Traffic Study

GTLA Project

Pine Bluff Industrial Development

prepared for:

Crafton, Tull & Associates, Inc.

Highway 365

Pine Bluff, Arkansas

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
ERNEST J. PETERS
No. 4682

PETERS & ASSOCIATES
ENGINEERS, INC.
• CIVIL & TRAFFIC ENGINEERING •
5507 Ranch Drive - Suite 209
Little Rock, Arkansas 72223 (501) 868-3999

Project No.: P-1980

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EXECUTIVE SUMMARY

Peters & Associates Engineers, Inc. conducted a traffic engineering services for Crafton, Tull & Associates, Inc. in conjunction with the planned GTLA - Pine Bluff Industrial Development on the east side of Highway 365, just north of Pine Bluff Arsenal in Pine Bluff, Arkansas. Vehicle access to the site is proposed at two locations along Highway 365. Additionally, there is a truck off load facility on Highway 365 that is proposed to be served by an inbound only intersection at Highway 365 and an outbound only intersection at Highway 365.

24-hour directional typical weekday traffic volume counts were conducted on Highway 365 in the vicinity of Shelva Road / Tracey Road.

Existing weekday AM peak hours (6:00 – 9:00 AM) and weekday PM peak hours (4:30 – 7:30 PM) vehicle turning movement count data were gathered for the following intersections in the vicinity of the development:

- Highway 365 and Shelva Road / W. Tracey Road.
- Highway 365 and Ussery Road / Stagecoach Road.

Projected traffic volumes for the proposed development were calculated for worst-case weekday AM and PM traffic conditions for the initial construction phase, Phase 1, Phase 2, and full build-out (Phase 3). These projected site-generated trips were added to the existing traffic volumes (weekday AM and PM peak hours), which resulted in total projected traffic volumes at for the initial construction period and for each phase of the proposed site development. Background traffic volumes on Highway 365 in the vicinity of the site have consistently decreased over the past ten years. Therefore, annual background traffic growth has not been included as a part of this analysis.

Existing conditions at the aforementioned intersections were analyzed and compared to projected traffic conditions at these same intersections, as well as the access drives proposed to serve the site and the product truck off load access drive intersections for worst-case weekday AM and PM peak hour conditions.

Recommendations of this study are summarized as follows:

- Recommended schematic lane geometry, including turn bay lengths, tapers and transitions of additional lanes, is depicted on the following page 40, Figure A, "Recommended Schematic Lane-Geometry Plus Lengths and Tapers." It is recommended that the lane geometry at the new access drive intersections be designed as shown on this figure.

- Roadway improvement and new intersection designs along Highway 365 must conform to Arkansas Department of Transportation (ARDOT) standards and will require approval by ARDOT.

INTRODUCTION

Peters & Associates Engineers, Inc. conducted a traffic engineering services for Crafton, Tull & Associates, Inc. in conjunction with the planned GTLA - Pine Bluff Industrial Development on the east side of Highway 365, just north of Pine Bluff Arsenal in Pine Bluff, Arkansas. Vehicle access to the site is proposed at two locations along Highway 365. Additionally, there is a truck off load facility on Highway 365 that is proposed to be served by an inbound only intersection at Highway 365 and an outbound only intersection at Highway 365.

Projected traffic volumes for the proposed development were calculated for worst-case weekday AM and PM traffic conditions for the initial construction phase, Phase 1, Phase 2, and full build-out (Phase 3). These projected site-generated trips were added to the existing traffic volumes (weekday AM and PM peak hours), which resulted in total projected traffic volumes at for the initial construction period and for each phase of the proposed site development. Background traffic volumes on Highway 365 in the vicinity of the site have consistently decreased over the past ten years. Therefore, annual background traffic growth has not been included as a part of this analysis.

Existing conditions at the study intersections were analyzed and compared to projected traffic conditions at these same intersections, as well as the access drives proposed to serve the site and the track off load facility for worst-case weekday AM and PM peak hour conditions.

This is a report of methodology and findings relating to a traffic engineering study undertaken to:

- Evaluate existing AM peak hour and PM peak hour traffic conditions at the study intersections.

- Calculate expected trip-generation with input from the development team, for the initial construction phase, Phase 1, Phase 2, and full build-out (Phase 3) conditions.

- Ascertain projected weekday AM and PM peak hour traffic operating conditions at the vicinity intersections and the access drives proposed to serve the site during the initial construction phase, Phase 1, Phase 2, and full build-out (Phase 3).

- Identify the effects on traffic operations resulting from existing traffic in combination with site-generated traffic associated with the development at the various phases.

- Evaluate proposed access to the site and make recommendations for mitigative improvements which may be necessary and appropriate to ensure minimum impact and acceptable traffic operations.

In the following sections of this report there are presented traffic data, study methods, findings and recommendations of this traffic engineering investigation. The traffic engineering study is technical in nature. Analysis techniques employed are those most commonly used in the traffic engineering profession for traffic impact analysis. Certain data and calculations relative to traffic operational analysis are referenced in the report. Complete calculations and data are included in the Appendix of the report.

THE SITE

The site is located on the east side of Highway 365 in Jefferson County, Arkansas. The proposed development site location and vicinity are shown on Figures 1 and 2, below.

Figure 1 – Vicinity Map

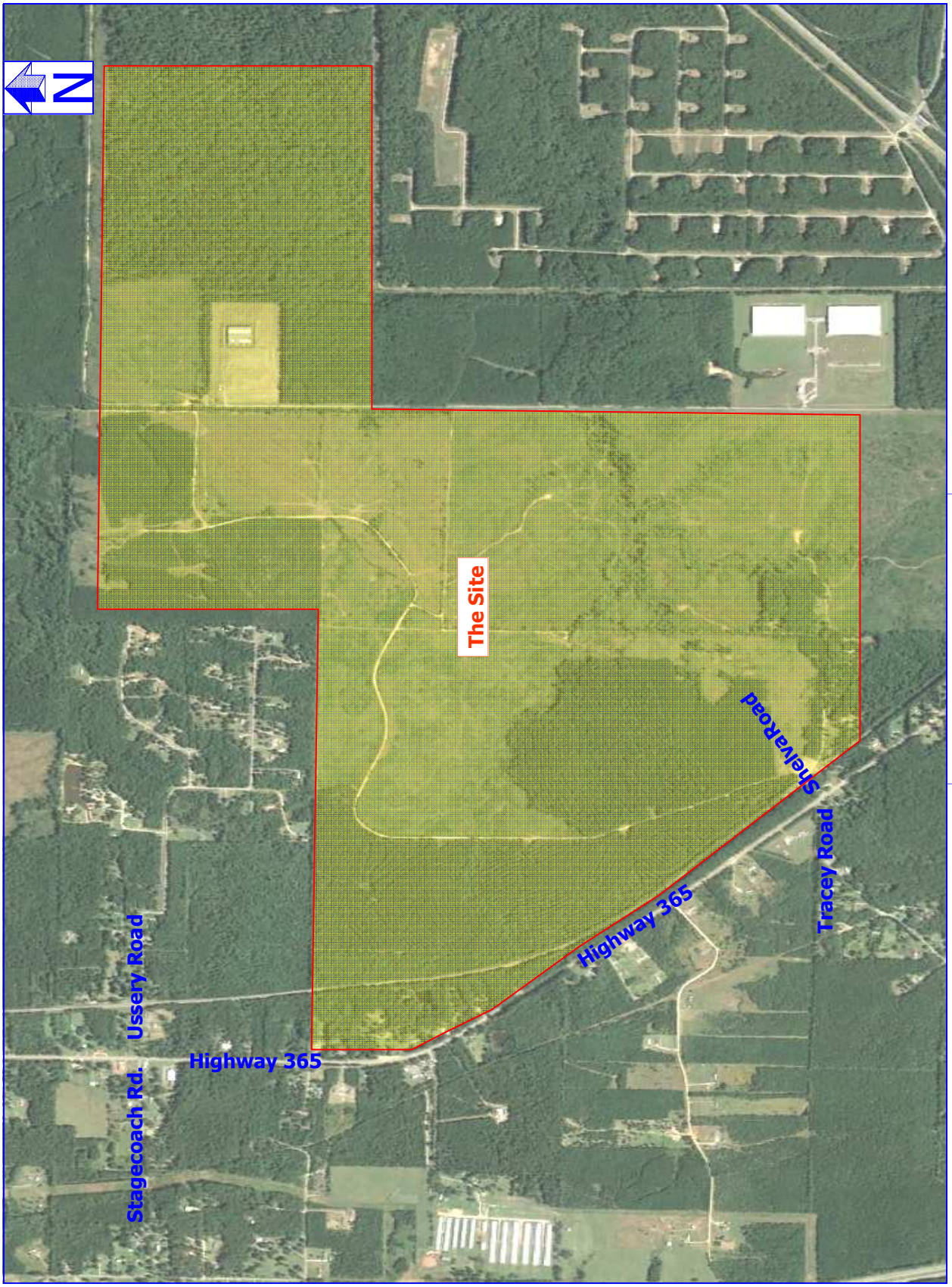


Figure 2 – Site Location Map

Highway 365 consists of a an 11-foot wide northbound lane and an 11-foot wide southbound lane. This roadway is asphalt is constructed with small shoulders and with drainage ditches. The speed limit is 55 miles per hour on Highway 365 along most of the site. However, the speed limit decreases to 45 miles per hour on Highway 365 approximately one quarter mile south of the Ussery Road / Stagecoach Road.

Shelva Road at Highway 365 is an approximate 16 -foot wide unpaved road. The speed limit is not posted in the vicinity of Highway 365.

W. Tracey Road at Highway 365 is an approximate 18-foot wide asphalt roadway without pavement markings. The speed limit is 25 miles per hour.

Stagecoach Road at Highway 365 is an approximate 22-foot wide asphalt roadway with drainage ditches. The speed limit is not posted in the vicinity of Highway 365.

Ussery Road at Highway 365 is an approximate 20-foot wide asphalt roadway with drainage ditches in the vicinity. The speed limit is not posted in the vicinity of Highway 365.

There are no sidewalks on any of the study roadways and it was observed that there were no pedestrians at in the vicinity of the study intersections.

The site is currently an undeveloped tract. The photos following show the general layout of the Highway 365 and Shelva Road / Tracey Road and the Highway 365 and Stagecoach Road / Ussery Road intersections in the vicinity of the site. These were taken at locations as indicated in the photo captions.

Highway 365 and W. Tracey Road / Shelva Road

W. Tracey Road

Shelva Road

Looking north on Highway 365
toward W. Tracey Road / Shelva Road.

Highway 365

Looking east on W. Tracey Road
toward Highway 365.

Highway 365

Looking west on Shelva Road
toward Highway 365.

Highway 365 and Stagecoach Road / Ussery Road

Stagecoach Road

Looking north on Highway 365
toward Stagecoach Road / Ussery Road.

Ussery Road

Stagecoach Road

Looking west on Ussery Road
toward Highway 365.

Highway 365

EXISTING TRAFFIC CONDITIONS

Hourly, weekday 24-hour traffic counts were made at Highway 365 at Shelva Road / Tracey Road in the vicinity of the site as a part of this study:

STREET	24-HOUR TWO-WAY VOLUME	TABLE & CHART
Highway 365 at Shelva Rd. / Tracy Rd.	2,681	Table 1/Chart 1

Hourly, weekday 24-hour traffic count data are summarized on Table 1 and Chart 1.

Existing weekday AM peak hours (6:00 – 9:00 AM) and weekday PM peak hours (4:30 – 7:30 PM) vehicle turning movement count data were gathered for the following intersections in the vicinity of the development:

- Highway 365 and Shelva Road / W. Tracey Road.
- Highway 365 and Ussery Road / Stagecoach Road.

The weekday AM and PM peak hours vehicle turning movement counts made as a part of this study are shown on Figure 3A, "Existing Traffic Volumes - Weekday AM Peak Hour," and Figure 3B, "Existing Traffic Volumes - Weekday PM Peak Hour." The peak hours vehicle turning movement count data for these intersections are presented in more detail in the Appendix of this report.

TIME	Highway 365 at Shelva Road / W. Tracey Road		
	Northbound	Soutbound	NB + SB
01:00 PM	87	70	157
02:00 PM	92	79	171
03:00 PM	130	78	208
04:00 PM	174	74	248
05:00 PM	148	113	261
06:00 PM	88	71	159
07:00 PM	58	45	103
08:00 PM	62	30	92
09:00 PM	45	22	67
10:00 PM	26	8	34
11:00 PM	7	4	11
12:00 AM	10	5	15
01:00 AM	3	0	3
02:00 AM	5	0	5
03:00 AM	2	6	8
04:00 AM	6	11	17
05:00 AM	22	44	66
06:00 AM	79	116	195
07:00 AM	52	129	181
08:00 AM	32	77	109
09:00 AM	62	55	117
10:00 AM	61	88	149
11:00 AM	84	73	157
12:00 PM	71	77	148
24-Hour Total:	**1406**	**1275**	**2681**

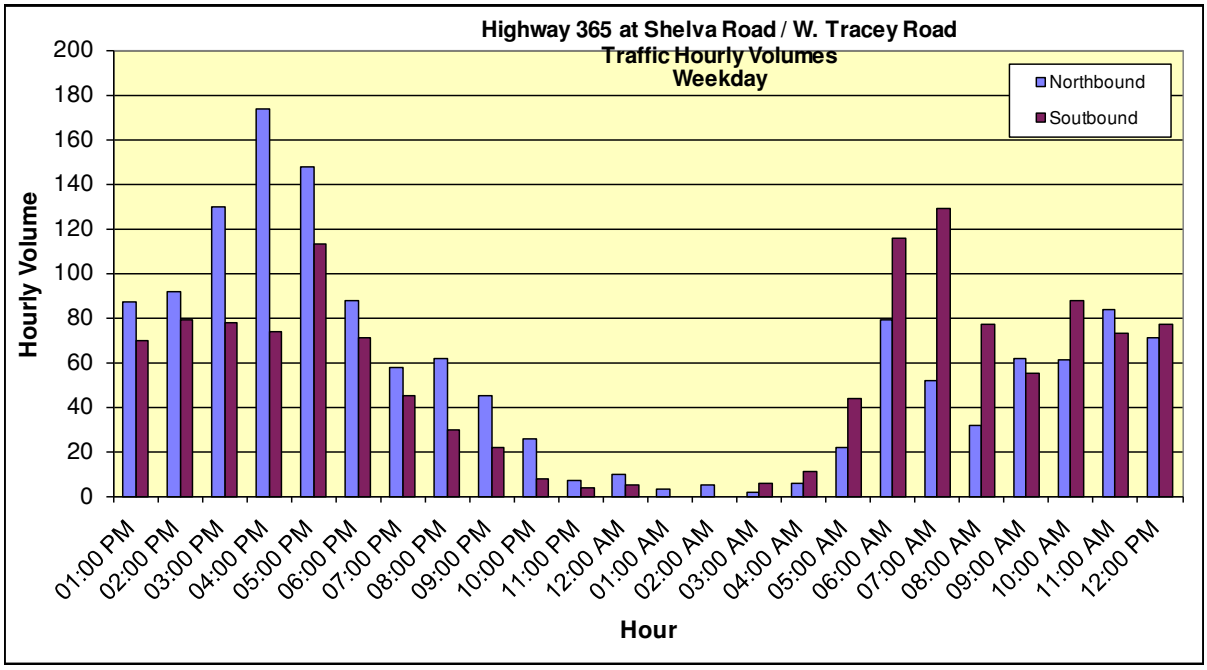


Table 1 – Chart 1 24-Hour Traffic Counts
Highway 365 at Shelva Road / W. Tracey Road.

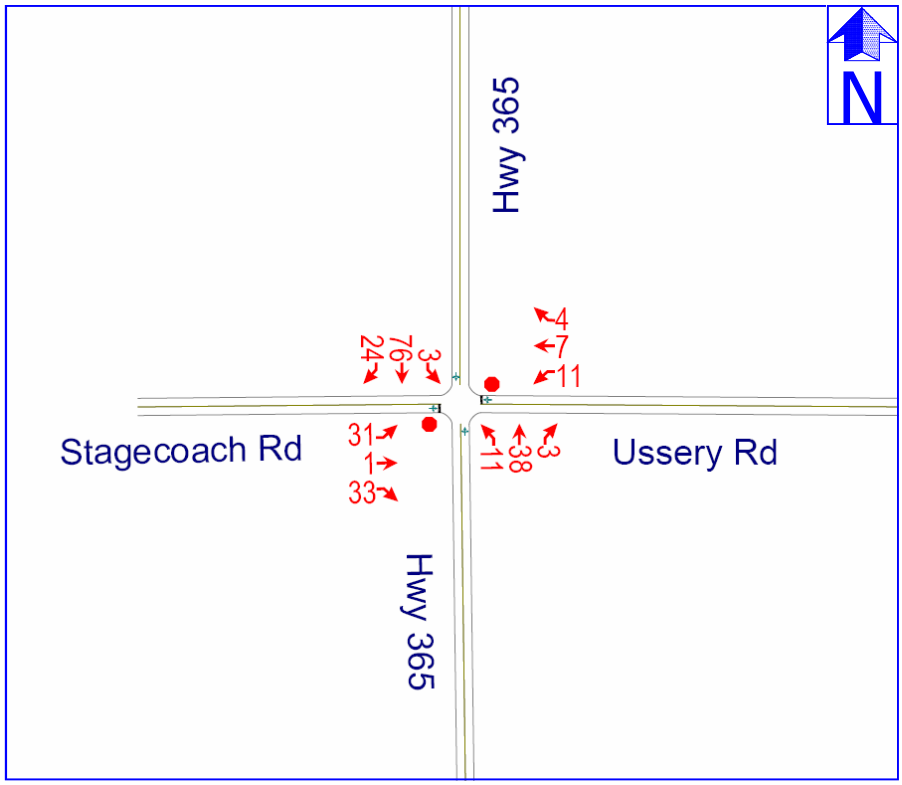
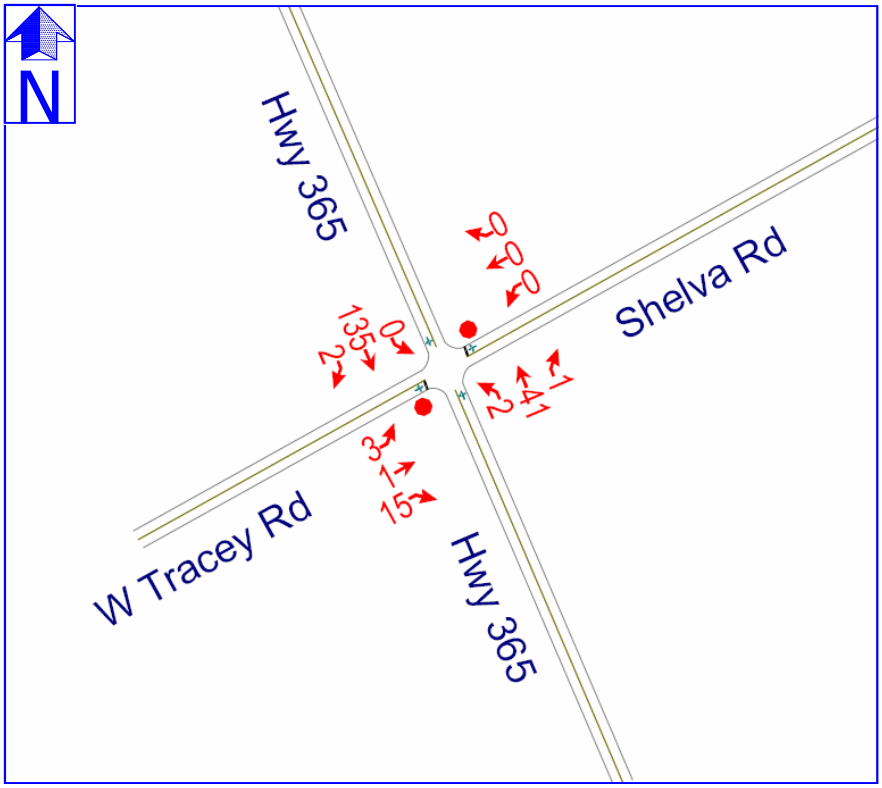


Figure 3A
Existing Traffic Volumes
Weekday AM Peak Hour



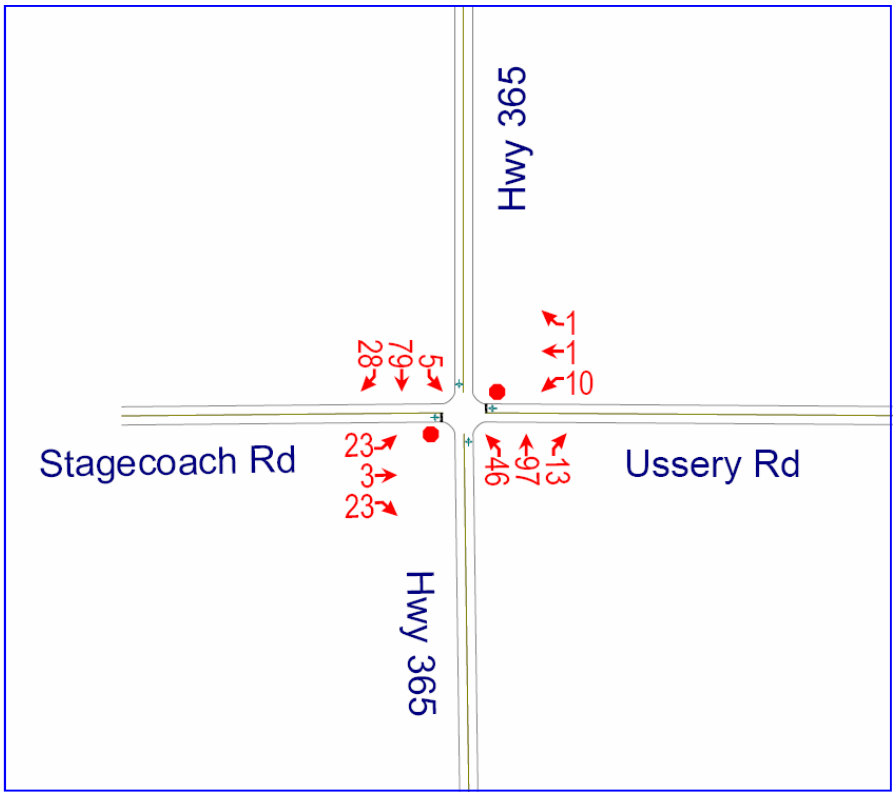
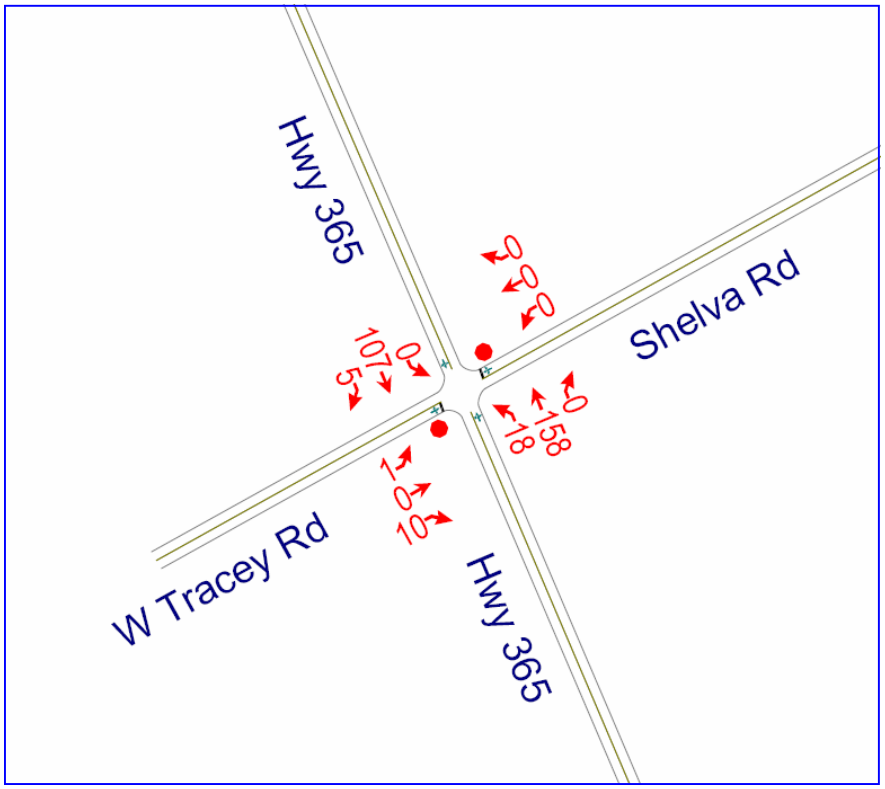


Figure 3B
Existing Traffic Volumes
Weekday PM Peak Hour



TRIP GENERATION and SITE TRAFFIC PROJECTIONS

The Trip Generation, an Informational Report, published by the Institute of Transportation Engineers (ITE) The Trip Generation Manual 10th Edition, 2017, was researched for calculating the magnitude of traffic volumes expected to be generated by the proposed industrial uses of this development. It was found that the land-uses included in the ITE Trip-Generation Manual were not applicable to the type of facility that is proposed. Therefore, a more accurate method for estimating trip-generation for projected traffic for this type of industrial land-use was calculated with input from the development team. With input from the development team, the calculated trip-generation for the initial construction phase and each phase of development was found to be the most applicable and was used as the basis of calculating estimated traffic volumes for this proposed industrial development.

Using the selected trip-generation rates, calculations were made as a part of this study to provide a reliable estimate of traffic volumes that can be expected to be associated with the development as proposed for the initial construction phase and each phase of development. Results of this calculation are summarized on Table 2, "Trip-Generation Summary."

The Pine Bluff Industrial Development traffic, as will be associated with this site for each phase of development, ordinarily does contribute to the adjacent roadways traffic conditions during the on-road weekday AM and PM peak traffic periods. Accordingly, the weekday AM and PM peak traffic periods of the adjacent roadways become the worst hour traffic condition for the immediate vicinity of the site and are the traffic operating conditions which has warranted primary traffic analysis as a part of this study. The peak hours are slightly different for the construction phase and Phases 1, 2 and 3, which has been taken into consideration for projected traffic volumes. Projected peak hours traffic volumes analyzed as a part of this study include adjustments to traffic volumes by calculating Passenger Car Equivalent (PCE) values to account for the impact of large truck traffic at the study intersections for the initial construction phase and each phase of development as described in the next section of this report.

Construction Phase Trips

TIME (Starting Hour)	*Construction Worker Trips ENTER	*Construction Worker Trips EXIT	Construction Trucks Trips ENTER	Construction Trucks Trips EXIT	TOTAL
06:00 AM	750	67	25	7	**849**
07:00 AM	500	58	37	6	**601**
08:00 AM	417	42	21	9	**489**
04:00 PM	42	750	9	21	**822**
05:00 PM	67	500	7	25	**599**
06:00 PM	33	417	5	37	**492**

**Assumes 2,500 Workers at 1.5 workers per vehicle.*

Phase 1 Trips

TIME (Starting Hour)	Plant Workers Trips ENTER	Plant Workers Trips EXIT	Administative Personnel Trips ENTER	Administative Personnel Trips EXIT	Trucks Trips ENTER	Trucks Trips EXIT	Service Trucks Trips ENTER	Service Trucks Trips EXIT	TOTAL
06:00 AM	40	10	10	5	10	10	1	1	**87**
07:00 AM	10	40	50	10	10	10	1	1	**132**
08:00 AM	5	5	10	5	10	10	5	5	**55**
04:00 PM	5	5	5	10	10	10	5	5	**55**
05:00 PM	5	5	10	50	10	10	5	5	**100**
06:00 PM	40	10	5	10	10	10	2	2	**89**
07:00 PM	10	40	2	2	10	10	1	1	**76**

Phase 1 & 2 Trips

TIME (Starting Hour)	Plant Workers Trips ENTER	Plant Workers Trips EXIT	Administative Personnel Trips ENTER	Administative Personnel Trips EXIT	Trucks Trips ENTER	Trucks Trips EXIT	Service Trucks Trips ENTER	Service Trucks Trips EXIT	TOTAL
06:00 AM	80	20	20	10	20	20	2	2	**174**
07:00 AM	20	80	100	20	20	20	2	2	**264**
08:00 AM	10	10	20	10	20	20	10	10	**110**
04:00 PM	10	10	10	20	20	20	10	10	**110**
05:00 PM	10	10	20	100	20	20	10	10	**200**
06:00 PM	20	20	10	20	20	20	4	4	**118**
07:00 PM	20	80	4	4	20	20	2	2	**152**

Full Build-Out (Phases 1, 2 & 3) Trips

TIME (Starting Hour)	Plant Workers Trips ENTER	Plant Workers Trips EXIT	Administative Personnel Trips ENTER	Administative Personnel Trips EXIT	Trucks Trips ENTER	Trucks Trips EXIT	Service Trucks Trips ENTER	Service Trucks Trips EXIT	TOTAL
06:00 AM	120	30	30	15	30	30	3	3	**261**
07:00 AM	30	120	150	30	30	30	3	3	**396**
08:00 AM	15	15	30	15	30	30	15	15	**165**
04:00 PM	15	15	15	30	30	30	15	15	**165**
05:00 PM	15	15	30	150	30	30	15	15	**300**
06:00 PM	30	30	15	30	30	30	6	6	**177**
07:00 PM	30	120	6	6	30	30	3	3	**228**

Tanker Trips at Tank Farm

TIME (Starting Hour)	Tanker Trucks Trips ENTER	Tanker Trucks Trips EXIT	TOTAL
06:00 AM	23	23	**46**
07:00 AM	23	23	**46**
08:00 AM	23	23	**46**
04:00 PM	23	23	**46**
05:00 PM	23	23	**46**
06:00 PM	23	23	**46**
07:00 PM	23	23	**46**

Table 2 – Summary of Trip Generation
(Note: These volumes have not been adjusted for PCE.)

PASSENGER CAR EQUIVALENT (PCE)

Projected peak hours traffic volumes analyzed as a part of this study include adjustments to traffic volumes by calculating Passenger Car Equivalent (PCE) values to account for the impact of large truck traffic at the study intersections. PCE is a metric used in transportation engineering, to assess traffic-flow rate on a highway. PCE is essentially the impact that a mode of transport has on traffic variables (such as headway, speed, acceleration, density) compared to a single car.

There are several types of trucks expected for each phase of development of the site. The following is the PCE that was used in this study for large trucks in each phase of development:

- Construction Phase Trucks = 2.4 PCE value.
- Phases 1, 2 and 3 Trucks = 2.4 PCE value.
- Phases 1, 2 and 3 Service Trucks = 2.4 PCE value.
- Tanker Trucks at the Tank Farm = 3.7 PCE value.

TRAFFIC VOLUME ASSIGNMENTS

Once projected traffic was estimated for the site, directional distributions were made to reflect the percent of thru, left and right-turns at the study intersections in the immediate vicinity of the site. Directional distribution percentages used in this report are shown on Figure 4, "Directional Distribution - Site Traffic."

The directional distribution percentages for site traffic have been equated to percentage turns for each movement at the study intersections. The site-generated traffic volumes for each phase of development result from applying the directional distribution percentages to the corresponding projected site-generated traffic volumes summarized on Table 2, "Trip-Generation Summary."

The site-generated traffic volumes for each phase of development and corresponding existing background traffic volumes have been combined and the results are depicted on the following figures:

- **Figure 5A**, "Projected Traffic Volumes - Construction Phase - Weekday AM Peak Hour."
- **Figure 5B**, "Projected Traffic Volumes - Construction Phase - Weekday PM peak hour."
- **Figure 6A**, "Projected Traffic Volumes - Phase 1 - Weekday AM Peak Hour."
- **Figure 6B**, "Projected Traffic Volumes - Phase 1 - Weekday PM peak hour."
- **Figure 7A**, "Projected Traffic Volumes - Phase 2 - Weekday AM Peak Hour."
- **Figure 7B**, "Projected Traffic Volumes - Phase 2 - Weekday PM peak hour."
- **Figure 8A**, "Projected Traffic Volumes - Phase 3 - Weekday AM Peak Hour."
- **Figure 8B**, "Projected Traffic Volumes - Phase 3 - Weekday PM peak hour."

Traffic volumes shown on these figures include adjustment for Passenger Car Equivalent (PCE) to account for the impact of large truck traffic at the study intersections.

Traffic volumes shown on Figures *5A, 5B, 6A, 6B, 7A, 7B 8A and 8B* are the values used in capacity and level of service calculations conducted as a part of this study. The effect of existing background traffic (i.e. the adjacent street non-site traffic which exists) and projected traffic associated with the site development has thus been accounted for in this analysis for each phase of development.

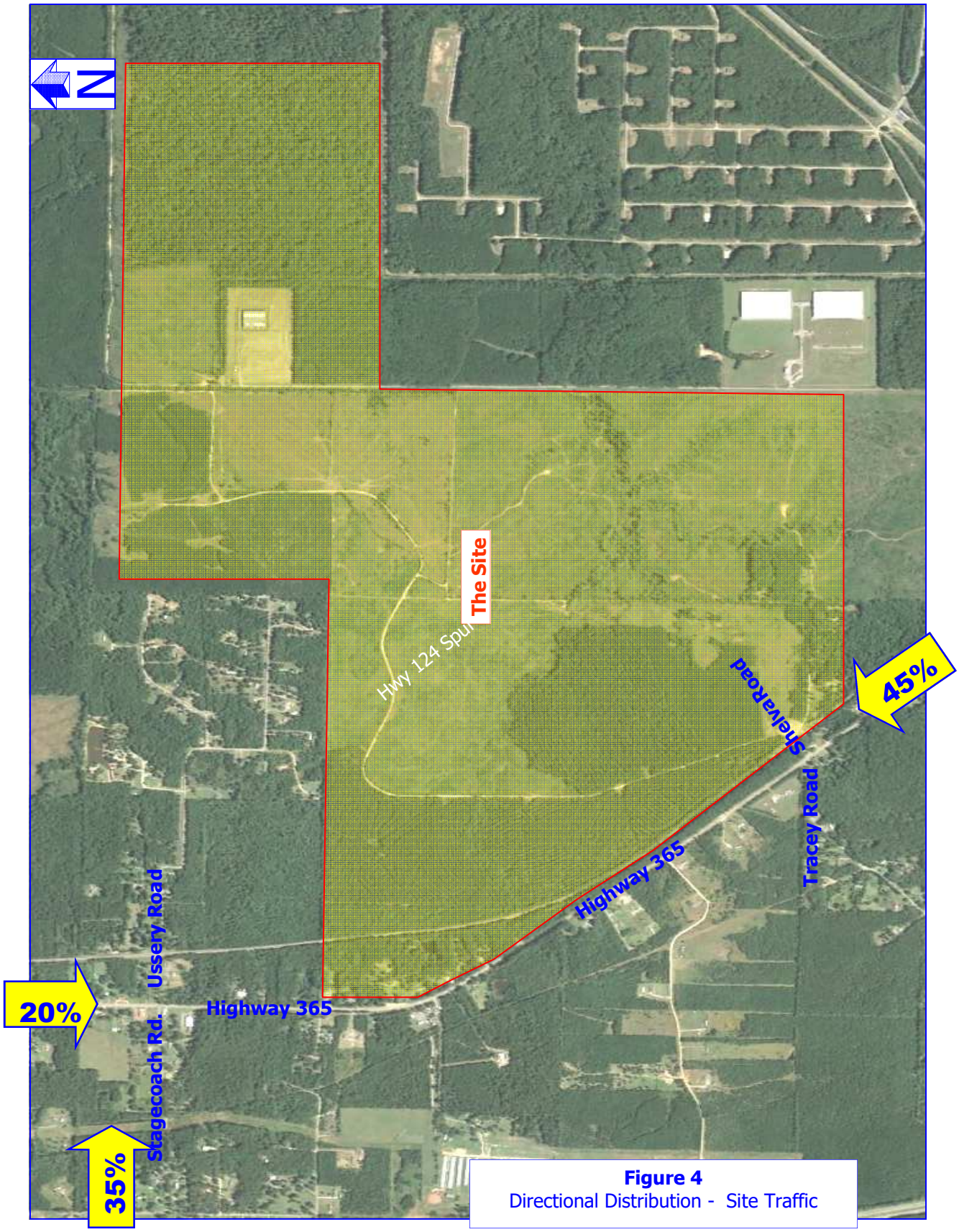


Figure 4
Directional Distribution - Site Traffic

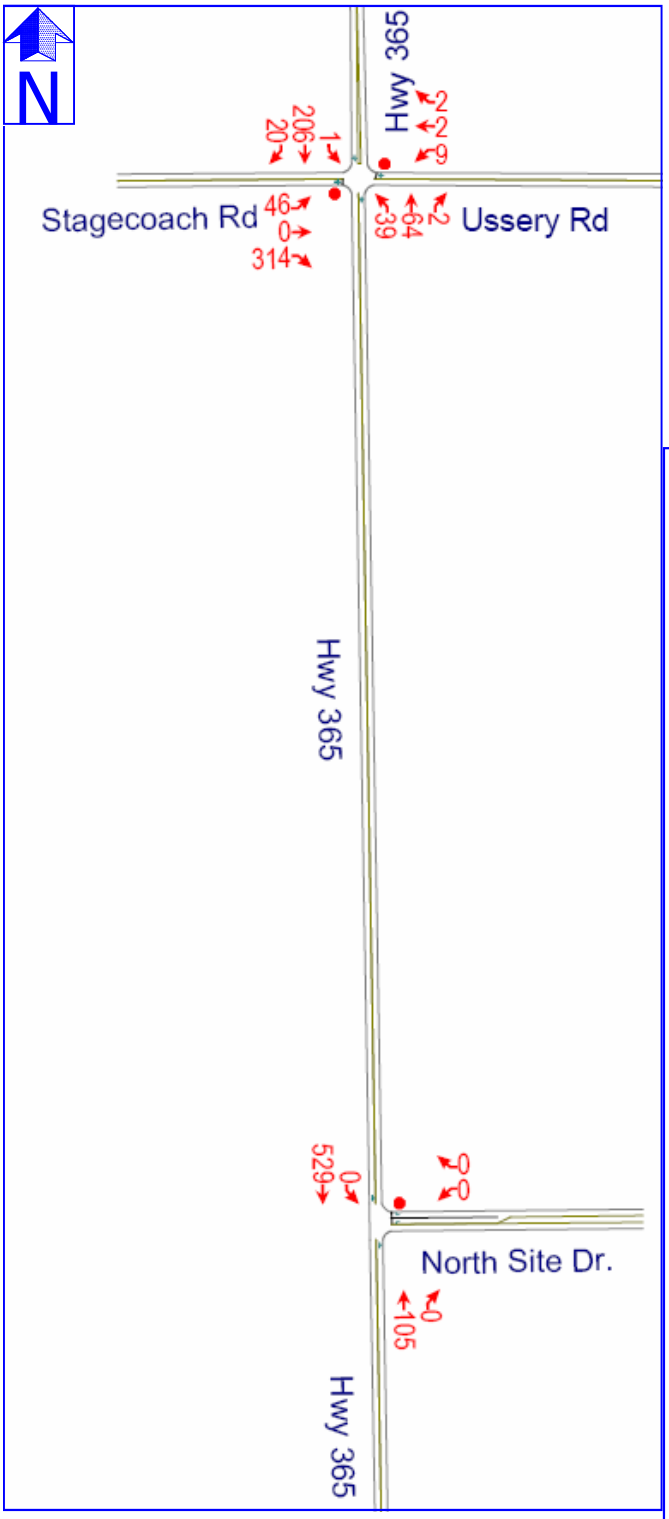
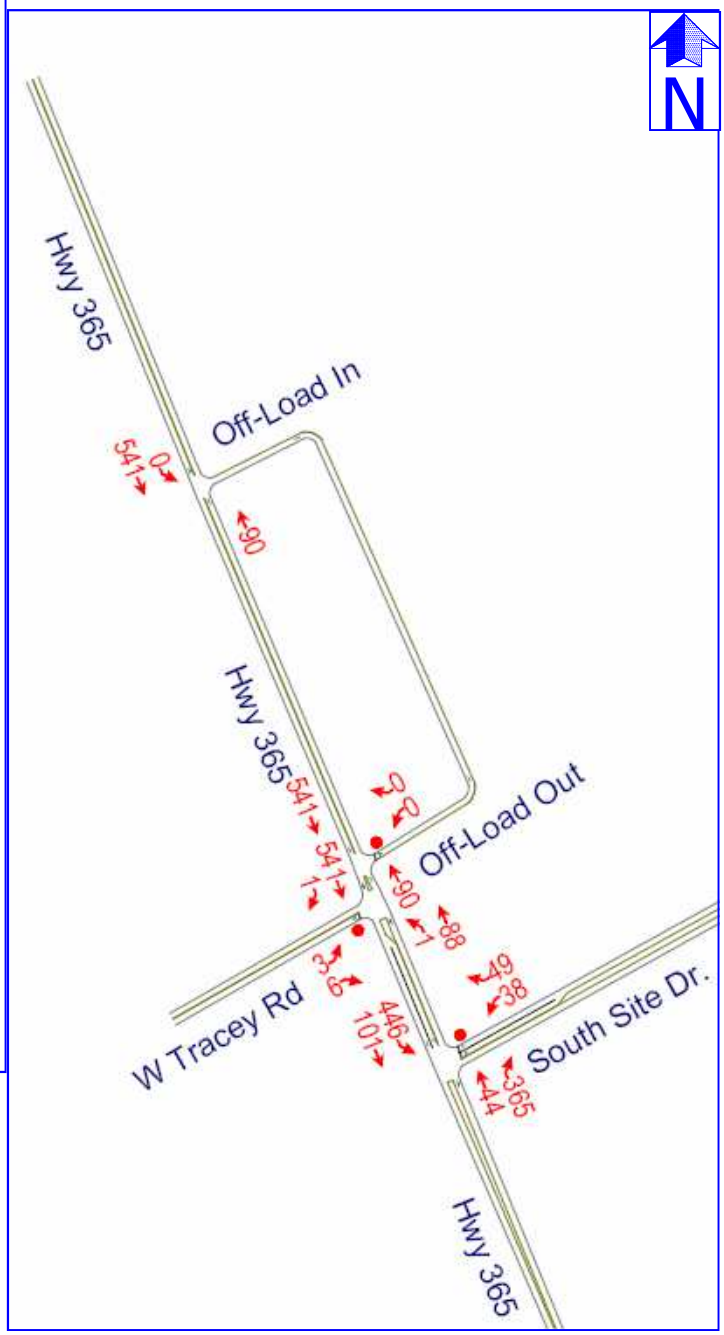


Figure 5A
Projected Traffic Volumes
Construction Phase
Weekday AM Peak Hour



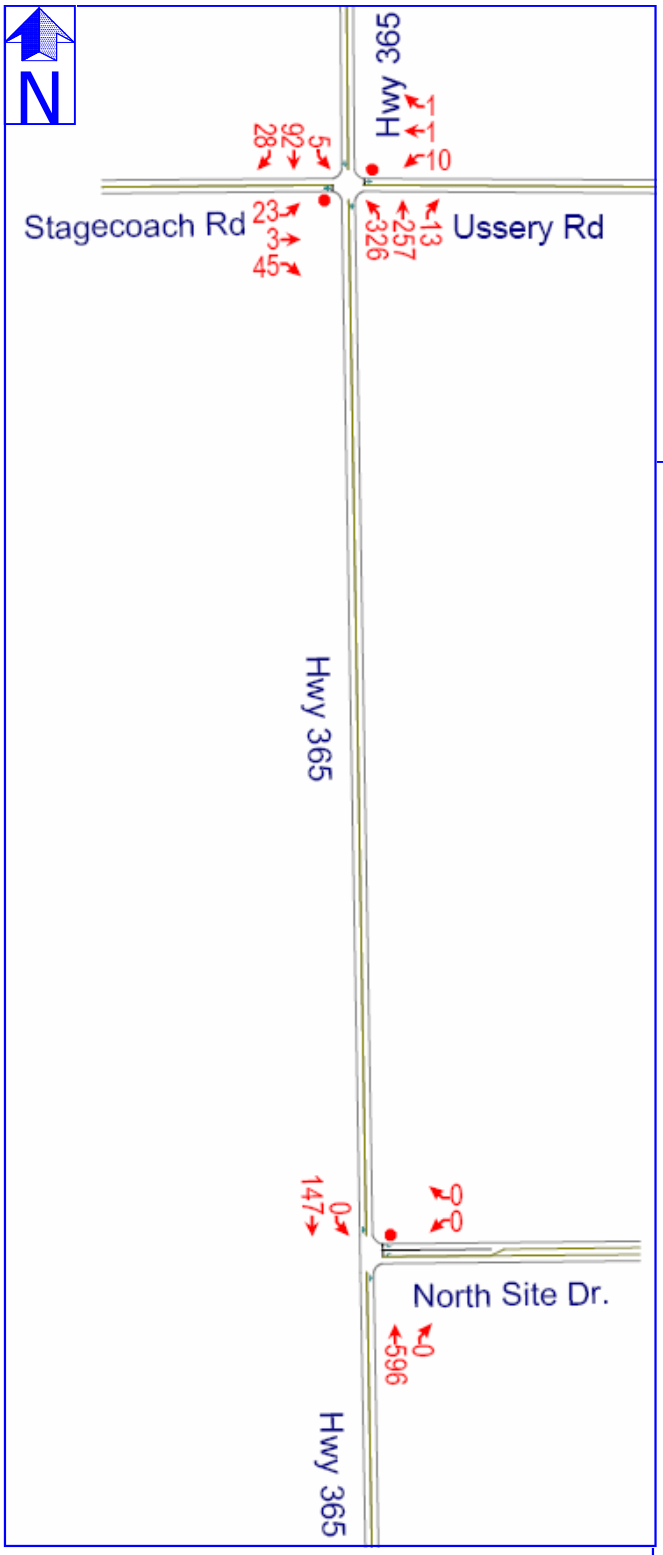
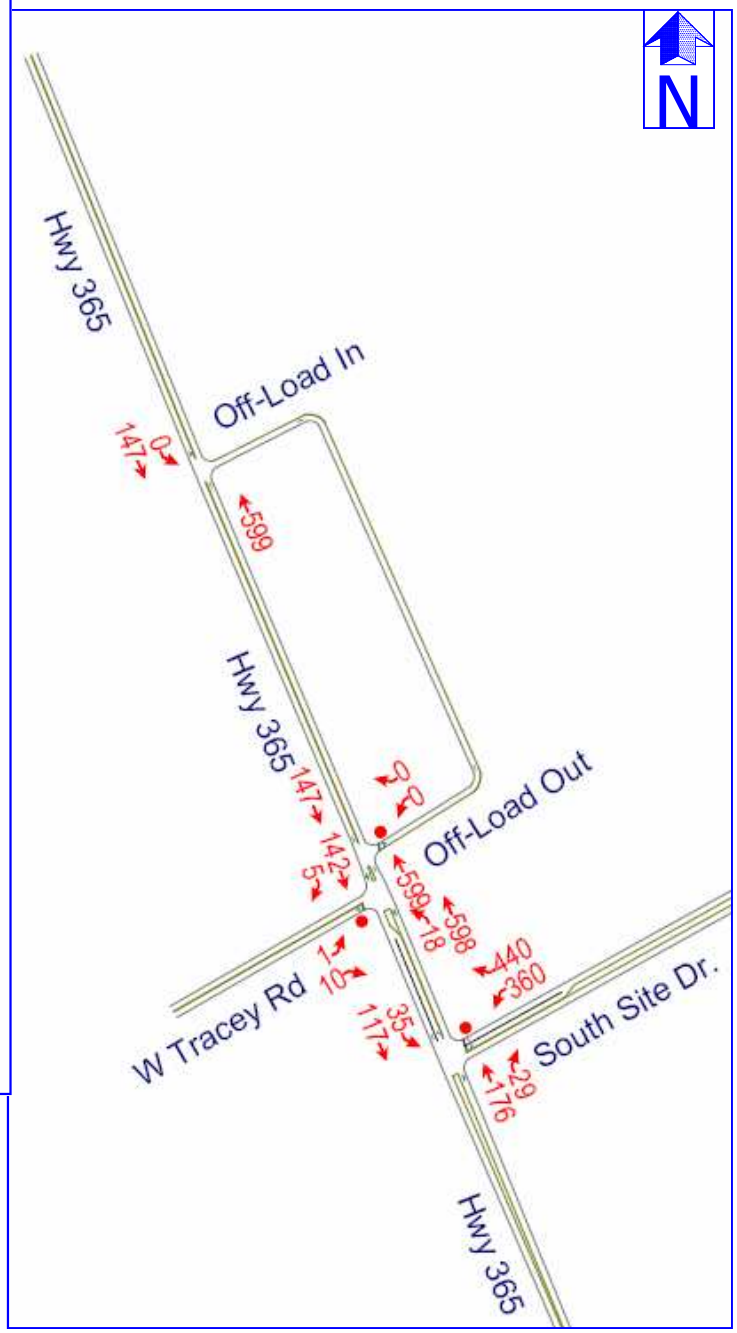


Figure 5B
Projected Traffic Volumes
Construction Phase
Weekday PM Peak Hour



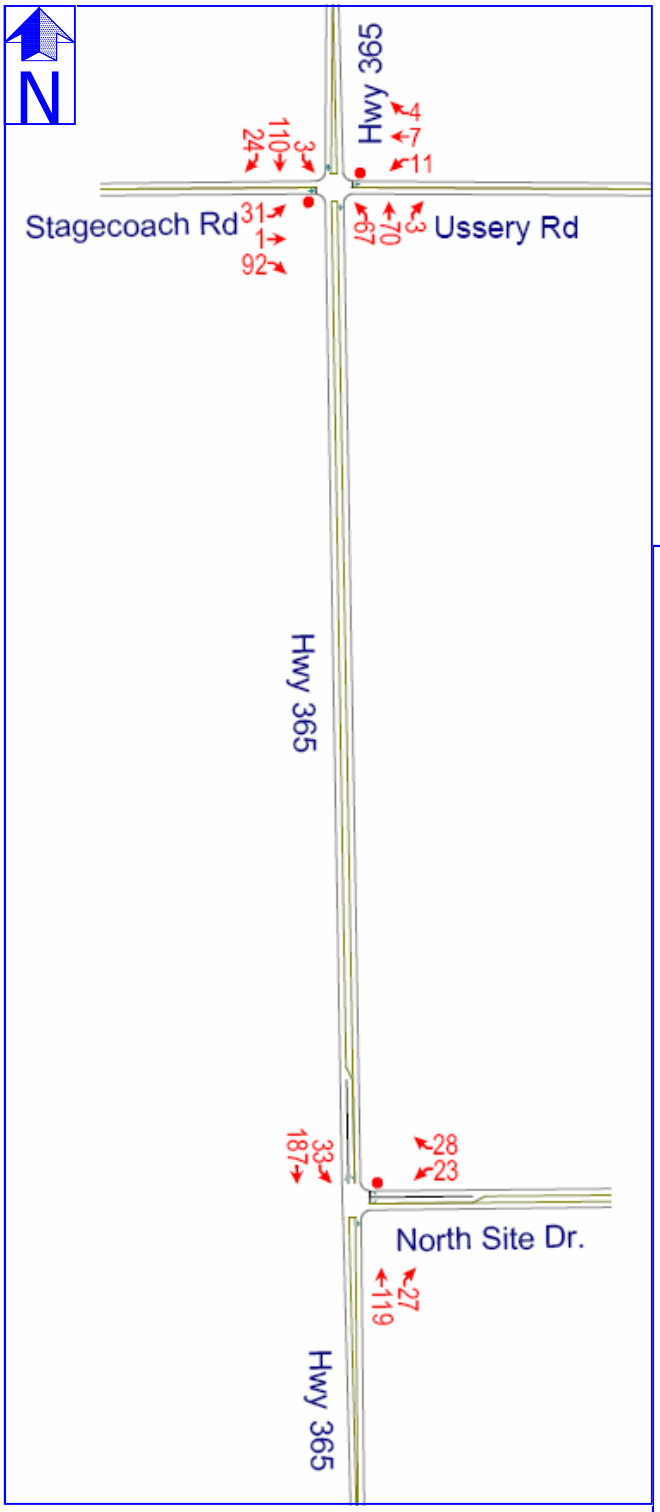
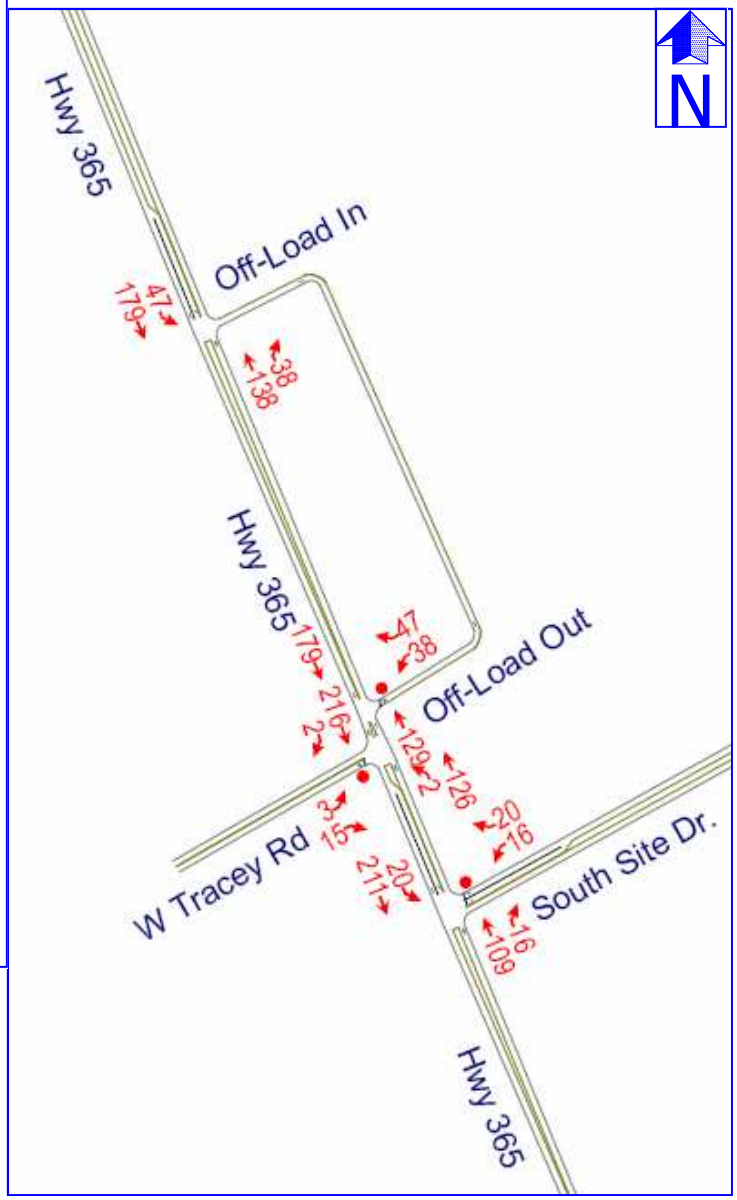


Figure 6A
Projected Traffic Volumes
Phase 1
Weekday AM Peak Hour



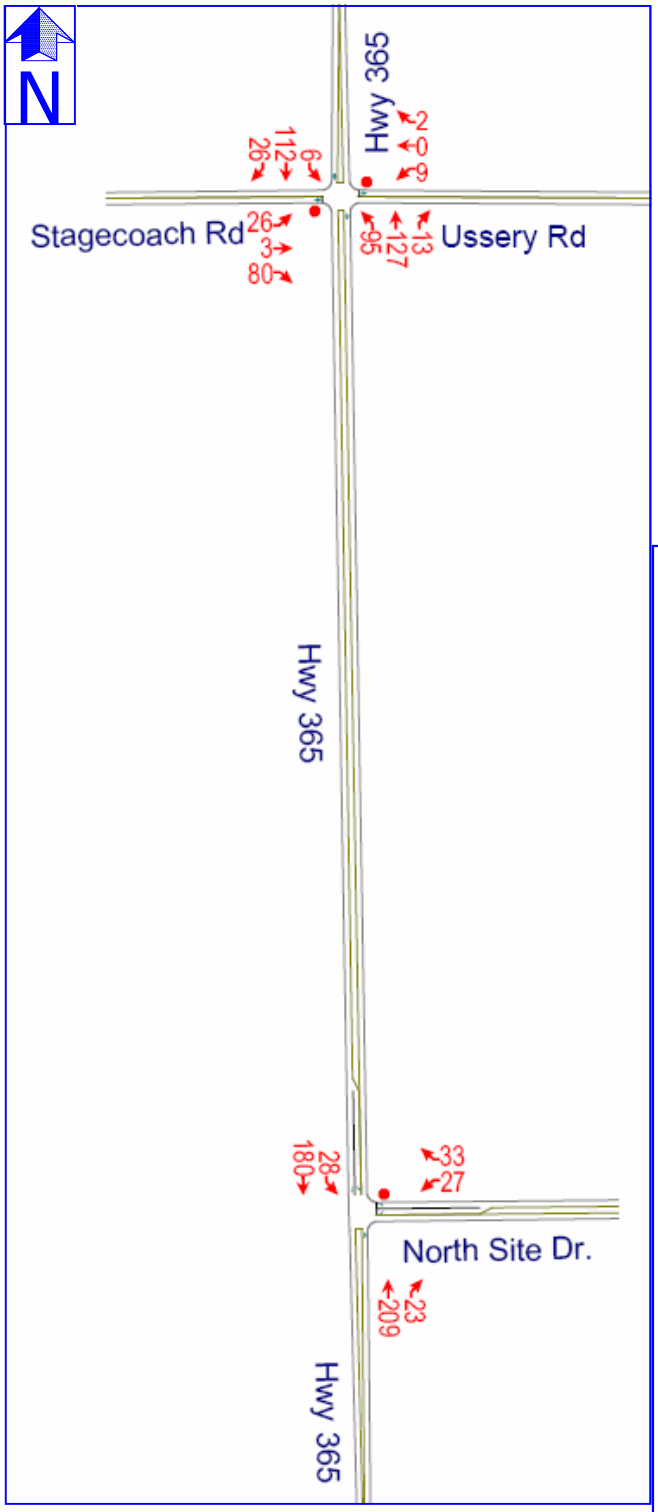
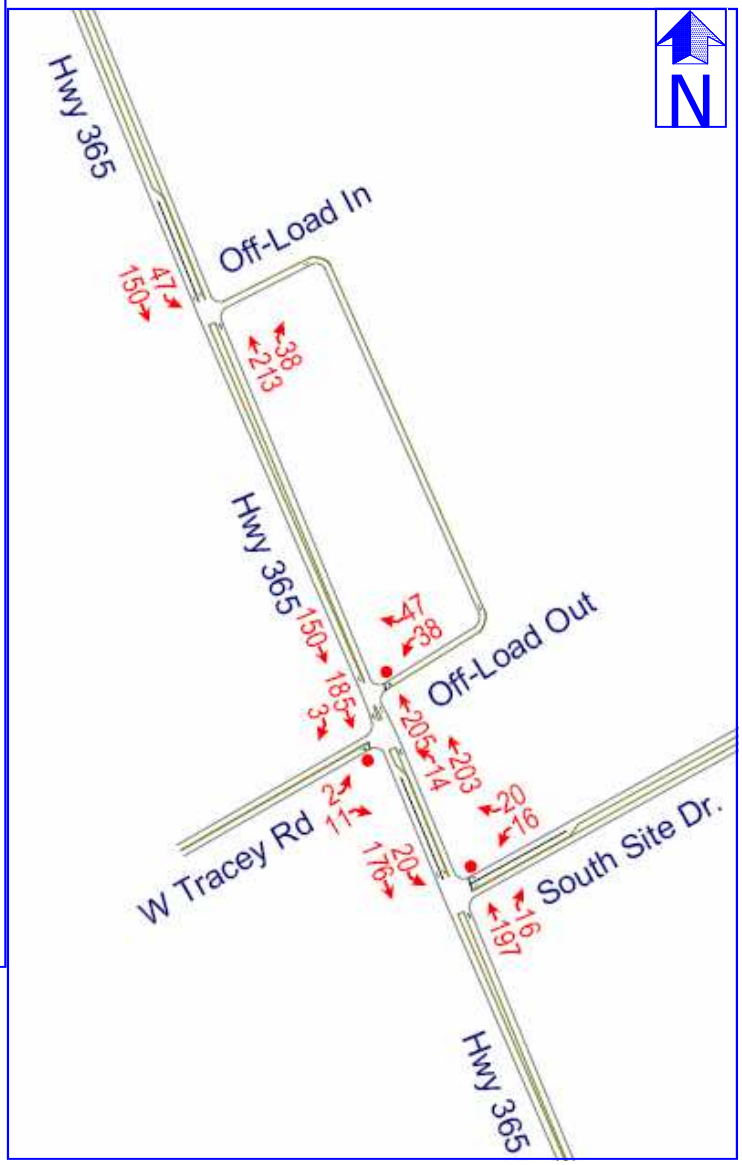


Figure 6B
Projected Traffic Volumes
Phase 1
Weekday PM Peak Hour



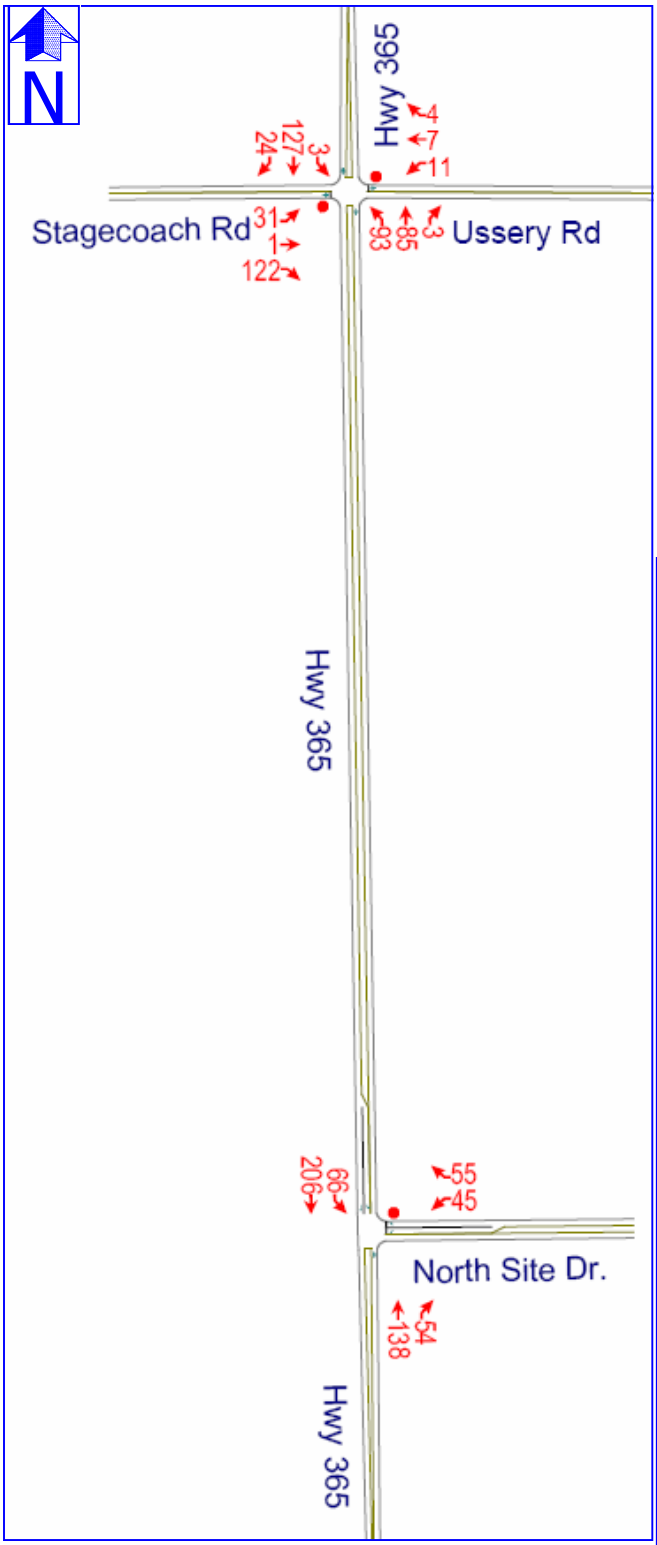
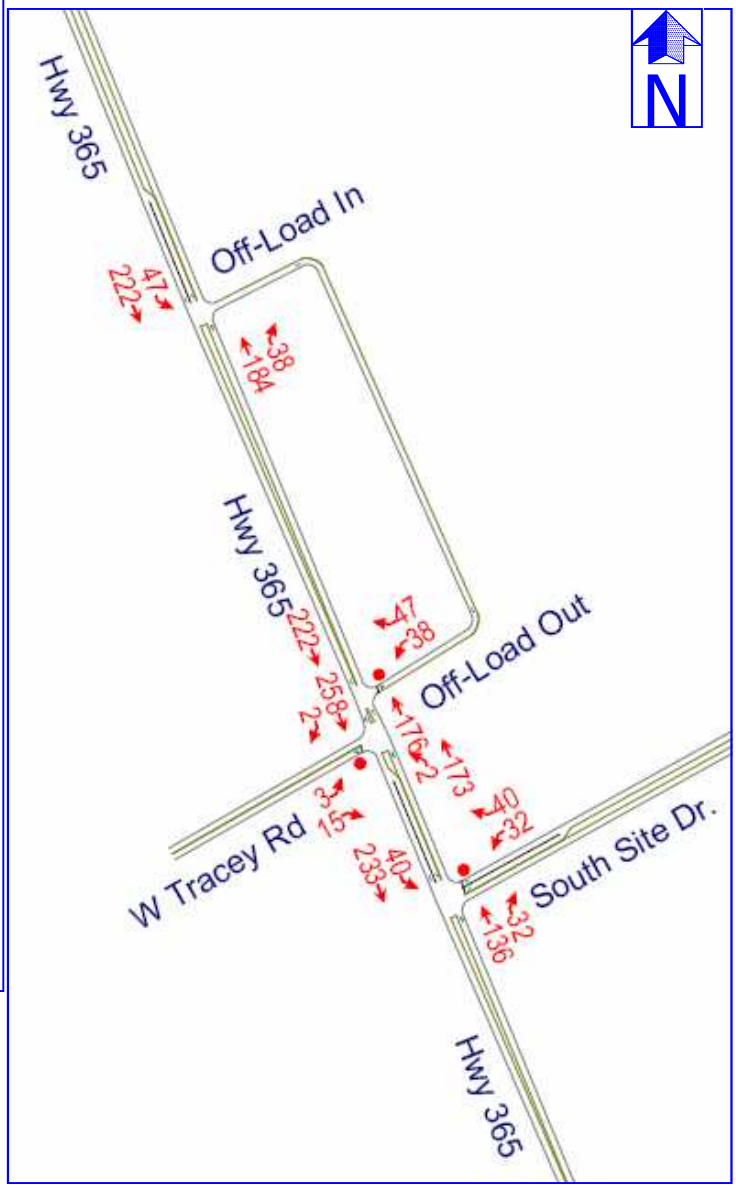


Figure 7A
Projected Traffic Volumes
Phase 2
Weekday AM Peak Hour



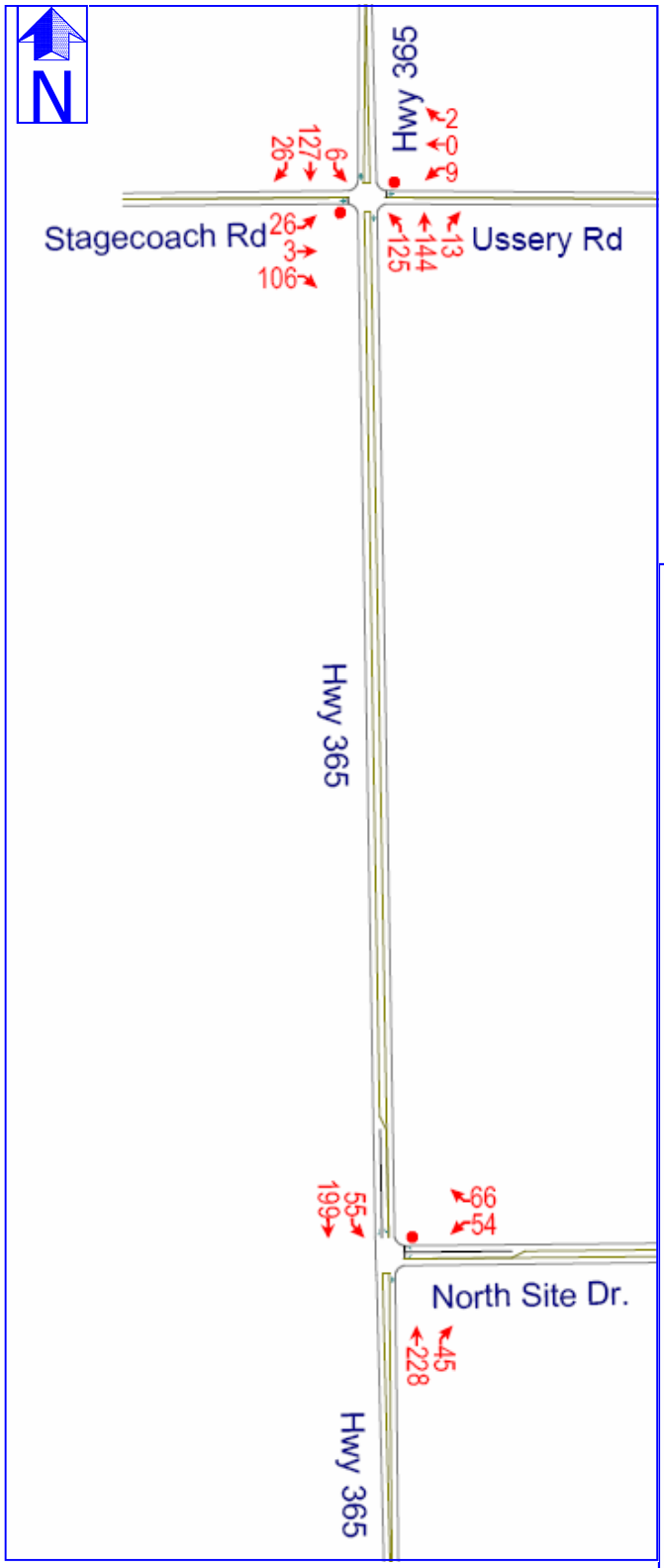
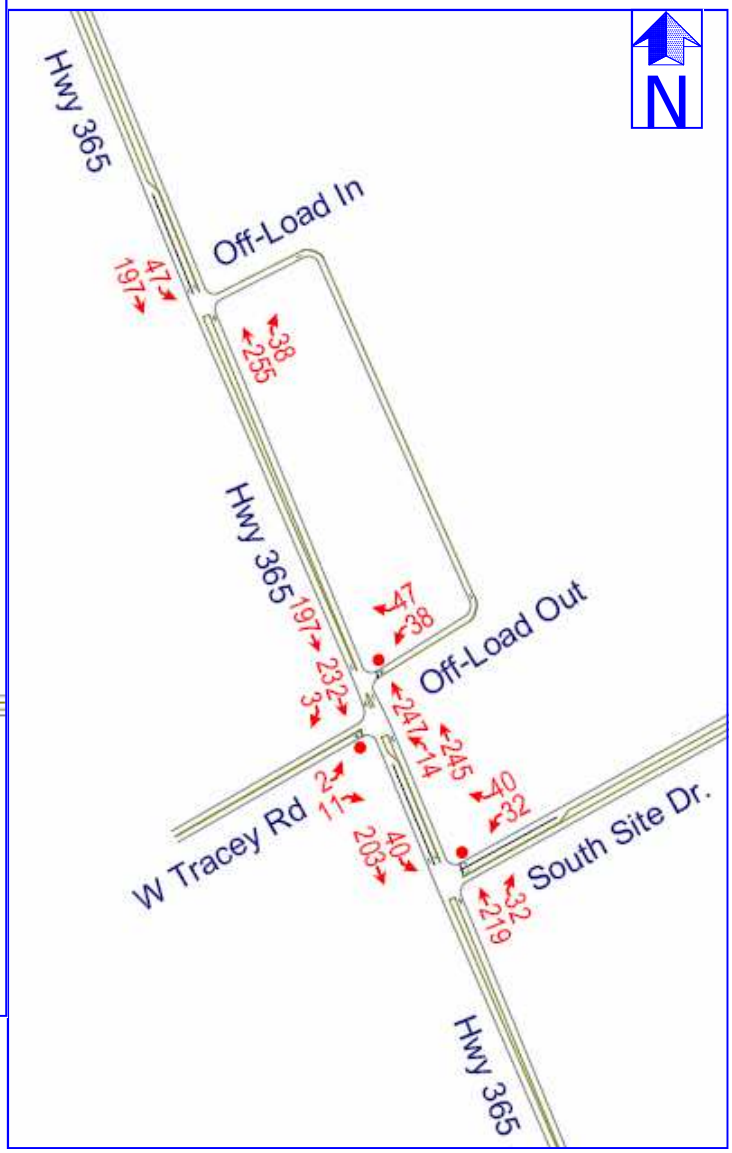


Figure 7B
Projected Traffic Volumes
Phase 2
Weekday PM Peak Hour



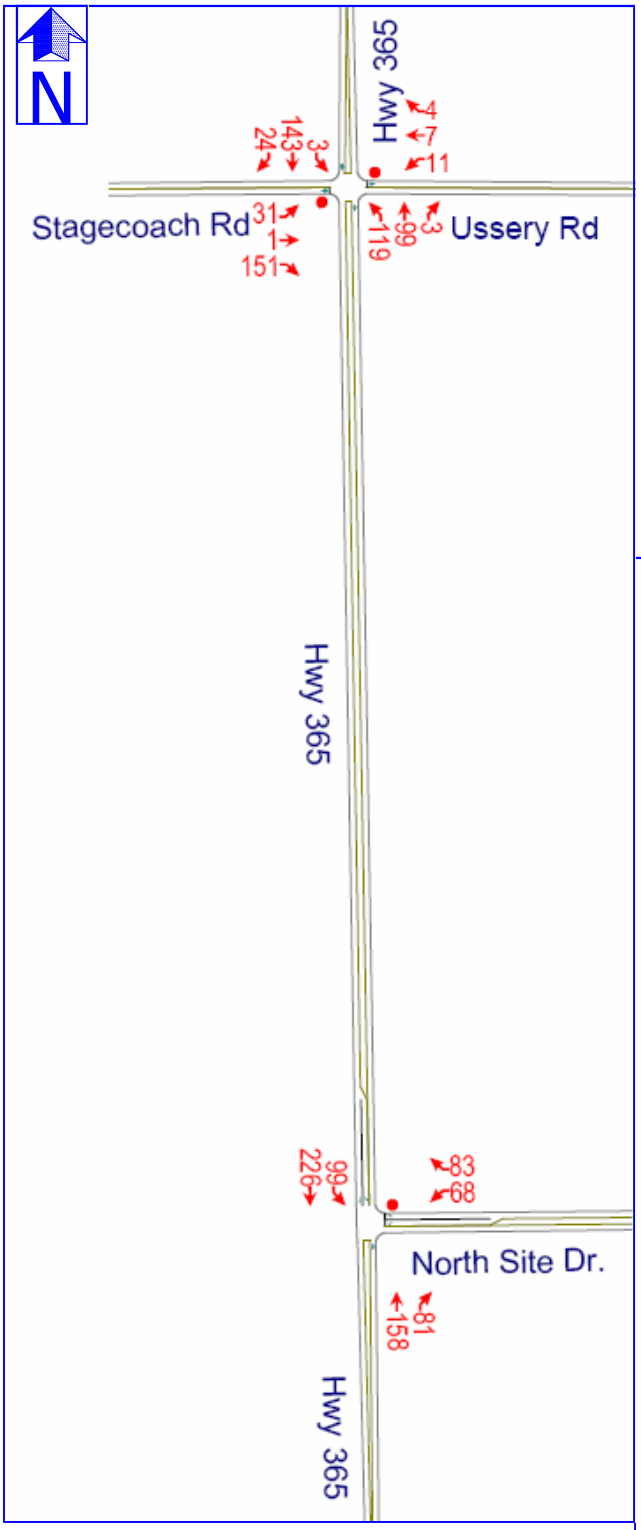
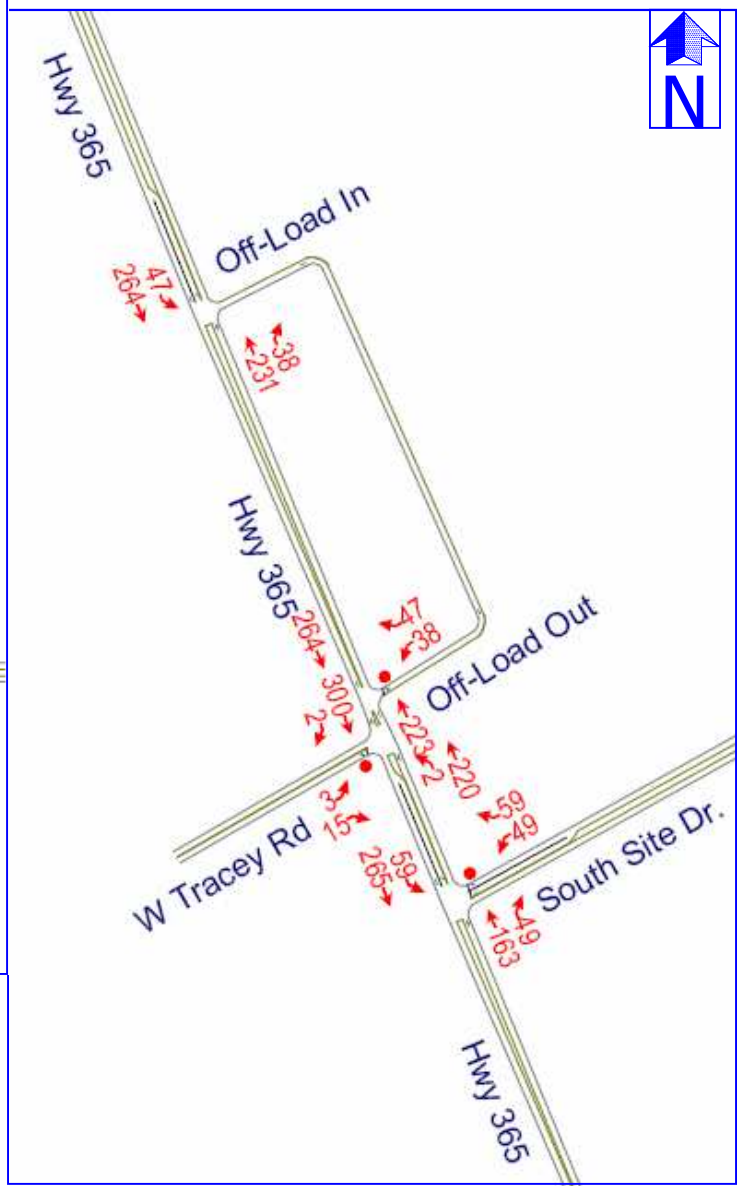


Figure 8A
Projected Traffic Volumes
Phase 3
Weekday AM Peak Hour



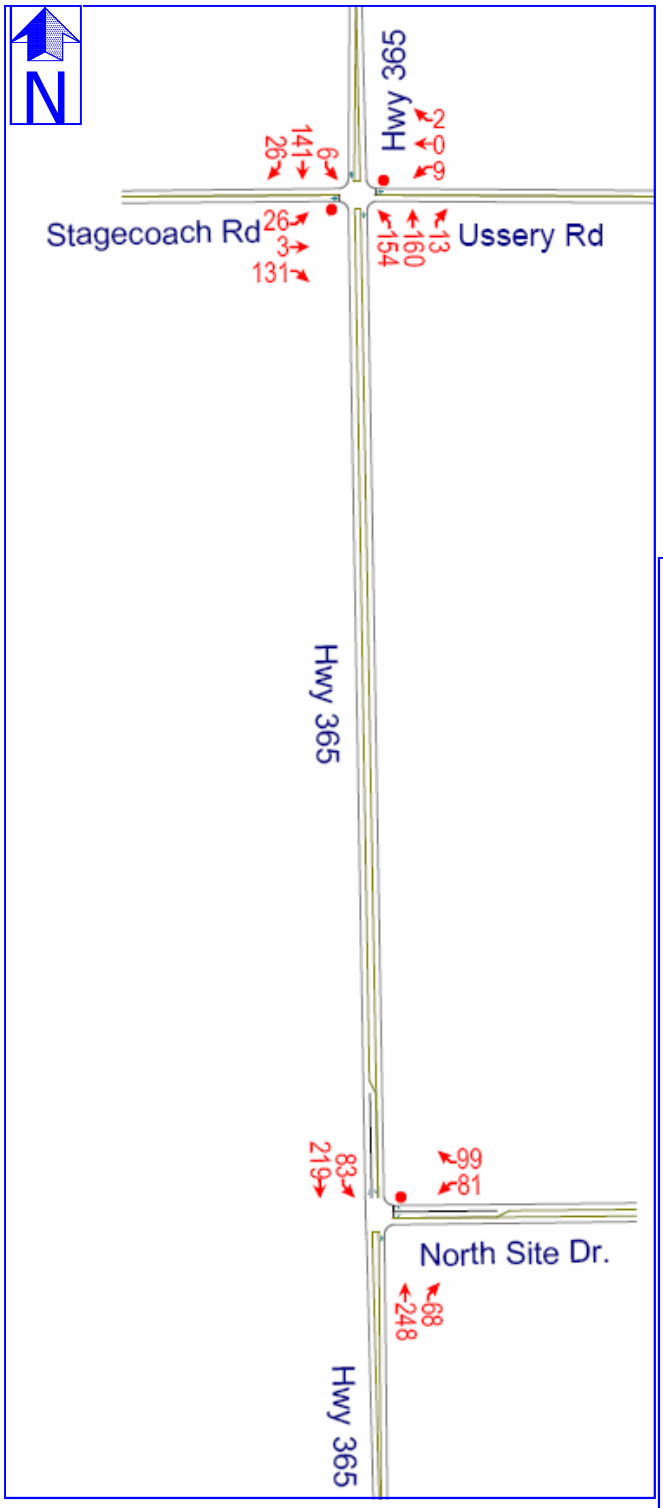
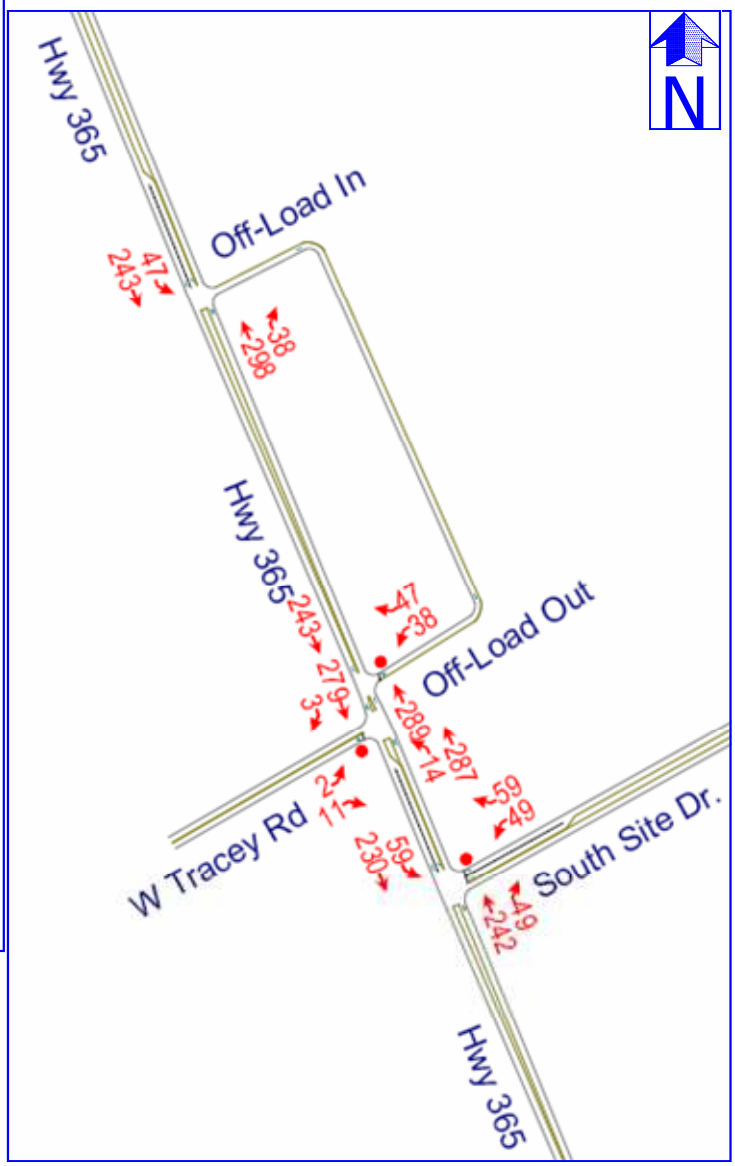


Figure 8B
Projected Traffic Volumes
Phase 3
Weekday PM Peak Hour



CAPACITY and LEVEL OF SERVICE

Generally, the "capacity" of a roadway is a measure of its ability to accommodate a certain magnitude of moving vehicles. It is a rate as opposed to a quantity, measured in terms of vehicles per hour. More specifically, street capacity refers to the maximum number of vehicles that a roadway element (e.g. an intersection) can be expected to accommodate in a given time period under the prevailing roadway and traffic conditions.

Traffic operational analysis for the study intersections were evaluated based on the methodologies outlined in the Highway Capacity Manual, 2010 Edition, published by the Transportation Research Board. The operating conditions at an intersection are graded by the "level of service" experienced by drivers. Level of service (LOS) describes the quality of traffic operating conditions and is rated from "A" to "F". LOS "A" represents the most desirable condition with free-flow movement of traffic with minimal delays. LOS "F" generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in the average delay per stopped vehicle. Delay is measured in seconds per vehicle. The table below shows the upper limit of delay associated with each level of service for signalized and un-signalized intersections.

Intersection Level of Service Delay Thresholds

Level of Service (LOS)	Signalized	Un-Signalized
A	< 10 Seconds	< 10 Seconds
B	< 20 Seconds	< 15 Seconds
C	< 35 Seconds	< 25 Seconds
D	< 55 Seconds	< 35 Seconds
E	< 80 Seconds	< 50 Seconds
F	≥ 80 Seconds	≥ 50 Seconds

The LOS rating deemed acceptable varies by community, facility type and traffic control device. LOS "D" is the desirable goal for movements at un-signalized intersections that must yield to other movements; however, a LOS "E" or "F" is often accepted for low to moderate traffic volumes where the installation of a traffic signal is not warranted by the conditions at the intersection or the location is deemed undesirable for signalization for other reasons. Other reasons may include the close proximity of an existing traffic signal or the presence of a convenient alternative route. For signalized intersections, level of service and average delay relate to all vehicles using the intersection. LOS "D" is the typical desirable standard for signalized intersections. All study intersections were evaluated using the Synchro analysis software package based on Highway Capacity Manual methods. This computer program has been proven to be reliable when used to analyze capacity and levels of traffic service under various operating conditions. Detailed results for all capacity calculations are included in the Appendix. The adjacent roadway weekday AM and PM peak traffic periods were used for these calculations. Factors included in the analysis are as follows

- Existing traffic volumes and patterns.
- Directional distribution of projected traffic volumes.
- Existing intersection geometry (including elements such as turn lanes, curb radii, etc.).
- Existing background traffic volumes and projected site-generated volumes for projected traffic conditions for each phase of development.
- Passenger Car Equivalent (PCE) factor for truck traffic.
- Existing or proposed traffic control.

CAPACITY ANALYSIS

Level of Service Analysis Results

Existing Traffic Conditions

Capacity and level of service analysis was performed for existing traffic volumes, lane geometry and traffic control for the weekday AM and PM peak hours for the following intersections:

- Highway 365 and Shelva Road / W. Tracey Road.
- Highway 365 and Ussery Road / Stagecoach Road.

As indicated in Table 3, "Level of Service Summary – Existing Traffic Conditions," all of the vehicle movements at the study intersections presently operate at what calculates as an acceptable LOS "C" or better for the weekday AM and PM peak hours.

Traffic volumes used for this analysis are shown on Figure 3A, "Existing Traffic Volumes - Weekday AM Peak Hour," and Figure 3B, "Existing Traffic Volumes - Weekday PM Peak Hour."

EXISTING TRAFFIC CONDITIONS		Traffic Control	Eastbound Left-Turn	Eastbound Thru	Eastbound Right-Turn	Westbound Left-Turn	Westbound Thru	Westbound Right-Turn	Northbound Left-Turn	Northbound Thru	Northbound Right-Turn	Southbound Left-Turn	Southbound Thru	Southbound Right-Turn	Avg. Control Delay Seconds / Vehicle
INTERSECTION	PEAK HR		PEAK HOUR - LEVEL OF SERVICE												
Highway 365 and Stagecoach / Ussery Rd.	AM	TWO-WAY "STOP" SIGN	A			B			A			A			3.9
	PM		B			B			A			A			3.1
Highway 365 and W. Tracey Rd. / Shelva Rd.	AM	TWO-WAY "STOP" SIGN	A			A			A			A			1.0
	PM		A			A			A			A			0.8

Table 3 - Level of Service Summary – Existing Traffic Conditions

Projected Traffic Conditions - Construction Phase

Capacity and level of service analysis was performed for projected traffic volumes for the construction phase of development for the weekday AM and PM peak hours for the following intersections:

- Highway 365 and Ussery Road / Stagecoach Road.
- Highway 365 and W. Tracey Road.
- Highway 365 and the South Site Access Drive.

As indicated in Table 4, "Level of Service Summary – Construction Phase Projected Traffic Conditions," all of the vehicle movements at the study intersections are expected to operate at what calculates as an acceptable LOS "D" or better for the weekday AM and PM peak hours except for the westbound left-turn vehicle movement on the South Access Drive at Highway 365 during the AM peak hour. This vehicle movement is low (only 38 vehicles) and the delay is caused by the much higher volume on Highway 365.

Additionally, AM and PM peak hour traffic signal warrants analysis were made for the worst-case projected traffic volumes for the construction phase for the intersection of Highway 365 and the South Drive. As shown in the Appendix of the report, it was found that traffic signal warrants are not projected to be met for this intersection for this worst-case condition. Traffic signal warrants analysis for this intersection indicates projected volumes are not expected to be sufficient to satisfy any warrants.

Traffic volumes used for this analysis are shown on Figure 5A, "Projected Traffic Volumes - Construction Phase - Weekday AM Peak Hour," and Figure 5B, "Projected Traffic Volumes - Construction Phase - Weekday PM peak hour."

CONSTRUCTION PHASE PROJECTED TRAFFIC CONDITIONS		Traffic Control	Eastbound Left-Turn	Eastbound Thru	Eastbound Right-Turn	Westbound Left-Turn	Westbound Thru	Westbound Right-Turn	Northbound Left-Turn	Northbound Thru	Northbound Right-Turn	Southbound Left-Turn	Southbound Thru	Southbound Right-Turn	Avg. Control Delay Seconds / Vehicle
INTERSECTION	PEAK HR		PEAK HOUR - LEVEL OF SERVICE												
Highway 365 and Stagecoach / Ussery Rd.	AM	TWO-WAY "STOP" SIGN	B			C			A			A			8.3
	PM		C			D			A			A			5.7
Highway 365 and W. Tracey Road	AM	TWO-WAY "STOP" SIGN	B		B				A				A		0.2
	PM		A		A				A				A		0.3
Highway 365 and South Drive	AM	ONE-WAY "STOP" SIGN				F		A		A		B	A		7.5
	PM					C		C		A		A	A		13.1

Table 4 - Level of Service Summary – Construction Phase Projected Traffic Conditions

Projected Traffic Conditions - Phases 1, 2 and 3

Capacity and level of service analysis was performed for projected traffic volumes for the development of Phase 1, Phase 2 and Phase 3 (full build-out) for the weekday AM and PM peak hours for the following intersections:

- Highway 365 and Ussery Road / Stagecoach Road.
- Highway 365 and the North Site Access Drive.
- Highway 365 and the Off-Load Inbound Access Drive.
- Highway 365 and the Off-Load Outbound Access Drive.
- Highway 365 and W. Tracey Road.
- Highway 365 and the South Site Access Drive.

As indicated in Table 5, "Level of Service Summary – Phase 1 Projected Traffic Conditions," Table 6, "Level of Service Summary – Phase 2 Projected Traffic Conditions," and Table 7, "Level of Service Summary – Phase 3 (Full Build-Out) Projected Traffic Conditions," all of the vehicle movements at the study intersections are expected to operate at what calculates as an acceptable LOS "C" or better for the weekday AM and PM peak hours.

Traffic volumes used for this analysis are shown on Figure 6A, 6B, 7A, 7B, 8A and 8B.

Furthermore, the average seconds per vehicle delay for each phase of development are expected to operate at acceptable levels with at the study intersections during the weekday AM and PM peak hours for these projected traffic conditions.

PHASE 1 PROJECTED TRAFFIC CONDITIONS		Traffic Control	Eastbound Left-Turn	Eastbound Thru	Eastbound Right-Turn	Westbound Left-Turn	Westbound Thru	Westbound Right-Turn	Northbound Left-Turn	Northbound Thru	Northbound Right-Turn	Southbound Left-Turn	Southbound Thru	Southbound Right-Turn	Avg. Control Delay Seconds / Vehicle
INTERSECTION	PEAK HR		PEAK HOUR - LEVEL OF SERVICE												
Highway 365 and Stagecoach / Ussery Rd.	AM	TWO-WAY "STOP" SIGN	B			B			A			A			5.0
	PM		B			B			A			A			4.3
Highway 365 and North Drive	AM	ONE-WAY "STOP" SIGN				B		A		A		A	A		1.8
	PM					B		A		A		A	A		1.8
Highway 365 and Truck Off-Load Inbound	AM	ONE-WAY "STOP" SIGN								A		A	A		0.0
	PM									A		A	A		0.0
Highway 365 and Truck Off-Load Outbound	AM	TWO-WAY "STOP" SIGN				B		B		A			A		2.2
	PM					B		B		A			A		2.1
Highway 365 and W. Tracey Road	AM	TWO-WAY "STOP" SIGN	A		A				A				A		0.5
	PM		A		A				A				A		0.6
Highway 365 and South Drive	AM	ONE-WAY "STOP" SIGN				B		A		A		A	A		1.3
	PM					B		A		A		A	A		1.2

Table 5 - Level of Service Summary – Phase 1 Projected Traffic Conditions

PHASES 1 & 2 PROJECTED TRAFFIC CONDITIONS		Traffic Control	Eastbound Left-Turn	Eastbound Thru	Eastbound Right-Turn	Westbound Left-Turn	Westbound Thru	Westbound Right-Turn	Northbound Left-Turn	Northbound Thru	Northbound Right-Turn	Southbound Left-Turn	Southbound Thru	Southbound Right-Turn	Avg. Control Delay Seconds / Vehicle
INTERSECTION	PEAK HR		PEAK HOUR - LEVEL OF SERVICE												
Highway 365 and Stagecoach / Ussery Rd.	AM	TWO-WAY "STOP" SIGN	B			B			A			A			5.4
	PM		B			C			A			A			4.7
Highway 365 and North Drive	AM	ONE-WAY "STOP" SIGN				B		A		A		A	A		2.9
	PM					B		B		A		A	A		2.9
Highway 365 and Truck Off-Load Inbound	AM	ONE-WAY "STOP" SIGN								A		A	A		0.0
	PM									A		A	A		0.0
Highway 365 and Truck Off-Load Outbound	AM	TWO-WAY "STOP" SIGN				B		B		A			A		1.9
	PM					B		B		A			A		1.8
Highway 365 and W. Tracey Road	AM	TWO-WAY "STOP" SIGN	B		B				A				A		0.4
	PM		B		B				A				A		0.5
Highway 365 and South Drive	AM	ONE-WAY "STOP" SIGN				B		A		A		A	A		2.0
	PM					B		A		A		A	A		1.2

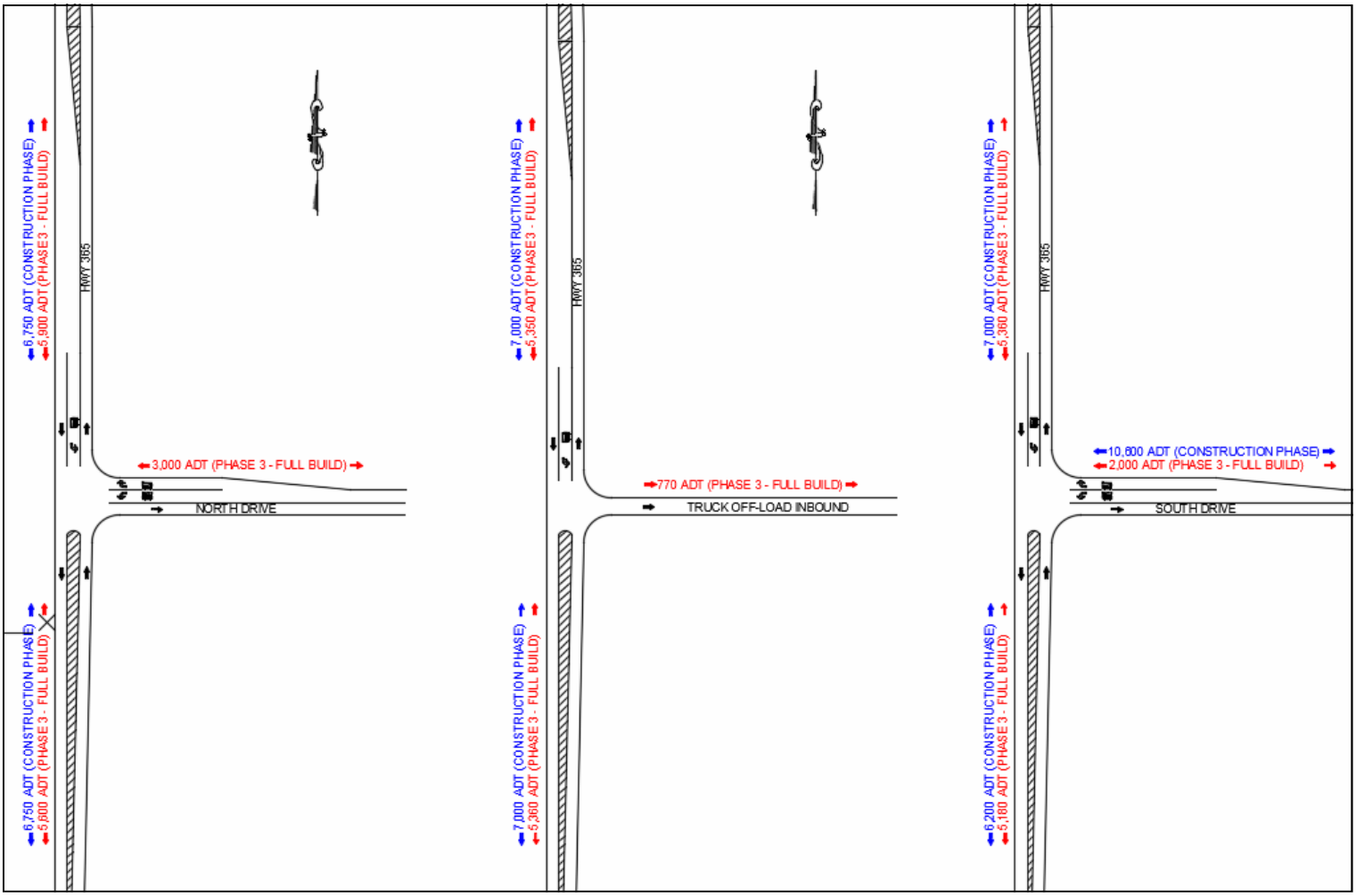
Table 6 - Level of Service Summary – Phase 2 Projected Traffic Conditions

PHASES 1, 2 & 3 (FULL BUILD-OUT) PROJECTED TRAFFIC CONDITIONS		Traffic Control	Eastbound Left-Turn	Eastbound Thru	Eastbound Right-Turn	Westbound Left-Turn	Westbound Thru	Westbound Right-Turn	Northbound Left-Turn	Northbound Thru	Northbound Right-Turn	Southbound Left-Turn	Southbound Thru	Southbound Right-Turn	Avg. Control Delay Seconds / Vehicle
INTERSECTION	PEAK HR		PEAK HOUR - LEVEL OF SERVICE												
Highway 365 and Stagecoach / Ussery Rd.	AM	TWO-WAY "STOP" SIGN	B			C			A			A			5.8
	PM		B			C			A			A			5.1
Highway 365 and North Drive	AM	ONE-WAY "STOP" SIGN				C		A		A		A	A		3.8
	PM					C		B		A		A	A		4.1
Highway 365 and Truck Off-Load Inbound	AM	ONE-WAY "STOP" SIGN								A		A	A		0.0
	PM									A		A	A		0.0
Highway 365 and Truck Off-Load Outbound	AM	TWO-WAY "STOP" SIGN				B		B		A			A		1.7
	PM					B		B		A			A		1.8
Highway 365 and W. Tracey Road	AM	TWO-WAY "STOP" SIGN	B		B				A				A		0.4
	PM		B		B				A				A		0.5
Highway 365 and South Drive	AM	ONE-WAY "STOP" SIGN				B		A		A		A	A		2.7
	PM					C		B		A		A	A		1.2

Table 7 - Level of Service Summary – Phase 3 (Full Build-Out) Projected Traffic Conditions

PROJECTED DAILY TRAFFIC VOLUMES

Projected daily traffic volumes for each of the legs of the access drive intersections have been calculated for the construction phase and for phase 3 (full build-out) conditions. The daily traffic volumes are shown below.



Projected Daily Traffic Volumes
Construction Phase and Phase 3 (Full Build)

FINDINGS AND RECOMMENDATIONS

Findings of this study are summarized as follows:

- Capacity and level of service analysis was performed for existing traffic volumes, lane geometry and traffic control for the weekday AM and PM peak hours for the study intersections. All of the vehicle movements at the study intersections presently operate at what calculates as an acceptable LOS "C" or better for the weekday AM and PM peak hours.

- Capacity and level of service analysis was performed for projected traffic volumes for the construction phase of development for the weekday AM and PM peak hours for the study intersections. All of the vehicle movements at the study intersections are expected to operate at what calculates as an acceptable LOS "D" or better for the weekday AM and PM peak hours except for the westbound left-turn vehicle movement on the South Access Drive at Highway 365 during the AM peak hour. This vehicle movement is low (only 38 vehicles) and the delay is caused by the much higher volume on Highway 365.

- AM and PM peak hour traffic signal warrants analysis were made for the worst-case projected traffic volumes for the construction phase for the intersection of Highway 365 and the South Drive. It was found that traffic signal warrants are not projected to be met for this intersection for this worst-case condition. Traffic signal warrants analysis for this intersection indicates projected volumes are not expected to be sufficient to satisfy any warrants.

- Capacity and level of service analysis was performed for projected traffic volumes for the development of Phase 1, Phase 2 and Phase 3 (full build-out) for the weekday AM and PM peak hours for the study intersections. All of the vehicle movements at the study intersections are expected to operate at what calculates as an acceptable LOS "C" or better for the weekday AM and PM peak

hours. Furthermore, the average seconds per vehicle delay for each phase of development are expected to operate at acceptable levels with at the study intersections during the weekday AM and PM peak hours for these projected traffic conditions

Recommendations of this study are summarized as follows:

- Recommended schematic lane geometry, including turn bay lengths, tapers and transitions of additional lanes, is depicted on the following page 40, Figure A, "Recommended Schematic Lane-Geometry Plus Lengths and Tapers." It is recommended that the lane geometry at the new access drive intersections be designed as shown on this figure.

- Roadway improvement and new intersection designs along Highway 365 must conform to Arkansas Department of Transportation (ARDOT) standards and will require approval by ARDOT.

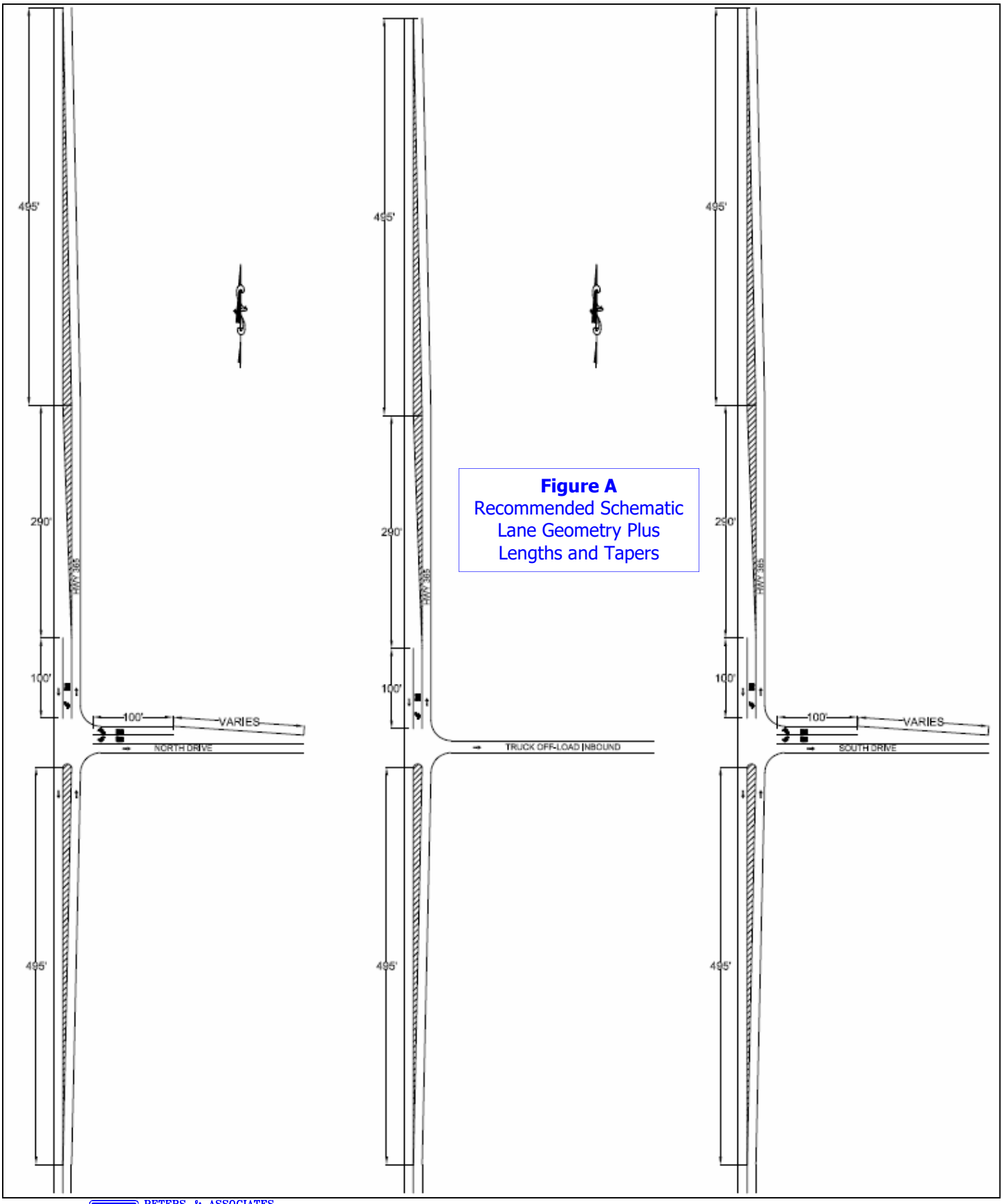


Figure A
Recommended Schematic
Lane Geometry Plus
Lengths and Tapers

APPENDIX

PETERS & ASSOCIATES
ENGINEERS, INC.

Vehicle Turning Movement Count Data

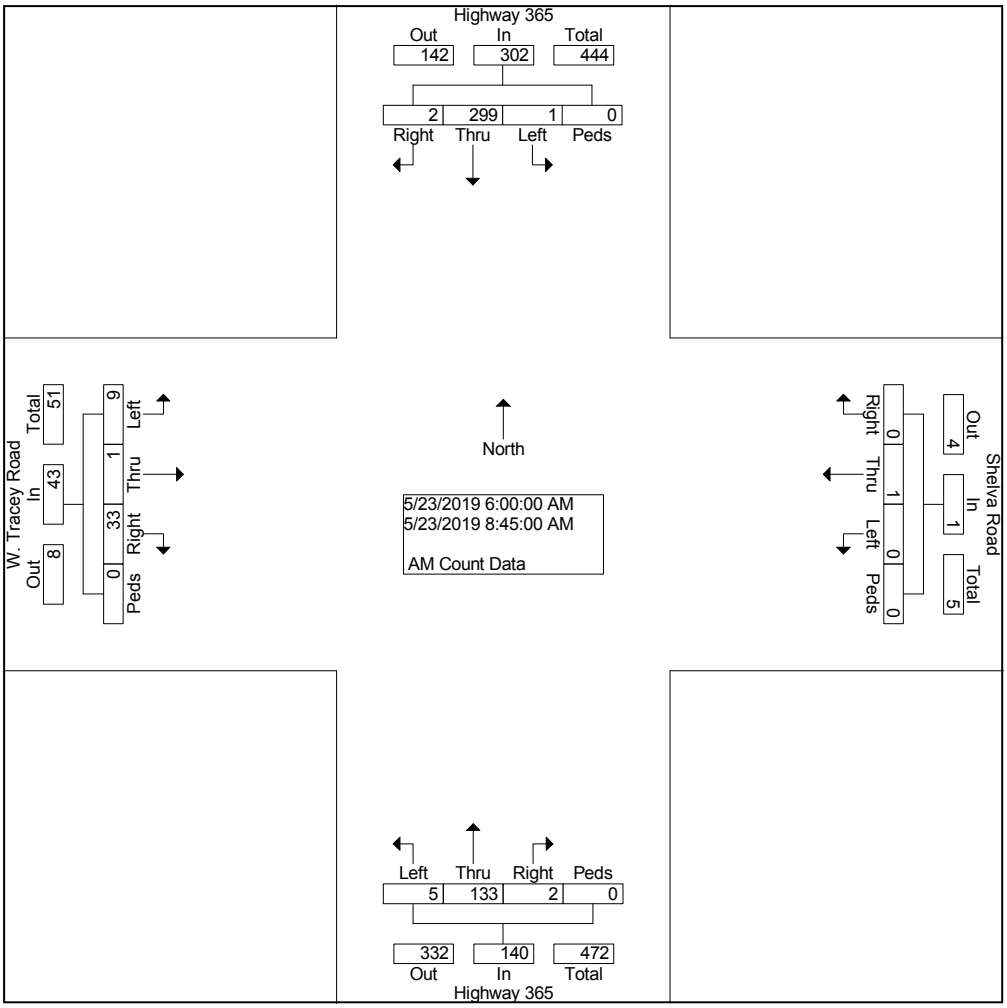
Peters & Associates Engineers, Inc.
Peak Hour Turning Movement Count Data

AM Hour Turning Movement Count Data
Highway 365 & Shelva Road W. Tracey Road
Little Rock, Arkansas
P-1980

File Name : AM-Shel
Site Code : 00000000
Start Date : 05/23/2019
Page No : 1

Groups Printed- AM Count Data

	Highway 365 From North					Shelva Road From East					Highway 365 From South					W. Tracey Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
06:00 AM	0	20	0	0	20	0	0	0	0	0	0	2	0	0	2	1	0	2	0	3	25
06:15 AM	0	28	0	0	28	0	0	0	0	0	1	12	0	0	13	3	0	0	0	3	44
06:30 AM	0	25	0	0	25	0	0	0	0	0	0	17	0	0	17	1	0	0	0	1	43
06:45 AM	0	22	0	0	22	0	0	0	0	0	0	11	1	0	12	1	0	1	0	2	36
Total	0	95	0	0	95	0	0	0	0	0	1	42	1	0	44	6	0	3	0	9	148
07:00 AM	0	18	0	0	18	0	0	0	0	0	0	7	1	0	8	4	0	1	0	5	31
07:15 AM	1	37	0	0	38	0	0	0	0	0	0	12	0	0	12	4	0	1	0	5	55
07:30 AM	0	38	0	0	38	0	0	0	0	0	0	6	1	0	7	2	0	2	0	4	49
07:45 AM	1	40	0	0	41	0	0	0	0	0	0	12	1	0	13	5	0	0	0	5	59
Total	2	133	0	0	135	0	0	0	0	0	0	37	3	0	40	15	0	4	0	19	194
08:00 AM	0	20	0	0	20	0	0	0	0	0	1	11	0	0	12	4	1	0	0	5	37
08:15 AM	0	21	1	0	22	0	0	0	0	0	0	13	0	0	13	4	0	1	0	5	40
08:30 AM	0	15	0	0	15	0	0	0	0	0	0	14	1	0	15	2	0	1	0	3	33
08:45 AM	0	15	0	0	15	0	1	0	0	1	0	16	0	0	16	2	0	0	0	2	34
Total	0	71	1	0	72	0	1	0	0	1	1	54	1	0	56	12	1	2	0	15	144
Grand Total	2	299	1	0	302	0	1	0	0	1	2	133	5	0	140	33	1	9	0	43	486
Apprch %	0.7	99.0	0.3	0.0		0.0	100.0	0.0	0.0		1.4	95.0	3.6	0.0		76.7	2.3	20.9	0.0		
Total %	0.4	61.5	0.2	0.0	62.1	0.0	0.2	0.0	0.0	0.2	0.4	27.4	1.0	0.0	28.8	6.8	0.2	1.9	0.0	8.8	

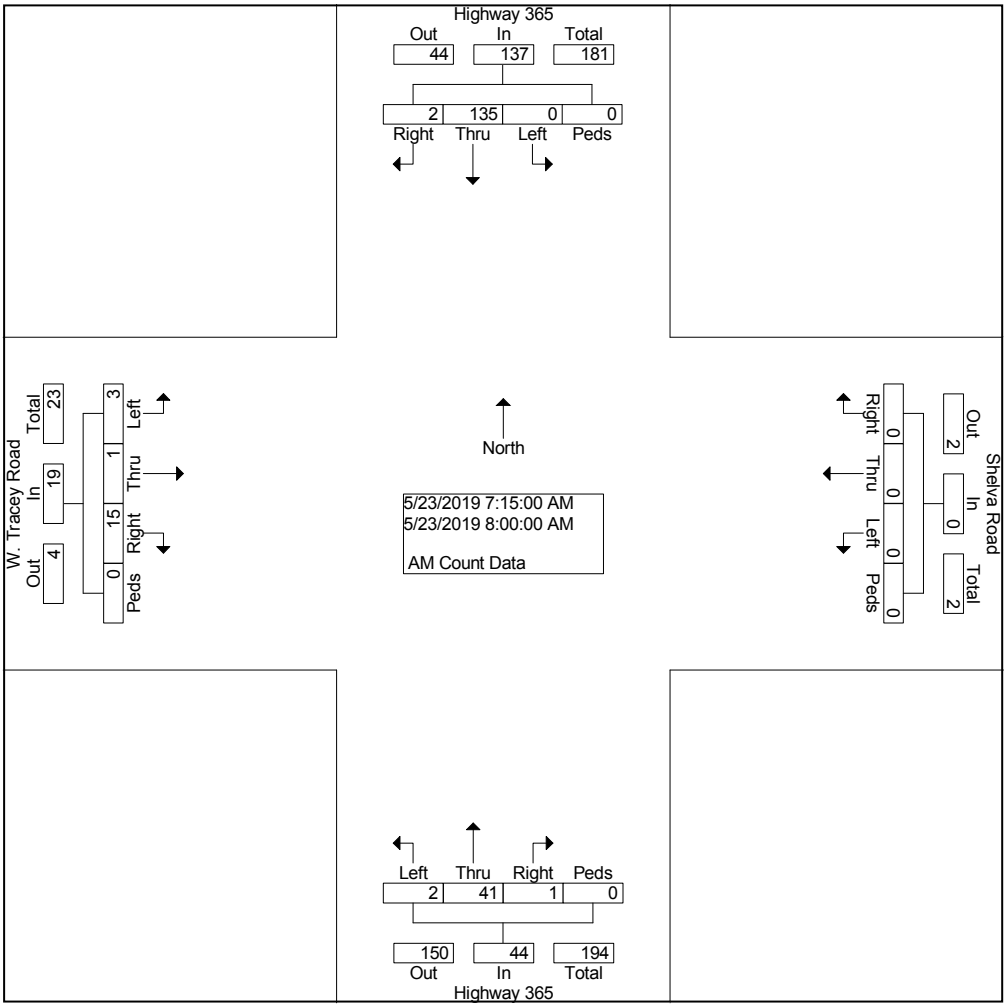


Peters & Associates Engineers, Inc.
Peak Hour Turning Movement Count Data

AM Hour Turning Movement Count Data
Highway 365 & Shelva Road W. Tracey Road
Little Rock, Arkansas
P-1980

File Name : AM-Shel
Site Code : 00000000
Start Date : 05/23/2019
Page No : 2

	Highway 365 From North					Shelva Road From East					Highway 365 From South					W. Tracey Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:15 AM																				
Volume	2	135	0	0	137	0	0	0	0	0	1	41	2	0	44	15	1	3	0	19	200
Percent	1.5	98.5	0.0	0.0		0.0	0.0	0.0	0.0		2.3	93.2	4.5	0.0		78.9	5.3	15.8	0.0		
07:45 Volume	1	40	0	0	41	0	0	0	0	0	0	12	1	0	13	5	0	0	0	5	59
Peak Factor																					0.847
High Int.	07:45 AM					5:45:00 AM					07:45 AM					07:15 AM					
Volume	1	40	0	0	41	0	0	0	0	0	0	12	1	0	13	4	0	1	0	5	
Peak Factor					0.835										0.846					0.950	



Peters & Associates Engineers, Inc.
Peak Hour Turning Movement Count Data

PM Hour Turning Movement Count Data
Highway 365 & Shelva Road/W. Tracey Road
Pine Bluff, Arkansas
P-1980

File Name : PM-Shel
Site Code : 00000000
Start Date : 05/21/2019
Page No : 1

Groups Printed- PM Count Data

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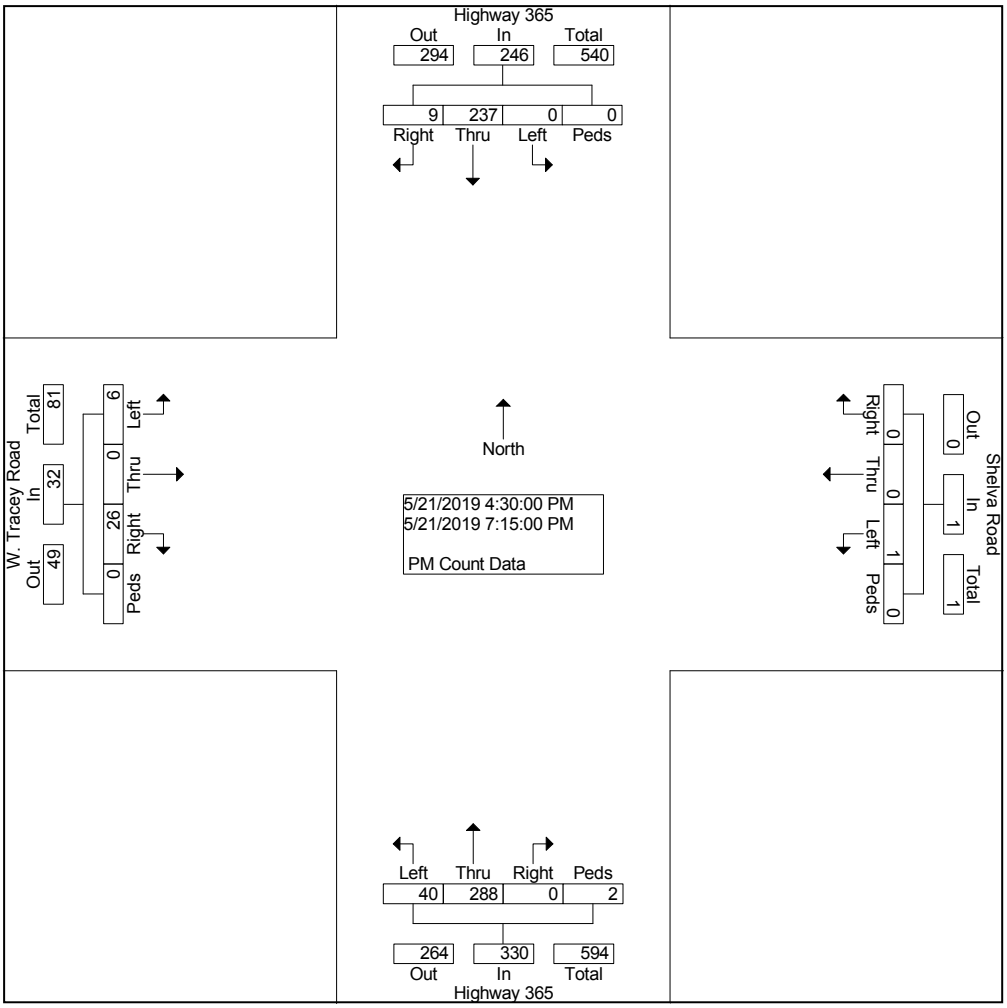
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
04:30 PM	2	22	0	0	24	0	0	0	0	0	0	32	3	0	35	2	0	0	0	2	61
04:45 PM	1	26	0	0	27	0	0	0	0	0	0	37	5	0	42	1	0	0	0	1	70
Total	3	48	0	0	51	0	0	0	0	0	0	69	8	0	77	3	0	0	0	3	131
05:00 PM	0	34	0	0	34	0	0	0	0	0	0	45	5	0	50	5	0	0	0	5	89
05:15 PM	2	25	0	0	27	0	0	0	0	0	0	44	5	0	49	2	0	1	0	3	79
05:30 PM	1	16	0	0	17	0	0	0	0	0	0	22	3	0	25	2	0	1	0	3	45
05:45 PM	0	25	0	0	25	0	0	0	0	0	0	11	1	0	12	2	0	0	0	2	39
Total	3	100	0	0	103	0	0	0	0	0	0	122	14	0	136	11	0	2	0	13	252
06:00 PM	0	16	0	0	16	0	0	0	0	0	0	22	4	0	26	1	0	1	0	2	44
06:15 PM	1	21	0	0	22	0	0	0	0	0	0	19	2	0	21	3	0	0	0	3	46
06:30 PM	1	13	0	0	14	0	0	0	0	0	0	20	5	0	25	4	0	1	0	5	44
06:45 PM	0	14	0	0	14	0	0	1	0	1	0	11	3	2	16	1	0	2	0	3	34
Total	2	64	0	0	66	0	0	1	0	1	0	72	14	2	88	9	0	4	0	13	168
07:00 PM	1	7	0	0	8	0	0	0	0	0	0	14	2	0	16	3	0	0	0	3	27
07:15 PM	0	18	0	0	18	0	0	0	0	0	0	11	2	0	13	0	0	0	0	0	31
Grand Total	9	237	0	0	246	0	0	1	0	1	0	288	40	2	330	26	0	6	0	32	609
Apprch %	3.7	96.3	0.0	0.0		0.0	0.0	100.0	0.0		0.0	87.3	12.1	0.6		81.3	0.0	18.8	0.0		
Total %	1.5	38.9	0.0	0.0	40.4	0.0	0.0	0.2	0.0	0.2	0.0	47.3	6.6	0.3	54.2	4.3	0.0	1.0	0.0	5.3	

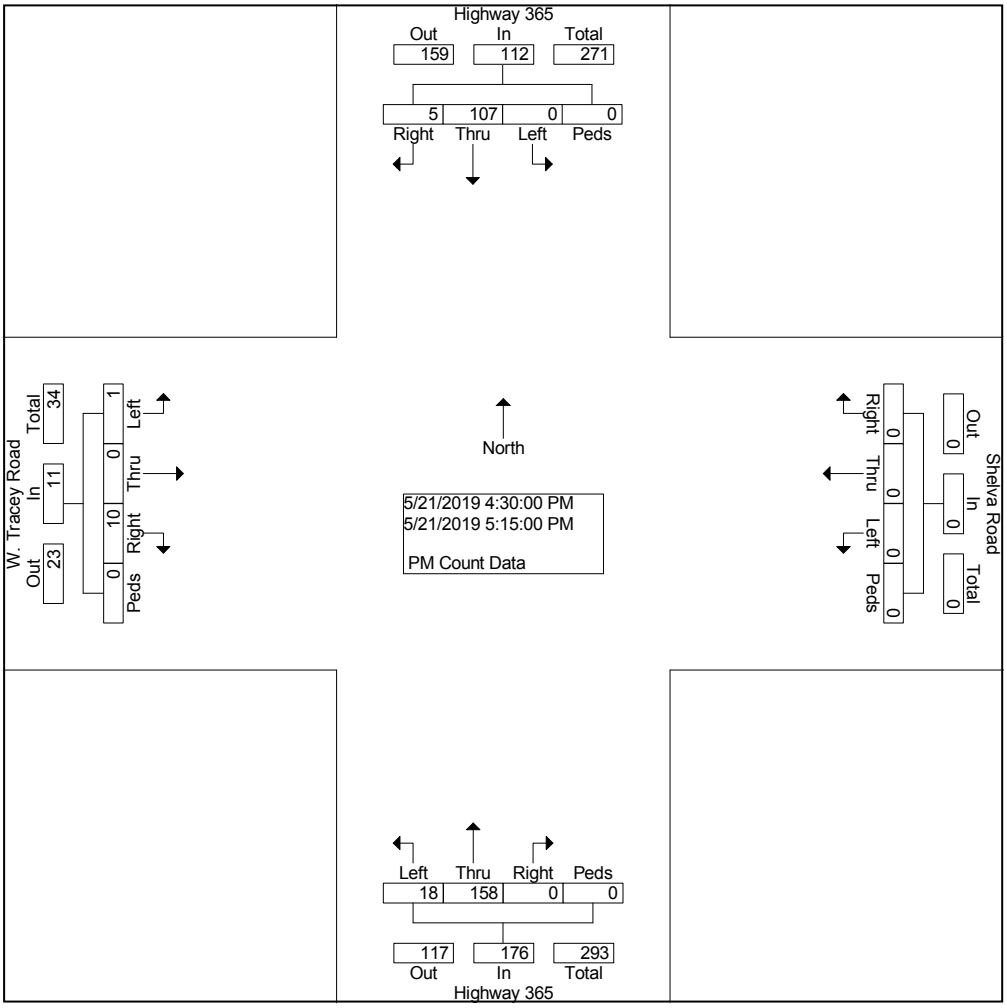


Peters & Associates Engineers, Inc.
Peak Hour Turning Movement Count Data

PM Hour Turning Movement Count Data
Highway 365 & Shelva Road/W. Tracey Road
Pine Bluff, Arkansas
P-1980

File Name : PM-Shel
Site Code : 00000000
Start Date : 05/21/2019
Page No : 2

	Highway 365 From North					Shelva Road From East					Highway 365 From South					W. Tracey Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:30 PM to 07:15 PM - Peak 1 of 1																					
Intersection	04:30 PM																				
Volume	5	107	0	0	112	0	0	0	0	0	0	158	18	0	176	10	0	1	0	11	299
Percent	4.5	95.5	0.0	0.0		0.0	0.0	0.0	0.0		0.0	89.8	10.2	0.0		90.9	0.0	9.1	0.0		
05:00 Volume	0	34	0	0	34	0	0	0	0	0	0	45	5	0	50	5	0	0	0	5	89
Peak Factor																					0.840
High Int.	05:00 PM					4:15:00 PM					05:00 PM					05:00 PM					
Volume	0	34	0	0	34	0	0	0	0	0	0	45	5	0	50	5	0	0	0	5	
Peak Factor					0.824										0.880					0.550	



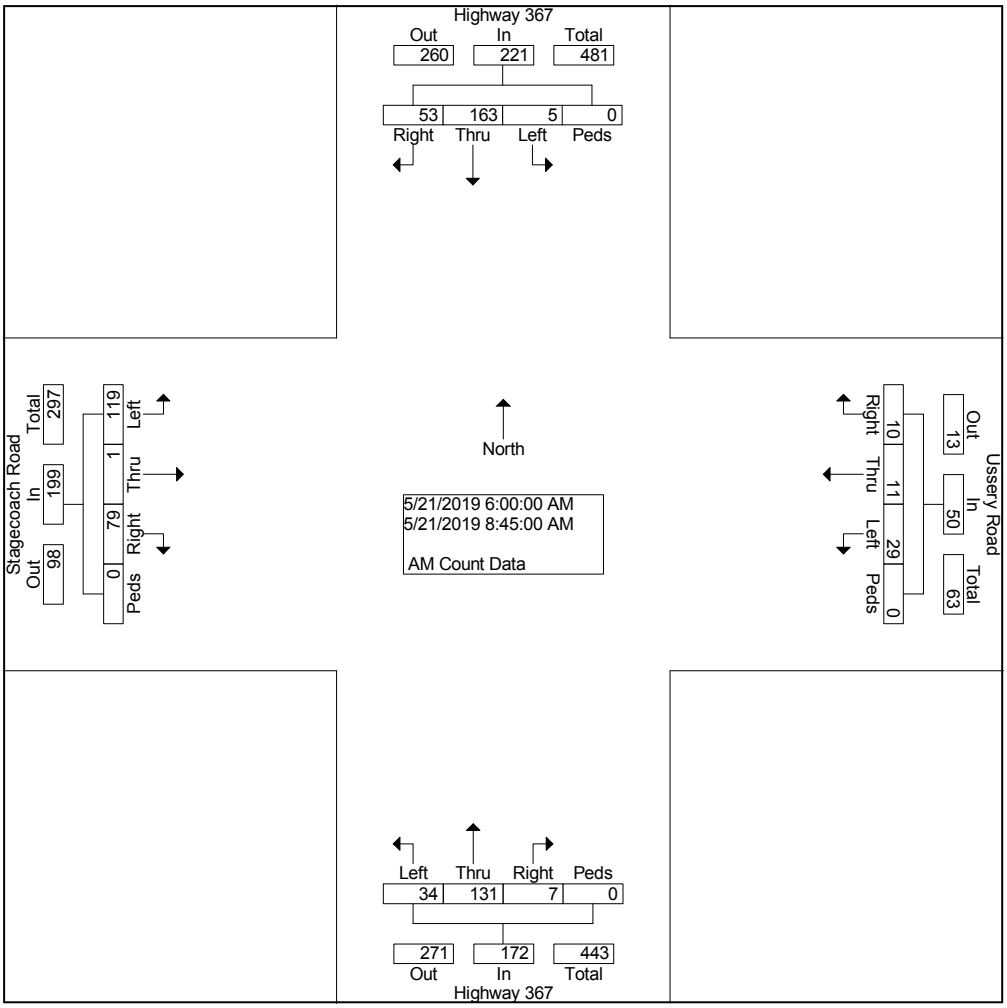
Peters & Associates Engineers, Inc.
Peak Hour Turning Movement Count Data

AM Hour Turning Movement Count Data
Highway 365 & Stagecoach Rd. /Ussery Rd.
Pine Bluff, Arkansas
P-1980

File Name : AM-Uss
Site Code : 00000000
Start Date : 05/21/2019
Page No : 1

Groups Printed- AM Count Data

	Highway 367 From North					Ussery Road From East					Highway 367 From South					Stagecoach Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
06:00 AM	2	9	0	0	11	1	1	1	0	3	0	4	2	0	6	7	0	7	0	14	34
06:15 AM	8	15	0	0	23	0	0	4	0	4	0	8	4	0	12	10	0	14	0	24	63
06:30 AM	5	11	0	0	16	0	0	2	0	2	1	20	1	0	22	7	0	12	0	19	59
06:45 AM	5	9	1	0	15	1	1	2	0	4	1	15	3	0	19	6	0	13	0	19	57
Total	20	44	1	0	65	2	2	9	0	13	2	47	10	0	59	30	0	46	0	76	213
07:00 AM	6	9	0	0	15	2	2	3	0	7	0	5	4	0	9	6	0	2	0	8	39
07:15 AM	9	20	0	0	29	0	1	2	0	3	1	8	4	0	13	6	1	9	0	16	61
07:30 AM	7	17	1	0	25	0	2	2	0	4	0	10	4	0	14	11	0	6	0	17	60
07:45 AM	3	18	1	0	22	2	1	3	0	6	2	11	3	0	16	7	0	14	0	21	65
Total	25	64	2	0	91	4	6	10	0	20	3	34	15	0	52	30	1	31	0	62	225
08:00 AM	5	21	1	0	27	2	3	4	0	9	0	9	0	0	9	9	0	2	0	11	56
08:15 AM	1	11	0	0	12	1	0	1	0	2	1	11	3	0	15	7	0	14	0	21	50
08:30 AM	2	19	1	0	22	1	0	1	0	2	1	13	4	0	18	1	0	13	0	14	56
08:45 AM	0	4	0	0	4	0	0	4	0	4	0	17	2	0	19	2	0	13	0	15	42
Total	8	55	2	0	65	4	3	10	0	17	2	50	9	0	61	19	0	42	0	61	204
Grand Total	53	163	5	0	221	10	11	29	0	50	7	131	34	0	172	79	1	119	0	199	642
Apprch %	24.0	73.8	2.3	0.0		20.0	22.0	58.0	0.0		4.1	76.2	19.8	0.0		39.7	0.5	59.8	0.0		
Total %	8.3	25.4	0.8	0.0	34.4	1.6	1.7	4.5	0.0	7.8	1.1	20.4	5.3	0.0	26.8	12.3	0.2	18.5	0.0	31.0	

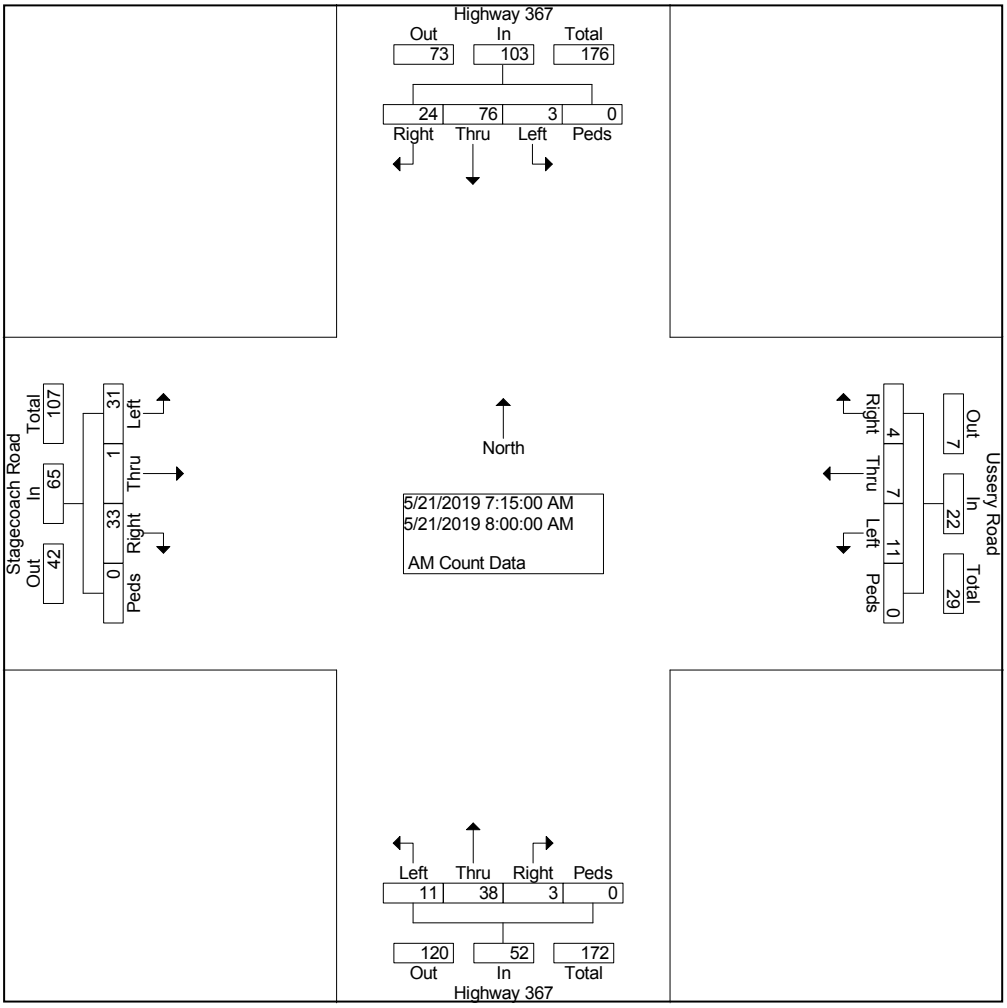


Peters & Associates Engineers, Inc.
Peak Hour Turning Movement Count Data

AM Hour Turning Movement Count Data
Highway 365 & Stagecoach Rd. /Ussery Rd.
Pine Bluff, Arkansas
P-1980

File Name : AM-Uss
Site Code : 00000000
Start Date : 05/21/2019
Page No : 2

	Highway 367 From North					Ussery Road From East					Highway 367 From South					Stagecoach Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:15 AM																				
Volume	24	76	3	0	103	4	7	11	0	22	3	38	11	0	52	33	1	31	0	65	242
Percent	23.3	73.8	2.9	0.0		18.2	31.8	50.0	0.0		5.8	73.1	21.2	0.0		50.8	1.5	47.7	0.0		
07:45 Volume	3	18	1	0	22	2	1	3	0	6	2	11	3	0	16	7	0	14	0	21	65
Peak Factor																					0.931
High Int.	07:15 AM					08:00 AM					07:45 AM					07:45 AM					
Volume	9	20	0	0	29	2	3	4	0	9	2	11	3	0	16	7	0	14	0	21	
Peak Factor					0.888					0.611					0.813					0.774	



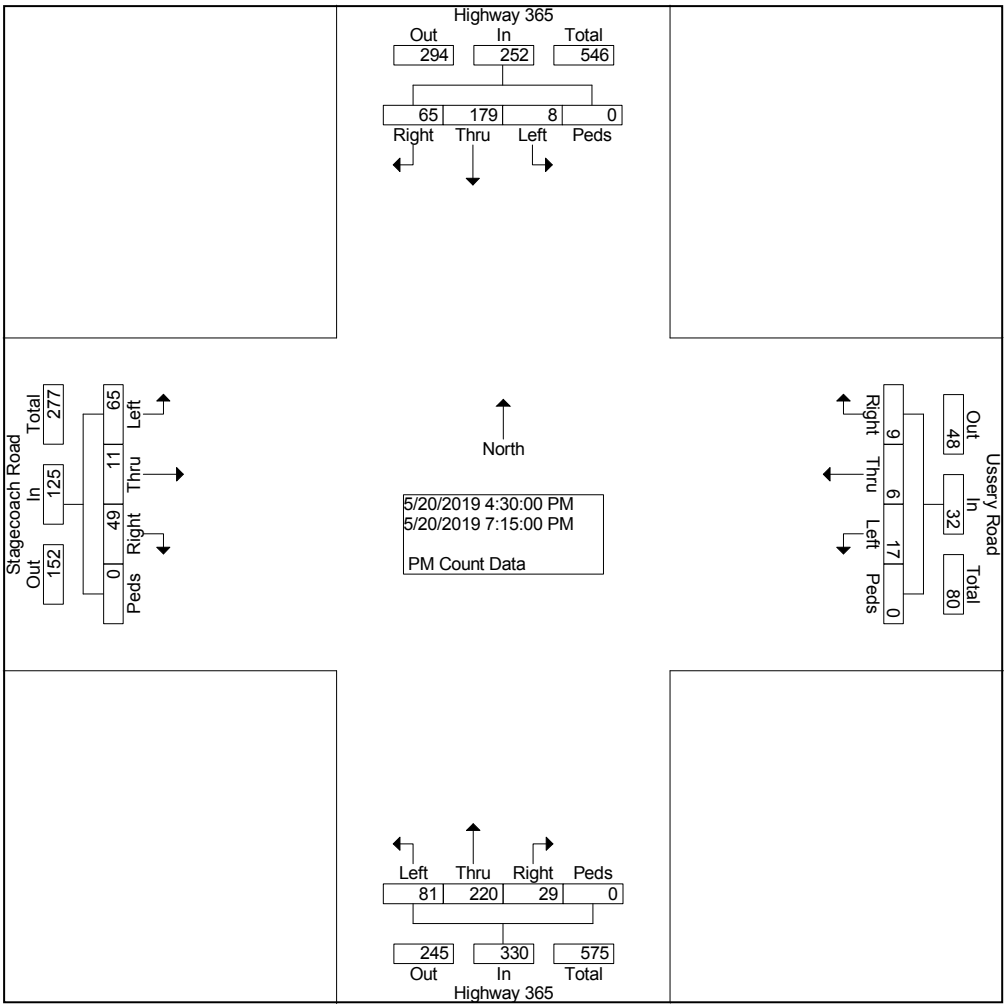
Peters & Associates Engineers, Inc.
Peak Hour Turning Movement Count Data

PM Hour Turning Movement Count Data
Highway 365 & Stagecoach Rd./Ussery Rd.
Pine Bluff, Arkansas
P-1980

File Name : PM-Uss
Site Code : 00000000
Start Date : 05/20/2019
Page No : 1

Groups Printed- PM Count Data

	Highway 365 From North					Ussery Road From East					Highway 365 From South					Stagecoach Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
04:30 PM	11	10	0	0	21	2	0	1	0	3	2	16	18	0	36	3	0	6	0	9	69
04:45 PM	11	10	0	0	21	0	1	2	0	3	3	24	15	0	42	4	1	6	0	11	77
Total	22	20	0	0	42	2	1	3	0	6	5	40	33	0	78	7	1	12	0	20	146
05:00 PM	6	21	1	0	28	1	0	2	0	3	5	31	12	0	48	7	2	6	0	15	94
05:15 PM	5	19	2	0	26	0	0	2	0	2	1	25	8	0	34	7	0	8	0	15	77
05:30 PM	6	29	2	0	37	0	0	4	0	4	4	17	11	0	32	5	0	3	0	8	81
05:45 PM	9	11	1	0	21	1	0	1	0	2	3	20	5	0	28	5	1	9	0	15	66
Total	26	80	6	0	112	2	0	9	0	11	13	93	36	0	142	24	3	26	0	53	318
06:00 PM	5	19	1	0	25	1	2	2	0	5	3	16	2	0	21	1	2	6	0	9	60
06:15 PM	4	14	0	0	18	1	1	1	0	3	5	15	2	0	22	3	0	7	0	10	53
06:30 PM	1	19	0	0	20	2	0	1	0	3	1	14	3	0	18	3	0	7	0	10	51
06:45 PM	1	8	1	0	10	1	2	1	0	4	1	10	1	0	12	3	1	2	0	6	32
Total	11	60	2	0	73	5	5	5	0	15	10	55	8	0	73	10	3	22	0	35	196
07:00 PM	5	12	0	0	17	0	0	0	0	0	1	9	2	0	12	4	1	2	0	7	36
07:15 PM	1	7	0	0	8	0	0	0	0	0	0	23	2	0	25	4	3	3	0	10	43
Grand Total	65	179	8	0	252	9	6	17	0	32	29	220	81	0	330	49	11	65	0	125	739
Apprch %	25.8	71.0	3.2	0.0		28.1	18.8	53.1	0.0		8.8	66.7	24.5	0.0		39.2	8.8	52.0	0.0		
Total %	8.8	24.2	1.1	0.0	34.1	1.2	0.8	2.3	0.0	4.3	3.9	29.8	11.0	0.0	44.7	6.6	1.5	8.8	0.0	16.9	

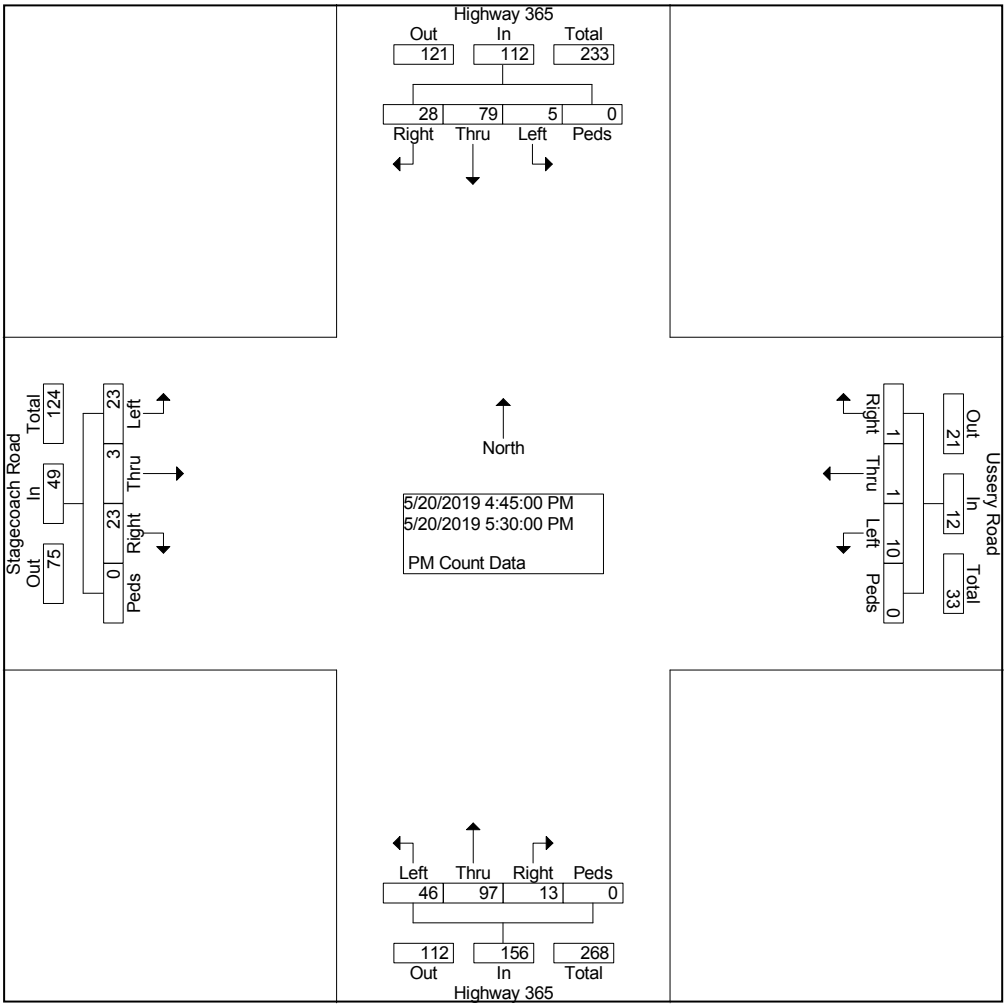


Peters & Associates Engineers, Inc.
Peak Hour Turning Movement Count Data

PM Hour Turning Movement Count Data
Highway 365 & Stagecoach Rd./Ussery Rd.
Pine Bluff, Arkansas
P-1980

File Name : PM-Uss
Site Code : 00000000
Start Date : 05/20/2019
Page No : 2

	Highway 365 From North					Ussery Road From East					Highway 365 From South					Stagecoach Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:30 PM to 07:15 PM - Peak 1 of 1																					
Intersection	04:45 PM																				
Volume	28	79	5	0	112	1	1	10	0	12	13	97	46	0	156	23	3	23	0	49	329
Percent	25.0	70.5	4.5	0.0		8.3	8.3	83.3	0.0		8.3	62.2	29.5	0.0		46.9	6.1	46.9	0.0		
05:00 Volume	6	21	1	0	28	1	0	2	0	3	5	31	12	0	48	7	2	6	0	15	94
Peak Factor																					0.875
High Int.	05:30 PM					05:30 PM					05:00 PM					05:00 PM					
Volume	6	29	2	0	37	0	0	4	0	4	5	31	12	0	48	7	2	6	0	15	
Peak Factor					0.757					0.750					0.813					0.817	



Trip-Generation Data

Project No. P1980

Pine Bluff Industrial Development

Trip-Generation

Date: June 19, 2019

Construction Phase Trips					
TIME (Starting Hour)	*Construction Worker Trips		Construction Trucks Trips		TOTAL
	ENTER	EXIT	ENTER	EXIT	
06:00 AM	750	67	25	7	**849**
07:00 AM	500	58	37	6	**601**
08:00 AM	417	42	21	9	**489**
04:00 PM	42	750	9	21	**822**
05:00 PM	67	500	7	25	**599**
06:00 PM	33	417	5	37	**492**

**Assumes 2,500 Workers at 1.5 workers per vehicle.*

Phase 1 Trips									
TIME (Starting Hour)	Plant Workers Trips		Administative Personnel Trips		Trucks Trips		Service Trucks Trips		TOTAL
	ENTER	EXIT	ENTER	EXIT	ENTER	EXIT	ENTER	EXIT	
06:00 AM	40	10	10	5	10	10	1	1	**87**
07:00 AM	10	40	50	10	10	10	1	1	**132**
08:00 AM	5	5	10	5	10	10	5	5	**55**
04:00 PM	5	5	5	10	10	10	5	5	**55**
05:00 PM	5	5	10	50	10	10	5	5	**100**
06:00 PM	40	10	5	10	10	10	2	2	**89**
07:00 PM	10	40	2	2	10	10	1	1	**76**

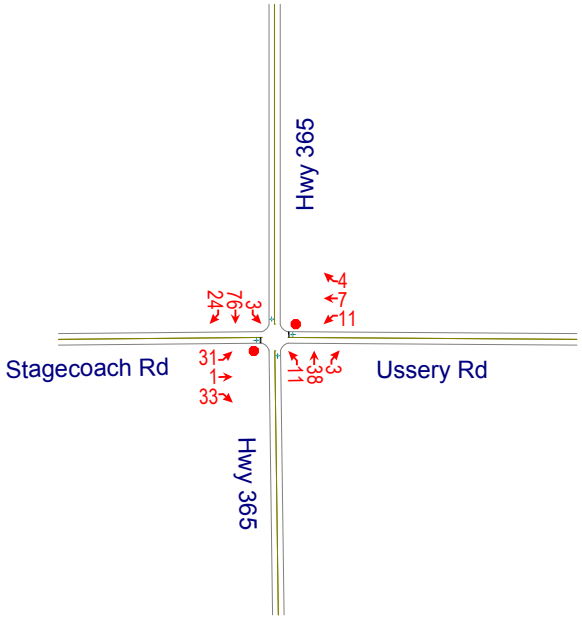
Phase 1 & 2 Trips									
TIME (Starting Hour)	Plant Workers Trips		Administative Personnel Trips		Trucks Trips		Service Trucks Trips		TOTAL
	ENTER	EXIT	ENTER	EXIT	ENTER	EXIT	ENTER	EXIT	
06:00 AM	80	20	20	10	20	20	2	2	**174**
07:00 AM	20	80	100	20	20	20	2	2	**264**
08:00 AM	10	10	20	10	20	20	10	10	**110**
04:00 PM	10	10	10	20	20	20	10	10	**110**
05:00 PM	10	10	20	100	20	20	10	10	**200**
06:00 PM	20	20	10	20	20	20	4	4	**118**
07:00 PM	20	80	4	4	20	20	2	2	**152**

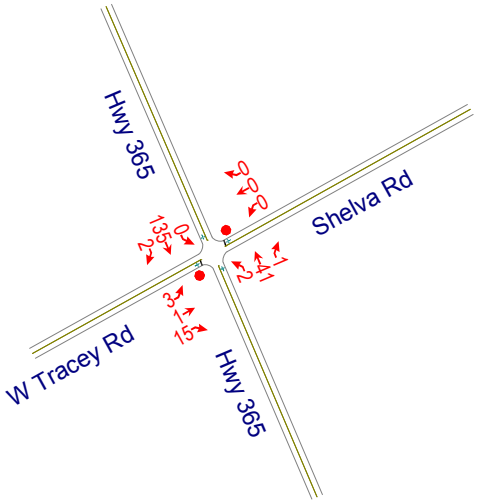
Full Build-Out (Phases 1, 2 & 3) Trips									
TIME (Starting Hour)	Plant Workers Trips		Administative Personnel Trips		Trucks Trips		Service Trucks Trips		TOTAL
	ENTER	EXIT	ENTER	EXIT	ENTER	EXIT	ENTER	EXIT	
06:00 AM	120	30	30	15	30	30	3	3	**261**
07:00 AM	30	120	150	30	30	30	3	3	**396**
08:00 AM	15	15	30	15	30	30	15	15	**165**
04:00 PM	15	15	15	30	30	30	15	15	**165**
05:00 PM	15	15	30	150	30	30	15	15	**300**
06:00 PM	30	30	15	30	30	30	6	6	**177**
07:00 PM	30	120	6	6	30	30	3	3	**228**

Tanker Trips at Tank Farm			
TIME (Starting Hour)	Tanker Trucks Trips		TOTAL
	ENTER	EXIT	
06:00 AM	23	23	**46**
07:00 AM	23	23	**46**
08:00 AM	23	23	**46**
04:00 PM	23	23	**46**
05:00 PM	23	23	**46**
06:00 PM	23	23	**46**
07:00 PM	23	23	**46**

PETERS & ASSOCIATES
ENGINEERS, INC.

Capacity & Level of Service Calculations


Hwy 365
Stagecoach Rd
Ussery Rd
Hwy 365
4
7
11
3
38
11
3
76
24
31
1
33


Hwy 365
Shelva Rd
W Tracey Rd
Hwy 365
0
0
0
1
41
2
135
0
2
3
1
15

Intersection	
Intersection Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	1	15	0	0	0	2	41	1	0	135	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	1	18	0	0	0	2	48	1	0	159	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	214	214	160	223	215	49	161	0	0	49	0	0
Stage 1	160	160	-	54	54	-	-	-	-	-	-	-
Stage 2	54	54	-	169	161	-	-	-	-	-	-	-
Follow-up Headway	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Capacity-1 Maneuver	743	684	885	733	683	1020	1418	-	-	1558	-	-
Stage 1	842	766	-	958	850	-	-	-	-	-	-	-
Stage 2	958	850	-	833	765	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	742	683	885	717	682	1020	1418	-	-	1558	-	-
Mov Capacity-2 Maneuver	742	683	-	717	682	-	-	-	-	-	-	-
Stage 1	841	766	-	957	849	-	-	-	-	-	-	-
Stage 2	957	849	-	815	765	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.4	0	0.3	0
HCM LOS	A	A		

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1418	-	-	846	0	1558	-	-
HCM Lane V/C Ratio	0.002	-	-	0.026	+	-	-	-
HCM Control Delay (s)	7.543	0	-	9.4	0	0	-	-
HCM Lane LOS	A	A		A	A	A		
HCM 95th %tile Q(veh)	0.005	-	-	0.081	+	0	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	31	1	33	11	7	4	11	38	3	3	76	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	1	39	13	8	5	13	45	4	4	89	28

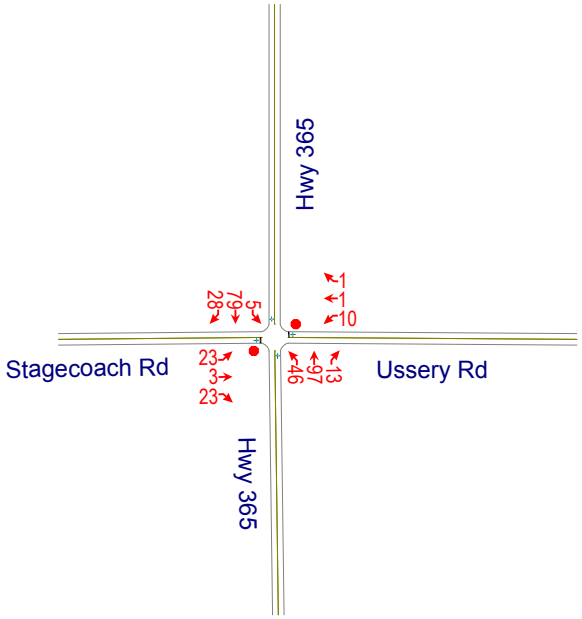
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	190	185	104	203	197	46	118	0	0	48	0	0
Stage 1	111	111	-	72	72	-	-	-	-	-	-	-
Stage 2	79	74	-	131	125	-	-	-	-	-	-	-
Follow-up Headway	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Capacity-1 Maneuver	770	709	951	755	699	1023	1470	-	-	1559	-	-
Stage 1	894	804	-	938	835	-	-	-	-	-	-	-
Stage 2	930	833	-	873	792	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	753	701	951	717	691	1023	1470	-	-	1559	-	-
Mov Capacity-2 Maneuver	753	701	-	717	691	-	-	-	-	-	-	-
Stage 1	886	802	-	930	827	-	-	-	-	-	-	-
Stage 2	908	826	-	834	790	-	-	-	-	-	-	-

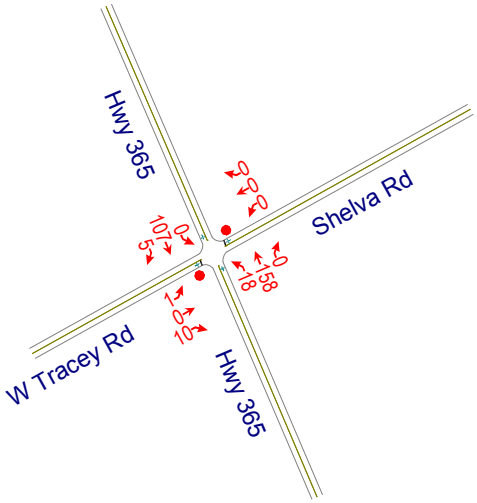
Approach	EB	WB	NB	SB
HCM Control Delay, s	9.7	10	1.6	0.2
HCM LOS	A	B		

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1470	-	-	841	749	1559	-	-
HCM Lane V/C Ratio	0.009	-	-	0.091	0.035	0.002	-	-
HCM Control Delay (s)	7.471	0	-	9.7	10	7.314	0	-
HCM Lane LOS	A	A		A	B	A	A	
HCM 95th %tile Q(veh)	0.027	-	-	0.299	0.107	0.007	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined


Hwy 365
Stagecoach Rd
Ussery Rd
Hwy 365
28
79
5
23
3
23
46
97
13
1
1
10


Hwy 365
Shelva Rd
W Tracey Rd
Hwy 365
101
0
5
1
0
10
0
0
0
158
18

Intersection	
Intersection Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	0	10	0	0	0	18	158	0	0	107	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	0	12	0	0	0	21	186	0	0	126	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	357	357	129	363	360	186	132	0	0	186	0	0
Stage 1	129	129	-	228	228	-	-	-	-	-	-	-
Stage 2	228	228	-	135	132	-	-	-	-	-	-	-
Follow-up Headway	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Capacity-1 Maneuver	598	569	921	593	567	856	1453	-	-	1388	-	-
Stage 1	875	789	-	775	715	-	-	-	-	-	-	-
Stage 2	775	715	-	868	787	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	591	560	921	578	558	856	1453	-	-	1388	-	-
Mov Capacity-2 Maneuver	591	560	-	578	558	-	-	-	-	-	-	-
Stage 1	861	789	-	763	704	-	-	-	-	-	-	-
Stage 2	763	704	-	857	787	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.2	0	0.8	0
HCM LOS	A	A		

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1453	-	-	877	0	1388	-	-
HCM Lane V/C Ratio	0.015	-	-	0.015	+	-	-	-
HCM Control Delay (s)	7.514	0	-	9.2	0	0	-	-
HCM Lane LOS	A	A		A	A	A		
HCM 95th %tile Q(veh)	0.044	-	-	0.045	+	0	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	23	3	23	10	1	1	46	97	13	5	79	28
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	4	27	12	1	1	54	114	15	6	93	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	352	359	109	366	368	122	126	0	0	129	0	0
Stage 1	121	121	-	230	230	-	-	-	-	-	-	-
Stage 2	231	238	-	136	138	-	-	-	-	-	-	-
Follow-up Headway	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Capacity-1 Maneuver	603	568	945	590	561	929	1460	-	-	1457	-	-
Stage 1	883	796	-	773	714	-	-	-	-	-	-	-
Stage 2	772	708	-	867	782	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	581	543	945	551	536	929	1460	-	-	1457	-	-
Mov Capacity-2 Maneuver	581	543	-	551	536	-	-	-	-	-	-	-
Stage 1	848	793	-	742	685	-	-	-	-	-	-	-
Stage 2	739	680	-	835	779	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	11.5	2.2	0.3
HCM LOS	B	B		

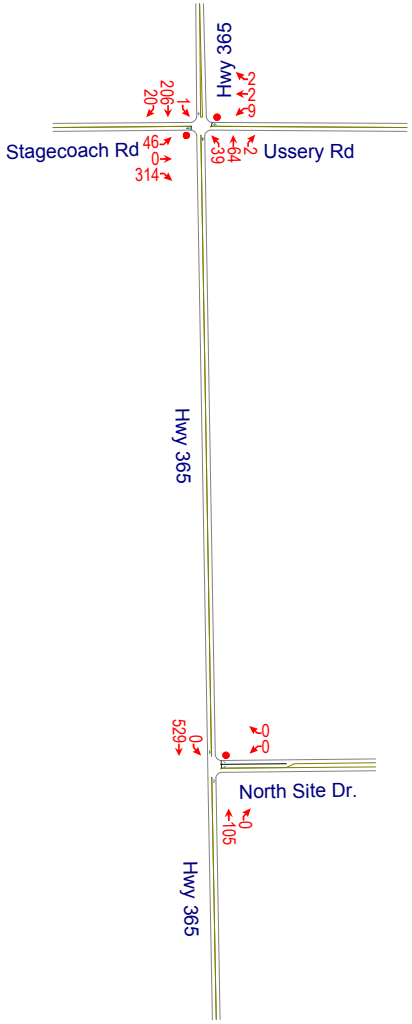
Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1460	-	-	706	569	1457	-	-
HCM Lane V/C Ratio	0.037	-	-	0.082	0.025	0.004	-	-
HCM Control Delay (s)	7.561	0	-	10.6	11.5	7.481	0	-
HCM Lane LOS	A	A		B	B	A	A	
HCM 95th %tile Q(veh)	0.115	-	-	0.266	0.076	0.012	-	-

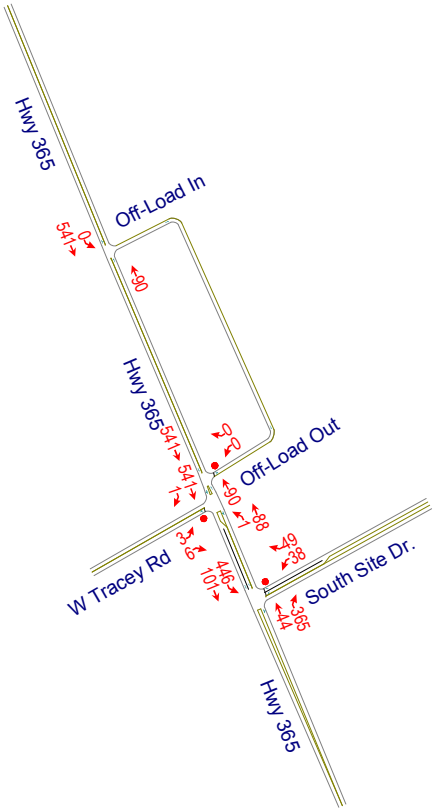
Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Projected Network
widening at S DW No Signal

6/17/2019
Construction Phase AM





Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	3	6	1	88	541	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	7	1	96	588	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	687	589	589	0	-	0
Stage 1	589	-	-	-	-	-
Stage 2	98	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	413	508	986	-	-	-
Stage 1	554	-	-	-	-	-
Stage 2	926	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	413	508	986	-	-	-
Mov Cap-2 Maneuver	413	-	-	-	-	-
Stage 1	554	-	-	-	-	-
Stage 2	925	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.8	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	986	-	472	-	-
HCM Lane V/C Ratio	0.001	-	0.021	-	-
HCM Control Delay (s)	8.7	0	12.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM research expects at least one 'Stop' controlled approach at the intersection.

Intersection	
Int Delay, s/veh	8.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	46	0	314	9	2	2	39	64	2	1	206	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	50	0	341	10	2	2	42	70	2	1	224	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	395	394	235	563	403	71	246	0	0	72	0	0
Stage 1	237	237	-	155	155	-	-	-	-	-	-	-
Stage 2	158	157	-	408	248	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	565	542	804	437	536	991	1320	-	-	1528	-	-
Stage 1	766	709	-	847	769	-	-	-	-	-	-	-
Stage 2	844	768	-	620	701	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	547	524	804	245	518	991	1320	-	-	1528	-	-
Mov Cap-2 Maneuver	547	524	-	245	518	-	-	-	-	-	-	-
Stage 1	741	708	-	819	744	-	-	-	-	-	-	-
Stage 2	812	743	-	356	700	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.7	17.4	2.9	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1320	-	-	758	305	1528	-	-
HCM Lane V/C Ratio	0.032	-	-	0.516	0.046	0.001	-	-
HCM Control Delay (s)	7.8	0	-	14.7	17.4	7.4	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	3	0.1	0	-	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	0	90	0	0	541
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	98	0	0	588

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	686	98	0	0	98	0
Stage 1	98	-	-	-	-	-
Stage 2	588	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	413	958	-	-	1495	-
Stage 1	926	-	-	-	-	-
Stage 2	555	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	413	958	-	-	1495	-
Mov Cap-2 Maneuver	413	-	-	-	-	-
Stage 1	926	-	-	-	-	-
Stage 2	555	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1495	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	7.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	38	49	44	365	446	101
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	53	48	397	485	110

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1325	246	0	0	445	0
Stage 1	246	-	-	-	-	-
Stage 2	1079	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	172	793	-	-	1115	-
Stage 1	795	-	-	-	-	-
Stage 2	326	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	97	793	-	-	1115	-
Mov Cap-2 Maneuver	97	-	-	-	-	-
Stage 1	795	-	-	-	-	-
Stage 2	184	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.9	0	8.7
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	97	793	1115	-
HCM Lane V/C Ratio	-	-	0.426	0.067	0.435	-
HCM Control Delay (s)	-	-	67.2	9.9	10.7	-
HCM Lane LOS	-	-	F	A	B	-
HCM 95th %tile Q(veh)	-	-	1.8	0.2	2.2	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	0	105	0	0	529
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	114	0	0	575

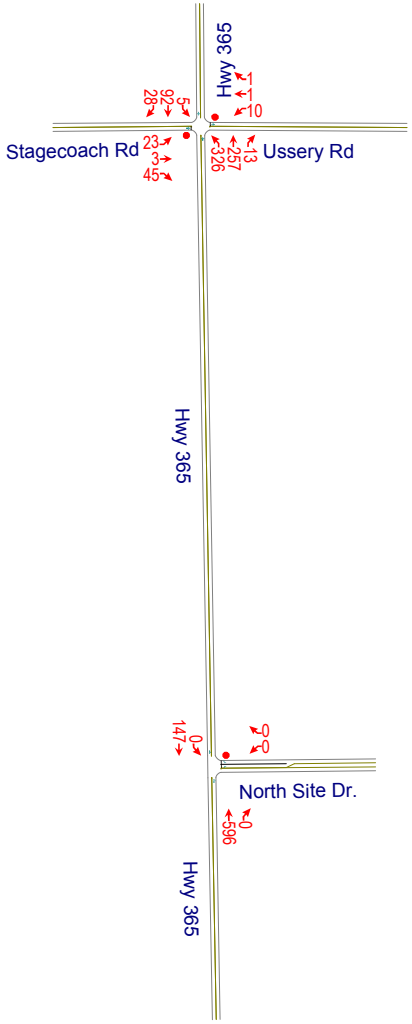
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	689	114	0	0	114	0
Stage 1	114	-	-	-	-	-
Stage 2	575	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	412	939	-	-	1475	-
Stage 1	911	-	-	-	-	-
Stage 2	563	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	412	939	-	-	1475	-
Mov Cap-2 Maneuver	412	-	-	-	-	-
Stage 1	911	-	-	-	-	-
Stage 2	563	-	-	-	-	-

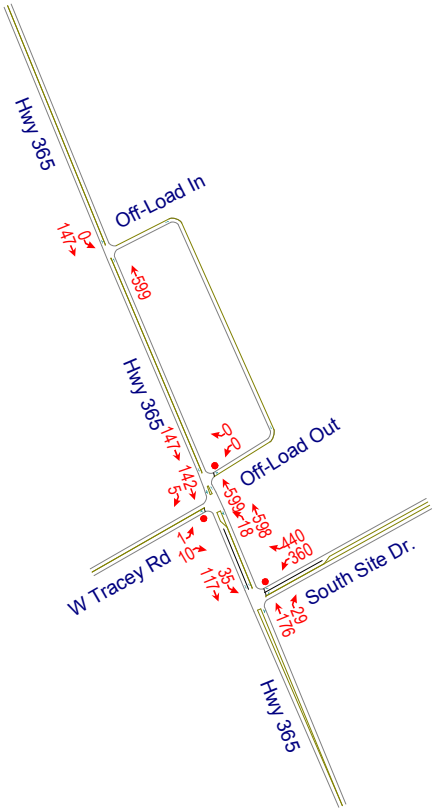
Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	-	1475	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	0	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	-	-	0	-

Projected Network
widening at S DW No Signal

6/17/2019
Construction Phase PM





Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	1	10	18	598	142	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	11	20	650	154	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	846	157	160	0	-	0
Stage 1	157	-	-	-	-	-
Stage 2	689	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	333	889	1419	-	-	-
Stage 1	871	-	-	-	-	-
Stage 2	498	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	326	889	1419	-	-	-
Mov Cap-2 Maneuver	326	-	-	-	-	-
Stage 1	871	-	-	-	-	-
Stage 2	487	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.8	0.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1419	-	768	-	-
HCM Lane V/C Ratio	0.014	-	0.016	-	-
HCM Control Delay (s)	7.6	0	9.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

HCM research expects at least one 'Stop' controlled approach at the intersection.

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	23	3	45	10	1	1	326	257	13	5	92	28
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	3	49	11	1	1	354	279	14	5	100	30

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1122	1128	115	1147	1136	286	130	0	0	293	0	0
Stage 1	126	126	-	995	995	-	-	-	-	-	-	-
Stage 2	996	1002	-	152	141	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	183	204	937	176	202	753	1455	-	-	1269	-	-
Stage 1	878	792	-	295	323	-	-	-	-	-	-	-
Stage 2	294	320	-	850	780	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	140	144	937	127	143	753	1455	-	-	1269	-	-
Mov Cap-2 Maneuver	140	144	-	127	143	-	-	-	-	-	-	-
Stage 1	623	789	-	209	229	-	-	-	-	-	-	-
Stage 2	207	227	-	799	777	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.8	33.8	4.5	0.3
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1455	-	-	305	138	1269	-	-
HCM Lane V/C Ratio	0.244	-	-	0.253	0.095	0.004	-	-
HCM Control Delay (s)	8.3	0	-	20.8	33.8	7.8	0	-
HCM Lane LOS	A	A	-	C	D	A	A	-
HCM 95th %tile Q(veh)	1	-	-	1	0.3	0	-	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	0	599	0	0	147
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	651	0	0	160

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	811	651	0	0	651	0
Stage 1	651	-	-	-	-	-
Stage 2	160	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	349	469	-	-	935	-
Stage 1	519	-	-	-	-	-
Stage 2	869	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	349	469	-	-	935	-
Mov Cap-2 Maneuver	349	-	-	-	-	-
Stage 1	519	-	-	-	-	-
Stage 2	869	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	935	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	13.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	360	440	176	29	35	117
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	391	478	191	32	38	127

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	410	207	0	0	223	0
Stage 1	207	-	-	-	-	-
Stage 2	203	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	598	833	-	-	1346	-
Stage 1	828	-	-	-	-	-
Stage 2	831	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	581	833	-	-	1346	-
Mov Cap-2 Maneuver	581	-	-	-	-	-
Stage 1	828	-	-	-	-	-
Stage 2	808	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.6	0	1.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	581	833	1346	-
HCM Lane V/C Ratio	-	-	0.674	0.574	0.028	-
HCM Control Delay (s)	-	-	23	15	7.8	-
HCM Lane LOS	-	-	C	C	A	-
HCM 95th %tile Q(veh)	-	-	5.1	3.7	0.1	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	0	596	0	0	147
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	648	0	0	160

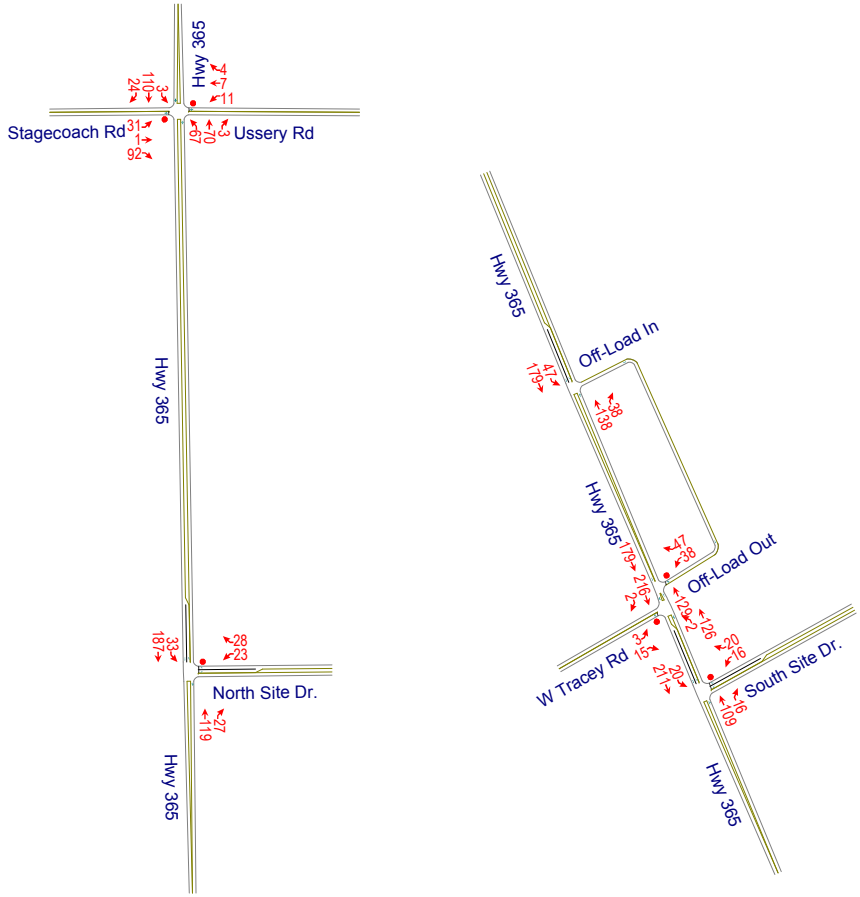
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	808	648	0	0	648	0
Stage 1	648	-	-	-	-	-
Stage 2	160	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	350	470	-	-	938	-
Stage 1	521	-	-	-	-	-
Stage 2	869	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	350	470	-	-	938	-
Mov Cap-2 Maneuver	350	-	-	-	-	-
Stage 1	521	-	-	-	-	-
Stage 2	869	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	-	938	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	0	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	-	-	0	-

Projected Network
assumed Hwy widening

6/17/2019
Phase 1 AM



Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	3	15	2	126	216	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	16	2	137	235	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	377	236	237	0	-	0
Stage 1	236	-	-	-	-	-
Stage 2	141	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	625	803	1330	-	-	-
Stage 1	803	-	-	-	-	-
Stage 2	886	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	624	803	1330	-	-	-
Mov Cap-2 Maneuver	624	-	-	-	-	-
Stage 1	803	-	-	-	-	-
Stage 2	884	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.8	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1330	-	766	-	-
HCM Lane V/C Ratio	0.002	-	0.026	-	-
HCM Control Delay (s)	7.7	0	9.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM research expects at least one 'Stop' controlled approach at the intersection.

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	31	1	92	11	7	4	67	70	3	3	110	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	34	1	100	12	8	4	73	76	3	3	120	26

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	368	364	133	413	375	78	146	0	0	79	0	0
Stage 1	139	139	-	223	223	-	-	-	-	-	-	-
Stage 2	229	225	-	190	152	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	588	564	916	549	556	983	1436	-	-	1519	-	-
Stage 1	864	782	-	780	719	-	-	-	-	-	-	-
Stage 2	774	718	-	812	772	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	555	533	916	468	525	983	1436	-	-	1519	-	-
Mov Cap-2 Maneuver	555	533	-	468	525	-	-	-	-	-	-	-
Stage 1	818	780	-	739	681	-	-	-	-	-	-	-
Stage 2	722	680	-	721	770	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.5	12	3.7	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1436	-	-	784	538	1519	-	-
HCM Lane V/C Ratio	0.051	-	-	0.172	0.044	0.002	-	-
HCM Control Delay (s)	7.6	0	-	10.5	12	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.6	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	38	47	129	0	0	179
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	51	140	0	0	195

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	335	140	0	0	140	0
Stage 1	140	-	-	-	-	-
Stage 2	195	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	660	908	-	-	1443	-
Stage 1	887	-	-	-	-	-
Stage 2	838	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	660	908	-	-	1443	-
Mov Cap-2 Maneuver	660	-	-	-	-	-
Stage 1	887	-	-	-	-	-
Stage 2	838	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	777	1443	-
HCM Lane V/C Ratio	-	-	0.119	-	-
HCM Control Delay (s)	-	-	10.3	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	16	20	109	16	20	211
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	22	118	17	22	229

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	400	127	0	0	136	0
Stage 1	127	-	-	-	-	-
Stage 2	273	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	606	923	-	-	1448	-
Stage 1	899	-	-	-	-	-
Stage 2	773	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	597	923	-	-	1448	-
Mov Cap-2 Maneuver	597	-	-	-	-	-
Stage 1	899	-	-	-	-	-
Stage 2	761	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	597	923	1448	-
HCM Lane V/C Ratio	-	-	0.029	0.024	0.015	-
HCM Control Delay (s)	-	-	11.2	9	7.5	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	23	28	119	27	33	187
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	30	129	29	36	203

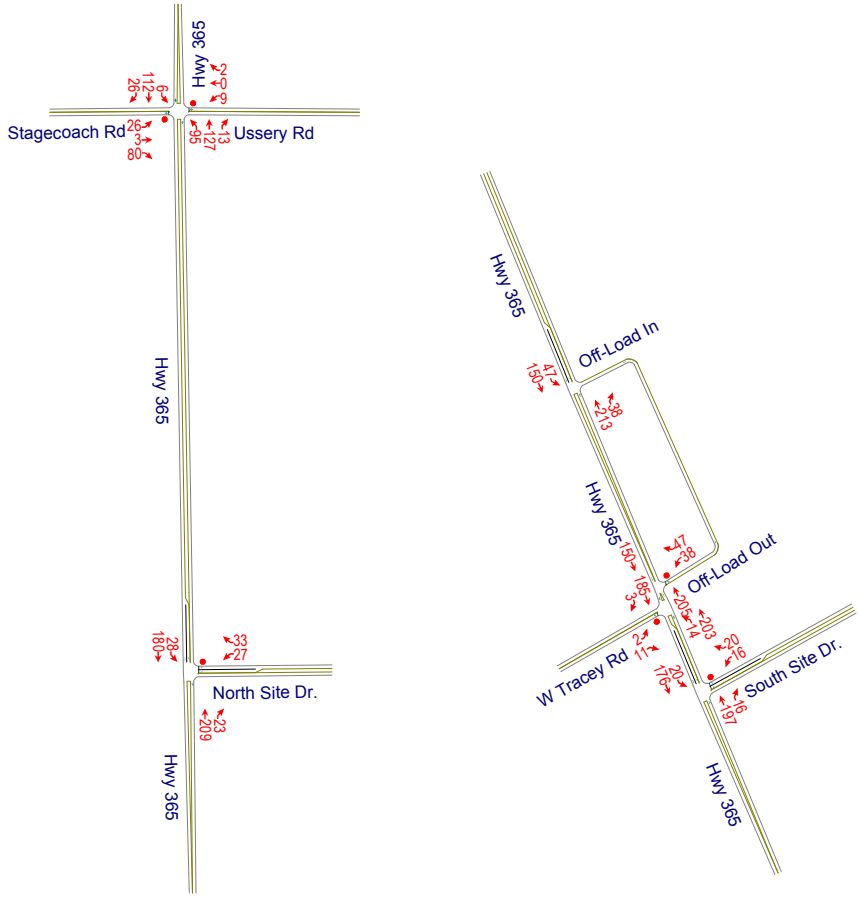
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	419	144	0	0	159	0
Stage 1	144	-	-	-	-	-
Stage 2	275	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	591	903	-	-	1420	-
Stage 1	883	-	-	-	-	-
Stage 2	771	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	576	903	-	-	1420	-
Mov Cap-2 Maneuver	576	-	-	-	-	-
Stage 1	883	-	-	-	-	-
Stage 2	751	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	576	903	1420	-
HCM Lane V/C Ratio	-	-	0.043	0.034	0.025	-
HCM Control Delay (s)	-	-	11.5	9.1	7.6	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0.1	-

Projected Network
assumed Hwy widening

6/17/2019
Phase 1 PM



Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	2	11	14	203	185	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	12	15	221	201	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	454	203	204	0	-	0
Stage 1	203	-	-	-	-	-
Stage 2	251	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	564	838	1368	-	-	-
Stage 1	831	-	-	-	-	-
Stage 2	791	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	557	838	1368	-	-	-
Mov Cap-2 Maneuver	557	-	-	-	-	-
Stage 1	831	-	-	-	-	-
Stage 2	782	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.7	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1368	-	778	-	-
HCM Lane V/C Ratio	0.011	-	0.018	-	-
HCM Control Delay (s)	7.7	0	9.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM research expects at least one 'Stop' controlled approach at the intersection.

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	26	3	80	9	0	2	95	127	13	6	112	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	3	87	10	0	2	103	138	14	7	122	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	502	508	136	546	515	145	150	0	0	152	0	0
Stage 1	149	149	-	352	352	-	-	-	-	-	-	-
Stage 2	353	359	-	194	163	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	480	468	913	448	464	902	1431	-	-	1429	-	-
Stage 1	854	774	-	665	632	-	-	-	-	-	-	-
Stage 2	664	627	-	808	763	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	448	429	913	377	425	902	1431	-	-	1429	-	-
Mov Cap-2 Maneuver	448	429	-	377	425	-	-	-	-	-	-	-
Stage 1	787	770	-	612	582	-	-	-	-	-	-	-
Stage 2	610	577	-	724	759	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11	13.8	3.1	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1431	-	-	714	422	1429	-	-
HCM Lane V/C Ratio	0.072	-	-	0.166	0.028	0.005	-	-
HCM Control Delay (s)	7.7	0	-	11	13.8	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.6	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	38	47	205	0	0	150
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	51	223	0	0	163

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	386	223	0	0	223	0
Stage 1	223	-	-	-	-	-
Stage 2	163	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	617	817	-	-	1346	-
Stage 1	814	-	-	-	-	-
Stage 2	866	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	617	817	-	-	1346	-
Mov Cap-2 Maneuver	617	-	-	-	-	-
Stage 1	814	-	-	-	-	-
Stage 2	866	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	714	1346	-
HCM Lane V/C Ratio	-	-	0.129	-	-
HCM Control Delay (s)	-	-	10.8	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	16	20	197	16	20	176
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	22	214	17	22	191

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	458	223	0	0	232	0
Stage 1	223	-	-	-	-	-
Stage 2	235	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	561	817	-	-	1336	-
Stage 1	814	-	-	-	-	-
Stage 2	804	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	552	817	-	-	1336	-
Mov Cap-2 Maneuver	552	-	-	-	-	-
Stage 1	814	-	-	-	-	-
Stage 2	791	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.5	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	552	817	1336	-
HCM Lane V/C Ratio	-	-	0.032	0.027	0.016	-
HCM Control Delay (s)	-	-	11.7	9.5	7.7	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	27	33	209	23	28	180
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	36	227	25	30	196

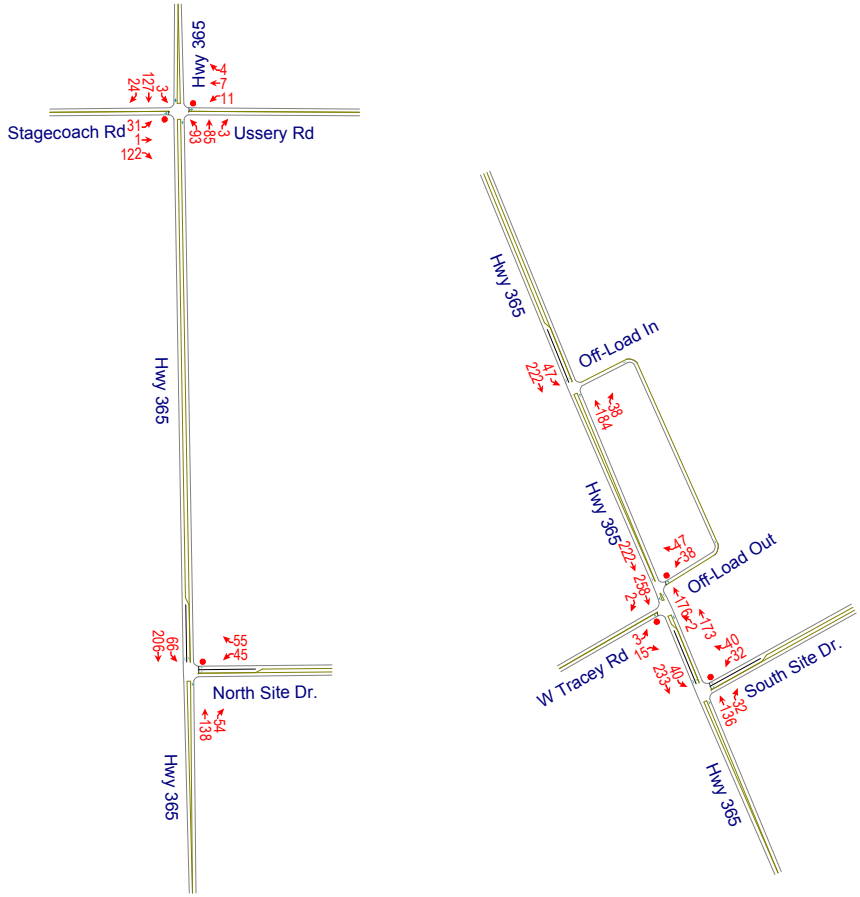
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	497	240	0	0	252	0
Stage 1	240	-	-	-	-	-
Stage 2	257	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	532	799	-	-	1313	-
Stage 1	800	-	-	-	-	-
Stage 2	786	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	520	799	-	-	1313	-
Mov Cap-2 Maneuver	520	-	-	-	-	-
Stage 1	800	-	-	-	-	-
Stage 2	768	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	520	799	1313	-
HCM Lane V/C Ratio	-	-	0.056	0.045	0.023	-
HCM Control Delay (s)	-	-	12.3	9.7	7.8	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	0.1	-

Projected Network
assumed Hwy widening

6/17/2019
Phase 2 AM



Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	3	15	2	173	258	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	16	2	188	280	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	474	282	283	0	-	0
Stage 1	282	-	-	-	-	-
Stage 2	192	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	549	757	1279	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	841	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	548	757	1279	-	-	-
Mov Cap-2 Maneuver	548	-	-	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	839	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1279	-	712	-	-
HCM Lane V/C Ratio	0.002	-	0.027	-	-
HCM Control Delay (s)	7.8	0	10.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM research expects at least one 'Stop' controlled approach at the intersection.

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	31	1	122	11	7	4	93	85	3	3	127	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	34	1	133	12	8	4	101	92	3	3	138	26

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	460	456	151	520	467	94	164	0	0	96	0	0
Stage 1	158	158	-	296	296	-	-	-	-	-	-	-
Stage 2	302	298	-	224	171	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	512	501	895	467	493	963	1414	-	-	1498	-	-
Stage 1	844	767	-	712	668	-	-	-	-	-	-	-
Stage 2	707	667	-	779	757	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	474	462	895	374	455	963	1414	-	-	1498	-	-
Mov Cap-2 Maneuver	474	462	-	374	455	-	-	-	-	-	-	-
Stage 1	781	765	-	659	618	-	-	-	-	-	-	-
Stage 2	643	617	-	661	755	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.1	13.5	4	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1414	-	-	755	449	1498	-	-
HCM Lane V/C Ratio	0.071	-	-	0.222	0.053	0.002	-	-
HCM Control Delay (s)	7.7	0	-	11.1	13.5	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.8	0.2	0	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	38	47	176	0	0	222
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	51	191	0	0	241

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	432	191	0	0	191	0
Stage 1	191	-	-	-	-	-
Stage 2	241	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	581	851	-	-	1383	-
Stage 1	841	-	-	-	-	-
Stage 2	799	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	581	851	-	-	1383	-
Mov Cap-2 Maneuver	581	-	-	-	-	-
Stage 1	841	-	-	-	-	-
Stage 2	799	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	705	1383	-
HCM Lane V/C Ratio	-	-	0.131	-	-
HCM Control Delay (s)	-	-	10.9	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	32	40	136	32	40	233
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	35	43	148	35	43	253

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	505	165	0	0	183	0
Stage 1	165	-	-	-	-	-
Stage 2	340	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	527	879	-	-	1392	-
Stage 1	864	-	-	-	-	-
Stage 2	721	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	511	879	-	-	1392	-
Mov Cap-2 Maneuver	511	-	-	-	-	-
Stage 1	864	-	-	-	-	-
Stage 2	699	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	511	879	1392	-
HCM Lane V/C Ratio	-	-	0.068	0.049	0.031	-
HCM Control Delay (s)	-	-	12.6	9.3	7.7	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.2	0.1	-

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	45	55	138	54	66	206
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	49	60	150	59	72	224

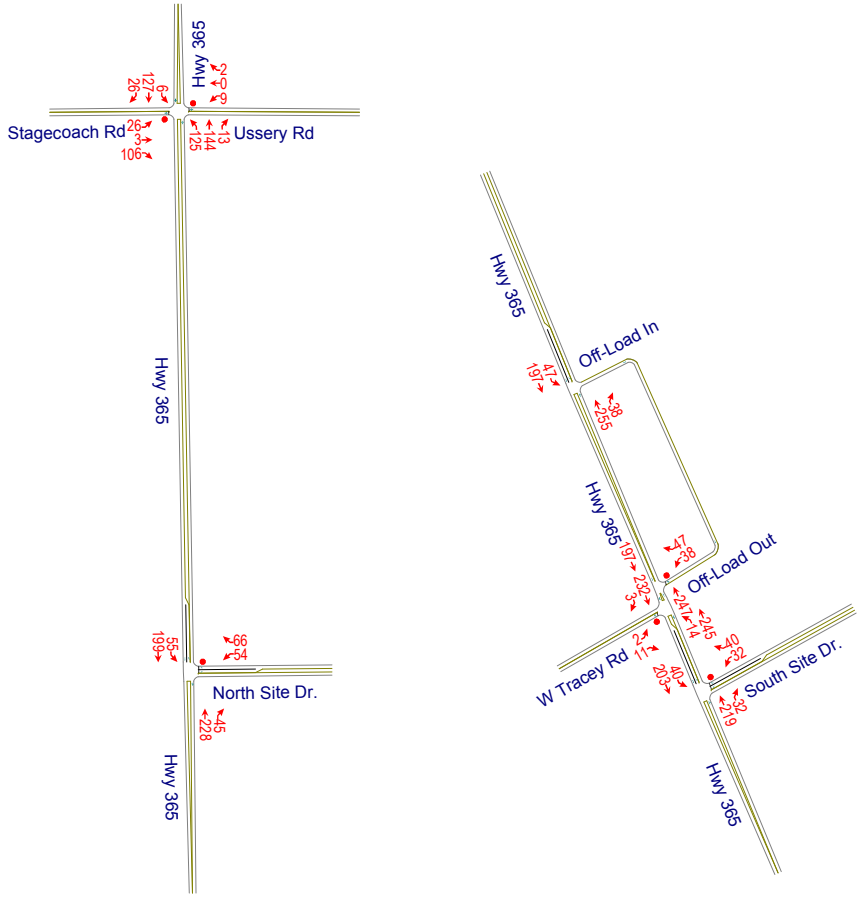
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	546	179	0	0	209	0
Stage 1	179	-	-	-	-	-
Stage 2	367	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	499	864	-	-	1362	-
Stage 1	852	-	-	-	-	-
Stage 2	701	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	473	864	-	-	1362	-
Mov Cap-2 Maneuver	473	-	-	-	-	-
Stage 1	852	-	-	-	-	-
Stage 2	664	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.3	0	1.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	473	864	1362	-
HCM Lane V/C Ratio	-	-	0.103	0.069	0.053	-
HCM Control Delay (s)	-	-	13.5	9.5	7.8	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.2	0.2	-

Projected Network
assumed Hwy widening

6/17/2019
Phase 2 PM



Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	2	11	14	245	232	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	12	15	266	252	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	551	254	255	0	-	0
Stage 1	254	-	-	-	-	-
Stage 2	297	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	495	785	1310	-	-	-
Stage 1	788	-	-	-	-	-
Stage 2	754	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	489	785	1310	-	-	-
Mov Cap-2 Maneuver	489	-	-	-	-	-
Stage 1	788	-	-	-	-	-
Stage 2	744	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1310	-	718	-	-
HCM Lane V/C Ratio	0.012	-	0.02	-	-
HCM Control Delay (s)	7.8	0	10.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM research expects at least one 'Stop' controlled approach at the intersection.

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	26	3	106	9	0	2	125	144	13	6	127	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	3	115	10	0	2	136	157	14	7	138	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	601	607	152	659	614	164	166	0	0	171	0	0
Stage 1	165	165	-	435	435	-	-	-	-	-	-	-
Stage 2	436	442	-	224	179	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	412	411	894	377	407	881	1412	-	-	1406	-	-
Stage 1	837	762	-	600	580	-	-	-	-	-	-	-
Stage 2	599	576	-	779	751	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	376	365	894	298	361	881	1412	-	-	1406	-	-
Mov Cap-2 Maneuver	376	365	-	298	361	-	-	-	-	-	-	-
Stage 1	747	757	-	536	518	-	-	-	-	-	-	-
Stage 2	534	514	-	672	746	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.6	16	3.5	0.3
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1412	-	-	689	339	1406	-	-
HCM Lane V/C Ratio	0.096	-	-	0.213	0.035	0.005	-	-
HCM Control Delay (s)	7.8	0	-	11.6	16	7.6	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0.8	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	38	47	247	0	0	197
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	51	268	0	0	214

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	482	268	0	0	268	0
Stage 1	268	-	-	-	-	-
Stage 2	214	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	543	771	-	-	1296	-
Stage 1	777	-	-	-	-	-
Stage 2	822	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	543	771	-	-	1296	-
Mov Cap-2 Maneuver	543	-	-	-	-	-
Stage 1	777	-	-	-	-	-
Stage 2	822	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	649	1296	-
HCM Lane V/C Ratio	-	-	0.142	-	-
HCM Control Delay (s)	-	-	11.5	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	32	40	219	32	40	203
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	35	43	238	35	43	221

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	563	255	0	0	273	0
Stage 1	255	-	-	-	-	-
Stage 2	308	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	487	784	-	-	1290	-
Stage 1	788	-	-	-	-	-
Stage 2	745	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	471	784	-	-	1290	-
Mov Cap-2 Maneuver	471	-	-	-	-	-
Stage 1	788	-	-	-	-	-
Stage 2	720	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	1.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	471	784	1290	-
HCM Lane V/C Ratio	-	-	0.074	0.055	0.034	-
HCM Control Delay (s)	-	-	13.3	9.9	7.9	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.2	0.1	-

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	54	66	228	45	55	199
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	59	72	248	49	60	216

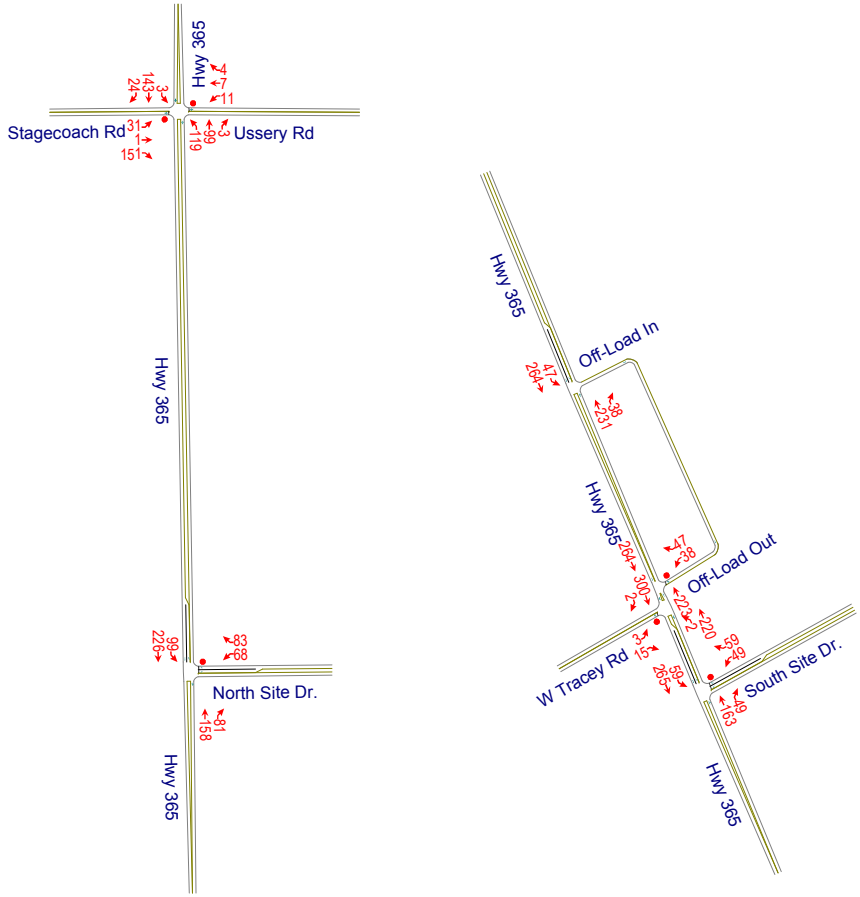
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	608	272	0	0	297	0
Stage 1	272	-	-	-	-	-
Stage 2	336	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	459	767	-	-	1264	-
Stage 1	774	-	-	-	-	-
Stage 2	724	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	437	767	-	-	1264	-
Mov Cap-2 Maneuver	437	-	-	-	-	-
Stage 1	774	-	-	-	-	-
Stage 2	690	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.1	0	1.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	437	767	1264	-
HCM Lane V/C Ratio	-	-	0.134	0.094	0.047	-
HCM Control Delay (s)	-	-	14.5	10.2	8	-
HCM Lane LOS	-	-	B	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.3	0.1	-

Projected Network
assumed Hwy widening

6/17/2019
Phase 3 AM



Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	3	15	2	220	300	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	16	2	239	326	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	570	327	328	0	-	0
Stage 1	327	-	-	-	-	-
Stage 2	243	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	483	714	1232	-	-	-
Stage 1	731	-	-	-	-	-
Stage 2	797	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	482	714	1232	-	-	-
Mov Cap-2 Maneuver	482	-	-	-	-	-
Stage 1	731	-	-	-	-	-
Stage 2	795	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.6	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1232	-	661	-	-
HCM Lane V/C Ratio	0.002	-	0.03	-	-
HCM Control Delay (s)	7.9	0	10.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM research expects at least one 'Stop' controlled approach at the intersection.

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	31	1	151	11	7	4	119	99	3	3	143	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	34	1	164	12	8	4	129	108	3	3	155	26

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	549	545	168	626	556	109	182	0	0	111	0	0
Stage 1	175	175	-	368	368	-	-	-	-	-	-	-
Stage 2	374	370	-	258	188	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	446	446	876	397	439	945	1393	-	-	1479	-	-
Stage 1	827	754	-	652	621	-	-	-	-	-	-	-
Stage 2	647	620	-	747	745	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	404	401	876	297	395	945	1393	-	-	1479	-	-
Mov Cap-2 Maneuver	404	401	-	297	395	-	-	-	-	-	-	-
Stage 1	745	752	-	587	560	-	-	-	-	-	-	-
Stage 2	572	559	-	605	744	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.8	15.3	4.2	0.1
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1393	-	-	727	373	1479	-	-
HCM Lane V/C Ratio	0.093	-	-	0.274	0.064	0.002	-	-
HCM Control Delay (s)	7.8	0	-	11.8	15.3	7.4	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	1.1	0.2	0	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	38	47	223	0	0	264
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	51	242	0	0	287

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	529	242	0	0	242	0
Stage 1	242	-	-	-	-	-
Stage 2	287	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	510	797	-	-	1324	-
Stage 1	798	-	-	-	-	-
Stage 2	762	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	510	797	-	-	1324	-
Mov Cap-2 Maneuver	510	-	-	-	-	-
Stage 1	798	-	-	-	-	-
Stage 2	762	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	637	1324	-
HCM Lane V/C Ratio	-	-	0.145	-	-
HCM Control Delay (s)	-	-	11.6	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	49	59	163	49	59	265
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	53	64	177	53	64	288

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	620	204	0	0	230	0
Stage 1	204	-	-	-	-	-
Stage 2	416	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	452	837	-	-	1338	-
Stage 1	830	-	-	-	-	-
Stage 2	666	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	430	837	-	-	1338	-
Mov Cap-2 Maneuver	430	-	-	-	-	-
Stage 1	830	-	-	-	-	-
Stage 2	634	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.9	0	1.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	430	837	1338	-
HCM Lane V/C Ratio	-	-	0.124	0.077	0.048	-
HCM Control Delay (s)	-	-	14.6	9.7	7.8	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.2	0.2	-

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	68	83	158	81	99	226
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	74	90	172	88	108	246

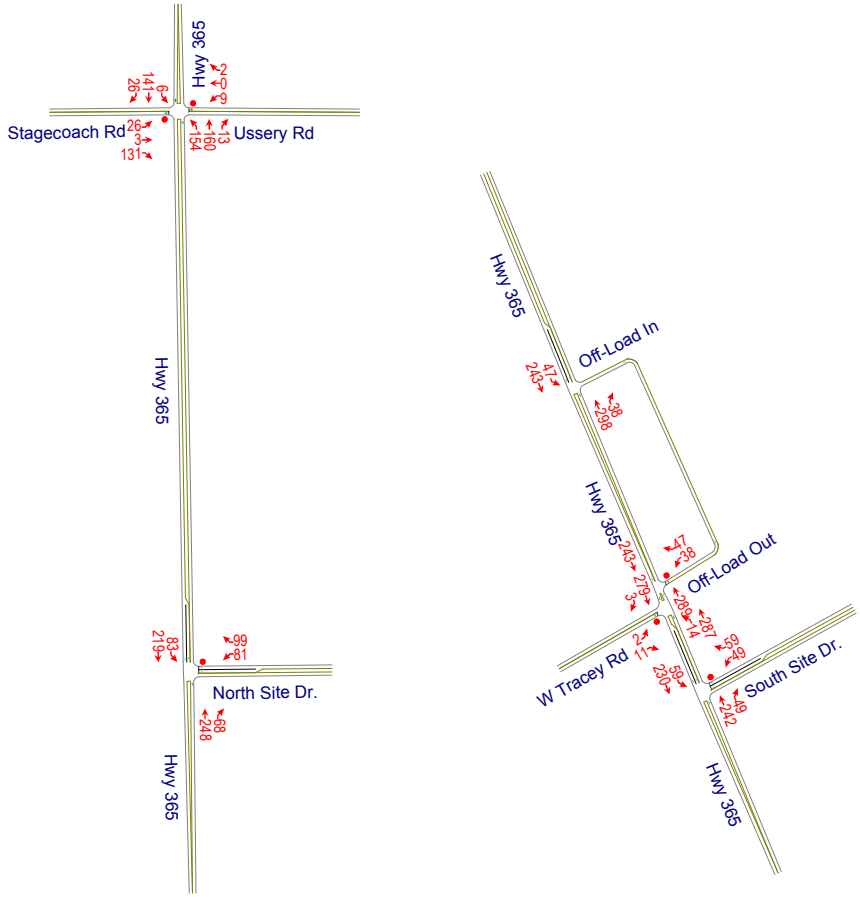
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	677	216	0	0	260	0
Stage 1	216	-	-	-	-	-
Stage 2	461	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	418	824	-	-	1304	-
Stage 1	820	-	-	-	-	-
Stage 2	635	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	383	824	-	-	1304	-
Mov Cap-2 Maneuver	383	-	-	-	-	-
Stage 1	820	-	-	-	-	-
Stage 2	582	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	2.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	383	824	1304	-
HCM Lane V/C Ratio	-	-	0.193	0.109	0.083	-
HCM Control Delay (s)	-	-	16.6	9.9	8	-
HCM Lane LOS	-	-	C	A	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.4	0.3	-

Projected Network
assumed Hwy widening

6/17/2019
Phase 3 PM



Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	2	11	14	287	279	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	12	15	312	303	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	647	305	307	0	-	0
Stage 1	305	-	-	-	-	-
Stage 2	342	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	436	735	1254	-	-	-
Stage 1	748	-	-	-	-	-
Stage 2	719	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	430	735	1254	-	-	-
Mov Cap-2 Maneuver	430	-	-	-	-	-
Stage 1	748	-	-	-	-	-
Stage 2	709	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.5	0.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1254	-	663	-	-
HCM Lane V/C Ratio	0.012	-	0.021	-	-
HCM Control Delay (s)	7.9	0	10.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM research expects at least one 'Stop' controlled approach at the intersection.

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	26	3	131	9	0	2	154	160	13	6	141	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	3	142	10	0	2	167	174	14	7	153	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	697	703	167	769	711	181	182	0	0	188	0	0
Stage 1	180	180	-	516	516	-	-	-	-	-	-	-
Stage 2	517	523	-	253	195	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	356	362	877	318	358	862	1393	-	-	1386	-	-
Stage 1	822	750	-	542	534	-	-	-	-	-	-	-
Stage 2	541	530	-	751	739	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	317	312	877	236	308	862	1393	-	-	1386	-	-
Mov Cap-2 Maneuver	317	312	-	236	308	-	-	-	-	-	-	-
Stage 1	712	746	-	469	462	-	-	-	-	-	-	-
Stage 2	467	459	-	623	735	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.3	18.8	3.7	0.3
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1393	-	-	664	272	1386	-	-
HCM Lane V/C Ratio	0.12	-	-	0.262	0.044	0.005	-	-
HCM Control Delay (s)	7.9	0	-	12.3	18.8	7.6	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.4	-	-	1	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	38	47	289	0	0	243
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	51	314	0	0	264

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	578	314	0	0	314	0
Stage 1	314	-	-	-	-	-
Stage 2	264	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	478	726	-	-	1246	-
Stage 1	741	-	-	-	-	-
Stage 2	780	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	478	726	-	-	1246	-
Mov Cap-2 Maneuver	478	-	-	-	-	-
Stage 1	741	-	-	-	-	-
Stage 2	780	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	589	1246	-
HCM Lane V/C Ratio	-	-	0.157	-	-
HCM Control Delay (s)	-	-	12.2	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.6	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	49	59	242	49	59	230
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	53	64	263	53	64	250

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	668	290	0	0	316	0
Stage 1	290	-	-	-	-	-
Stage 2	378	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	423	749	-	-	1244	-
Stage 1	759	-	-	-	-	-
Stage 2	693	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	401	749	-	-	1244	-
Mov Cap-2 Maneuver	401	-	-	-	-	-
Stage 1	759	-	-	-	-	-
Stage 2	657	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	1.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	401	749	1244	-
HCM Lane V/C Ratio	-	-	0.133	0.086	0.052	-
HCM Control Delay (s)	-	-	15.3	10.3	8.1	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.3	0.2	-

Intersection	
Int Delay, s/veh	4.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	81	99	248	68	83	219
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	88	108	270	74	90	238

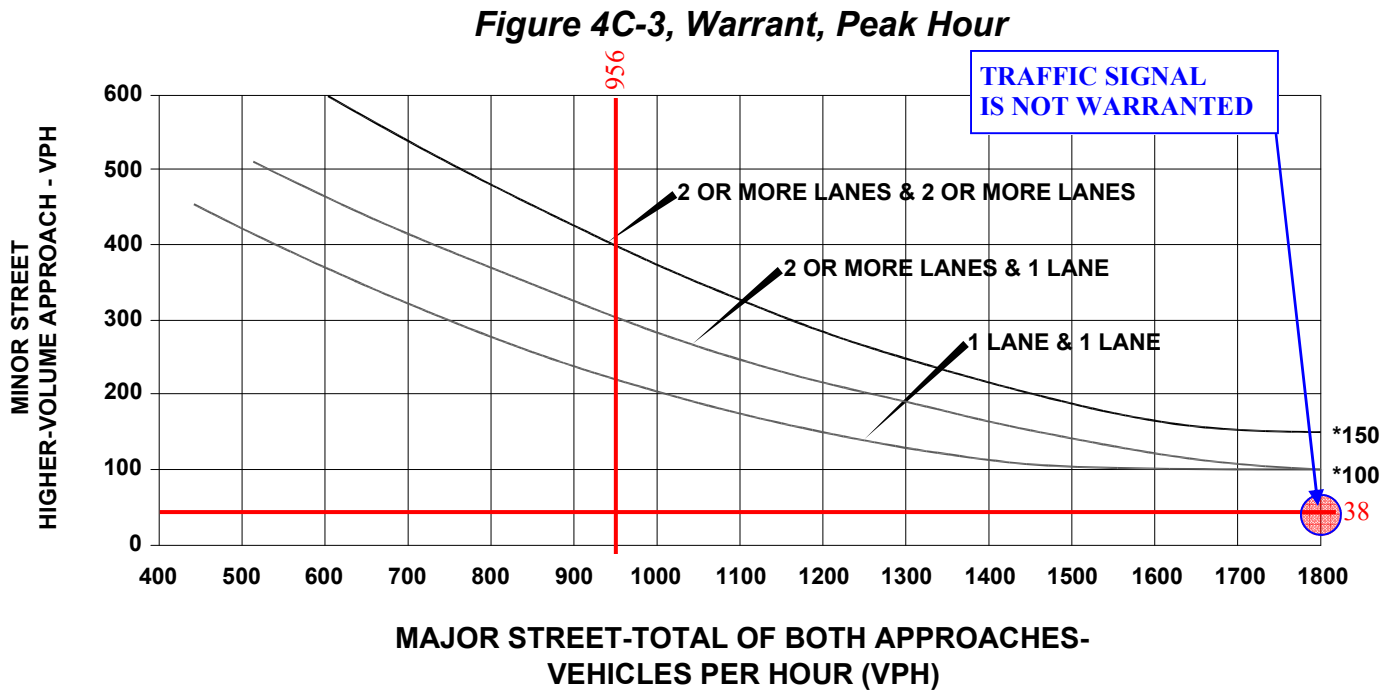
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	725	307	0	0	343	0
Stage 1	307	-	-	-	-	-
Stage 2	418	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	392	733	-	-	1216	-
Stage 1	746	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	363	733	-	-	1216	-
Mov Cap-2 Maneuver	363	-	-	-	-	-
Stage 1	746	-	-	-	-	-
Stage 2	615	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	2.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	363	733	1216	-
HCM Lane V/C Ratio	-	-	0.243	0.147	0.074	-
HCM Control Delay (s)	-	-	18.1	10.8	8.2	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0.5	0.2	-

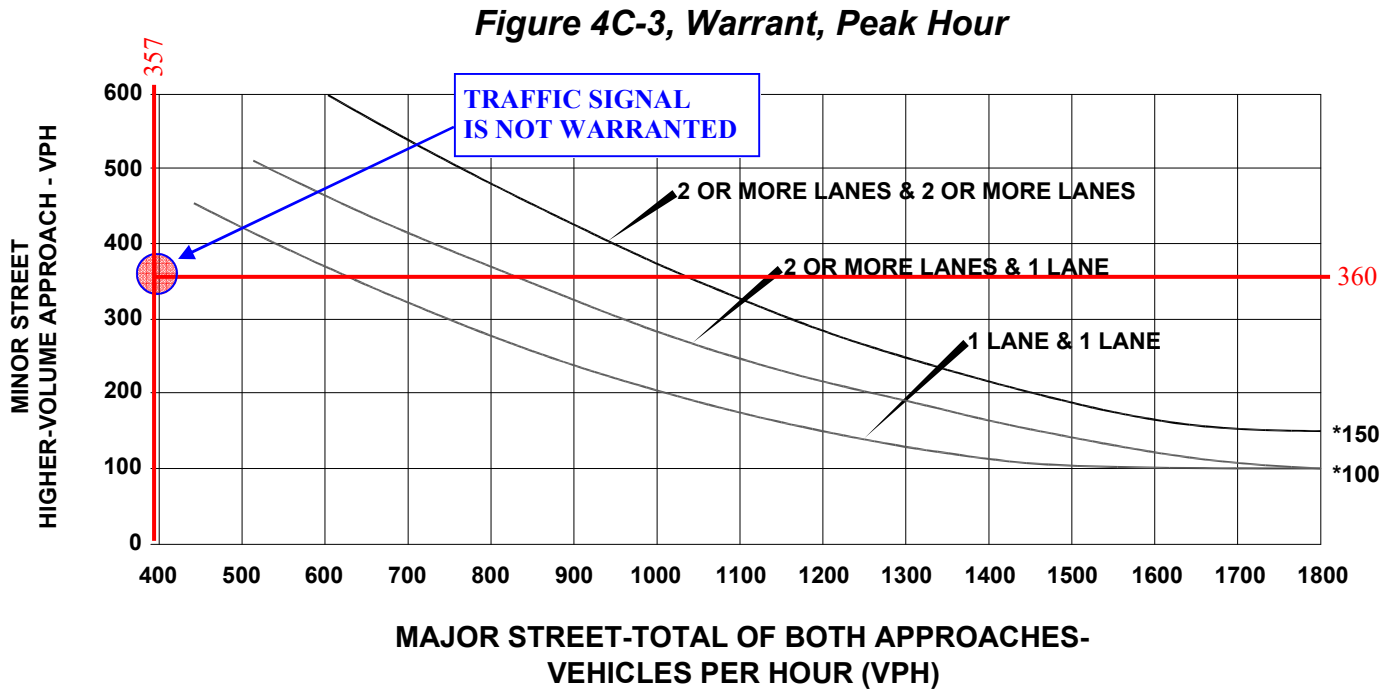
Traffic Signal Warrants Results

HIGHWAY 365 AND SOUTH ACCESS DRIVE
CONSTRUCTION PHASE PROJECTED TRAFFIC CONDITIONS



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

WEEKDAY AM PEAK HOUR



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

WEEKDAY PM PEAK HOUR

CHAPTER 4C. TRAFFIC CONTROL SIGNAL NEEDS STUDIES

Section 4C.01 Studies and Factors for Justifying Traffic Control Signals

Standard:

01 **An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.**

02 **The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:**

Warrant 1, Eight-Hour Vehicular Volume
Warrant 2, Four-Hour Vehicular Volume
Warrant 3, Peak Hour
Warrant 4, Pedestrian Volume
Warrant 5, School Crossing
Warrant 6, Coordinated Signal System
Warrant 7, Crash Experience
Warrant 8, Roadway Network
Warrant 9, Intersection Near a Grade Crossing

03 **The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.**

Support:

04 Sections 8C.09 and 8C.10 contain information regarding the use of traffic control signals instead of gates and/or flashing-light signals at highway-rail grade crossings and highway-light rail transit grade crossings, respectively.

Guidance:

05 *A traffic control signal should not be installed unless one or more of the factors described in this Chapter are met.*

06 *A traffic control signal should not be installed unless an engineering study indicates that installing a traffic control signal will improve the overall safety and/or operation of the intersection.*

07 *A traffic control signal should not be installed if it will seriously disrupt progressive traffic flow.*

08 *The study should consider the effects of the right-turn vehicles from the minor-street approaches. Engineering judgment should be used to determine what, if any, portion of the right-turn traffic is subtracted from the minor-street traffic count when evaluating the count against the signal warrants listed in Paragraph 2.*

09 *Engineering judgment should also be used in applying various traffic signal warrants to cases where approaches consist of one lane plus one left-turn or right-turn lane. The site-specific traffic characteristics should dictate whether an approach is considered as one lane or two lanes. For example, for an approach with one lane for through and right-turning traffic plus a left-turn lane, if engineering judgment indicates that it should be considered a one-lane approach because the traffic using the left-turn lane is minor, the total traffic volume approaching the intersection should be applied against the signal warrants as a one-lane approach. The approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles.*

10 *Similar engineering judgment and rationale should be applied to a street approach with one through/left-turn lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.*

11 *At a location that is under development or construction and where it is not possible to obtain a traffic count that would represent future traffic conditions, hourly volumes should be estimated as part of an engineering study for comparison with traffic signal warrants. Except for locations where the engineering study uses the satisfaction of Warrant 8 to justify a signal, a traffic control signal installed under projected conditions should have an engineering study done within 1 year of putting the signal into stop-and-go operation to determine if the signal is justified. If not justified, the signal should be taken out of stop-and-go operation or removed.*

12 *For signal warrant analysis, a location with a wide median, even if the median width is greater than 30 feet, should be considered as one intersection.*

Option:

13 At an intersection with a high volume of left-turn traffic from the major street, the signal warrant analysis may be performed in a manner that considers the higher of the major-street left-turn volumes as the "minor-street" volume and the corresponding single direction of opposing traffic on the major street as the "major-street" volume.

14 For signal warrants requiring conditions to be present for a certain number of hours in order to be satisfied, any four sequential 15-minute periods may be considered as 1 hour if the separate 1-hour periods used in the warrant analysis do not overlap each other and both the major-street volume and the minor-street volume are for the same specific one-hour periods.

15 For signal warrant analysis, bicyclists may be counted as either vehicles or pedestrians.

Support:

16 When performing a signal warrant analysis, bicyclists riding in the street with other vehicular traffic are usually counted as vehicles and bicyclists who are clearly using pedestrian facilities are usually counted as pedestrians.

Option:

17 Engineering study data may include the following:

A. The number of vehicles entering the intersection in each hour from each approach during 12 hours of an average day. It is desirable that the hours selected contain the greatest percentage of the 24-hour traffic volume.
B. Vehicular volumes for each traffic movement from each approach, classified by vehicle type (heavy trucks, passenger cars and light trucks, public-transit vehicles, and, in some locations, bicycles), during each 15-minute period of the 2 hours in the morning and 2 hours in the afternoon during which total traffic entering the intersection is greatest.
C. Pedestrian volume counts on each crosswalk during the same periods as the vehicular counts in Item B and during hours of highest pedestrian volume. Where young, elderly, and/or persons with physical or visual disabilities need special consideration, the pedestrians and their crossing times may be classified by general observation.
D. Information about nearby facilities and activity centers that serve the young, elderly, and/or persons with disabilities, including requests from persons with disabilities for accessible crossing improvements at the location under study. These persons might not be adequately reflected in the pedestrian volume count if the absence of a signal restrains their mobility.
E. The posted or statutory speed limit or the 85th-percentile speed on the uncontrolled approaches to the location.
F. A condition diagram showing details of the physical layout, including such features as intersection geometrics, channelization, grades, sight-distance restrictions, transit stops and routes, parking conditions, pavement markings, roadway lighting, driveways, nearby railroad crossings, distance to nearest traffic control signals, utility poles and fixtures, and adjacent land use.
G. A collision diagram showing crash experience by type, location, direction of movement, severity, weather, time of day, date, and day of week for at least 1 year.

18 The following data, which are desirable for a more precise understanding of the operation of the intersection, may be obtained during the periods described in Item B of Paragraph 17:

A. Vehicle-hours of stopped time delay determined separately for each approach.
B. The number and distribution of acceptable gaps in vehicular traffic on the major street for entrance from the minor street.
C. The posted or statutory speed limit or the 85th-percentile speed on controlled approaches at a point near to the intersection but unaffected by the control.
D. Pedestrian delay time for at least two 30-minute peak pedestrian delay periods of an average weekday or like periods of a Saturday or Sunday.
E. Queue length on stop-controlled approaches.

Section 4C.02 Warrant 1, Eight-Hour Vehicular Volume

Support:

01 The Minimum Vehicular Volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

02 The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

03 It is intended that Warrant 1 be treated as a single warrant. If Condition A is satisfied, then Warrant 1 is satisfied and analyses of Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied, then Warrant 1 is satisfied and an analysis of the combination of Conditions A and B is not needed.

Standard:

04 **The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:**

A. The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or

B. The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

In applying each condition the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.

Option:

05 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 70 percent columns in Table 4C-1 may be used in place of the 100 percent columns.

Guidance:

06 *The combination of Conditions A and B is intended for application at locations where Condition A is not satisfied and Condition B is not satisfied and should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.*

Standard:

07 **The need for a traffic control signal shall be considered if an engineering study finds that both of the following conditions exist for each of any 8 hours of an average day:**

A. The vehicles per hour given in both of the 80 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; and

B. The vehicles per hour given in both of the 80 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Option:

08 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

Section 4C.03 Warrant 2, Four-Hour Vehicular Volume

Support:

01 The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Standard:

02 **The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.**

Option:

03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-2 may be used in place of Figure 4C-1.

Section 4C.04 Warrant 3, Peak Hour

Support:

01 The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

Standard:

02 **This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.**

03 **The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:**

- **A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:**
  1. **The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and**
  2. **The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and**
  3. **The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.**
- **B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.**

Option:

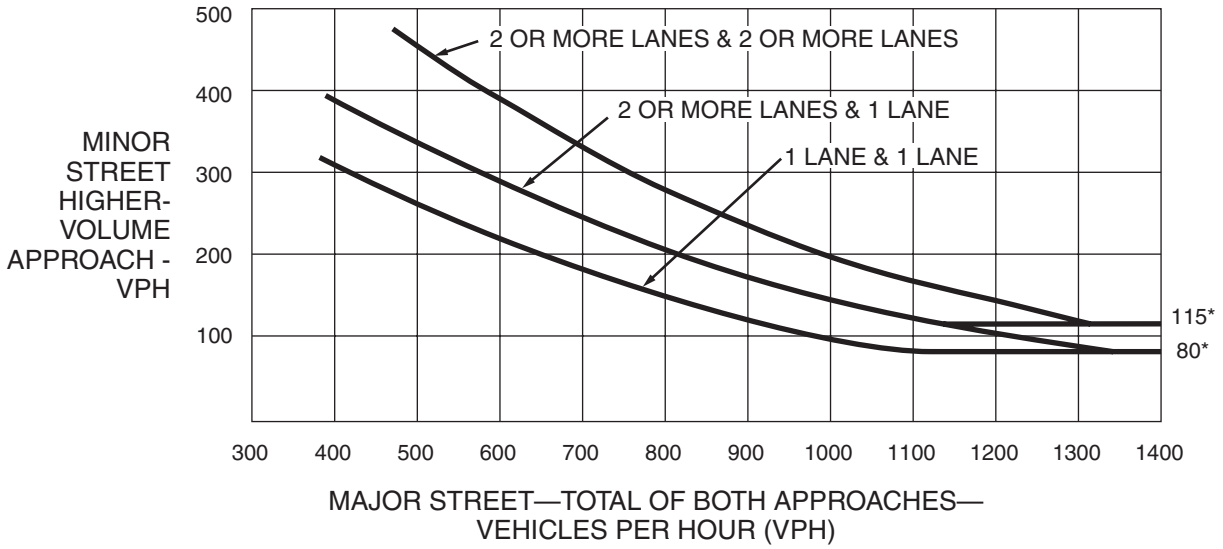
04 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-4 may be used in place of Figure 4C-3 to evaluate the criteria in the second category of the Standard.

05 If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Guidance:

06 *If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal should be traffic-actuated.*

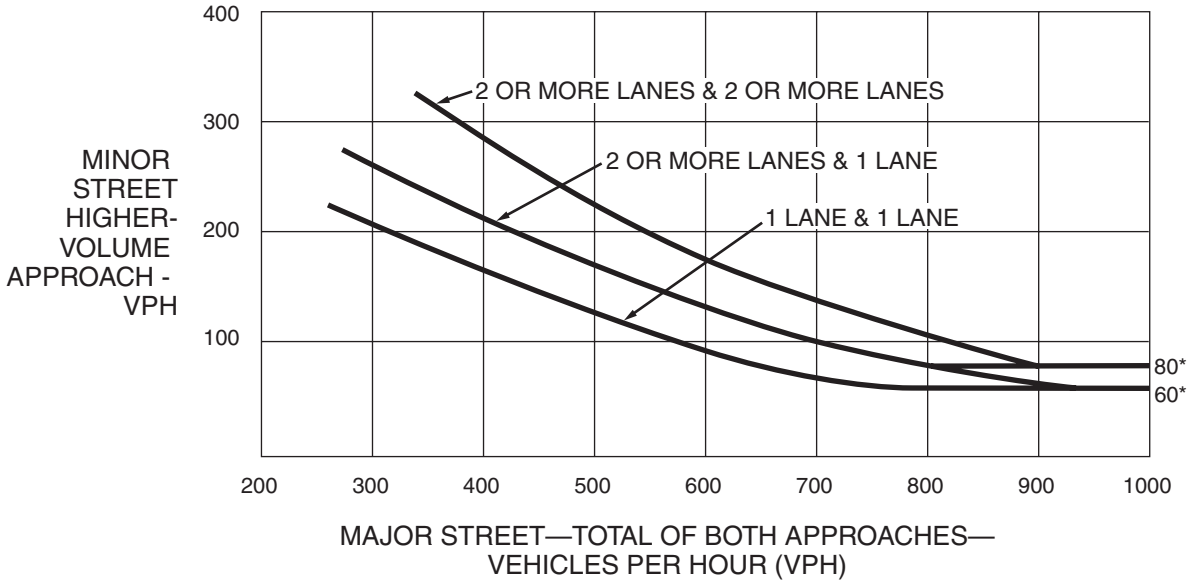
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

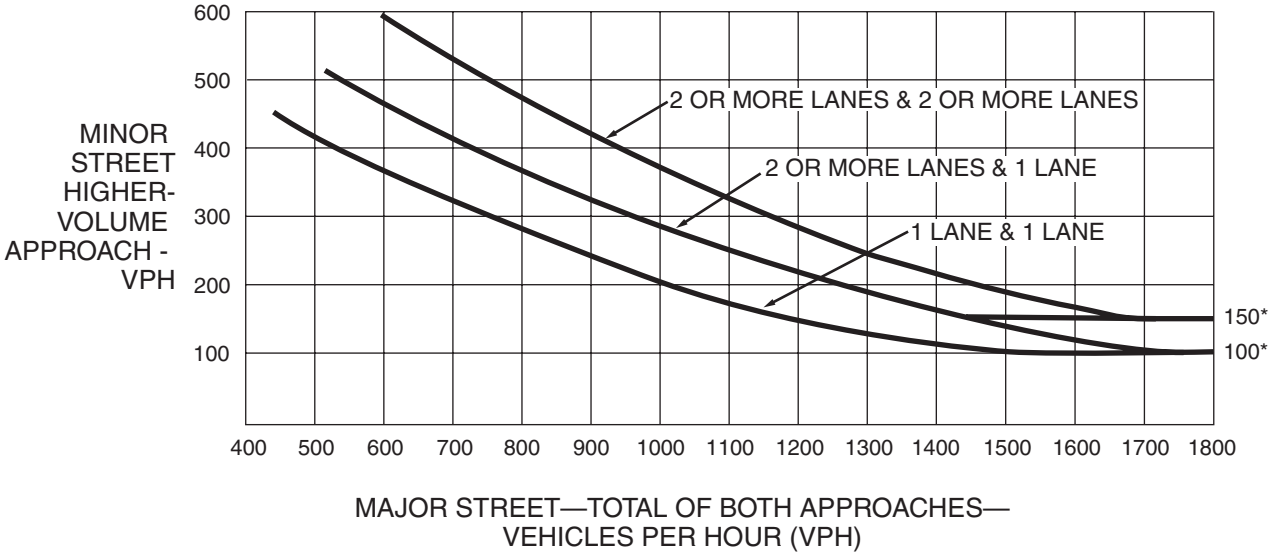
Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

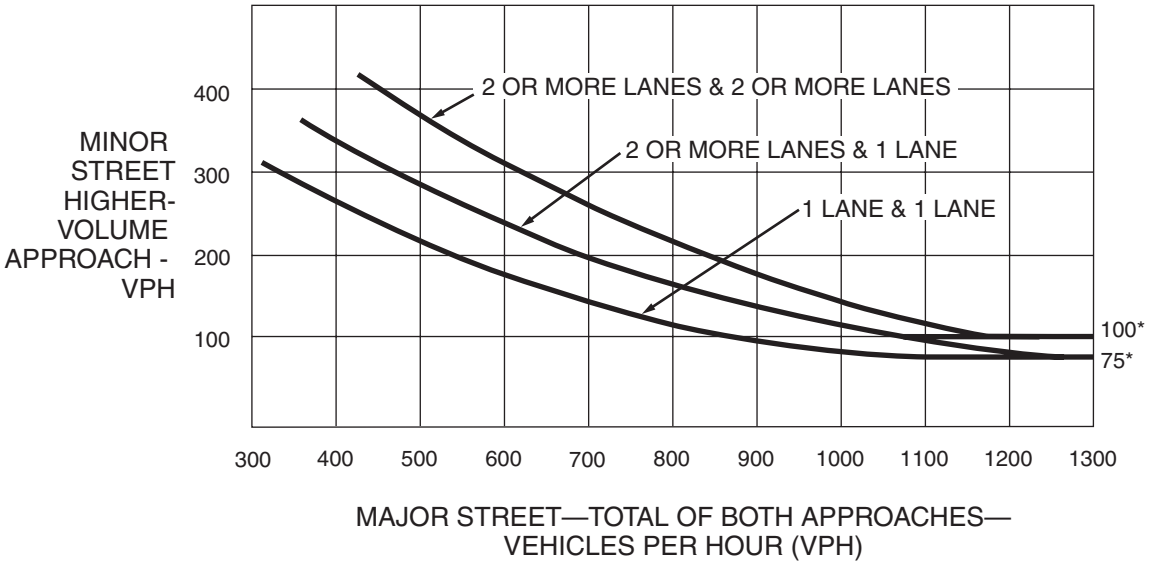
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Section 4C.05 Warrant 4, Pedestrian Volume

Support:

01 The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Standard:

02 **The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:**

A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or

B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

Option:

03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-6 may be used in place of Figure 4C-5 to evaluate Criterion A in Paragraph 2, and Figure 4C-8 may be used in place of Figure 4C-7 to evaluate Criterion B in Paragraph 2.

Standard:

04 **The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal or STOP sign controlling the street that pedestrians desire to cross is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.**

05 **If this warrant is met and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E.**

Guidance:

06 *If this warrant is met and a traffic control signal is justified by an engineering study, then:*

A. If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.

B. If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.

C. Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.

Option:

07 The criterion for the pedestrian volume crossing the major street may be reduced as much as 50 percent if the 15th-percentile crossing speed of pedestrians is less than 3.5 feet per second.

08 A traffic control signal may not be needed at the study location if adjacent coordinated traffic control signals consistently provide gaps of adequate length for pedestrians to cross the street.

Section 4C.06 Warrant 5, School Crossing

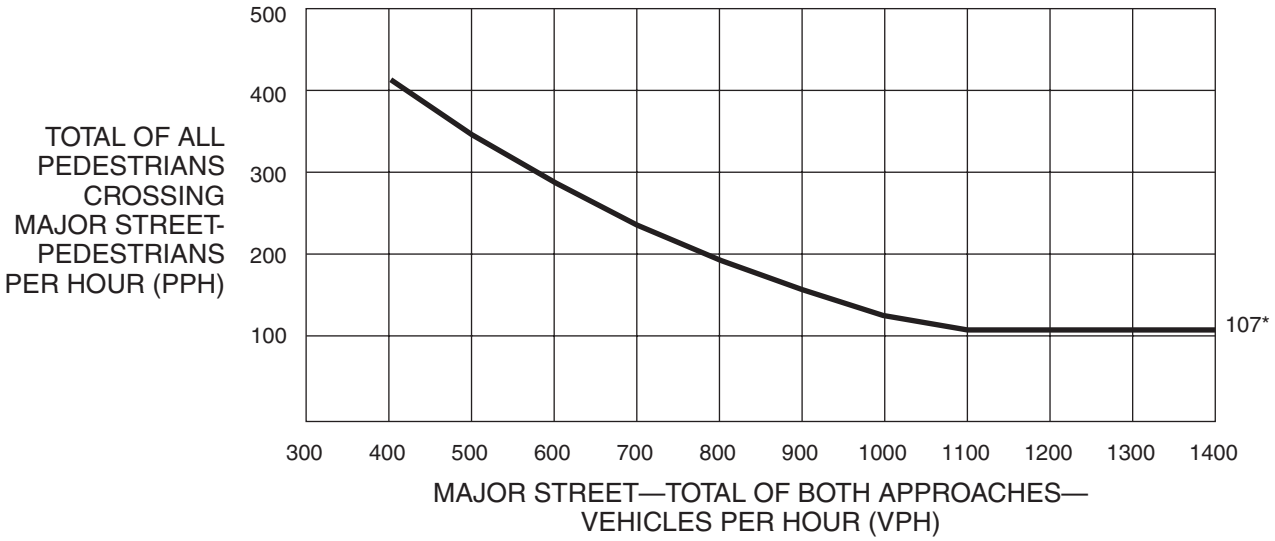
Support:

01 The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word “schoolchildren” includes elementary through high school students.

Standard:

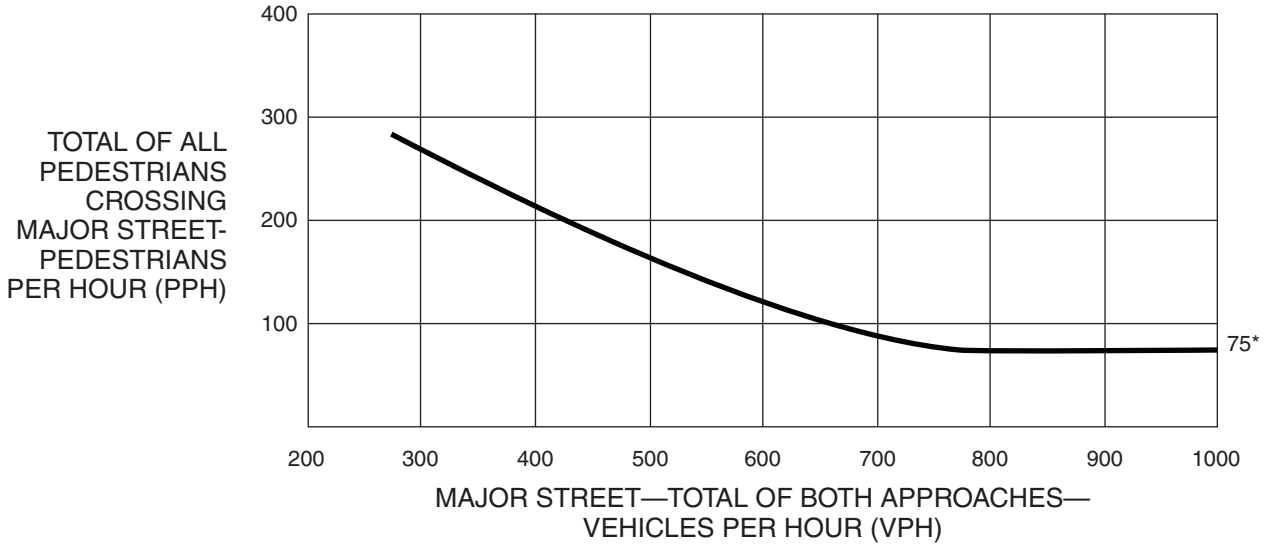
02 **The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.**

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



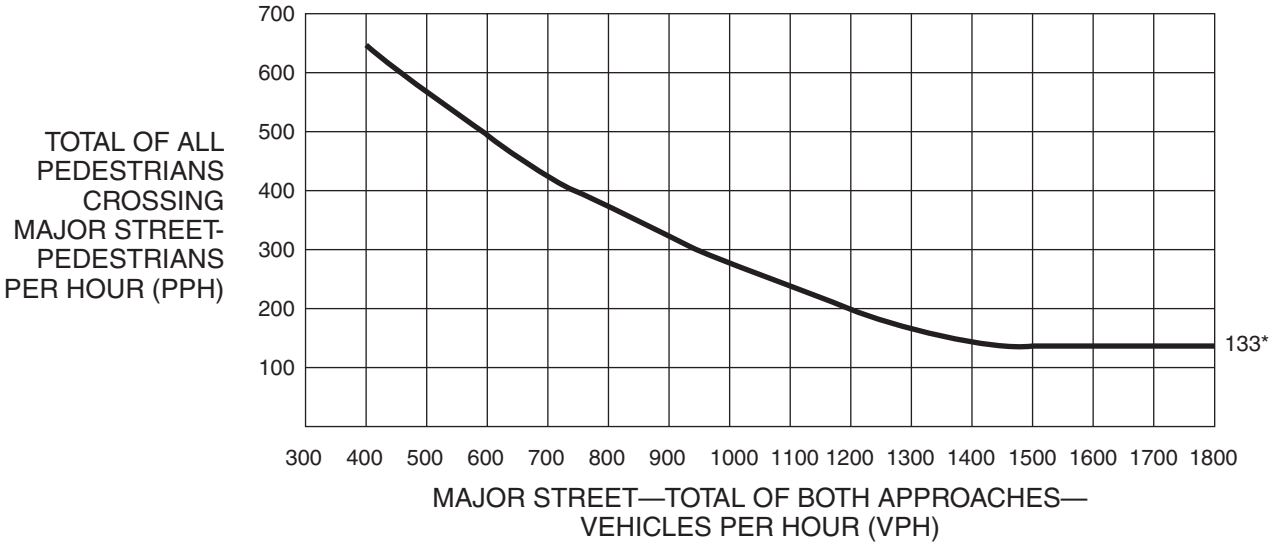
*Note: 107 pph applies as the lower threshold volume.

Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)



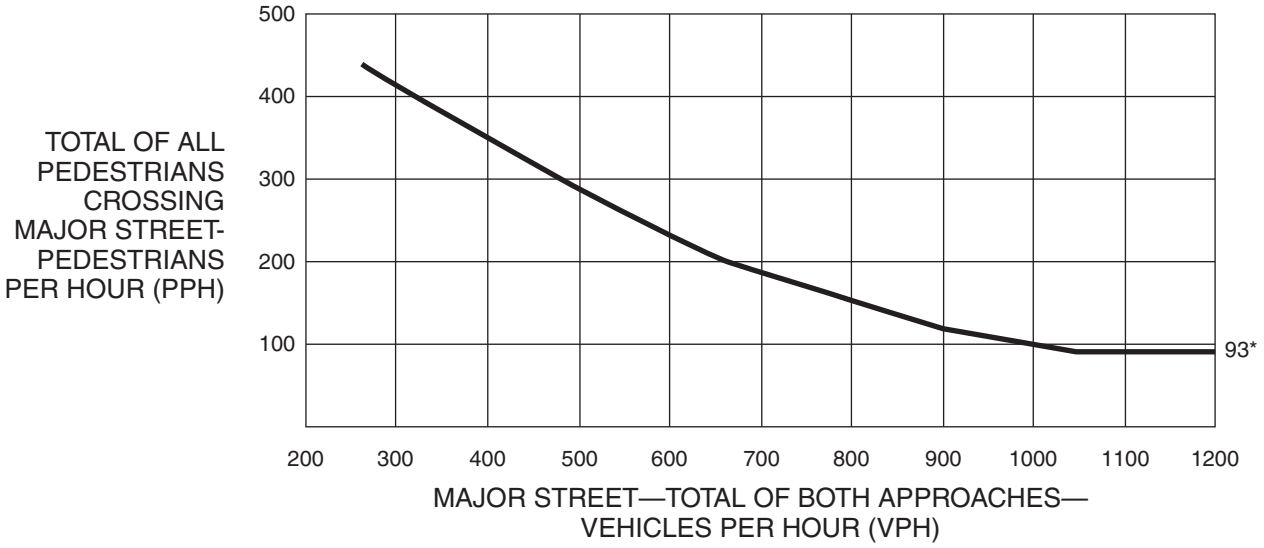
*Note: 75 pph applies as the lower threshold volume.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



*Note: 133 pph applies as the lower threshold volume.

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)



*Note: 93 pph applies as the lower threshold volume.

03 **Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.**

04 **The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.**

Guidance:

05 *If this warrant is met and a traffic control signal is justified by an engineering study, then:*

A. If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.

B. If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.

C. Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.

Section 4C.07 Warrant 6, Coordinated Signal System

Support:

01 Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

Standard:

02 **The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:**

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Guidance:

03 *The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.*

Section 4C.08 Warrant 7, Crash Experience

Support:

01 The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Standard:

02 **The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:**

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Option:

03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

Section 4C.09 Warrant 8, Roadway Network

Support:

01 Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

Standard:

02 **The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:**

- **A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or**
- **B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).**

03 **A major route as used in this signal warrant shall have at least one of the following characteristics:**

- **A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow.**
- **B. It includes rural or suburban highways outside, entering, or traversing a city.**
- **C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.**

Section 4C.10 Warrant 9, Intersection Near a Grade Crossing

Support:

01 The Intersection Near a Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

Guidance:

02 *This signal warrant should be applied only after adequate consideration has been given to other alternatives or after a trial of an alternative has failed to alleviate the safety concerns associated with the grade crossing. Among the alternatives that should be considered or tried are:*

- *A. Providing additional pavement that would enable vehicles to clear the track or that would provide space for an evasive maneuver, or*
- *B. Reassigning the stop controls at the intersection to make the approach across the track a non-stopping approach.*

Standard:

03 **The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:**

- **A. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and**
- **B. During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13.**

Guidance:

04 *The following considerations apply when plotting the traffic volume data on Figure 4C-9 or 4C-10:*

- *A. Figure 4C-9 should be used if there is only one lane approaching the intersection at the track crossing location and Figure 4C-10 should be used if there are two or more lanes approaching the intersection at the track crossing location.*

PETERS & ASSOCIATES
ENGINEERS, INC.
• *CIVIL & TRAFFIC ENGINEERING* •
5507 Ranch Drive - Suite 209
Little Rock, Arkansas 72223 (501) 868-3999