail Cap(c_a), veh/h	391	1308	0	0	1348	603	676	0	603			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	20.3	9.7	0.0	0.0	15.6	0.0	9.6	0.0	9.5			
Incr Delay (d2), s/veh	6.4	0.4	0.0	0.0	0.2	0.0	0.6	0.0	0.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.2	3.2	0.0	0.0	1.3	0.0	1.2	0.0	0.9			
LnGrp Delay(d),s/veh	26.7	10.1	0.0	0.0	15.8	0.0	10.2	0.0	10.0			
LnGrp LOS	C	B			B		B		B			
Approach Vol, veh/h		490			227			215				
Approach Delay, s/veh		15.1			15.8			10.1				
Approach LOS		B			B			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		22.5		24.2			9.7	14.5
Change Period (Y+Rc), s		* 4.7		* 4.7			* 4.7	* 4.7
Max Green Setting (Gmax), s		* 18		* 33			* 10	* 18
Max Q Clear Time (g_c+I1), s		4.2		8.1			5.8	4.5
Green Ext Time (p_c), s		0.8		3.7			0.1	3.0

Intersection Summary	
HCM 2010 Ctrl Delay	14.1
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	267	71	40	266	0	0	0	0	183	2	237
Future Volume (veh/h)	0	267	71	40	266	0	0	0	0	183	2	237
Number	7	4	14	3	8	18				1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1900	1863	1863
Adj Flow Rate, veh/h	0	300	80	47	313	0				191	2	0
Adj No. of Lanes	0	2	1	1	1	0				0	1	1
Peak Hour Factor	0.89	0.89	0.89	0.85	0.85	0.85				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	814	355	88	718	0				708	7	638
Arrive On Green	0.00	0.23	0.23	0.05	0.39	0.00				0.40	0.40	0.00
Sat Flow, veh/h	0	3632	1543	1774	1863	0				1757	18	1583
Grp Volume(v), veh/h	0	300	80	47	313	0				193	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1543	1774	1863	0				1775	0	1583
Q Serve(g_s), s	0.0	3.2	1.9	1.1	5.5	0.0				3.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	3.2	1.9	1.1	5.5	0.0				3.2	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	814	355	88	718	0				715	0	638
V/C Ratio(X)	0.00	0.37	0.23	0.53	0.44	0.00				0.27	0.00	0.00
Avail Cap(c_a), veh/h	0	1434	625	200	1162	0				715	0	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	14.4	13.9	20.6	10.1	0.0				8.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.3	5.0	0.4	0.0				0.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.6	0.8	0.7	2.9	0.0				1.7	0.0	0.0
LnGrp Delay(d),s/veh	0.0	14.7	14.2	25.6	10.5	0.0				9.8	0.0	0.0
LnGrp LOS		B	B	C	B					A		
Approach Vol, veh/h		380			360						193	
Approach Delay, s/veh		14.6			12.5						9.8	
Approach LOS		B			B						A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs			3	4		6		8
Phs Duration (G+Y+Rc), s			6.9	14.9		22.6		21.8
Change Period (Y+Rc), s			* 4.7	* 4.7		4.7		* 4.7
Max Green Setting (Gmax), s			* 5	* 18		17.9		* 28
Max Q Clear Time (g_c+I1), s			3.1	5.2		5.2		7.5
Green Ext Time (p_c), s			0.0	3.4		0.8		4.1

Intersection Summary	
HCM 2010 Ctrl Delay	12.8
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	325	2	19	252	234	0	0	15	0	0	4
Future Vol, veh/h	0	325	2	19	252	234	0	0	15	0	0	4
Conflicting Peds, #/hr	0	0	3	3	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	82	82	82	75	75	75	50	50	50
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	378	2	23	307	285	0	0	20	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	383	0	0	-	-	193	-	-	450
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	5.33	-	-	-	-	7.13	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	3.119	-	-	-	-	3.919	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	769	-	-	0	0	695	0	0	608
Stage 1	0	-	-	-	-	-	0	0	-	0	0	-
Stage 2	0	-	-	-	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	769	-	-	-	-	693	-	-	608
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	10.3	11
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	693	-	-	769	-	-	608
HCM Lane V/C Ratio	0.029	-	-	0.03	-	-	0.013
HCM Control Delay (s)	10.3	-	-	9.8	-	-	11
HCM Lane LOS	B	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-	-	0

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	24	1	14	48	79	0	4	18	213	0	2
Future Vol, veh/h	1	24	1	14	48	79	0	4	18	213	0	2
Peak Hour Factor	0.56	0.56	0.56	0.67	0.67	0.67	0.61	0.61	0.61	0.84	0.84	0.84
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	43	2	21	72	118	0	7	30	254	0	2
Number of Lanes	0	1	0	0	1	1	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	1
HCM Control Delay	9.1	8.7	7.9	12.3
HCM LOS	A	A	A	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	4%	23%	0%	100%	0%
Vol Thru, %	100%	18%	92%	77%	0%	0%	0%
Vol Right, %	0%	82%	4%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	22	26	62	79	213	2
LT Vol	0	0	1	14	0	213	0
Through Vol	0	4	24	48	0	0	0
RT Vol	0	18	1	0	79	0	2
Lane Flow Rate	0	36	46	93	118	254	2
Geometry Grp	7	7	6	7	7	7	7
Degree of Util (X)	0	0.049	0.073	0.142	0.155	0.402	0.003
Departure Headway (Hd)	5.469	4.891	5.625	5.538	4.72	5.705	4.499
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	727	634	647	758	629	791
Service Time	3.235	2.657	3.682	3.28	2.461	3.455	2.249
HCM Lane V/C Ratio	0	0.05	0.073	0.144	0.156	0.404	0.003
HCM Control Delay	8.2	7.9	9.1	9.2	8.3	12.3	7.3
HCM Lane LOS	N	A	A	A	A	B	A
HCM 95th-tile Q	0	0.2	0.2	0.5	0.5	1.9	0

Intersection	
Int Delay, s/veh	78.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	168	65	364	25	65	27	249	112	5	33	98	150
Future Vol, veh/h	168	65	364	25	65	27	249	112	5	33	98	150
Conflicting Peds, #/hr	1	0	3	3	0	1	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	0	-	-	-	215	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	77	77	77	85	85	85	79	79	79
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	189	73	409	32	84	35	293	132	6	42	124	190

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	120	0	0	76	0	0	684	639	76	687	622	104
Stage 1	-	-	-	-	-	-	454	454	-	168	168	-
Stage 2	-	-	-	-	-	-	230	185	-	519	454	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1468	-	-	1523	-	-	363	394	985	361	403	951
Stage 1	-	-	-	-	-	-	586	569	-	834	759	-
Stage 2	-	-	-	-	-	-	773	747	-	540	569	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1467	-	-	1523	-	-	~ 172	311	982	205	318	949
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 172	311	-	205	318	-
Stage 1	-	-	-	-	-	-	474	461	-	677	741	-
Stage 2	-	-	-	-	-	-	503	729	-	311	461	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.2	1.6	271	21.6
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	172	320	1467	-	-	1523	-	-	279	949
HCM Lane V/C Ratio	1.703	0.43	0.129	-	-	0.021	-	-	0.594	0.2
HCM Control Delay (s)	$ 386.8	24.5	7.8	0	-	7.4	0	-	35.2	9.7
HCM Lane LOS	F	C	A	A	-	A	A	-	E	A
HCM 95th %tile Q(veh)	20.5	2.1	0.4	-	-	0.1	-	-	3.5	0.7

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	236	536	0	0	240	221	125	1	61	0	0	0
Future Volume (veh/h)	236	536	0	0	240	221	125	1	61	0	0	0
Number	7	4	14	3	8	18	5	2	12			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1863	1863	0	0	1863	1863	1900	1863	1863			
Adj Flow Rate, veh/h	259	589	0	0	261	0	147	1	72			
Adj No. of Lanes	1	1	0	0	2	1	0	1	1			
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.85	0.85	0.85			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	314	864	0	0	686	307	619	4	556			
Arrive On Green	0.18	0.46	0.00	0.00	0.19	0.00	0.35	0.35	0.35			
Sat Flow, veh/h	1774	1863	0	0	3632	1583	1763	12	1583			
Grp Volume(v), veh/h	259	589	0	0	261	0	148	0	72			
Grp Sat Flow(s),veh/h/ln	1774	1863	0	0	1770	1583	1775	0	1583			
Q Serve(g_s), s	7.1	12.6	0.0	0.0	3.3	0.0	3.0	0.0	1.6			
Cycle Q Clear(g_c), s	7.1	12.6	0.0	0.0	3.3	0.0	3.0	0.0	1.6			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	314	864	0	0	686	307	623	0	556			
V/C Ratio(X)	0.82	0.68	0.00	0.00	0.38	0.00	0.24	0.00	0.13			
Avail Cap(c_a), veh/h	360	1205	0	0	1242	556	623	0	556			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	20.1	10.7	0.0	0.0	17.8	0.0	11.7	0.0	11.2			
Incr Delay (d2), s/veh	12.9	1.0	0.0	0.0	0.3	0.0	0.9	0.0	0.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	4.6	6.6	0.0	0.0	1.6	0.0	1.6	0.0	0.8			
LnGrp Delay(d),s/veh	33.0	11.6	0.0	0.0	18.1	0.0	12.6	0.0	11.7			
LnGrp LOS	C	B			B		B		B			
Approach Vol, veh/h		848			261			220				
Approach Delay, s/veh		18.1			18.1			12.3				
Approach LOS		B			B			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		22.5		28.2			13.7	14.5
Change Period (Y+Rc), s		* 4.7		* 4.7			* 4.7	* 4.7
Max Green Setting (Gmax), s		* 18		* 33			* 10	* 18
Max Q Clear Time (g_c+I1), s		5.0		14.6			9.1	5.3
Green Ext Time (p_c), s		0.8		5.5			0.1	4.6

Intersection Summary	
HCM 2010 Ctrl Delay	17.2
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	494	186	54	280	0	0	0	0	281	0	446
Future Volume (veh/h)	0	494	186	54	280	0	0	0	0	281	0	446
Number	7	4	14	3	8	18				1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1900	1863	1863
Adj Flow Rate, veh/h	0	520	196	59	304	0				323	0	0
Adj No. of Lanes	0	2	1	1	1	0				0	1	1
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92				0.87	0.87	0.87
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	928	411	101	781	0				675	0	603
Arrive On Green	0.00	0.26	0.26	0.06	0.42	0.00				0.38	0.00	0.00
Sat Flow, veh/h	0	3632	1568	1774	1863	0				1774	0	1583
Grp Volume(v), veh/h	0	520	196	59	304	0				323	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1568	1774	1863	0				1774	0	1583
Q Serve(g_s), s	0.0	6.0	5.0	1.5	5.3	0.0				6.5	0.0	0.0
Cycle Q Clear(g_c), s	0.0	6.0	5.0	1.5	5.3	0.0				6.5	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	928	411	101	781	0				675	0	603
V/C Ratio(X)	0.00	0.56	0.48	0.58	0.39	0.00				0.48	0.00	0.00
Avail Cap(c_a), veh/h	0	1355	600	189	1097	0				675	0	603
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	15.0	14.6	21.6	9.5	0.0				11.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.5	0.9	5.2	0.3	0.0				2.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.0	2.2	0.9	2.8	0.0				3.6	0.0	0.0
LnGrp Delay(d),s/veh	0.0	15.5	15.5	26.8	9.8	0.0				13.4	0.0	0.0
LnGrp LOS		B	B	C	A					B		
Approach Vol, veh/h		716			363						323	
Approach Delay, s/veh		15.5			12.6						13.4	
Approach LOS		B			B						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs			3	4		6		8
Phs Duration (G+Y+Rc), s			7.4	17.0		22.6		24.4
Change Period (Y+Rc), s			* 4.7	* 4.7		4.7		* 4.7
Max Green Setting (Gmax), s			* 5	* 18		17.9		* 28
Max Q Clear Time (g_c+I1), s			3.5	8.0		8.5		7.3
Green Ext Time (p_c), s			0.0	4.3		1.3		6.2

Intersection Summary	
HCM 2010 Ctrl Delay	14.3
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	650	1	26	448	255	0	0	30	0	0	23
Future Vol, veh/h	0	650	1	26	448	255	0	0	30	0	0	23
Conflicting Peds, #/hr	0	0	6	6	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	75	75	75	72	72	72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	677	1	27	467	266	0	0	40	0	0	32

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	684	0	0	-	-	345	-	-	599
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	5.33	-	-	-	-	7.13	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	3.119	-	-	-	-	3.919	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	556	-	-	0	0	556	0	0	501
Stage 1	0	-	-	-	-	-	0	0	-	0	0	-
Stage 2	0	-	-	-	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	556	-	-	-	-	553	-	-	501
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	12	12.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	553	-	-	556	-	-	501
HCM Lane V/C Ratio	0.072	-	-	0.049	-	-	0.064
HCM Control Delay (s)	12	-	-	11.8	-	-	12.7
HCM Lane LOS	B	-	-	B	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	0.2	-	-	0.2

Intersection	
Intersection Delay, s/veh	19.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	98	3	21	99	202	2	9	11	358	6	8
Future Vol, veh/h	8	98	3	21	99	202	2	9	11	358	6	8
Peak Hour Factor	0.85	0.85	0.85	0.95	0.95	0.95	0.61	0.61	0.61	0.81	0.81	0.81
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	115	4	22	104	213	3	15	18	442	7	10
Number of Lanes	0	1	0	0	1	1	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	1
HCM Control Delay	11.9	11.3	9.6	28.9
HCM LOS	B	B	A	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	7%	17%	0%	100%	0%
Vol Thru, %	0%	45%	90%	82%	0%	0%	43%
Vol Right, %	0%	55%	3%	0%	100%	0%	57%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	2	20	109	120	202	358	14
LT Vol	2	0	8	21	0	358	0
Through Vol	0	9	98	99	0	0	6
RT Vol	0	11	3	0	202	0	8
Lane Flow Rate	3	33	128	126	213	442	17
Geometry Grp	7	7	6	7	7	7	7
Degree of Util (X)	0.007	0.058	0.239	0.228	0.336	0.794	0.027
Departure Headway (Hd)	7.237	6.331	6.723	6.489	5.691	6.466	5.554
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	493	563	532	552	629	561	644
Service Time	5.004	4.099	4.791	4.249	3.451	4.204	3.293
HCM Lane V/C Ratio	0.006	0.059	0.241	0.228	0.339	0.788	0.026
HCM Control Delay	10.1	9.5	11.9	11.2	11.3	29.7	8.4
HCM Lane LOS	B	A	B	B	B	D	A
HCM 95th-tile Q	0	0.2	0.9	0.9	1.5	7.6	0.1

Intersection: 1: S Auburn Street & E McKnight Way

Movement	EB	WB	NB	NB	SB
Directions Served	LT	LTR	L	TR	LT
Maximum Queue (ft)	52	47	274	340	55
Average Queue (ft)	24	4	114	68	34
95th Queue (ft)	53	20	199	159	57
Link Distance (ft)	72	169		325	586
Upstream Blk Time (%)				0	
Queuing Penalty (veh)				0	
Storage Bay Dist (ft)			215		
Storage Blk Time (%)			2		1
Queuing Penalty (veh)			3		1

Intersection: 2: SR 49 NB Off-Ramp/SR 49 NB On-Ramp & E McKnight Way

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	LT	R
Maximum Queue (ft)	110	233	38	75	96	87	116
Average Queue (ft)	59	77	8	44	27	35	30
95th Queue (ft)	100	144	25	80	74	67	72
Link Distance (ft)	239	239	72	72	72	383	383
Upstream Blk Time (%)		0		2	1		
Queuing Penalty (veh)		0		4	2		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 3: SR 49 SB On-Ramp/SR 49 SB Off-Ramp & W McKnight Way/E McKnight Way

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	T	T	R	L	T	LT	R
Maximum Queue (ft)	72	74	52	49	154	129	87
Average Queue (ft)	33	55	22	27	68	59	3
95th Queue (ft)	62	86	48	50	131	104	29
Link Distance (ft)	57	57	57	239	239	527	
Upstream Blk Time (%)	1	8	0				
Queuing Penalty (veh)	2	9	0				
Storage Bay Dist (ft)							375
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 4: Taylorville Road & W McKnight Way

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	T	T	TR	L	TR	R	R
Maximum Queue (ft)	73	75	26	30	125	29	31
Average Queue (ft)	5	26	2	3	87	16	4
95th Queue (ft)	33	71	12	17	141	39	21
Link Distance (ft)				57	57	194	363
Upstream Blk Time (%)					2		
Queuing Penalty (veh)					5		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Freeman Lane & W McKnight Way

Movement	EB	WB	WB	NB	SB	SB
Directions Served	LTR	LT	R	TR	L	TR
Maximum Queue (ft)	30	52	66	30	68	19
Average Queue (ft)	20	25	24	9	37	1
95th Queue (ft)	42	47	47	31	58	6
Link Distance (ft)	160			255		397
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)					180	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Zone Summary

Zone wide Queuing Penalty: 26

Intersection: 1: S Auburn Street & E McKnight Way

Movement	EB	EB	NB	NB	SB	SB
Directions Served	LT	R	L	TR	LT	R
Maximum Queue (ft)	73	120	241	75	78	101
Average Queue (ft)	20	17	78	36	40	3
95th Queue (ft)	57	78	160	56	66	33
Link Distance (ft)	72	72		325	586	
Upstream Blk Time (%)	0	2				
Queuing Penalty (veh)	1	6				
Storage Bay Dist (ft)			215			50
Storage Blk Time (%)			0		4	
Queuing Penalty (veh)			1		7	

Intersection: 2: SR 49 NB Off-Ramp/SR 49 NB On-Ramp & E McKnight Way

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	LT	R
Maximum Queue (ft)	156	216	73	79	129	108	75
Average Queue (ft)	98	128	15	37	54	41	28
95th Queue (ft)	154	211	42	76	110	91	67
Link Distance (ft)	239	239	72	72	72	383	383
Upstream Blk Time (%)			0	1	5		
Queuing Penalty (veh)			1	1	7		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 3: SR 49 SB On-Ramp/SR 49 SB Off-Ramp & W McKnight Way/E McKnight Way

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	T	T	R	L	T	LT	R
Maximum Queue (ft)	75	73	66	71	194	140	202
Average Queue (ft)	44	67	42	26	64	83	34
95th Queue (ft)	82	80	68	56	134	133	140
Link Distance (ft)	57	57	57	239	239	527	
Upstream Blk Time (%)	3	20	2				
Queuing Penalty (veh)	8	45	4				
Storage Bay Dist (ft)							375
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 4: Taylorville Road & W McKnight Way

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	T	T	TR	L	TR	R	R
Maximum Queue (ft)	75	75	75	50	128	51	32
Average Queue (ft)	20	56	13	3	111	19	15
95th Queue (ft)	66	97	49	20	146	43	39
Link Distance (ft)				57	57	194	363
Upstream Blk Time (%)				0	5		
Queuing Penalty (veh)				0	18		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Freeman Lane & W McKnight Way

Movement	EB	WB	WB	NB	SB	SB
Directions Served	LTR	LT	R	TR	L	TR
Maximum Queue (ft)	78	70	74	56	195	23
Average Queue (ft)	41	35	40	17	58	9
95th Queue (ft)	70	58	67	44	127	26
Link Distance (ft)	160			255		397
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)					180	
Storage Blk Time (%)					0	
Queuing Penalty (veh)					0	

Zone Summary

Zone wide Queuing Penalty: 98

DELAY (CONTROL)

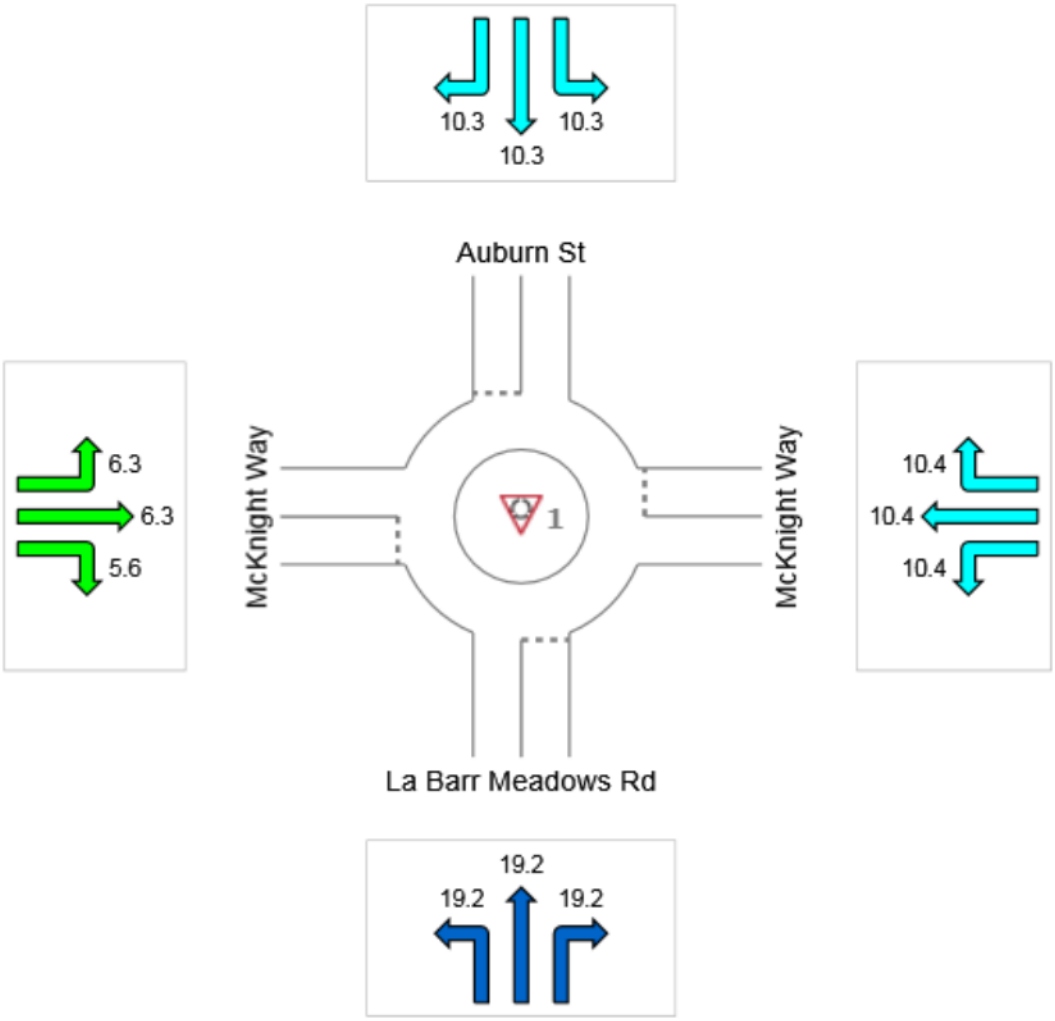
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [821 Auburn Existing AM]

Roundabout with 1-lane approaches and circulating road, and an extra turn lane
MUTCD (FHWA 2009) example number: 3C-3
Roundabout Guide (TRB 2010) example number: A-2
Roundabout

All Movement Classes

	South	East	North	West	Intersection
Delay (Control)	19.2	10.4	10.3	6.0	12.9
LOS	C	B	B	A	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

DELAY (CONTROL)

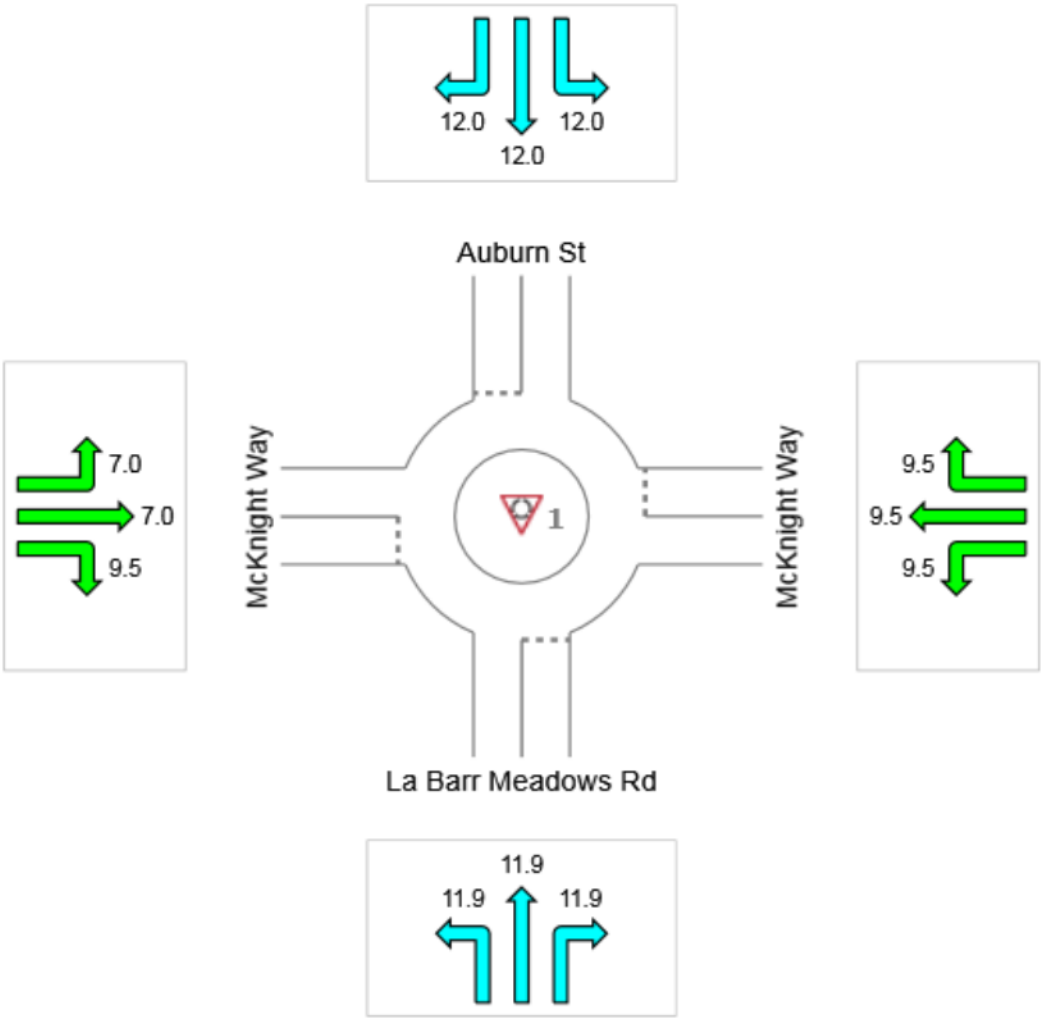
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [821 Auburn Existing PM]

Roundabout with 1-lane approaches and circulating road, and an extra turn lane
MUTCD (FHWA 2009) example number: 3C-3
Roundabout Guide (TRB 2010) example number: A-2
Roundabout

All Movement Classes

	South	East	North	West	Intersection
Delay (Control)	11.9	9.5	12.0	8.5	10.3
LOS	B	A	B	A	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

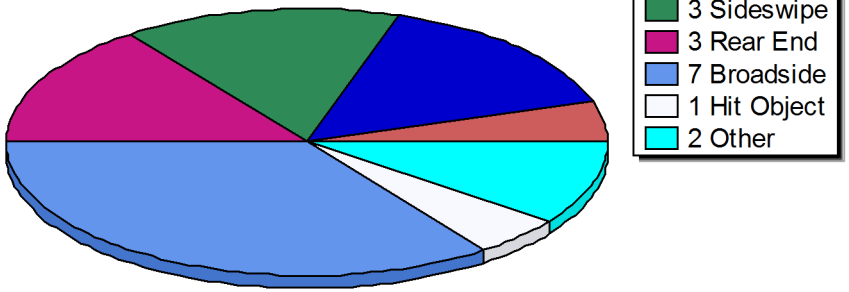
Appendix C COLLISION DIAGRAMS

00.00 McKnight Way Corridor
1/1/2010 - 10/3/2017

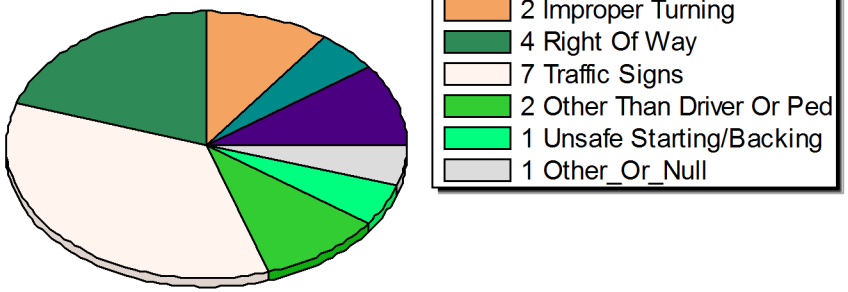
20 Crashes

Distance less than 300

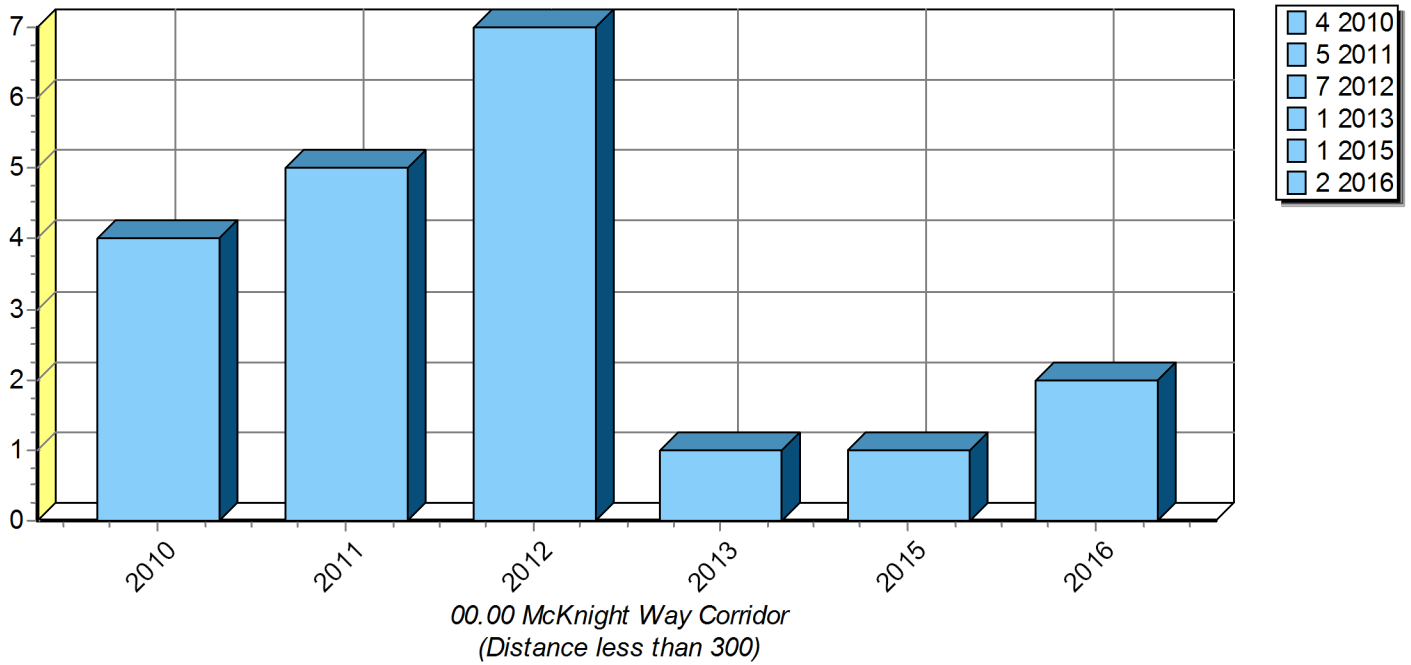
Collision Type



Primary Collision Factor



Collisions by Year

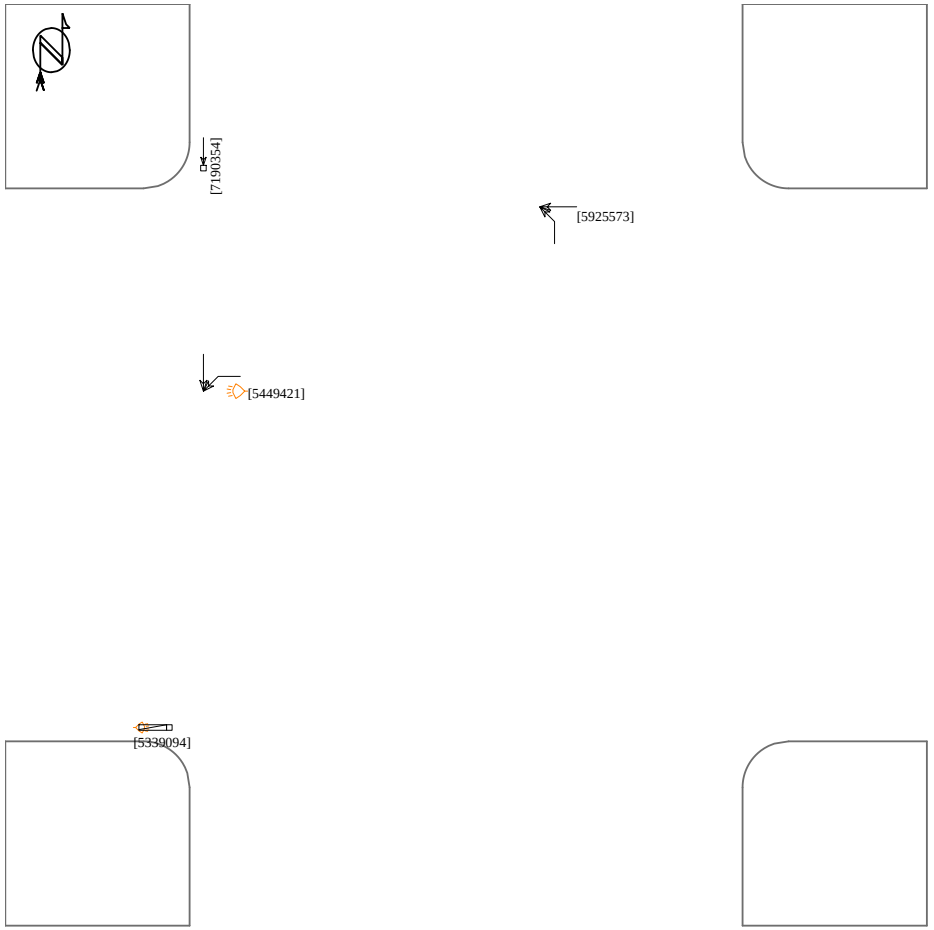


01.00 S Auburn-La Barr Meadows & E McKnight
1/1/2010 - 10/3/2017

4 Crashes

Caseid	Date	Distance	Direction	PCF Violation Category
5339094	8/9/2011	0		Other Than Driver (or Pedestrian)
5449421	12/15/2011	0		Automobile Right of Way
5925573	12/21/2012	0		Automobile Right of Way
7190354	5/25/2016	0		Other Than Driver (or Pedestrian)

Distance less than 300



(0) crashes could not be placed in this schematic

- Straight
- Stopped
- Unknown
- Backing
- Overtaking
- Sideswipe
- Parked
- Erratic
- Out of control
- Right turn
- Left turn
- U-turn
- Pedestrian
- Bicycle
- Injury
- Fatality
- Nighttime
- DUI

Fixed objects:

- General
- Signal
- Tree
- Pole
- Curb
- Animal

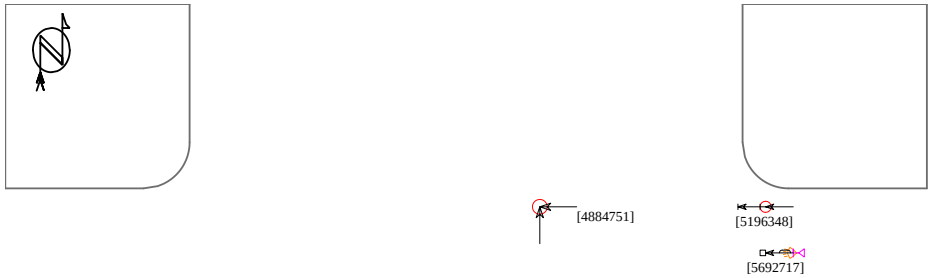
- 3rd vehicle
- Extra data

02.00 SR 49 NB & E McKnight Way
1/1/2010 - 10/3/2017

4 Crashes

Distance less than 300

Caseid	Date	Distance	Direction	PCF Violation Category
4884751	9/14/2010	0		Traffic Signals and Signs
4989413	11/25/2010	0		Traffic Signals and Signs
5196348	6/23/2011	0		Unsafe Speed
5692717	6/23/2012	0		Drive/Bike Under Infl Alcohol/Drug



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- Sideswipe
- Parked
- Erratic
- Out of control
- Right turn
- Left turn
- U-turn
- Pedestrian
- Bicycle
- Injury
- Fatality
- Nighttime
- DUI

Fixed objects:

- General
- Signal
- Tree
- Pole
- Curb
- Animal

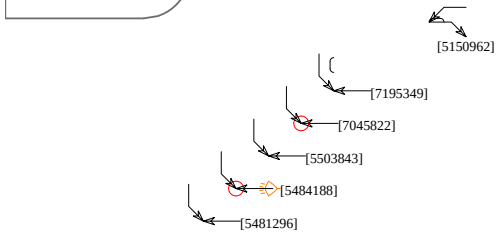
- 3rd vehicle
- Extra data

03.00 SR 49 SB Ramps & E McKnight Way
1/1/2010 - 10/3/2017

6 Crashes

Distance less than 300

Caseid	Date	Distance	Direction	PCF Violation Category
5150962	4/26/2011	0		Automobile Right of Way
5481296	2/1/2012	0		Traffic Signals and Signs
5484188	1/6/2012	0		Traffic Signals and Signs
5503843	1/30/2012	0		Traffic Signals and Signs
7045822	8/22/2015	0		Traffic Signals and Signs
7195349	1/16/2016	0		Traffic Signals and Signs



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- Parked
- Erratic
- Out of control
- Right turn
- Left turn
- U-turn
- Pedestrian
- Bicycle
- Injury
- Fatality
- Nighttime
- DUI

Fixed objects:

- General
- Signal
- Tree
- Pole
- Curb
- Animal

3rd vehicle

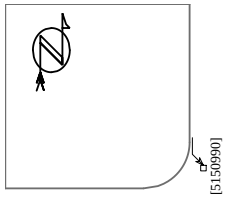
Extra data

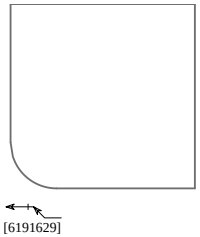
04.00 Taylorville & W McKnight
1/1/2010 - 10/3/2017

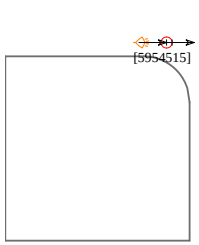
4 Crashes

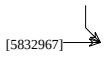
Caseid	Date	Distance	Direction	PCF Violation Category
5150990	4/14/2011	0		Automobile Right of Way
5832967	11/8/2012	0		Improper Turning
5954515	11/7/2012	0		Unsafe Starting or Backing
6191629	8/31/2013	0		Improper Turning

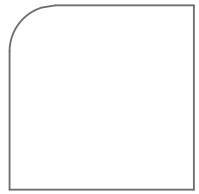
Distance less than 300











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- Erratic
- Out of control
- Right turn
- Left turn
- U-turn
- Pedestrian
- Bicycle
- Injury
- Fatality
- Nighttime
- DUI

Fixed objects:

- General
- Signal
- Tree
- Pole
- Curb
- Animal

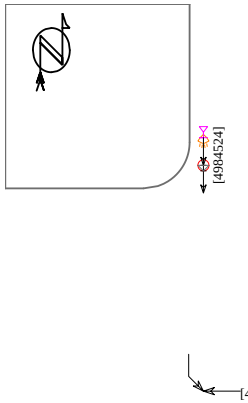
- 3rd vehicle
- Extra data

05.00 FREEMAN LN & WEST MCKNIGHT WY
1/1/2010 - 10/3/2017

2 Crashes

Distance less than 300

Caseid	Date	Distance	Direction	PCF Violation Category
4831740	8/7/2010	0		00
4984524	12/17/2010	0		Drive/Bike Under Infl Alcohol/Drug



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- Bicycle
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- Fatality
- Nighttime
- DUI

Fixed objects:

- General
- Signal
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- Animal

- 3rd vehicle
- Extra data

Appendix D EXISTING PLUS PROJECT LOS CALCULATION SHEETS

Arterial Level of Service: EB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 SB On-Ramp	III	30	26.7	14.2	40.9	0.21	18.5	C
SR 49 NB Off-Ramp	III	30	8.7	10.6	19.3	0.06	10.4	E
Total	III		35.4	24.8	60.2	0.27	15.9	D

Arterial Level of Service: WB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 NB On-Ramp	IV	30	15.8	17.9	33.7	0.07	7.4	E
SR 49 SB Off-Ramp	IV	30	12.7	12.7	25.4	0.06	7.9	E
Total	IV		28.5	30.6	59.1	0.13	7.6	E

Arterial Level of Service: EB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 SB On-Ramp	III	30	26.7	15.9	42.6	0.21	17.8	D
SR 49 NB Off-Ramp	III	30	8.7	14.4	23.1	0.06	8.7	F
Total	III		35.4	30.3	65.7	0.27	14.6	D

Arterial Level of Service: WB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 NB On-Ramp	IV	30	15.8	19.1	34.9	0.07	7.2	E
SR 49 SB Off-Ramp	IV	30	12.7	10.8	23.5	0.06	8.6	E
Total	IV		28.5	29.9	58.4	0.13	7.7	E

Intersection	
Int Delay, s/veh	114.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	151	101	170	21	66	30	369	176	20	25	61	105
Future Vol, veh/h	151	101	170	21	66	30	369	176	20	25	61	105
Conflicting Peds, #/hr	1	0	2	2	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	0	-	-	-	215	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	69	69	69	91	91	91	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	166	111	187	30	96	43	405	193	22	32	79	136

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	140	0	0	113	0	0	663	646	115	732	624	118
Stage 1	-	-	-	-	-	-	445	445	-	179	179	-
Stage 2	-	-	-	-	-	-	218	201	-	553	445	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1443	-	-	1476	-	-	~ 375	390	937	337	402	934
Stage 1	-	-	-	-	-	-	592	575	-	823	751	-
Stage 2	-	-	-	-	-	-	784	735	-	517	575	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1443	-	-	1473	-	-	~ 231	327	933	155	337	933
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 231	327	-	155	337	-
Stage 1	-	-	-	-	-	-	508	493	-	706	734	-
Stage 2	-	-	-	-	-	-	584	718	-	263	493	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.8	1.3	267.5	18.9
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	231	350	1443	-	-	1473	-	-	251	933
HCM Lane V/C Ratio	1.755	0.615	0.115	-	-	0.021	-	-	0.445	0.146
HCM Control Delay (s)	$ 393.5	30.4	7.8	0	-	7.5	0	-	30.4	9.5
HCM Lane LOS	F	D	A	A	-	A	A	-	D	A
HCM 95th %tile Q(veh)	27.4	3.9	0.4	-	-	0.1	-	-	2.1	0.5

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	134	330	0	0	220	320	107	1	92	0	0	0
Future Volume (veh/h)	134	330	0	0	220	320	107	1	92	0	0	0
Number	7	4	14	3	8	18	5	2	12			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1863	1863	0	0	1863	1863	1900	1863	1863			
Adj Flow Rate, veh/h	147	363	0	0	244	0	122	1	105			
Adj No. of Lanes	1	1	0	0	2	1	0	1	1			
Peak Hour Factor	0.91	0.91	0.91	0.90	0.90	0.90	0.88	0.88	0.88			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	191	778	0	0	742	332	671	5	603			
Arrive On Green	0.11	0.42	0.00	0.00	0.21	0.00	0.38	0.38	0.38			
Sat Flow, veh/h	1774	1863	0	0	3632	1583	1760	14	1583			
Grp Volume(v), veh/h	147	363	0	0	244	0	123	0	105			
Grp Sat Flow(s),veh/h/ln	1774	1863	0	0	1770	1583	1775	0	1583			
Q Serve(g_s), s	3.8	6.6	0.0	0.0	2.7	0.0	2.2	0.0	2.1			
Cycle Q Clear(g_c), s	3.8	6.6	0.0	0.0	2.7	0.0	2.2	0.0	2.1			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	191	778	0	0	742	332	676	0	603			
V/C Ratio(X)	0.77	0.47	0.00	0.00	0.33	0.00	0.18	0.00	0.17			
Avail Cap(c_a), veh/h	391	1308	0	0	1348	603	676	0	603			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	20.3	9.8	0.0	0.0	15.7	0.0	9.6	0.0	9.6			
Incr Delay (d2), s/veh	6.4	0.4	0.0	0.0	0.3	0.0	0.6	0.0	0.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.2	3.4	0.0	0.0	1.3	0.0	1.2	0.0	1.0			
LnGrp Delay(d),s/veh	26.7	10.3	0.0	0.0	15.9	0.0	10.2	0.0	10.2			
LnGrp LOS	C	B			B		B		B			
Approach Vol, veh/h		510			244			228				
Approach Delay, s/veh		15.0			15.9			10.2				
Approach LOS		B			B			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		22.5		24.2			9.7	14.5
Change Period (Y+Rc), s		* 4.7		* 4.7			* 4.7	* 4.7
Max Green Setting (Gmax), s		* 18		* 33			* 10	* 18
Max Q Clear Time (g_c+I1), s		4.2		8.6			5.8	4.7
Green Ext Time (p_c), s		0.8		4.0			0.1	3.2

Intersection Summary	
HCM 2010 Ctrl Delay	14.1
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	273	71	49	273	0	0	0	0	195	2	237
Future Volume (veh/h)	0	273	71	49	273	0	0	0	0	195	2	237
Number	7	4	14	3	8	18				1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1900	1863	1863
Adj Flow Rate, veh/h	0	307	80	58	321	0				203	2	0
Adj No. of Lanes	0	2	1	1	1	0				0	1	1
Peak Hour Factor	0.89	0.89	0.89	0.85	0.85	0.85				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	808	352	102	727	0				702	7	633
Arrive On Green	0.00	0.23	0.23	0.06	0.39	0.00				0.40	0.40	0.00
Sat Flow, veh/h	0	3632	1543	1774	1863	0				1758	17	1583
Grp Volume(v), veh/h	0	307	80	58	321	0				205	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1543	1774	1863	0				1775	0	1583
Q Serve(g_s), s	0.0	3.3	1.9	1.4	5.7	0.0				3.5	0.0	0.0
Cycle Q Clear(g_c), s	0.0	3.3	1.9	1.4	5.7	0.0				3.5	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	808	352	102	727	0				709	0	633
V/C Ratio(X)	0.00	0.38	0.23	0.57	0.44	0.00				0.29	0.00	0.00
Avail Cap(c_a), veh/h	0	1422	620	198	1152	0				709	0	633
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	14.6	14.1	20.6	10.1	0.0				9.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.3	4.9	0.4	0.0				1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.6	0.8	0.8	2.9	0.0				1.9	0.0	0.0
LnGrp Delay(d),s/veh	0.0	14.9	14.4	25.5	10.5	0.0				10.2	0.0	0.0
LnGrp LOS		B	B	C	B					B		
Approach Vol, veh/h		387			379						205	
Approach Delay, s/veh		14.8			12.8						10.2	
Approach LOS		B			B						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs			3	4		6		8
Phs Duration (G+Y+Rc), s			7.3	14.9		22.6		22.2
Change Period (Y+Rc), s			* 4.7	* 4.7		4.7		* 4.7
Max Green Setting (Gmax), s			* 5	* 18		17.9		* 28
Max Q Clear Time (g_c+I1), s			3.4	5.3		5.5		7.7
Green Ext Time (p_c), s			0.0	3.5		0.9		4.2

Intersection Summary	
HCM 2010 Ctrl Delay	13.0
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	329	2	19	257	236	0	0	17	0	0	4
Future Vol, veh/h	0	329	2	19	257	236	0	0	17	0	0	4
Conflicting Peds, #/hr	0	0	3	3	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	82	82	82	75	75	75	50	50	50
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	383	2	23	313	288	0	0	23	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	388	0	0	-	-	195	-	-	457
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	5.33	-	-	-	-	7.13	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	3.119	-	-	-	-	3.919	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	765	-	-	0	0	693	0	0	603
Stage 1	0	-	-	-	-	-	0	0	-	0	0	-
Stage 2	0	-	-	-	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	765	-	-	-	-	691	-	-	603
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	10.4	11.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	691	-	-	765	-	-	603
HCM Lane V/C Ratio	0.033	-	-	0.03	-	-	0.013
HCM Control Delay (s)	10.4	-	-	9.9	-	-	11.1
HCM Lane LOS	B	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-	-	0

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	24	1	14	48	84	0	4	18	217	0	2
Future Vol, veh/h	1	24	1	14	48	84	0	4	18	217	0	2
Peak Hour Factor	0.56	0.56	0.56	0.67	0.67	0.67	0.61	0.61	0.61	0.84	0.84	0.84
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	43	2	21	72	125	0	7	30	258	0	2
Number of Lanes	0	1	0	0	1	1	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	1
HCM Control Delay	9.2	8.7	7.9	12.4
HCM LOS	A	A	A	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	4%	23%	0%	100%	0%
Vol Thru, %	100%	18%	92%	77%	0%	0%	0%
Vol Right, %	0%	82%	4%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	22	26	62	84	217	2
LT Vol	0	0	1	14	0	217	0
Through Vol	0	4	24	48	0	0	0
RT Vol	0	18	1	0	84	0	2
Lane Flow Rate	0	36	46	93	125	258	2
Geometry Grp	7	7	6	7	7	7	7
Degree of Util (X)	0	0.049	0.073	0.143	0.165	0.411	0.003
Departure Headway (Hd)	5.493	4.915	5.649	5.553	4.735	5.721	4.515
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	722	631	645	755	628	788
Service Time	3.264	2.686	3.711	3.297	2.479	3.474	2.268
HCM Lane V/C Ratio	0	0.05	0.073	0.144	0.166	0.411	0.003
HCM Control Delay	8.3	7.9	9.2	9.2	8.4	12.4	7.3
HCM Lane LOS	N	A	A	A	A	B	A
HCM 95th-tile Q	0	0.2	0.2	0.5	0.6	2	0

Intersection	
Int Delay, s/veh	136.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	187	84	364	30	103	27	249	118	5	33	98	150
Future Vol, veh/h	187	84	364	30	103	27	249	118	5	33	98	150
Conflicting Peds, #/hr	1	0	3	3	0	1	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	0	-	-	-	215	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	77	77	77	85	85	85	79	79	79
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	210	94	409	39	134	35	293	139	6	42	124	190

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	170	0	0	97	0	0	810	766	97	817	748	153
Stage 1	-	-	-	-	-	-	518	518	-	230	230	-
Stage 2	-	-	-	-	-	-	292	248	-	587	518	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1407	-	-	1496	-	-	298	333	959	295	341	893
Stage 1	-	-	-	-	-	-	541	533	-	773	714	-
Stage 2	-	-	-	-	-	-	716	701	-	496	533	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1406	-	-	1496	-	-	~ 120	251	956	137	257	891
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 120	251	-	137	257	-
Stage 1	-	-	-	-	-	-	420	414	-	602	693	-
Stage 2	-	-	-	-	-	-	449	680	-	255	414	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.4	1.4	$ 500.9	35.8
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	120	259	1406	-	-	1496	-	-	211	891
HCM Lane V/C Ratio	2.441	0.559	0.149	-	-	0.026	-	-	0.786	0.213
HCM Control Delay (s)	$ 730.9	35.2	8	0	-	7.5	0	-	65.3	10.1
HCM Lane LOS	F	E	A	A	-	A	A	-	F	B
HCM 95th %tile Q(veh)	25.9	3.1	0.5	-	-	0.1	-	-	5.6	0.8

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	236	561	0	0	262	237	125	1	74	0	0	0
Future Volume (veh/h)	236	561	0	0	262	237	125	1	74	0	0	0
Number	7	4	14	3	8	18	5	2	12			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1863	1863	0	0	1863	1863	1900	1863	1863			
Adj Flow Rate, veh/h	259	616	0	0	285	0	147	1	87			
Adj No. of Lanes	1	1	0	0	2	1	0	1	1			
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.85	0.85	0.85			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	314	877	0	0	716	320	611	4	549			
Arrive On Green	0.18	0.47	0.00	0.00	0.20	0.00	0.35	0.35	0.35			
Sat Flow, veh/h	1774	1863	0	0	3632	1583	1763	12	1583			
Grp Volume(v), veh/h	259	616	0	0	285	0	148	0	87			
Grp Sat Flow(s),veh/h/ln	1774	1863	0	0	1770	1583	1775	0	1583			
Q Serve(g_s), s	7.2	13.4	0.0	0.0	3.6	0.0	3.1	0.0	2.0			
Cycle Q Clear(g_c), s	7.2	13.4	0.0	0.0	3.6	0.0	3.1	0.0	2.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	314	877	0	0	716	320	615	0	549			
V/C Ratio(X)	0.83	0.70	0.00	0.00	0.40	0.00	0.24	0.00	0.16			
Avail Cap(c_a), veh/h	356	1189	0	0	1226	549	615	0	549			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	20.4	10.8	0.0	0.0	17.8	0.0	12.0	0.0	11.6			
Incr Delay (d2), s/veh	13.3	1.2	0.0	0.0	0.4	0.0	0.9	0.0	0.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	4.7	7.1	0.0	0.0	1.8	0.0	1.6	0.0	0.9			
LnGrp Delay(d),s/veh	33.7	11.9	0.0	0.0	18.1	0.0	12.9	0.0	12.2			
LnGrp LOS	C	B			B		B		B			
Approach Vol, veh/h		875			285			235				
Approach Delay, s/veh		18.4			18.1			12.6				
Approach LOS		B			B			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		22.5		28.9			13.8	15.1
Change Period (Y+Rc), s		* 4.7		* 4.7			* 4.7	* 4.7
Max Green Setting (Gmax), s		* 18		* 33			* 10	* 18
Max Q Clear Time (g_c+I1), s		5.1		15.4			9.2	5.6
Green Ext Time (p_c), s		0.9		5.8			0.1	4.8

Intersection Summary	
HCM 2010 Ctrl Delay	17.4
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	503	186	67	289	0	0	0	0	297	0	446
Future Volume (veh/h)	0	503	186	67	289	0	0	0	0	297	0	446
Number	7	4	14	3	8	18				1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1900	1863	1863
Adj Flow Rate, veh/h	0	529	196	73	314	0				341	0	0
Adj No. of Lanes	0	2	1	1	1	0				0	1	1
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92				0.87	0.87	0.87
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	932	413	115	795	0				667	0	595
Arrive On Green	0.00	0.26	0.26	0.07	0.43	0.00				0.38	0.00	0.00
Sat Flow, veh/h	0	3632	1568	1774	1863	0				1774	0	1583
Grp Volume(v), veh/h	0	529	196	73	314	0				341	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1568	1774	1863	0				1774	0	1583
Q Serve(g_s), s	0.0	6.2	5.0	1.9	5.5	0.0				7.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	6.2	5.0	1.9	5.5	0.0				7.1	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	932	413	115	795	0				667	0	595
V/C Ratio(X)	0.00	0.57	0.47	0.63	0.39	0.00				0.51	0.00	0.00
Avail Cap(c_a), veh/h	0	1337	593	186	1083	0				667	0	595
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	15.2	14.8	21.7	9.4	0.0				11.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.5	0.8	5.6	0.3	0.0				2.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.1	2.2	1.1	2.9	0.0				3.9	0.0	0.0
LnGrp Delay(d),s/veh	0.0	15.7	15.6	27.3	9.7	0.0				14.3	0.0	0.0
LnGrp LOS		B	B	C	A					B		
Approach Vol, veh/h		725			387						341	
Approach Delay, s/veh		15.7			13.0						14.3	
Approach LOS		B			B						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs			3	4		6		8
Phs Duration (G+Y+Rc), s			7.8	17.2		22.6		25.0
Change Period (Y+Rc), s			* 4.7	* 4.7		4.7		* 4.7
Max Green Setting (Gmax), s			* 5	* 18		17.9		* 28
Max Q Clear Time (g_c+I1), s			3.9	8.2		9.1		7.5
Green Ext Time (p_c), s			0.0	4.3		1.3		6.3

Intersection Summary	
HCM 2010 Ctrl Delay	14.7
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	656	1	26	455	257	0	0	33	0	0	23
Future Vol, veh/h	0	656	1	26	455	257	0	0	33	0	0	23
Conflicting Peds, #/hr	0	0	6	6	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	75	75	75	72	72	72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	683	1	27	474	268	0	0	44	0	0	32

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	690	0	0	-	-	348	-	-	608
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	5.33	-	-	-	-	7.13	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	3.119	-	-	-	-	3.919	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	552	-	-	0	0	554	0	0	495
Stage 1	0	-	-	-	-	-	0	0	-	0	0	-
Stage 2	0	-	-	-	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	552	-	-	-	-	551	-	-	495
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	12.1	12.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	551	-	-	552	-	-	495
HCM Lane V/C Ratio	0.08	-	-	0.049	-	-	0.065
HCM Control Delay (s)	12.1	-	-	11.9	-	-	12.8
HCM Lane LOS	B	-	-	B	-	-	B
HCM 95th %tile Q(veh)	0.3	-	-	0.2	-	-	0.2

Intersection	
Intersection Delay, s/veh	20.5
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	99	3	22	100	207	2	9	11	363	6	8
Future Vol, veh/h	8	99	3	22	100	207	2	9	11	363	6	8
Peak Hour Factor	0.85	0.85	0.85	0.95	0.95	0.95	0.61	0.61	0.61	0.81	0.81	0.81
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	116	4	23	105	218	3	15	18	448	7	10
Number of Lanes	0	1	0	0	1	1	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	1
HCM Control Delay	12	11.4	9.6	30.5
HCM LOS	B	B	A	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	7%	18%	0%	100%	0%
Vol Thru, %	0%	45%	90%	82%	0%	0%	43%
Vol Right, %	0%	55%	3%	0%	100%	0%	57%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	2	20	110	122	207	363	14
LT Vol	2	0	8	22	0	363	0
Through Vol	0	9	99	100	0	0	6
RT Vol	0	11	3	0	207	0	8
Lane Flow Rate	3	33	129	128	218	448	17
Geometry Grp	7	7	6	7	7	7	7
Degree of Util (X)	0.007	0.058	0.243	0.233	0.347	0.809	0.027
Departure Headway (Hd)	7.287	6.381	6.767	6.526	5.726	6.495	5.583
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	489	558	528	548	625	556	640
Service Time	5.059	4.153	4.838	4.287	3.486	4.235	3.324
HCM Lane V/C Ratio	0.006	0.059	0.244	0.234	0.349	0.806	0.027
HCM Control Delay	10.1	9.5	12	11.3	11.5	31.3	8.5
HCM Lane LOS	B	A	B	B	B	D	A
HCM 95th-tile Q	0	0.2	0.9	0.9	1.5	7.9	0.1

Intersection: 1: S Auburn Street & E McKnight Way

Movement	EB	WB	NB	NB	SB
Directions Served	LT	LTR	L	TR	LT
Maximum Queue (ft)	47	23	196	116	95
Average Queue (ft)	17	3	97	56	36
95th Queue (ft)	40	14	168	86	61
Link Distance (ft)	72	169		325	586
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			215		
Storage Blk Time (%)			0		3
Queuing Penalty (veh)			0		3

Intersection: 2: SR 49 NB Off-Ramp/SR 49 NB On-Ramp & E McKnight Way

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	LT	R
Maximum Queue (ft)	109	174	59	75	119	88	96
Average Queue (ft)	52	71	12	41	39	37	35
95th Queue (ft)	90	132	35	75	91	69	75
Link Distance (ft)	239	239	72	72	72	383	383
Upstream Blk Time (%)			0	2	3		
Queuing Penalty (veh)			0	4	5		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 3: SR 49 SB On-Ramp/SR 49 SB Off-Ramp & W McKnight Way/E McKnight Way

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	T	T	R	L	T	LT	R
Maximum Queue (ft)	73	73	52	71	158	117	113
Average Queue (ft)	33	48	22	25	77	68	7
95th Queue (ft)	65	77	45	56	141	110	50
Link Distance (ft)	57	57	57	239	239	527	
Upstream Blk Time (%)	1	6	0				
Queuing Penalty (veh)	1	7	0				
Storage Bay Dist (ft)							375
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 4: Taylorville Road & W McKnight Way

Movement	EB	EB	EB	WB	NB	SB
Directions Served	T	T	TR	TR	R	R
Maximum Queue (ft)	27	73	26	124	29	29
Average Queue (ft)	1	14	2	88	16	3
95th Queue (ft)	9	46	12	135	39	17
Link Distance (ft)				57	194	363
Upstream Blk Time (%)				2		
Queuing Penalty (veh)				4		
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 5: Freeman Lane & W McKnight Way

Movement	EB	WB	WB	NB	SB	SB
Directions Served	LTR	LT	R	TR	L	TR
Maximum Queue (ft)	54	48	48	30	64	23
Average Queue (ft)	19	21	24	16	33	1
95th Queue (ft)	47	41	39	40	52	8
Link Distance (ft)	160			255		397
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)					180	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Zone Summary

Zone wide Queuing Penalty: 25

Intersection: 1: S Auburn Street & E McKnight Way

Movement	EB	EB	WB	NB	NB	SB
Directions Served	LT	R	LTR	L	TR	LT
Maximum Queue (ft)	94	119	42	221	75	120
Average Queue (ft)	36	8	7	90	41	45
95th Queue (ft)	86	56	25	164	67	81
Link Distance (ft)	72	72	169		325	586
Upstream Blk Time (%)	1	1				
Queuing Penalty (veh)	5	3				
Storage Bay Dist (ft)				215		
Storage Blk Time (%)				0		6
Queuing Penalty (veh)				0		8

Intersection: 2: SR 49 NB Off-Ramp/SR 49 NB On-Ramp & E McKnight Way

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	LT	R
Maximum Queue (ft)	260	255	58	79	127	101	75
Average Queue (ft)	109	147	20	40	57	44	29
95th Queue (ft)	195	253	48	75	113	79	65
Link Distance (ft)	239	239	72	72	72	383	383
Upstream Blk Time (%)	1	1	0	2	7		
Queuing Penalty (veh)	5	2	0	3	12		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 3: SR 49 SB On-Ramp/SR 49 SB Off-Ramp & W McKnight Way/E McKnight Way

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	T	T	R	L	T	LT	R
Maximum Queue (ft)	72	74	70	93	128	136	221
Average Queue (ft)	49	70	42	46	59	88	33
95th Queue (ft)	80	77	66	86	120	137	138
Link Distance (ft)	57	57	57	239	239	527	
Upstream Blk Time (%)	4	23	2				
Queuing Penalty (veh)	9	53	4				
Storage Bay Dist (ft)							375
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 4: Taylorville Road & W McKnight Way

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	T	T	TR	L	TR	R	R
Maximum Queue (ft)	75	112	72	50	144	49	31
Average Queue (ft)	31	55	9	5	112	23	12
95th Queue (ft)	87	100	41	25	149	46	36
Link Distance (ft)				57	57	194	363
Upstream Blk Time (%)		0		0	4		
Queuing Penalty (veh)		0		0	15		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Freeman Lane & W McKnight Way

Movement	EB	WB	WB	NB	SB	SB
Directions Served	LTR	LT	R	TR	L	TR
Maximum Queue (ft)	75	73	74	30	164	23
Average Queue (ft)	39	32	39	12	65	7
95th Queue (ft)	61	52	67	36	127	25
Link Distance (ft)	160			255		397
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)					180	
Storage Blk Time (%)					0	
Queuing Penalty (veh)					0	

Zone Summary

Zone wide Queuing Penalty: 119

Intersection	
Intersection Delay, s/veh	24.5
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	151	101	170	21	66	30	369	176	20	25	61	105
Future Vol, veh/h	151	101	170	21	66	30	369	176	20	25	61	105
Peak Hour Factor	0.91	0.91	0.91	0.69	0.69	0.69	0.91	0.91	0.91	0.77	0.77	0.77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	166	111	187	30	96	43	405	193	22	32	79	136
Number of Lanes	0	1	1	0	1	0	1	1	0	0	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	19.2	16.4	35.1	13.3
HCM LOS	C	C	E	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	60%	0%	18%	29%	0%
Vol Thru, %	0%	90%	40%	0%	56%	71%	0%
Vol Right, %	0%	10%	0%	100%	26%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	369	196	252	170	117	86	105
LT Vol	369	0	151	0	21	25	0
Through Vol	0	176	101	0	66	61	0
RT Vol	0	20	0	170	30	0	105
Lane Flow Rate	405	215	277	187	170	112	136
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.88	0.432	0.616	0.362	0.386	0.255	0.278
Departure Headway (Hd)	7.815	7.228	8.009	6.984	8.187	8.214	7.339
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	462	498	451	514	439	437	488
Service Time	5.571	4.984	5.766	4.741	6.255	5.982	5.106
HCM Lane V/C Ratio	0.877	0.432	0.614	0.364	0.387	0.256	0.279
HCM Control Delay	45.6	15.4	22.9	13.7	16.4	13.8	12.9
HCM Lane LOS	E	C	C	B	C	B	B
HCM 95th-tile Q	9.3	2.1	4	1.6	1.8	1	1.1

Intersection	
Intersection Delay, s/veh	26
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	187	84	364	30	103	27	249	118	5	33	98	150
Future Vol, veh/h	187	84	364	30	103	27	249	118	5	33	98	150
Peak Hour Factor	0.89	0.89	0.89	0.77	0.77	0.77	0.85	0.85	0.85	0.79	0.79	0.79
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	210	94	409	39	134	35	293	139	6	42	124	190
Number of Lanes	0	1	1	0	1	0	1	1	0	0	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	32.3	20.6	26	16.7
HCM LOS	D	C	D	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	69%	0%	19%	25%	0%
Vol Thru, %	0%	96%	31%	0%	64%	75%	0%
Vol Right, %	0%	4%	0%	100%	17%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	249	123	271	364	160	131	150
LT Vol	249	0	187	0	30	33	0
Through Vol	0	118	84	0	103	98	0
RT Vol	0	5	0	364	27	0	150
Lane Flow Rate	293	145	304	409	208	166	190
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.719	0.333	0.701	0.819	0.506	0.402	0.415
Departure Headway (Hd)	8.833	8.285	8.283	7.207	8.765	8.719	7.859
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	407	433	435	499	409	411	456
Service Time	6.615	6.066	6.065	4.988	6.86	6.505	5.645
HCM Lane V/C Ratio	0.72	0.335	0.699	0.82	0.509	0.404	0.417
HCM Control Delay	31.3	15.2	28.4	35.2	20.6	17.3	16.2
HCM Lane LOS	D	C	D	E	C	C	C
HCM 95th-tile Q	5.5	1.4	5.3	7.9	2.8	1.9	2

Intersection: 1: S Auburn Street & McKnight Way

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LT	LTR	L	TR	LT	R
Maximum Queue (ft)	94	68	152	76	70	143
Average Queue (ft)	63	34	71	47	35	5
95th Queue (ft)	94	55	113	72	54	47
Link Distance (ft)	72	169		325	586	
Upstream Blk Time (%)	3					
Queuing Penalty (veh)	7					
Storage Bay Dist (ft)			215			50
Storage Blk Time (%)					1	
Queuing Penalty (veh)					1	

Intersection: 1: S Auburn Street & McKnight Way

Movement	EB	EB	WB	NB	NB	SB
Directions Served	LT	R	LTR	L	TR	LT
Maximum Queue (ft)	95	131	93	134	76	53
Average Queue (ft)	68	32	43	59	38	37
95th Queue (ft)	103	115	79	112	60	53
Link Distance (ft)	72	72	169		325	586
Upstream Blk Time (%)	8	3				
Queuing Penalty (veh)	26	11				
Storage Bay Dist (ft)				215		
Storage Blk Time (%)						1
Queuing Penalty (veh)						2

DELAY (CONTROL)

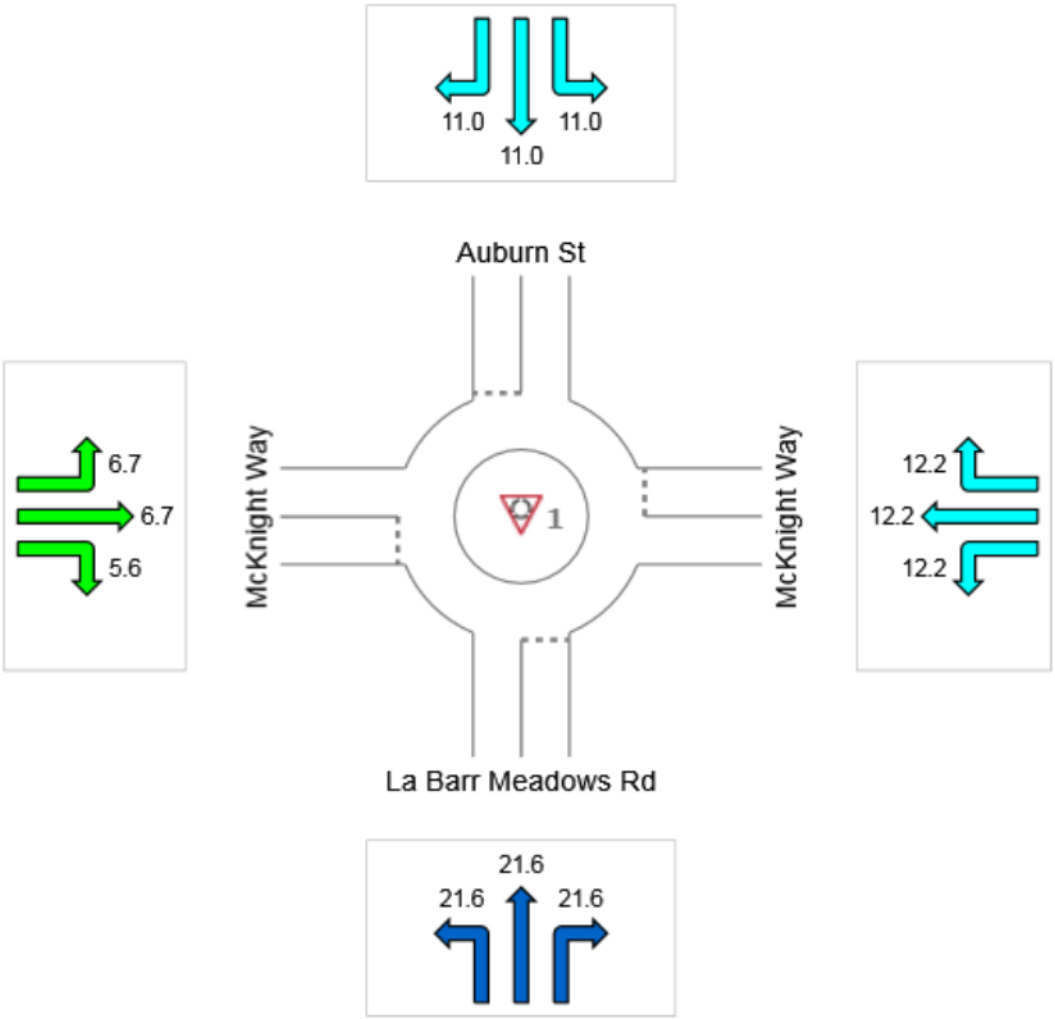
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [821 Auburn Existing Plus Project AM]

Roundabout with 1-lane approaches and circulating road, and an extra turn lane
MUTCD (FHWA 2009) example number: 3C-3
Roundabout Guide (TRB 2010) example number: A-2
Roundabout

All Movement Classes

	South	East	North	West	Intersection
Delay (Control)	21.6	12.2	11.0	6.3	14.1
LOS	C	B	B	A	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Roundabout Level of Service Method: Same as Sign Control

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

DELAY (CONTROL)

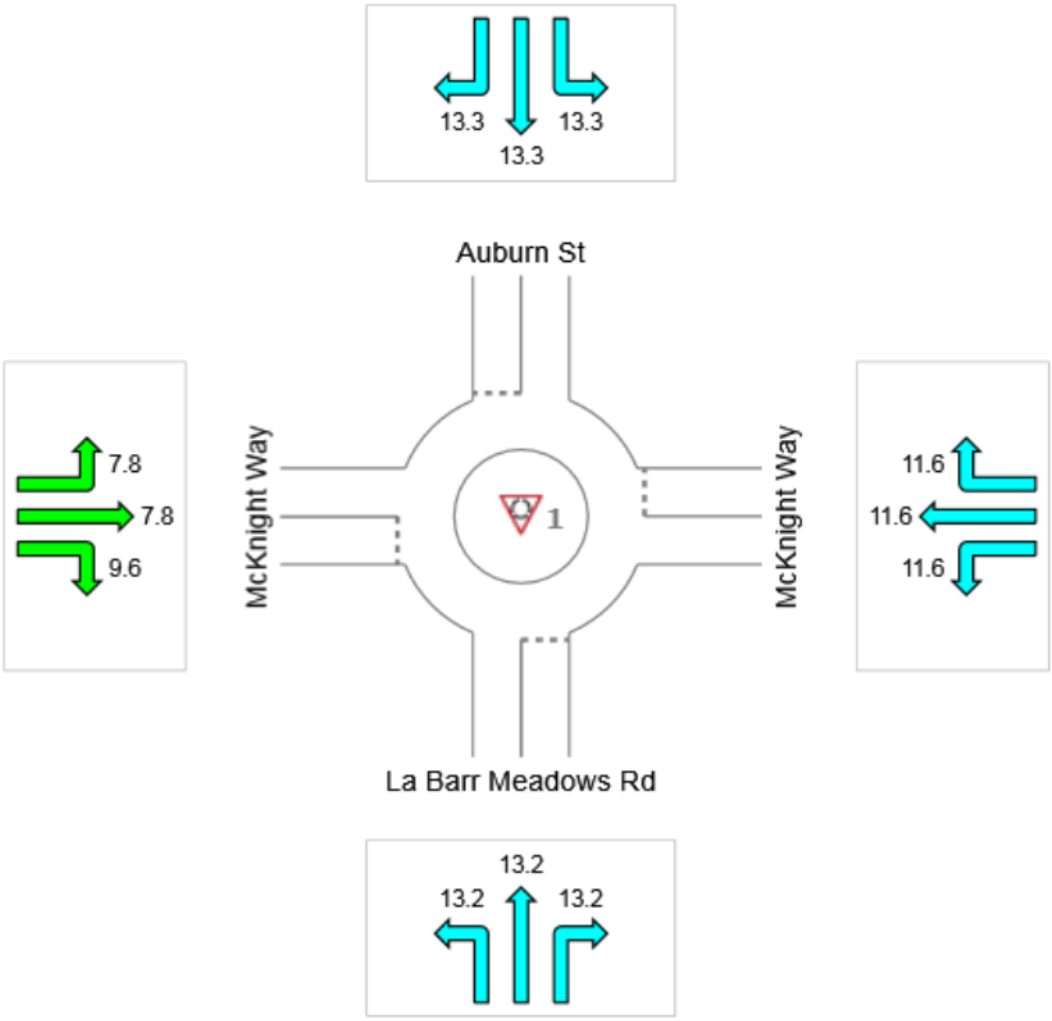
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [821 Auburn Existing Plus Project PM]

Roundabout with 1-lane approaches and circulating road, and an extra turn lane
MUTCD (FHWA 2009) example number: 3C-3
Roundabout Guide (TRB 2010) example number: A-2
Roundabout

All Movement Classes

	South	East	North	West	Intersection
Delay (Control)	13.2	11.6	13.3	8.8	11.2
LOS	B	B	B	A	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Roundabout Level of Service Method: Same as Sign Control

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Appendix E CUMULATIVE CONDITIONS LOS CALCULATION SHEETS

Arterial Level of Service: EB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 SB On-Ramp	III	30	26.7	15.5	42.2	0.21	18.0	D
SR 49 NB Off-Ramp	III	30	8.7	11.6	20.3	0.06	9.9	F
Total	III		35.4	27.1	62.5	0.27	15.3	D

Arterial Level of Service: WB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 NB On-Ramp	IV	30	15.8	18.8	34.6	0.07	7.2	E
SR 49 SB Off-Ramp	IV	30	12.7	13.0	25.7	0.06	7.8	E
Total	IV		28.5	31.8	60.3	0.13	7.5	E

Arterial Level of Service: EB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 SB On-Ramp	III	30	26.7	16.7	43.4	0.21	17.5	D
SR 49 NB Off-Ramp	III	30	8.7	16.0	24.7	0.06	8.1	F
Total	III		35.4	32.7	68.1	0.27	14.1	D

Arterial Level of Service: WB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 NB On-Ramp	IV	30	15.8	22.0	37.8	0.07	6.6	F
SR 49 SB Off-Ramp	IV	30	12.7	11.6	24.3	0.06	8.3	E
Total	IV		28.5	33.6	62.1	0.13	7.3	E

Intersection	
Int Delay, s/veh	255.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	172	108	214	21	49	38	465	216	25	31	77	132
Future Vol, veh/h	172	108	214	21	49	38	465	216	25	31	77	132
Conflicting Peds, #/hr	1	0	2	2	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	0	-	-	-	215	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	69	69	69	91	91	91	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	189	119	235	30	71	55	511	237	27	40	100	171

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	127	0	0	121	0	0	708	687	123	791	659	100
Stage 1	-	-	-	-	-	-	499	499	-	160	160	-
Stage 2	-	-	-	-	-	-	209	188	-	631	499	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1459	-	-	1467	-	-	~ 350	370	928	307	384	956
Stage 1	-	-	-	-	-	-	554	544	-	842	766	-
Stage 2	-	-	-	-	-	-	793	745	-	469	544	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1459	-	-	1464	-	-	~ 186	301	924	91	312	955
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 186	301	-	91	312	-
Stage 1	-	-	-	-	-	-	~ 461	452	-	701	748	-
Stage 2	-	-	-	-	-	-	551	728	-	180	452	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.7	1.5	$ 570.7	36.3
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	186	324	1459	-	-	1464	-	-	184	955
HCM Lane V/C Ratio	2.747	0.817	0.13	-	-	0.021	-	-	0.762	0.18
HCM Control Delay (s)	$ 840	51	7.8	0	-	7.5	0	-	68.9	9.6
HCM Lane LOS	F	F	A	A	-	A	A	-	F	A
HCM 95th %tile Q(veh)	44.9	6.9	0.4	-	-	0.1	-	-	5	0.7

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	168	392	0	0	256	388	135	1	102	0	0	0
Future Volume (veh/h)	168	392	0	0	256	388	135	1	102	0	0	0
Number	7	4	14	3	8	18	5	2	12			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1863	1863	0	0	1863	1863	1900	1863	1863			
Adj Flow Rate, veh/h	185	431	0	0	284	0	153	1	116			
Adj No. of Lanes	1	1	0	0	2	1	0	1	1			
Peak Hour Factor	0.91	0.91	0.91	0.90	0.90	0.90	0.88	0.88	0.88			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	235	795	0	0	705	315	673	4	605			
Arrive On Green	0.13	0.43	0.00	0.00	0.20	0.00	0.38	0.38	0.38			
Sat Flow, veh/h	1774	1863	0	0	3632	1583	1763	12	1583			
Grp Volume(v), veh/h	185	431	0	0	284	0	154	0	116			
Grp Sat Flow(s),veh/h/ln	1774	1863	0	0	1770	1583	1775	0	1583			
Q Serve(g_s), s	5.0	8.5	0.0	0.0	3.4	0.0	2.9	0.0	2.4			
Cycle Q Clear(g_c), s	5.0	8.5	0.0	0.0	3.4	0.0	2.9	0.0	2.4			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	235	795	0	0	705	315	678	0	605			
V/C Ratio(X)	0.79	0.54	0.00	0.00	0.40	0.00	0.23	0.00	0.19			
Avail Cap(c_a), veh/h	335	1204	0	0	1280	573	678	0	605			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	20.7	10.5	0.0	0.0	17.2	0.0	10.3	0.0	10.1			
Incr Delay (d2), s/veh	7.8	0.6	0.0	0.0	0.4	0.0	0.8	0.0	0.7			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.9	4.4	0.0	0.0	1.7	0.0	1.6	0.0	1.1			
LnGrp Delay(d),s/veh	28.5	11.1	0.0	0.0	17.5	0.0	11.1	0.0	10.8			
LnGrp LOS	C	B			B		B		B			
Approach Vol, veh/h		616			284			270				
Approach Delay, s/veh		16.3			17.5			11.0				
Approach LOS		B			B			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		23.5		25.7			11.2	14.5
Change Period (Y+Rc), s		* 4.7		* 4.7			* 4.7	* 4.7
Max Green Setting (Gmax), s		* 19		* 32			* 9.3	* 18
Max Q Clear Time (g_c+I1), s		4.9		10.5			7.0	5.4
Green Ext Time (p_c), s		1.0		4.7			0.1	3.7

Intersection Summary	
HCM 2010 Ctrl Delay	15.4
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	336	89	50	334	0	0	0	0	230	3	298
Future Volume (veh/h)	0	336	89	50	334	0	0	0	0	230	3	298
Number	7	4	14	3	8	18				1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1900	1863	1863
Adj Flow Rate, veh/h	0	378	100	59	393	0				240	3	0
Adj No. of Lanes	0	2	1	1	1	0				0	1	1
Peak Hour Factor	0.89	0.89	0.89	0.85	0.85	0.85				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	815	355	103	732	0				698	9	630
Arrive On Green	0.00	0.23	0.23	0.06	0.39	0.00				0.40	0.40	0.00
Sat Flow, veh/h	0	3632	1543	1774	1863	0				1753	22	1583
Grp Volume(v), veh/h	0	378	100	59	393	0				243	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1543	1774	1863	0				1775	0	1583
Q Serve(g_s), s	0.0	4.1	2.4	1.5	7.3	0.0				4.3	0.0	0.0
Cycle Q Clear(g_c), s	0.0	4.1	2.4	1.5	7.3	0.0				4.3	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	815	355	103	732	0				707	0	630
V/C Ratio(X)	0.00	0.46	0.28	0.57	0.54	0.00				0.34	0.00	0.00
Avail Cap(c_a), veh/h	0	1417	618	197	1148	0				707	0	630
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	14.9	14.2	20.6	10.5	0.0				9.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.4	5.0	0.6	0.0				1.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.0	1.1	0.8	3.8	0.0				2.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	15.3	14.7	25.6	11.1	0.0				10.8	0.0	0.0
LnGrp LOS		B	B	C	B					B		
Approach Vol, veh/h		478			452						243	
Approach Delay, s/veh		15.2			13.0						10.8	
Approach LOS		B			B						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs			3	4		6		8
Phs Duration (G+Y+Rc), s			7.3	15.1		22.6		22.4
Change Period (Y+Rc), s			* 4.7	* 4.7		4.7		* 4.7
Max Green Setting (Gmax), s			* 5	* 18		17.9		* 28
Max Q Clear Time (g_c+I1), s			3.5	6.1		6.3		9.3
Green Ext Time (p_c), s			0.0	4.2		1.0		5.2

Intersection Summary	
HCM 2010 Ctrl Delay	13.4
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	409	3	24	317	294	0	0	19	0	0	5
Future Vol, veh/h	0	409	3	24	317	294	0	0	19	0	0	5
Conflicting Peds, #/hr	0	0	3	3	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	82	82	82	75	75	75	50	50	50
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	476	3	29	387	359	0	0	25	0	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	482	0	0	-	-	243	-	-	566
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	5.33	-	-	-	-	7.13	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	3.119	-	-	-	-	3.919	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	692	-	-	0	0	646	0	0	523
Stage 1	0	-	-	-	-	-	0	0	-	0	0	-
Stage 2	0	-	-	-	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	692	-	-	-	-	644	-	-	523
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	10.8	12
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	644	-	-	692	-	-	523
HCM Lane V/C Ratio	0.039	-	-	0.042	-	-	0.019
HCM Control Delay (s)	10.8	-	-	10.4	-	-	12
HCM Lane LOS	B	-	-	B	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-	-	0.1

Intersection	
Intersection Delay, s/veh	12
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	30	1	18	60	99	0	5	23	268	0	3
Future Vol, veh/h	3	30	1	18	60	99	0	5	23	268	0	3
Peak Hour Factor	0.56	0.56	0.56	0.67	0.67	0.67	0.61	0.61	0.61	0.84	0.84	0.84
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	54	2	27	90	148	0	8	38	319	0	4
Number of Lanes	0	1	0	0	1	1	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	1
HCM Control Delay	9.8	9.5	8.4	15
HCM LOS	A	A	A	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	9%	23%	0%	100%	0%
Vol Thru, %	100%	18%	88%	77%	0%	0%	0%
Vol Right, %	0%	82%	3%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	28	34	78	99	268	3
LT Vol	0	0	3	18	0	268	0
Through Vol	0	5	30	60	0	0	0
RT Vol	0	23	1	0	99	0	3
Lane Flow Rate	0	46	61	116	148	319	4
Geometry Grp	7	7	6	7	7	7	7
Degree of Util (X)	0	0.068	0.102	0.188	0.204	0.523	0.005
Departure Headway (Hd)	5.881	5.299	6.07	5.804	4.982	5.901	4.693
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	680	594	614	714	606	754
Service Time	3.584	3.001	4.074	3.583	2.76	3.687	2.478
HCM Lane V/C Ratio	0	0.068	0.103	0.189	0.207	0.526	0.005
HCM Control Delay	8.6	8.4	9.8	9.9	9.1	15.1	7.5
HCM Lane LOS	N	A	A	A	A	C	A
HCM 95th-tile Q	0	0.2	0.3	0.7	0.8	3	0

Intersection	
Int Delay, s/veh	376

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	211	82	458	31	82	34	313	141	6	41	123	189
Future Vol, veh/h	211	82	458	31	82	34	313	141	6	41	123	189
Conflicting Peds, #/hr	1	0	3	3	0	1	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	0	-	-	-	215	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	77	77	77	85	85	85	79	79	79
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	237	92	515	40	106	44	368	166	7	52	156	239

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	152	0	0	95	0	0	857	801	95	863	779	131
Stage 1	-	-	-	-	-	-	569	569	-	210	210	-
Stage 2	-	-	-	-	-	-	288	232	-	653	569	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1429	-	-	1499	-	-	~ 277	318	962	275	327	919
Stage 1	-	-	-	-	-	-	507	506	-	792	728	-
Stage 2	-	-	-	-	-	-	720	713	-	456	506	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1428	-	-	1499	-	-	~ 74	223	959	86	230	917
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 74	223	-	86	230	-
Stage 1	-	-	-	-	-	-	~ 367	366	-	574	706	-
Stage 2	-	-	-	-	-	-	402	692	-	180	366	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	1.6	$ 1312.2	107.9
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	74	230	1428	-	-	1499	-	-	162	917
HCM Lane V/C Ratio	4.976	0.752	0.166	-	-	0.027	-	-	1.281	0.261
HCM Control Delay (s)	$ 1901.9	56.6	8	0	-	7.5	0	-	220.3	10.3
HCM Lane LOS	F	F	A	A	-	A	A	-	F	B
HCM 95th %tile Q(veh)	40.2	5.2	0.6	-	-	0.1	-	-	12.1	1

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	297	674	0	0	302	278	157	1	77	0	0	0
Future Volume (veh/h)	297	674	0	0	302	278	157	1	77	0	0	0
Number	7	4	14	3	8	18	5	2	12			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1863	1863	0	0	1863	1863	1900	1863	1863			
Adj Flow Rate, veh/h	326	741	0	0	328	0	185	1	91			
Adj No. of Lanes	1	1	0	0	2	1	0	1	1			
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.85	0.85	0.85			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	385	960	0	0	759	340	560	3	502			
Arrive On Green	0.22	0.52	0.00	0.00	0.21	0.00	0.32	0.32	0.32			
Sat Flow, veh/h	1774	1863	0	0	3632	1583	1765	10	1583			
Grp Volume(v), veh/h	326	741	0	0	328	0	186	0	91			
Grp Sat Flow(s),veh/h/ln	1774	1863	0	0	1770	1583	1774	0	1583			
Q Serve(g_s), s	9.9	18.0	0.0	0.0	4.5	0.0	4.5	0.0	2.3			
Cycle Q Clear(g_c), s	9.9	18.0	0.0	0.0	4.5	0.0	4.5	0.0	2.3			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	385	960	0	0	759	340	563	0	502			
V/C Ratio(X)	0.85	0.77	0.00	0.00	0.43	0.00	0.33	0.00	0.18			
Avail Cap(c_a), veh/h	484	1255	0	0	1123	502	563	0	502			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	21.1	10.9	0.0	0.0	19.1	0.0	14.6	0.0	13.9			
Incr Delay (d2), s/veh	11.0	2.2	0.0	0.0	0.4	0.0	1.6	0.0	0.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	6.0	9.7	0.0	0.0	2.2	0.0	2.4	0.0	1.1			
LnGrp Delay(d),s/veh	32.0	13.2	0.0	0.0	19.5	0.0	16.2	0.0	14.7			
LnGrp LOS	C	B			B		B		B			
Approach Vol, veh/h		1067			328			277				
Approach Delay, s/veh		18.9			19.5			15.7				
Approach LOS		B			B			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		22.5		33.6			16.9	16.7
Change Period (Y+Rc), s		* 4.7		* 4.7			* 4.7	* 4.7
Max Green Setting (Gmax), s		* 18		* 38			* 15	* 18
Max Q Clear Time (g_c+I1), s		6.5		20.0			11.9	6.5
Green Ext Time (p_c), s		1.0		7.2			0.3	5.5

Intersection Summary	
HCM 2010 Ctrl Delay	18.5
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	621	234	68	352	0	0	0	0	353	0	561
Future Volume (veh/h)	0	621	234	68	352	0	0	0	0	353	0	561
Number	7	4	14	3	8	18				1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1900	1863	1863
Adj Flow Rate, veh/h	0	654	246	74	383	0				406	0	0
Adj No. of Lanes	0	2	1	1	1	0				0	1	1
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92				0.87	0.87	0.87
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1034	459	114	840	0				638	0	570
Arrive On Green	0.00	0.29	0.29	0.06	0.45	0.00				0.36	0.00	0.00
Sat Flow, veh/h	0	3632	1570	1774	1863	0				1774	0	1583
Grp Volume(v), veh/h	0	654	246	74	383	0				406	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1570	1774	1863	0				1774	0	1583
Q Serve(g_s), s	0.0	8.0	6.5	2.0	7.1	0.0				9.4	0.0	0.0
Cycle Q Clear(g_c), s	0.0	8.0	6.5	2.0	7.1	0.0				9.4	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1034	459	114	840	0				638	0	570
V/C Ratio(X)	0.00	0.63	0.54	0.65	0.46	0.00				0.64	0.00	0.00
Avail Cap(c_a), veh/h	0	1281	568	178	1037	0				638	0	570
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	15.3	14.8	22.7	9.4	0.0				13.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	1.0	6.0	0.4	0.0				4.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.0	2.9	1.2	3.7	0.0				5.5	0.0	0.0
LnGrp Delay(d),s/veh	0.0	16.0	15.7	28.8	9.8	0.0				18.0	0.0	0.0
LnGrp LOS		B	B	C	A					B		
Approach Vol, veh/h		900			457						406	
Approach Delay, s/veh		15.9			12.9						18.0	
Approach LOS		B			B						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs			3	4		6		8
Phs Duration (G+Y+Rc), s			7.9	19.2		22.6		27.1
Change Period (Y+Rc), s			* 4.7	* 4.7		4.7		* 4.7
Max Green Setting (Gmax), s			* 5	* 18		17.9		* 28
Max Q Clear Time (g_c+I1), s			4.0	10.0		11.4		9.1
Green Ext Time (p_c), s			0.0	4.6		1.4		7.7

Intersection Summary	
HCM 2010 Ctrl Delay	15.6
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	817	1	33	563	321	0	0	38	0	0	29
Future Vol, veh/h	0	817	1	33	563	321	0	0	38	0	0	29
Conflicting Peds, #/hr	0	0	6	6	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	75	75	75	72	72	72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	851	1	34	586	334	0	0	51	0	0	40

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	858	0	0	-	-	432	-	-	754
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	5.33	-	-	-	-	7.13	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	3.119	-	-	-	-	3.919	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	459	-	-	0	0	489	0	0	408
Stage 1	0	-	-	-	-	-	0	0	-	0	0	-
Stage 2	0	-	-	-	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	459	-	-	-	-	486	-	-	408
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	13.3	14.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	486	-	-	459	-	-	408
HCM Lane V/C Ratio	0.104	-	-	0.075	-	-	0.099
HCM Control Delay (s)	13.3	-	-	13.5	-	-	14.8
HCM Lane LOS	B	-	-	B	-	-	B
HCM 95th %tile Q(veh)	0.3	-	-	0.2	-	-	0.3

Intersection	
Intersection Delay, s/veh	46.7
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	123	4	26	124	254	3	11	14	450	8	10
Future Vol, veh/h	10	123	4	26	124	254	3	11	14	450	8	10
Peak Hour Factor	0.85	0.85	0.85	0.95	0.95	0.95	0.61	0.61	0.61	0.81	0.81	0.81
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	145	5	27	131	267	5	18	23	556	10	12
Number of Lanes	0	1	0	0	1	1	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	1
HCM Control Delay	14.3	14.1	10.6	82.6
HCM LOS	B	B	B	F

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	7%	17%	0%	100%	0%
Vol Thru, %	0%	44%	90%	83%	0%	0%	44%
Vol Right, %	0%	56%	3%	0%	100%	0%	56%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	3	25	137	150	254	450	18
LT Vol	3	0	10	26	0	450	0
Through Vol	0	11	123	124	0	0	8
RT Vol	0	14	4	0	254	0	10
Lane Flow Rate	5	41	161	158	267	556	22
Geometry Grp	7	7	6	7	7	7	7
Degree of Util (X)	0.011	0.08	0.328	0.308	0.464	1.07	0.037
Departure Headway (Hd)	8.204	7.282	7.623	7.277	6.476	6.931	6.027
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	439	495	475	497	559	522	593
Service Time	5.904	4.982	5.623	4.977	4.176	4.677	3.772
HCM Lane V/C Ratio	0.011	0.083	0.339	0.318	0.478	1.065	0.037
HCM Control Delay	11	10.6	14.3	13.2	14.7	85.5	9
HCM Lane LOS	B	B	B	B	B	F	A
HCM 95th-tile Q	0	0.3	1.4	1.3	2.4	16.8	0.1

Intersection: 1: S Auburn Street & E McKnight Way

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LT	LTR	L	TR	LT	R
Maximum Queue (ft)	74	23	275	377	209	150
Average Queue (ft)	31	5	194	172	53	13
95th Queue (ft)	64	20	329	394	111	79
Link Distance (ft)	72	169		325	586	
Upstream Blk Time (%)	0			12		
Queuing Penalty (veh)	0			0		
Storage Bay Dist (ft)			215			50
Storage Blk Time (%)			32		9	
Queuing Penalty (veh)			78		12	

Intersection: 2: SR 49 NB Off-Ramp/SR 49 NB On-Ramp & E McKnight Way

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	LT	R
Maximum Queue (ft)	240	174	37	81	129	112	99
Average Queue (ft)	93	97	7	56	47	42	42
95th Queue (ft)	165	158	24	92	125	84	81
Link Distance (ft)	239	239	72	72	72	383	383
Upstream Blk Time (%)	0			8	15		
Queuing Penalty (veh)	1			16	31		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 3: SR 49 SB On-Ramp/SR 49 SB Off-Ramp & W McKnight Way/E McKnight Way

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	T	T	R	L	T	LT	R
Maximum Queue (ft)	74	96	51	68	190	160	224
Average Queue (ft)	45	66	26	30	83	71	27
95th Queue (ft)	78	83	52	54	156	125	125
Link Distance (ft)	57	57	57	239	239	527	
Upstream Blk Time (%)	4	15	0				
Queuing Penalty (veh)	6	22	0				
Storage Bay Dist (ft)							375
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 4: Taylorville Road & W McKnight Way

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	T	T	TR	L	TR	R	R
Maximum Queue (ft)	99	75	26	30	125	29	31
Average Queue (ft)	12	32	1	5	96	13	5
95th Queue (ft)	55	76	8	23	144	36	21
Link Distance (ft)				57	57	194	363
Upstream Blk Time (%)					3		
Queuing Penalty (veh)					10		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Freeman Lane & W McKnight Way

Movement	EB	WB	WB	NB	SB	SB
Directions Served	LTR	LT	R	TR	L	TR
Maximum Queue (ft)	66	52	46	54	96	23
Average Queue (ft)	22	27	24	18	39	5
95th Queue (ft)	50	50	37	44	66	19
Link Distance (ft)	160			255		397
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)					180	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Zone Summary

Zone wide Queuing Penalty: 176

Intersection: 1: S Auburn Street & E McKnight Way

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	LT	R
Maximum Queue (ft)	95	132	64	274	333	228	150
Average Queue (ft)	30	40	8	123	52	72	22
95th Queue (ft)	72	127	36	212	141	144	105
Link Distance (ft)	72	72	169		325	586	
Upstream Blk Time (%)	0	5			1		
Queuing Penalty (veh)	2	18			0		
Storage Bay Dist (ft)				215			50
Storage Blk Time (%)				4		16	
Queuing Penalty (veh)				5		31	

Intersection: 2: SR 49 NB Off-Ramp/SR 49 NB On-Ramp & E McKnight Way

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	LT	R
Maximum Queue (ft)	242	259	38	75	129	134	91
Average Queue (ft)	142	178	16	55	75	73	34
95th Queue (ft)	211	277	36	88	142	114	69
Link Distance (ft)	239	239	72	72	72	383	383
Upstream Blk Time (%)	0	4		7	21		
Queuing Penalty (veh)	0	18		15	42		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 3: SR 49 SB On-Ramp/SR 49 SB Off-Ramp & W McKnight Way/E McKnight Way

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	T	T	R	L	T	LT	R
Maximum Queue (ft)	83	96	73	70	195	267	280
Average Queue (ft)	60	73	44	34	109	115	112
95th Queue (ft)	84	83	67	59	188	195	271
Link Distance (ft)	57	57	57	239	239	527	
Upstream Blk Time (%)	13	38	3				
Queuing Penalty (veh)	37	109	7				
Storage Bay Dist (ft)							375
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 4: Taylorville Road & W McKnight Way

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	T	T	TR	L	TR	R	R
Maximum Queue (ft)	75	75	75	52	144	112	32
Average Queue (ft)	51	71	11	7	124	36	20
95th Queue (ft)	96	87	40	29	143	84	43
Link Distance (ft)				57	57	194	363
Upstream Blk Time (%)				1	9		
Queuing Penalty (veh)				3	42		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Freeman Lane & W McKnight Way

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	TR	L	TR
Maximum Queue (ft)	93	92	66	27	30	197	23
Average Queue (ft)	43	38	41	1	18	77	13
95th Queue (ft)	70	66	61	9	41	142	31
Link Distance (ft)	160				255		397
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				105		180	
Storage Blk Time (%)						1	
Queuing Penalty (veh)						0	

Zone Summary

Zone wide Queuing Penalty: 329

DELAY (CONTROL)

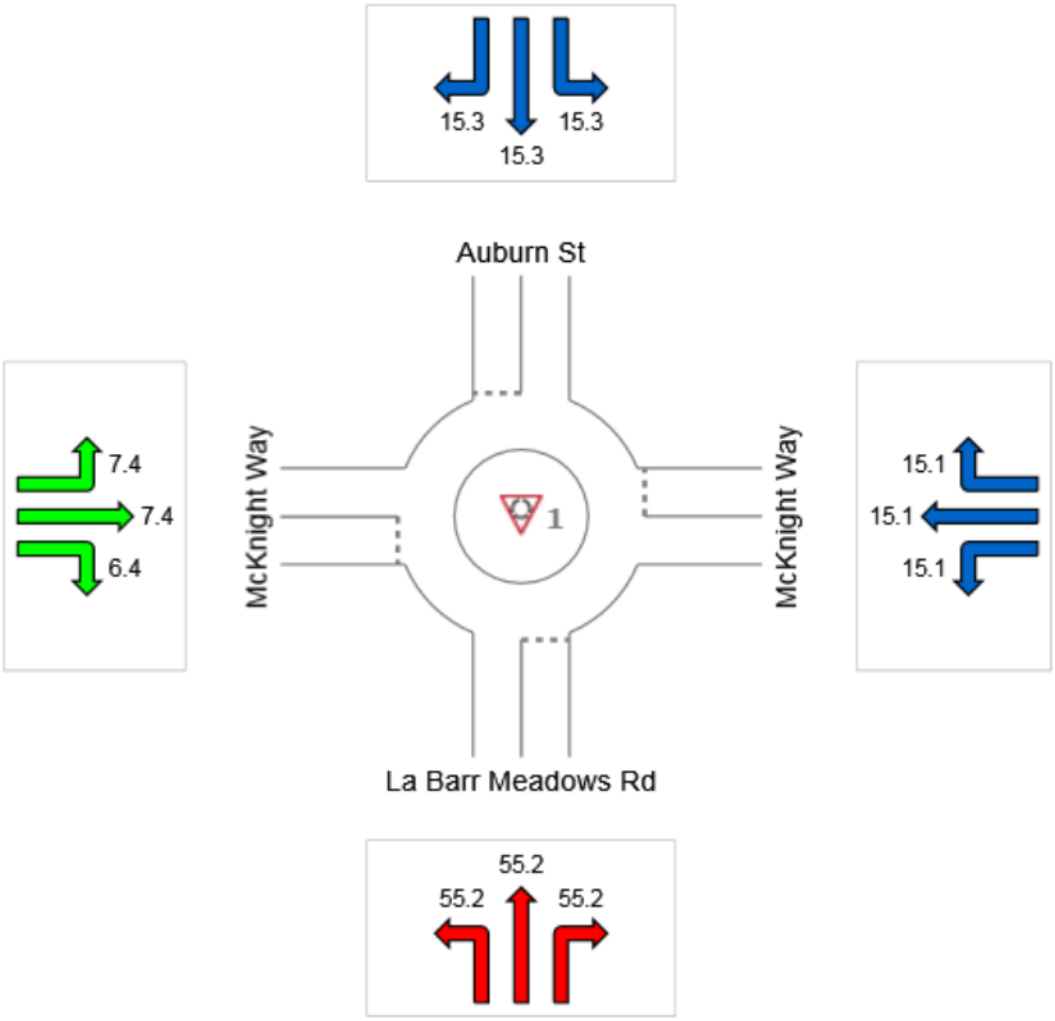
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [821 Auburn Cumulative AM]

Roundabout with 1-lane approaches and circulating road, and an extra turn lane
MUTCD (FHWA 2009) example number: 3C-3
Roundabout Guide (TRB 2010) example number: A-2
Roundabout

All Movement Classes

	South	East	North	West	Intersection
Delay (Control)	55.2	15.1	15.3	7.0	30.1
LOS	F	C	C	A	D



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Roundabout Level of Service Method: Same as Sign Control

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

DELAY (CONTROL)

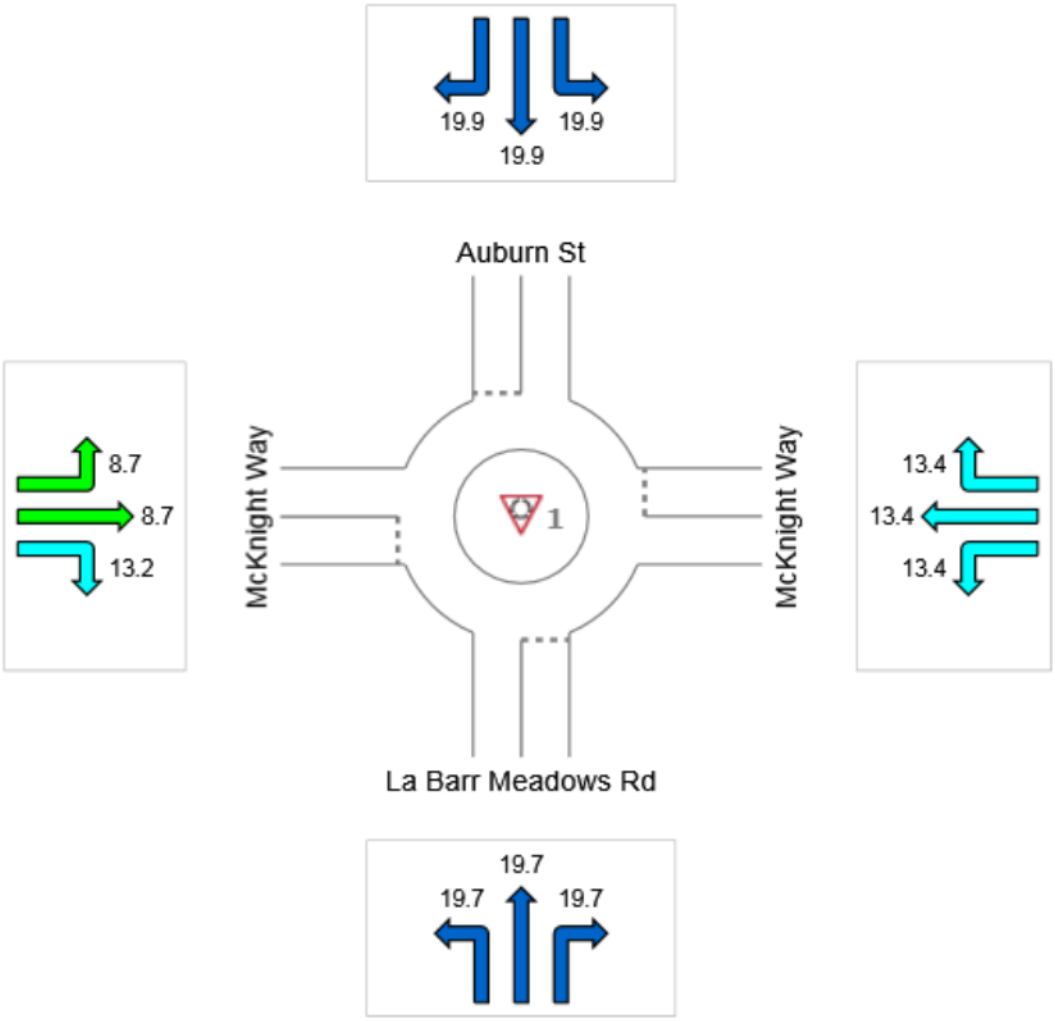
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [821 Auburn Cumulative PM]

Roundabout with 1-lane approaches and circulating road, and an extra turn lane
MUTCD (FHWA 2009) example number: 3C-3
Roundabout Guide (TRB 2010) example number: A-2
Roundabout

All Movement Classes

	South	East	North	West	Intersection
Delay (Control)	19.7	13.4	19.9	11.4	15.7
LOS	C	B	C	B	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Roundabout Level of Service Method: Same as Sign Control

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Appendix F CUMULATIVE PLUS PROJECT LOS CALCULATION SHEETS

Arterial Level of Service: EB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 SB On-Ramp	III	30	26.7	15.5	42.2	0.21	18.0	D
SR 49 NB Off-Ramp	III	30	8.7	11.8	20.5	0.06	9.8	F
Total	III		35.4	27.3	62.7	0.27	15.3	D

Arterial Level of Service: WB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 NB On-Ramp	IV	30	15.8	18.8	34.6	0.07	7.2	E
SR 49 SB Off-Ramp	IV	30	12.7	13.2	25.9	0.06	7.8	E
Total	IV		28.5	32.0	60.5	0.13	7.5	E

Arterial Level of Service: EB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 SB On-Ramp	III	30	26.7	17.8	44.5	0.21	17.0	D
SR 49 NB Off-Ramp	III	30	8.7	16.7	25.4	0.06	7.9	F
Total	III		35.4	34.5	69.9	0.27	13.7	E

Arterial Level of Service: WB McKnight Way

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
SR 49 NB On-Ramp	IV	30	15.8	21.9	37.7	0.07	6.6	F
SR 49 SB Off-Ramp	IV	30	12.7	11.0	23.7	0.06	8.5	E
Total	IV		28.5	32.9	61.4	0.13	7.4	E

Intersection	
Int Delay, s/veh	365.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	186	123	214	25	76	38	465	220	25	31	77	132
Future Vol, veh/h	186	123	214	25	76	38	465	220	25	31	77	132
Conflicting Peds, #/hr	1	0	2	2	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	0	-	-	-	215	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	69	69	69	91	91	91	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	204	135	235	36	110	55	511	242	27	40	100	171

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	166	0	0	137	0	0	806	785	139	892	757	139
Stage 1	-	-	-	-	-	-	546	546	-	211	211	-
Stage 2	-	-	-	-	-	-	260	239	-	681	546	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1412	-	-	1447	-	-	~ 300	325	909	263	337	909
Stage 1	-	-	-	-	-	-	522	518	-	791	728	-
Stage 2	-	-	-	-	-	-	745	708	-	440	518	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1412	-	-	1444	-	-	~ 146	256	906	~ 36	265	908
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 146	256	-	~ 36	265	-
Stage 1	-	-	-	-	-	-	~ 423	420	-	642	707	-
Stage 2	-	-	-	-	-	-	~ 504	688	-	147	420	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.8	1.4	$ 808.6	162.5
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	146	276	1412	-	-	1444	-	-	94	908
HCM Lane V/C Ratio	3.5	0.975	0.145	-	-	0.025	-	-	1.492	0.189
HCM Control Delay (s)	$ 1188.1	88.4	8	0	-	7.6	0	-	$ 348.9	9.9
HCM Lane LOS	F	F	A	A	-	A	A	-	F	A
HCM 95th %tile Q(veh)	49.5	9.6	0.5	-	-	0.1	-	-	10.7	0.7

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	168	410	0	0	272	399	135	1	113	0	0	0
Future Volume (veh/h)	168	410	0	0	272	399	135	1	113	0	0	0
Number	7	4	14	3	8	18	5	2	12			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1863	1863	0	0	1863	1863	1900	1863	1863			
Adj Flow Rate, veh/h	185	451	0	0	302	0	153	1	128			
Adj No. of Lanes	1	1	0	0	2	1	0	1	1			
Peak Hour Factor	0.91	0.91	0.91	0.90	0.90	0.90	0.88	0.88	0.88			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	235	795	0	0	705	315	673	4	605			
Arrive On Green	0.13	0.43	0.00	0.00	0.20	0.00	0.38	0.38	0.38			
Sat Flow, veh/h	1774	1863	0	0	3632	1583	1763	12	1583			
Grp Volume(v), veh/h	185	451	0	0	302	0	154	0	128			
Grp Sat Flow(s),veh/h/ln	1774	1863	0	0	1770	1583	1775	0	1583			
Q Serve(g_s), s	5.0	9.0	0.0	0.0	3.7	0.0	2.9	0.0	2.7			
Cycle Q Clear(g_c), s	5.0	9.0	0.0	0.0	3.7	0.0	2.9	0.0	2.7			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	235	795	0	0	705	315	678	0	605			
V/C Ratio(X)	0.79	0.57	0.00	0.00	0.43	0.00	0.23	0.00	0.21			
Avail Cap(c_a), veh/h	335	1204	0	0	1280	573	678	0	605			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	20.7	10.7	0.0	0.0	17.3	0.0	10.3	0.0	10.2			
Incr Delay (d2), s/veh	7.8	0.6	0.0	0.0	0.4	0.0	0.8	0.0	0.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.9	4.8	0.0	0.0	1.8	0.0	1.6	0.0	1.3			
LnGrp Delay(d),s/veh	28.5	11.3	0.0	0.0	17.7	0.0	11.1	0.0	11.0			
LnGrp LOS	C	B			B		B		B			
Approach Vol, veh/h		636			302			282				
Approach Delay, s/veh		16.3			17.7			11.0				
Approach LOS		B			B			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		23.5		25.7			11.2	14.5
Change Period (Y+Rc), s		* 4.7		* 4.7			* 4.7	* 4.7
Max Green Setting (Gmax), s		* 19		* 32			* 9.3	* 18
Max Q Clear Time (g_c+I1), s		4.9		11.0			7.0	5.7
Green Ext Time (p_c), s		1.1		4.9			0.1	3.9

Intersection Summary	
HCM 2010 Ctrl Delay	15.4
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	342	89	59	341	0	0	0	0	242	3	298
Future Volume (veh/h)	0	342	89	59	341	0	0	0	0	242	3	298
Number	7	4	14	3	8	18				1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1900	1863	1863
Adj Flow Rate, veh/h	0	384	100	69	401	0				252	3	0
Adj No. of Lanes	0	2	1	1	1	0				0	1	1
Peak Hour Factor	0.89	0.89	0.89	0.85	0.85	0.85				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	819	357	114	743	0				691	8	624
Arrive On Green	0.00	0.23	0.23	0.06	0.40	0.00				0.39	0.39	0.00
Sat Flow, veh/h	0	3632	1543	1774	1863	0				1754	21	1583
Grp Volume(v), veh/h	0	384	100	69	401	0				255	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1543	1774	1863	0				1775	0	1583
Q Serve(g_s), s	0.0	4.2	2.4	1.7	7.5	0.0				4.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	4.2	2.4	1.7	7.5	0.0				4.6	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	819	357	114	743	0				700	0	624
V/C Ratio(X)	0.00	0.47	0.28	0.61	0.54	0.00				0.36	0.00	0.00
Avail Cap(c_a), veh/h	0	1403	612	195	1136	0				700	0	624
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	15.0	14.3	20.7	10.5	0.0				9.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.4	5.2	0.6	0.0				1.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.1	1.1	1.0	3.9	0.0				2.6	0.0	0.0
LnGrp Delay(d),s/veh	0.0	15.5	14.8	25.9	11.1	0.0				11.2	0.0	0.0
LnGrp LOS		B	B	C	B					B		
Approach Vol, veh/h		484			470						255	
Approach Delay, s/veh		15.3			13.2						11.2	
Approach LOS		B			B						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs			3	4		6		8
Phs Duration (G+Y+Rc), s			7.6	15.2		22.6		22.8
Change Period (Y+Rc), s			* 4.7	* 4.7		4.7		* 4.7
Max Green Setting (Gmax), s			* 5	* 18		17.9		* 28
Max Q Clear Time (g_c+I1), s			3.7	6.2		6.6		9.5
Green Ext Time (p_c), s			0.0	4.2		1.1		5.3

Intersection Summary	
HCM 2010 Ctrl Delay	13.6
HCM 2010 LOS	B

Notes

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	413	3	24	322	296	0	0	21	0	0	5
Future Vol, veh/h	0	413	3	24	322	296	0	0	21	0	0	5
Conflicting Peds, #/hr	0	0	3	3	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	82	82	82	75	75	75	50	50	50
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	480	3	29	393	361	0	0	28	0	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	487	0	0	-	-	245	-	-	573
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	5.33	-	-	-	-	7.13	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	3.119	-	-	-	-	3.919	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	688	-	-	0	0	644	0	0	518
Stage 1	0	-	-	-	-	-	0	0	-	0	0	-
Stage 2	0	-	-	-	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	688	-	-	-	-	642	-	-	518
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	10.9	12.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	642	-	-	688	-	-	518
HCM Lane V/C Ratio	0.044	-	-	0.043	-	-	0.019
HCM Control Delay (s)	10.9	-	-	10.5	-	-	12.1
HCM Lane LOS	B	-	-	B	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-	-	0.1

Intersection	
Intersection Delay, s/veh	12.1
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	30	1	18	60	104	0	5	23	272	0	3
Future Vol, veh/h	1	30	1	18	60	104	0	5	23	272	0	3
Peak Hour Factor	0.56	0.56	0.56	0.67	0.67	0.67	0.61	0.61	0.61	0.84	0.84	0.84
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	54	2	27	90	155	0	8	38	324	0	4
Number of Lanes	0	1	0	0	1	1	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	1
HCM Control Delay	9.7	9.5	8.4	15.2
HCM LOS	A	A	A	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	3%	23%	0%	100%	0%
Vol Thru, %	100%	18%	94%	77%	0%	0%	0%
Vol Right, %	0%	82%	3%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	28	32	78	104	272	3
LT Vol	0	0	1	18	0	272	0
Through Vol	0	5	30	60	0	0	0
RT Vol	0	23	1	0	104	0	3
Lane Flow Rate	0	46	57	116	155	324	4
Geometry Grp	7	7	6	7	7	7	7
Degree of Util (X)	0	0.068	0.097	0.188	0.215	0.531	0.005
Departure Headway (Hd)	5.897	5.314	6.085	5.817	4.995	5.907	4.7
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	678	592	612	712	606	752
Service Time	3.601	3.018	4.089	3.594	2.771	3.697	2.488
HCM Lane V/C Ratio	0	0.068	0.096	0.19	0.218	0.535	0.005
HCM Control Delay	8.6	8.4	9.7	10	9.2	15.3	7.5
HCM Lane LOS	N	A	A	A	A	C	A
HCM 95th-tile Q	0	0.2	0.3	0.7	0.8	3.1	0

Intersection	
Int Delay, s/veh	954

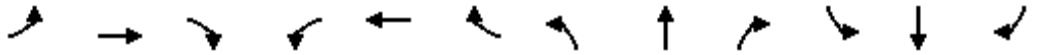
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	230	101	458	36	120	34	313	147	6	41	123	189
Future Vol, veh/h	230	101	458	36	120	34	313	147	6	41	123	189
Conflicting Peds, #/hr	1	0	3	3	0	1	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	0	-	-	-	215	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	77	77	77	85	85	85	79	79	79
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	258	113	515	47	156	44	368	173	7	52	156	239

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	201	0	0	116	0	0	983	928	116	992	905	180
Stage 1	-	-	-	-	-	-	633	633	-	272	272	-
Stage 2	-	-	-	-	-	-	350	295	-	720	633	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1371	-	-	1473	-	-	~ 228	268	936	225	276	863
Stage 1	-	-	-	-	-	-	468	473	-	734	685	-
Stage 2	-	-	-	-	-	-	666	669	-	419	473	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1370	-	-	1473	-	-	~ 35	176	933	~ 15	181	861
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 35	176	-	~ 15	181	-
Stage 1	-	-	-	-	-	-	~ 319	322	-	501	660	-
Stage 2	-	-	-	-	-	-	~ 354	644	-	131	322	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.4	1.4	$ 3062.8	$ 780.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	35	182	1370	-	-	1473	-	-	48	861
HCM Lane V/C Ratio	10.521	0.989	0.189	-	-	0.032	-	-	4.325	0.278
HCM Control Delay (s)	$ 4503.1	116.2	8.2	0	-	7.5	0	-	$ 1668.1	10.8
HCM Lane LOS	F	F	A	A	-	A	A	-	F	B
HCM 95th %tile Q(veh)	44.7	8.1	0.7	-	-	0.1	-	-	23.3	1.1

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	297	699	0	0	324	294	157	1	90	0	0	0
Future Volume (veh/h)	297	699	0	0	324	294	157	1	90	0	0	0
Number	7	4	14	3	8	18	5	2	12			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1863	1863	0	0	1863	1863	1900	1863	1863			
Adj Flow Rate, veh/h	326	768	0	0	352	0	185	1	106			
Adj No. of Lanes	1	1	0	0	2	1	0	1	1			
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.85	0.85	0.85			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	384	970	0	0	783	350	554	3	497			
Arrive On Green	0.22	0.52	0.00	0.00	0.22	0.00	0.31	0.31	0.31			
Sat Flow, veh/h	1774	1863	0	0	3632	1583	1765	10	1583			
Grp Volume(v), veh/h	326	768	0	0	352	0	186	0	106			
Grp Sat Flow(s),veh/h/ln	1774	1863	0	0	1770	1583	1774	0	1583			
Q Serve(g_s), s	10.0	19.1	0.0	0.0	4.9	0.0	4.6	0.0	2.8			
Cycle Q Clear(g_c), s	10.0	19.1	0.0	0.0	4.9	0.0	4.6	0.0	2.8			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	384	970	0	0	783	350	557	0	497			
V/C Ratio(X)	0.85	0.79	0.00	0.00	0.45	0.00	0.33	0.00	0.21			
Avail Cap(c_a), veh/h	478	1241	0	0	1111	497	557	0	497			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	21.3	11.1	0.0	0.0	19.1	0.0	14.9	0.0	14.3			
Incr Delay (d2), s/veh	11.3	2.8	0.0	0.0	0.4	0.0	1.6	0.0	1.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	6.1	10.3	0.0	0.0	2.4	0.0	2.5	0.0	1.3			
LnGrp Delay(d),s/veh	32.7	13.9	0.0	0.0	19.5	0.0	16.5	0.0	15.3			
LnGrp LOS	C	B			B		B		B			
Approach Vol, veh/h		1094			352			292				
Approach Delay, s/veh		19.5			19.5			16.1				
Approach LOS		B			B			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		22.5		34.2			17.0	17.3
Change Period (Y+Rc), s		* 4.7		* 4.7			* 4.7	* 4.7
Max Green Setting (Gmax), s		* 18		* 38			* 15	* 18
Max Q Clear Time (g_c+I1), s		6.6		21.1			12.0	6.9
Green Ext Time (p_c), s		1.0		7.4			0.3	5.7

Intersection Summary	
HCM 2010 Ctrl Delay	18.9
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	630	234	81	361	0	0	0	0	369	0	561
Future Volume (veh/h)	0	630	234	81	361	0	0	0	0	369	0	561
Number	7	4	14	3	8	18				1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1900	1863	1863
Adj Flow Rate, veh/h	0	663	246	88	392	0				424	0	0
Adj No. of Lanes	0	2	1	1	1	0				0	1	1
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92				0.87	0.87	0.87
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1036	460	125	851	0				632	0	564
Arrive On Green	0.00	0.29	0.29	0.07	0.46	0.00				0.36	0.00	0.00
Sat Flow, veh/h	0	3632	1570	1774	1863	0				1774	0	1583
Grp Volume(v), veh/h	0	663	246	88	392	0				424	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1570	1774	1863	0				1774	0	1583
Q Serve(g_s), s	0.0	8.2	6.6	2.4	7.3	0.0				10.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	8.2	6.6	2.4	7.3	0.0				10.2	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1036	460	125	851	0				632	0	564
V/C Ratio(X)	0.00	0.64	0.54	0.70	0.46	0.00				0.67	0.00	0.00
Avail Cap(c_a), veh/h	0	1268	562	177	1027	0				632	0	564
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	15.5	14.9	22.8	9.4	0.0				13.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.8	1.0	7.1	0.4	0.0				5.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.1	3.0	1.4	3.8	0.0				5.9	0.0	0.0
LnGrp Delay(d),s/veh	0.0	16.2	15.9	29.9	9.8	0.0				19.3	0.0	0.0
LnGrp LOS		B	B	C	A					B		
Approach Vol, veh/h		909			480						424	
Approach Delay, s/veh		16.1			13.5						19.3	
Approach LOS		B			B						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs			3	4		6		8
Phs Duration (G+Y+Rc), s			8.2	19.4		22.6		27.7
Change Period (Y+Rc), s			* 4.7	* 4.7		4.7		* 4.7
Max Green Setting (Gmax), s			* 5	* 18		17.9		* 28
Max Q Clear Time (g_c+I1), s			4.4	10.2		12.2		9.3
Green Ext Time (p_c), s			0.0	4.5		1.3		7.8

Intersection Summary	
HCM 2010 Ctrl Delay	16.2
HCM 2010 LOS	B

Notes

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	823	1	33	570	323	0	0	41	0	0	29
Future Vol, veh/h	0	823	1	33	570	323	0	0	41	0	0	29
Conflicting Peds, #/hr	0	0	6	6	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	75	75	75	72	72	72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	857	1	34	594	336	0	0	55	0	0	40

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	864	0	0	-	-	435	-	-	762
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	5.33	-	-	-	-	7.13	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	3.119	-	-	-	-	3.919	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	456	-	-	0	0	487	0	0	404
Stage 1	0	-	-	-	-	-	0	0	-	0	0	-
Stage 2	0	-	-	-	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	456	-	-	-	-	484	-	-	404
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	13.4	14.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	484	-	-	456	-	-	404
HCM Lane V/C Ratio	0.113	-	-	0.075	-	-	0.1
HCM Control Delay (s)	13.4	-	-	13.5	-	-	14.9
HCM Lane LOS	B	-	-	B	-	-	B
HCM 95th %tile Q(veh)	0.4	-	-	0.2	-	-	0.3

Intersection	
Intersection Delay, s/veh	49.1
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	124	4	27	125	259	2	11	14	455	8	10
Future Vol, veh/h	10	124	4	27	125	259	2	11	14	455	8	10
Peak Hour Factor	0.85	0.85	0.85	0.95	0.95	0.95	0.61	0.61	0.61	0.81	0.81	0.81
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	146	5	28	132	273	3	18	23	562	10	12
Number of Lanes	0	1	0	0	1	1	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	1
HCM Control Delay	14.4	14.3	10.7	87.5
HCM LOS	B	B	B	F

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	7%	18%	0%	100%	0%
Vol Thru, %	0%	44%	90%	82%	0%	0%	44%
Vol Right, %	0%	56%	3%	0%	100%	0%	56%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	2	25	138	152	259	455	18
LT Vol	2	0	10	27	0	455	0
Through Vol	0	11	124	125	0	0	8
RT Vol	0	14	4	0	259	0	10
Lane Flow Rate	3	41	162	160	273	562	22
Geometry Grp	7	7	6	7	7	7	7
Degree of Util (X)	0.007	0.08	0.331	0.313	0.473	1.086	0.037
Departure Headway (Hd)	8.254	7.332	7.662	7.311	6.507	6.958	6.054
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	436	492	472	494	556	522	591
Service Time	5.954	5.032	5.662	5.011	4.207	4.696	3.791
HCM Lane V/C Ratio	0.007	0.083	0.343	0.324	0.491	1.077	0.037
HCM Control Delay	11	10.7	14.4	13.3	14.9	90.6	9
HCM Lane LOS	B	B	B	B	B	F	A
HCM 95th-tile Q	0	0.3	1.4	1.3	2.5	17.5	0.1

Intersection: 1: S Auburn Street & E McKnight Way

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	LT	R
Maximum Queue (ft)	92	99	23	275	377	99	141
Average Queue (ft)	41	3	3	264	329	47	5
95th Queue (ft)	87	32	14	325	444	85	47
Link Distance (ft)	72	72	169		325	586	
Upstream Blk Time (%)	1	0			63		
Queuing Penalty (veh)	2	1			0		
Storage Bay Dist (ft)				215			50
Storage Blk Time (%)				86	0	8	
Queuing Penalty (veh)				212	1	11	

Intersection: 2: SR 49 NB Off-Ramp/SR 49 NB On-Ramp & E McKnight Way

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	LT	R
Maximum Queue (ft)	136	243	37	80	134	112	115
Average Queue (ft)	69	121	9	51	45	46	53
95th Queue (ft)	119	217	26	87	102	95	101
Link Distance (ft)	239	239	72	72	72	383	383
Upstream Blk Time (%)		0		6	3		
Queuing Penalty (veh)		1		13	6		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 3: SR 49 SB On-Ramp/SR 49 SB Off-Ramp & W McKnight Way/E McKnight Way

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	T	T	R	L	T	LT	R
Maximum Queue (ft)	70	73	49	69	131	176	158
Average Queue (ft)	38	65	24	31	73	73	14
95th Queue (ft)	67	82	42	59	128	126	83
Link Distance (ft)	57	57	57	239	239	527	
Upstream Blk Time (%)	2	14	0				
Queuing Penalty (veh)	3	20	0				
Storage Bay Dist (ft)							375
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 4: Taylorville Road & W McKnight Way

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	T	T	TR	L	TR	R	R
Maximum Queue (ft)	75	75	26	31	125	50	53
Average Queue (ft)	10	30	2	3	102	17	6
95th Queue (ft)	43	77	12	18	137	42	27
Link Distance (ft)				57	57	194	363
Upstream Blk Time (%)					4		
Queuing Penalty (veh)					12		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Freeman Lane & W McKnight Way

Movement	EB	WB	WB	NB	SB	SB
Directions Served	LTR	LT	R	TR	L	TR
Maximum Queue (ft)	54	72	72	50	74	23
Average Queue (ft)	23	26	27	23	41	1
95th Queue (ft)	47	51	48	46	67	10
Link Distance (ft)	160			255		397
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)					180	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Zone Summary

Zone wide Queuing Penalty: 282

Intersection: 1: S Auburn Street & E McKnight Way

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	LT	R
Maximum Queue (ft)	76	119	181	275	340	590	145
Average Queue (ft)	41	30	28	165	127	136	43
95th Queue (ft)	82	105	113	290	316	400	138
Link Distance (ft)	72	72	169		325	586	
Upstream Blk Time (%)	1	3	7		16	8	
Queuing Penalty (veh)	3	13	0		0	0	
Storage Bay Dist (ft)				215			50
Storage Blk Time (%)				22	0	25	
Queuing Penalty (veh)				34	0	48	

Intersection: 2: SR 49 NB Off-Ramp/SR 49 NB On-Ramp & E McKnight Way

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	LT	R
Maximum Queue (ft)	188	261	59	75	129	390	97
Average Queue (ft)	102	168	19	59	79	101	44
95th Queue (ft)	199	302	48	89	144	281	82
Link Distance (ft)	239	239	72	72	72	383	383
Upstream Blk Time (%)		4	0	21	24	8	
Queuing Penalty (veh)		18	0	44	49	0	
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 3: SR 49 SB On-Ramp/SR 49 SB Off-Ramp & W McKnight Way/E McKnight Way

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	T	T	R	L	T	LT	R
Maximum Queue (ft)	74	110	73	94	245	559	422
Average Queue (ft)	44	59	41	34	114	207	159
95th Queue (ft)	87	109	82	77	233	496	380
Link Distance (ft)	57	57	57	239	239	527	
Upstream Blk Time (%)	10	29	3		18	18	
Queuing Penalty (veh)	30	84	8		43	0	
Storage Bay Dist (ft)							375
Storage Blk Time (%)						18	1
Queuing Penalty (veh)						102	3

Intersection: 4: Taylorville Road & W McKnight Way

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	T	T	TR	L	TR	R	R
Maximum Queue (ft)	94	75	74	31	161	158	112
Average Queue (ft)	49	64	13	3	119	50	30
95th Queue (ft)	92	91	45	17	147	127	80
Link Distance (ft)				57	57	194	363
Upstream Blk Time (%)					28		
Queuing Penalty (veh)					128		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Freeman Lane & W McKnight Way

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	TR	L	TR
Maximum Queue (ft)	103	90	95	28	30	176	23
Average Queue (ft)	43	36	48	2	14	72	9
95th Queue (ft)	76	63	81	13	38	128	27
Link Distance (ft)	160				255		397
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				105		180	
Storage Blk Time (%)						0	
Queuing Penalty (veh)						0	

Zone Summary

Zone wide Queuing Penalty: 607

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	123	4	26	124	254	2	11	14	450	8	10
Future Volume (veh/h)	10	123	4	26	124	254	2	11	14	450	8	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	12	145	5	27	131	267	3	18	23	556	10	12
Adj No. of Lanes	0	1	0	0	1	1	1	1	0	1	1	0
Peak Hour Factor	0.85	0.85	0.85	0.95	0.95	0.95	0.61	0.61	0.61	0.81	0.81	0.81
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	101	335	11	130	321	893	209	87	112	658	286	344
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.12	0.12	0.12	0.37	0.37	0.37
Sat Flow, veh/h	59	1685	56	163	1615	1534	1774	742	948	1774	772	926
Grp Volume(v), veh/h	162	0	0	158	0	267	3	0	41	556	0	22
Grp Sat Flow(s),veh/h/ln	1799	0	0	1778	0	1534	1774	0	1691	1774	0	1698
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	3.9	0.1	0.0	0.9	12.4	0.0	0.4
Cycle Q Clear(g_c), s	3.3	0.0	0.0	3.2	0.0	3.9	0.1	0.0	0.9	12.4	0.0	0.4
Prop In Lane	0.07		0.03	0.17		1.00	1.00		0.56	1.00		0.55
Lane Grp Cap(c), veh/h	447	0	0	451	0	893	209	0	199	658	0	630
V/C Ratio(X)	0.36	0.00	0.00	0.35	0.00	0.30	0.01	0.00	0.21	0.84	0.00	0.03
Avail Cap(c_a), veh/h	826	0	0	824	0	1227	739	0	705	1047	0	1002
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.2	0.0	0.0	15.2	0.0	4.8	16.8	0.0	17.2	12.4	0.0	8.7
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.5	0.0	0.2	0.0	0.0	0.5	3.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	0.0	1.7	0.0	3.1	0.0	0.0	0.5	6.7	0.0	0.2
LnGrp Delay(d),s/veh	15.7	0.0	0.0	15.6	0.0	5.0	16.9	0.0	17.7	16.2	0.0	8.7
LnGrp LOS	B			B		A	B		B	B		A
Approach Vol, veh/h		162			425			44			578	
Approach Delay, s/veh		15.7			9.0			17.7			15.9	
Approach LOS		B			A			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		9.6		13.1		20.5		13.1
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		25.5		18.0
Max Q Clear Time (g_c+I1), s		2.9		5.3		14.4		5.9
Green Ext Time (p_c), s		0.1		2.4		1.6		2.3

Intersection Summary	
HCM 2010 Ctrl Delay	13.5
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	124	4	27	125	259	2	11	14	455	8	10
Future Volume (veh/h)	10	124	4	27	125	259	2	11	14	455	8	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	12	146	5	28	132	273	3	18	23	562	10	12
Adj No. of Lanes	0	1	0	0	1	1	1	1	0	1	1	0
Peak Hour Factor	0.85	0.85	0.85	0.95	0.95	0.95	0.61	0.61	0.61	0.81	0.81	0.81
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	100	335	11	130	320	902	206	86	110	669	291	349
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.12	0.12	0.12	0.38	0.38	0.38
Sat Flow, veh/h	58	1686	55	169	1606	1534	1774	742	948	1774	772	926
Grp Volume(v), veh/h	163	0	0	160	0	273	3	0	41	562	0	22
Grp Sat Flow(s),veh/h/ln	1799	0	0	1775	0	1534	1774	0	1691	1774	0	1698
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	4.0	0.1	0.0	1.0	12.7	0.0	0.4
Cycle Q Clear(g_c), s	3.4	0.0	0.0	3.3	0.0	4.0	0.1	0.0	1.0	12.7	0.0	0.4
Prop In Lane	0.07		0.03	0.17		1.00	1.00		0.56	1.00		0.55
Lane Grp Cap(c), veh/h	446	0	0	450	0	902	206	0	196	669	0	640
V/C Ratio(X)	0.37	0.00	0.00	0.36	0.00	0.30	0.01	0.00	0.21	0.84	0.00	0.03
Avail Cap(c_a), veh/h	814	0	0	811	0	1227	728	0	694	1234	0	1181
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.4	0.0	0.0	15.4	0.0	4.8	17.2	0.0	17.6	12.4	0.0	8.6
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.5	0.0	0.2	0.0	0.0	0.5	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.0	1.7	0.0	3.2	0.0	0.0	0.5	6.6	0.0	0.2
LnGrp Delay(d),s/veh	15.9	0.0	0.0	15.9	0.0	5.0	17.2	0.0	18.1	15.4	0.0	8.6
LnGrp LOS	B			B		A	B		B	B		A
Approach Vol, veh/h		163			433			44			584	
Approach Delay, s/veh		15.9			9.0			18.0			15.1	
Approach LOS		B			A			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		9.6		13.2		21.0		13.2
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		30.5		18.0
Max Q Clear Time (g_c+I1), s		3.0		5.4		14.7		6.0
Green Ext Time (p_c), s		0.1		2.4		1.9		2.4

Intersection Summary	
HCM 2010 Ctrl Delay	13.2
HCM 2010 LOS	B

DELAY (CONTROL)

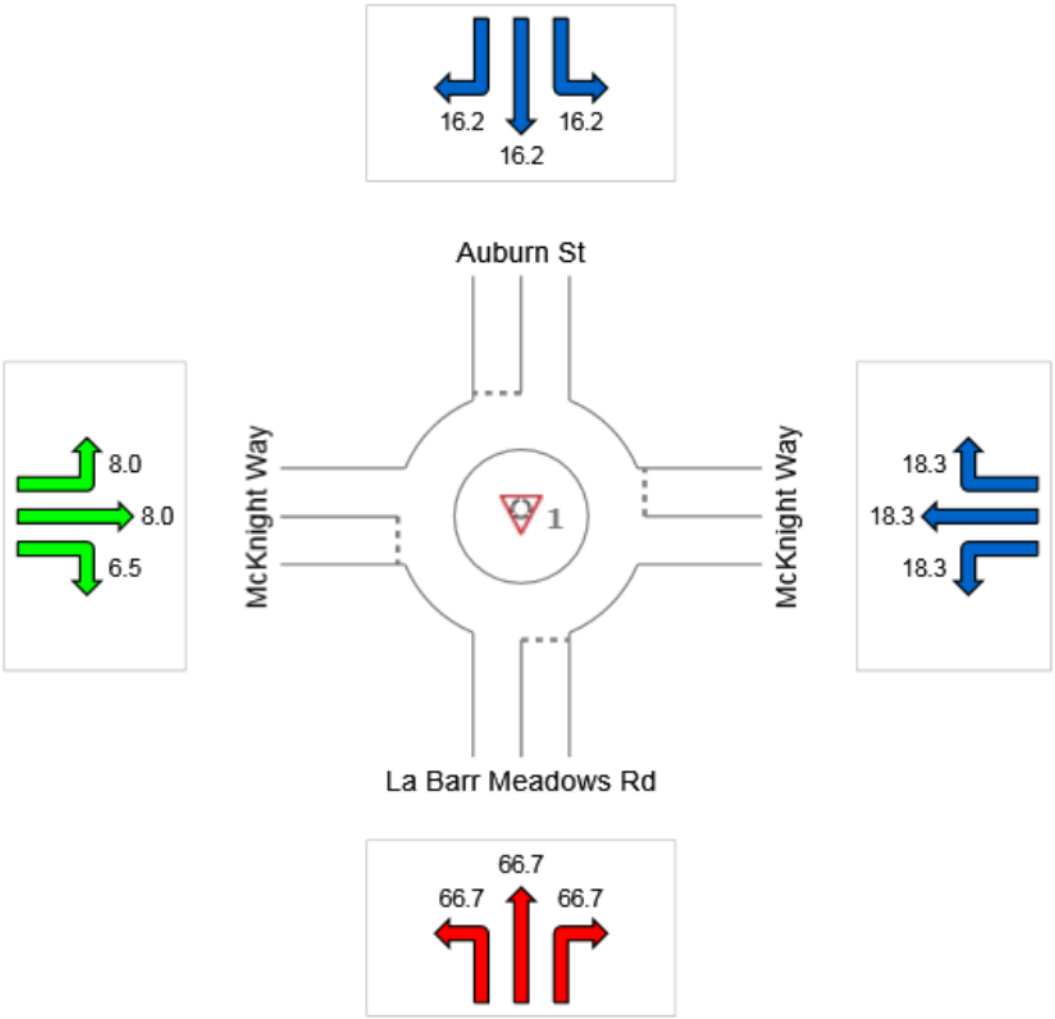
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [821 Auburn Cumulative Plus Project AM]

Roundabout with 1-lane approaches and circulating road, and an extra turn lane
MUTCD (FHWA 2009) example number: 3C-3
Roundabout Guide (TRB 2010) example number: A-2
Roundabout

All Movement Classes

	South	East	North	West	Intersection
Delay (Control)	66.7	18.3	16.2	7.4	34.8
LOS	F	C	C	A	D



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

DELAY (CONTROL)

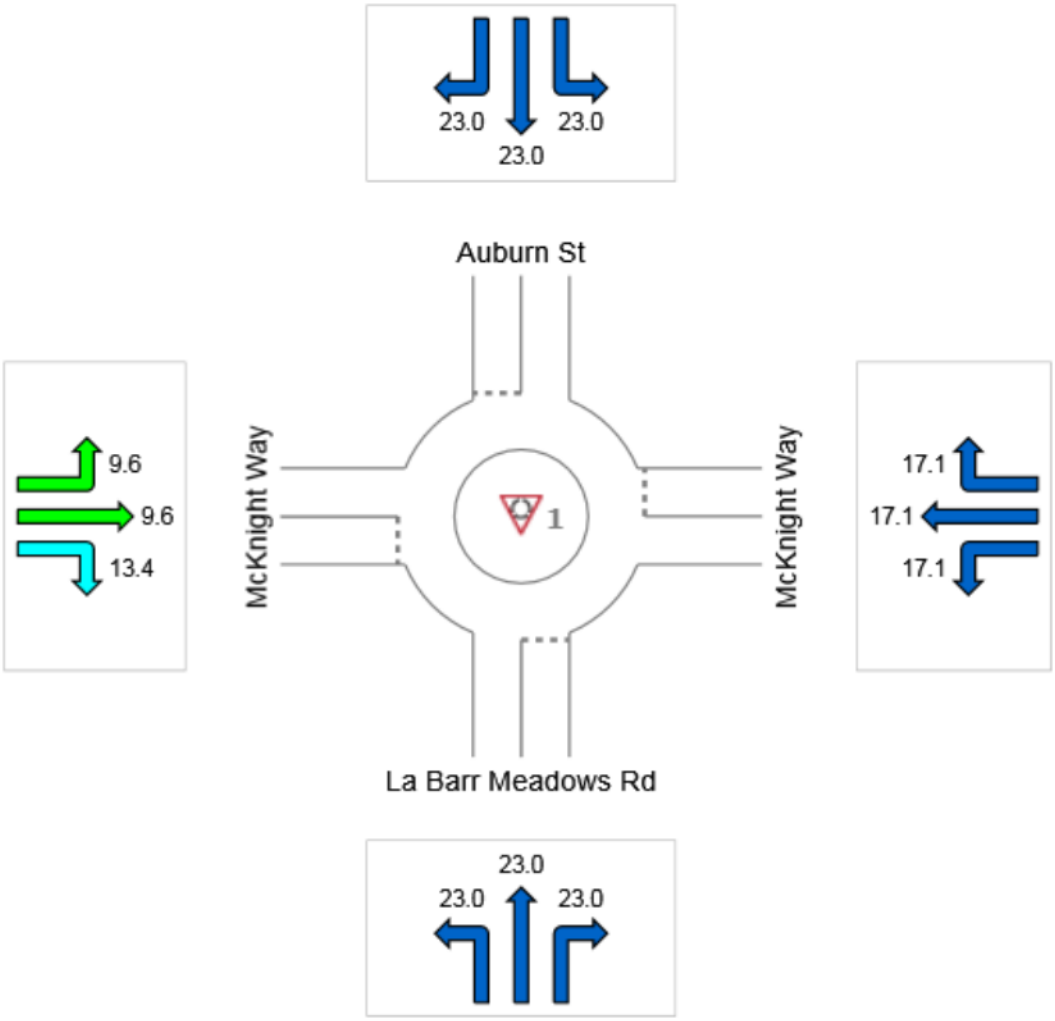
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [821 Auburn Cumulative Plus Project PM]

Roundabout with 1-lane approaches and circulating road, and an extra turn lane
MUTCD (FHWA 2009) example number: 3C-3
Roundabout Guide (TRB 2010) example number: A-2
Roundabout

All Movement Classes

	South	East	North	West	Intersection
Delay (Control)	23.0	17.1	23.0	11.8	17.7
LOS	C	C	C	B	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).