



# **TRAFFIC IMPACT STUDY** **Proposed Chick-fil-A**

**Hamilton County, Ohio**



**Prepared For:**



Chick-fil-A  
5200 Buffington Road  
Atlanta, Georgia 30349

**Prepared By:**

GPD Group  
520 South Main Street  
Suite 2531  
Akron, OH 44311

**July 2019**

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Engineer's Seal



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## **I. Purpose:**

This Traffic Impact Study is being prepared at the request of the Hamilton County Engineer's Office in association with the proposed construction of a Chick-fil-A restaurant to be located at the Kenwood Towne Centre in Hamilton County, Ohio. The purpose of this particular Traffic Impact Study is to analyze the vehicular operating conditions of the roadways in the vicinity of the proposed development; both before and after its construction to determine what, if any, impact the proposed Chick-fil-A will have on the surrounding roadway network.

## **II. Project Setting:**

### ***Study Area***

The subject property is currently a parking lot located in the northwest corner of the Kenwood Towne Centre. The site is located on the southeast corner of the Kenwood Road / E. Galbraith Road intersection. See **Figure 1** for a project location map and **Figure 2** for an aerial photograph of the project area.

### ***Area Roadway System***

Kenwood Road exists as a five (5) lane asphalt roadway (two (2) travel lanes in each direction with a center two-way left turn lane) with dedicated left turn lanes at key intersections. The current posted speed limit on Kenwood Road is 35 miles per hour (mph). According to information obtained from the Ohio Department of Transportation's (ODOT) website, Kenwood Road is classified as an Urban Minor Arterial.

E. Galbraith Road exists as a three (3) lane asphalt roadway (one (1) travel lane in each direction with a center two-way left turn lane) with dedicated left and right turning lanes at various intersections. The current posted speed limit on E. Galbraith Road is 35 miles per hour (mph). According to information obtained from the Ohio Department of Transportation's (ODOT) website, E. Galbraith Road is also classified as an Urban Minor Arterial.

Additionally, Kenwood Towne Centre has an internal ring roadway that will provide access to the proposed Chick-fil-A site, with connections to both Kenwood Road and E. Galbraith Road (as well as the rest of the Kenwood Towne Centre property). The internal ring road varies from a two (2) to four (4) lane asphalt roadway.

There is one (1) existing signalized intersection and five (5) unsignalized intersections that are currently located within the study area that are of special interest to this project. The six (6) existing intersections included in this study are as follows:

Kenwood Road / E. Galbraith Road Intersection:

The intersection is currently signalized using a typical mast arm configuration with signal poles located on all four (4) corners of the intersection. The intersection consists of four (4) approaches with the following lane configurations: NB Kenwood Road – three (3) lanes (left, thru, thru-right), SB Kenwood Road – three (3) lanes (left, thru, thru-right), EB E. Galbraith Road – three (3) lanes (left, thru, right), and WB E. Galbraith Road – three (3) lanes (left, thru, right)

#### Kenwood Road / Kenwood Towne Centre Drive / Mercy Health Drive Intersection:

The intersection is currently unsignalized with the WB Kenwood Towne Centre Drive and EB Mercy Health Drive approaches operating under stop control. The intersection consists of four (4) approaches with the following lane configurations: EB Mercy Health Drive – one (1) lane (left-thru-right), WB Kenwood Towne Centre Drive Road – two (2) lanes (left-thru, right), NB Kenwood Road – three (3) lanes (left, thru, thru-right), and SB Kenwood Road – three (3) lanes (left, thru, thru-right).

#### E. Galbraith Road / Kenwood Towne Centre Drive / Sycamore Executive Center Drive Intersection:

The intersection is currently unsignalized with the NB Kenwood Towne Centre Drive and SB Sycamore Executive Center Drive approaches operating under stop control. The intersection consists of four (4) approaches with the following lane configurations: EB E. Galbraith Road – two (2) lanes (left, thru-right), WB E. Galbraith Road – three (3) lanes (left, thru, right), NB Kenwood Towne Centre Drive – two (2) lanes (left, thru-right), SB Sycamore Executive Center Drive – two (2) lanes (left-thru, right).

#### Kenwood Towne Centre Drive from Kenwood Road / Towne Centre Ring Road Intersection:

The intersection is currently unsignalized with the NB and SB Towne Centre Ring Road and WB Towne Centre Drive approaches operating under stop control. The intersection consists of four (4) approaches with the following lane configurations: EB Kenwood Towne Centre Drive from Kenwood Road – two (2) lanes (left, right), WB Kenwood Towne Centre Drive – two (2) lanes (left, thru-right), NB Towne Centre Ring Road – two (2) lanes (left-thru, thru-right), SB Towne Centre Ring Road – two (2) lanes (left-thru, thru-right).

#### Kenwood Towne Centre Drive from E. Galbraith Road / Towne Centre Ring Road Intersection:

The intersection is currently unsignalized with EB Towne Centre Ring Road and WB Towne Centre Ring Road approaches operating under stop control. The intersection consists of three (3) approaches with the following lane configurations: SB Kenwood Towne Centre Drive from E. Galbraith Road – one (1) lane (left-right), EB Towne Centre Ring Road – two (2) lanes (left-thru, thru), WB Towne Centre Ring Road – two (2) lanes (thru, thru-right).

#### Towne Centre Ring Road / Parking Garage Access Intersection:

The intersection is currently unsignalized with the EB Parking Lot Drive and WB Parking Garage Access approaches operating under stop control. The intersection consists of four (4) approaches with the following lane configurations: EB Parking Lot Drive – one (1) lane (left-thru-right), WB Parking Garage Access – one (1) lane (left-thru-right), NB Towne Centre Ring Road – two (2) lanes (left-thru, right), SB Towne Centre Ring Road – two (2) lanes (left-thru, thru-right).

### ***Existing Traffic Volumes***

For this study, Cummins Consulting Services, PLLC performed turning movement traffic counts for three (3) intersections on Wednesday, March 20, 2019:

- Kenwood Road / E. Galbraith Road
- Kenwood Road / Kenwood Towne Centre Drive / Mercy Health Drive
- E. Galbraith Road / Kenwood Towne Centre Drive / Sycamore Executive Center Drive

Three (3) additional intersections were counted on Tuesday, April 16, 2019:

- Kenwood Towne Centre Drive from Kenwood Road / Towne Centre Ring Road
- Kenwood Towne Centre Drive from E. Galbraith Road / Towne Centre Ring Road
- Towne Centre Ring Road / Parking Garage Access

From the count data, the AM peak hour of the study area was determined to occur from 7:30 AM to 8:30 AM while the PM Peak hour was found to occur from 4:45 PM to 5:45 PM. See **Appendix A** for printouts of the turning movement counts.

### **III. Proposed Action:**

The proposed development will be a Chick-fil-A restaurant consisting of a total of 4,975 square feet (SF) of gross floor area. The restaurant will be constructed on the northwest corner of the Kenwood Towne Centre property. See **Figure 3** for a preliminary site plan.

As shown on the site plan, the proposed development will utilize two (2) driveways that access the Towne Centre Ring Road. The driveway aligning with the Parking Garage Access will be referred to as the South Site Drive and will only allow right turns out of the Chick-fil-A property. The second proposed drive will be referred to as North Site Drive and will allow full movement access in and out of the property. Note that no direct access to either Kenwood Road or E. Galbraith Road is being proposed with this project.

### **IV. Trip Generation:**

#### ***Trip Generation Calculations***

The trip generation calculations were performed for the proposed development utilizing the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10<sup>th</sup> Edition. This manual includes data from numerous trip generation studies of different land uses that have been performed by public agencies, developers, consulting firms and associations and submitted to ITE. It serves as a tool for estimating the number of vehicle trips generated by a proposed development. For this study, the trip generation calculations will evaluate the AM and PM peak periods.

According to information contained in the ITE Trip Generation Manual, 10<sup>th</sup> Edition, the proposed Chick-fil-A restaurant is expected to generate the following trip ends once constructed.

## LAND USE 934 – Fast-Food Restaurant with Drive-Through Window

- i. Weekday AM Peak Hour (i.e. morning rush hour):
  - = 200 trip ends (102 entering and 98 exiting)
  - a. Pass-By Trips (49%)
    - = 98 trip ends (50 entering and 48 exiting)
  - b. Net Primary Trips
    - = 102 trip ends (52 entering and 50 exiting)
- ii. Weekday PM Peak Hour (i.e. evening rush hour):
  - = 163 trip ends (85 entering and 78 exiting)
  - a. Pass-By Trips (50%)
    - = 82 trip ends (43 entering and 39 exiting)
  - b. Net Primary Trips
    - = 81 trip ends (42 entering and 39 exiting)

Note that the variable utilized in the trip generation calculations was ‘square feet of gross floor area’, which in this particular case is 4,975 SF. See **Appendix B** for the detailed trip generation calculations for the proposed Chick-fil-A restaurant.

A certain portion of vehicles that will travel to and from the site will occur as pass-by traffic. Pass-by trips are made as intermediate stops on the way from an origin to a primary trip destination without a route diversion. Since these trips are attracted from the traffic passing the site on the adjacent roadways, pass-by vehicles that are currently traveling along Kenwood Road and E. Galbraith Road will now be rerouted into and out of the site. Trip generation studies for a fast-food restaurant with a drive-thru window documented in the ITE Trip Generation Handbook estimate that pass-by trips make up an average of 49% of the total site trips during the AM peak hour and 50% during the PM peak hour. The remaining trips traveling to and from the site are referred to as primary trips they consist of new trips on the roadway network traveling directly between the origin and the primary trip destination. While the pass-by capture reduction was applied to the trip generation calculations for the proposed Chick-fil-A, it should be noted that these pass-by trips are still assigned as new turning movements entering and exiting the site at the proposed access locations.

## **V. Traffic Volumes:**

### ***‘No-Build’ Traffic Volumes***

The construction of the proposed Chick-fil-A is anticipated to be completed in the year 2020 which will serve as the ‘Opening Year’ for the study while the ‘Design Year’ will be 2040 (twenty (20) year design criteria). In order to develop the projected future traffic volumes, the annual growth rate of 3% (provided by the Hamilton County Engineer’s Office) was applied linearly to the existing traffic volumes to compute the Opening Year 2020 as well as the Design Year 2040 traffic conditions. This increase in traffic accounts for ‘background growth’ which consists of additional traffic from non-specific development and general regional growth that could be expected to occur in the future. The Opening Year 2020 traffic incorporates a 3% increase in existing traffic (1 year of growth) while the Design Year 2040 traffic incorporates a 63% increase in existing traffic (21 years of growth). See



**Figure 4** for the Opening Year 2020 ‘No-Build’ peak hour traffic volumes and **Figure 5** for the Design Year 2040 ‘No-Build’ peak hour traffic volumes.

***Site Trip Distribution & Assignment***

The new trips discussed in the Trip Generation section were distributed and assigned to the roadway network based on existing travel volumes/patterns near the site, surrounding land uses and roadway network, and engineering judgement. It is estimated the 25% of the projected site trips will travel to/from the north on Kenwood Road while 25% will travel to/from the south on Kenwood Road. 20% of the site trips are expected to travel to/from the east on E. Galbraith Road while 15% will likely travel to/from the west on E. Galbraith Road. The remaining 15% are expected to be captured from the Kenwood Towne Center via the internal ring road. While not included in the study area, it was assumed that some Chick-fil-A traffic will choose to utilize the adjacent signalized intersections serving Kenwood Towne Centre which traveling to or from the site due to the expected difficulty of making left turn movements from the adjacent unsignalized intersections.

***‘Build’ Traffic Volumes***

In order to create the ‘Build’ traffic volumes, the site trips discussed in the previous section were added to the Opening Year 2020 and Design Year 2040 ‘No-Build’ peak hour traffic volumes. The ‘Build’ traffic volumes will allow a direct comparison between the projected traffic conditions without the development and those following the completion of the proposed Chick-fil-A restaurant. **Figure 6** displays the Opening Year 2020 ‘Build’ peak hour traffic volumes while **Figure 7** depicts the Design Year 2040 ‘Build’ peak hour traffic volumes.

**VI. Traffic Analysis:**

***HCM Intersection Capacity Analysis***

Intersection Capacity analyses were performed for the ‘No-Build’ and ‘Build’ traffic scenarios in order to determine the operating conditions that would be expected to be experienced at each study intersection. The quality of the operating conditions experienced by an intersection is measured in terms of Level-of-Service (LOS). Levels-of-Service can range from LOS A to LOS F. Level-of-Service rating of A – D are considered to be in the acceptable range while Levels-of-Service E and F are considered to be below average with significant levels of delay experienced by vehicles. The Level-of-Service thresholds vary for signalized and unsignalized intersections. The thresholds related to average control delay for both signalized and unsignalized intersections are as follows:

Levels-of-Service	Delay Threshold – Signalized (sec)	Delay Threshold – Unsignalized (sec)
A	< 10	< 10
B	> 10 – 20	> 10 – 15
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	> 80	> 50

The capacity analyses were performed for the weekday AM and PM peak hours utilizing the computer program HCS 7 which is developed by McTrans Corporation and based on the 2010 Highway Capacity Manual and the 2009 Manual of Uniform Traffic Control Devices (MUTCD). The existing signal timings (cycle lengths, splits, and clearance intervals) for the Kenwood Road / E. Galbraith Road intersection were provided by the Hamilton County Engineer’s Office for use in this study. These timings were utilized for the capacity analysis of both the Opening Year 2020 and Design Year 2040 ‘No-Build’ and ‘Build’ traffic conditions. Also note that the Kenwood Towne Centre Drive from Kenwood Road / Towne Centre Ring Road intersection was evaluated as a two-way stop control condition as the Highway Capacity Manual is unable to evaluate a three-way stop control condition.

*Opening Year 2020 Capacity Analysis*

**Table 1** summarizes the results of the capacity analysis for the signalized intersection within the study area under the Opening Year 2020 ‘No-Build’ and ‘Build’ traffic conditions. See **Appendix D** for the HCS Intersection Capacity Analysis printouts.

Table 1: HCS Intersection Capacity Analysis Summary Opening Year 2020 ‘No-Build’ vs. ‘Build’ Conditions – Signalized Intersection								
Intersection / Movement	‘No-Build’ Conditions				‘Build’ Conditions			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
<b>Kenwood Road / E. Galbraith Road Intersection</b>								
Eastbound Left	C	22.3	C	24.0	C	22.3	C	24.0
Eastbound Thru	D	35.2	D	36.2	D	35.4	D	36.4
Eastbound Right	C	23.0	C	24.4	C	23.0	C	24.4
<i>Eastbound Approach</i>	C	29.1	C	29.3	C	29.2	C	29.4
Westbound Left	C	22.6	C	23.3	C	22.6	C	23.4
Westbound Thru	C	33.9	D	35.9	C	34.0	D	36.0
Westbound Right	C	22.4	C	25.3	C	22.4	C	25.3
<i>Westbound Approach</i>	C	28.1	C	29.4	C	28.2	C	29.4
Northbound Left	C	23.2	C	23.4	C	23.4	C	23.6
Northbound Thru	C	31.8	C	34.6	C	31.9	C	34.8
Northbound Thru-Right	C	31.9	C	34.7	C	32.0	C	34.9
<i>Northbound Approach</i>	C	29.8	C	32.4	C	29.9	C	32.5
Southbound Left	C	30.7	C	30.8	C	31.8	C	31.5
Southbound Thru	D	35.9	D	35.5	D	36.2	D	35.7
Southbound Thru-Right	D	36.0	D	35.6	D	36.3	D	35.9
<i>Southbound Approach</i>	C	34.4	C	34.3	D	34.9	C	34.6
<b>Intersection Total</b>	<b>C</b>	<b>31.4</b>	<b>C</b>	<b>31.8</b>	<b>C</b>	<b>31.7</b>	<b>C</b>	<b>32.0</b>

Note: Orange highlighted cells indicate a Level of Service E.

Red highlighted cells indicate a Level of Service F

Gray shaded cells indicate a movement that does not exist in the analysis scenario.

As shown in **Table 1** on the previous page, all movements and approaches of the Kenwood Road / E. Galbraith Road intersection are projected to operate at a LOS D or better during the AM and PM peak hours under the Opening Year 2020 ‘No-Build’ and ‘Build’ traffic conditions. As can be seen in the capacity analysis results, no movements are expected to degrade to an unacceptable Level-of-Service as a result of the additional site traffic. This indicates that the E Galbraith Road / Kenwood Road intersection is currently anticipated to have sufficient vehicular capacity to accommodate the additional traffic generated by the proposed development.

**Table 2** summarizes the HCS Intersection Capacity Analysis and details the Levels-of-Service and delay experienced under the Opening Year 2020 ‘No-Build’ vs. ‘Build’ traffic conditions for the unsignalized intersections within the study area. See **Appendix D** for the HCS analysis printouts.

Table 2: HCS Intersection Capacity Analysis Summary Opening Year 2020 ‘No-Build’ vs. ‘Build’ Conditions – Unsignalized Intersections								
Intersection / Movement	‘No-Build’ Conditions				‘Build’ Conditions			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
<b>Kenwood Road / Kenwood Towne Centre Drive / Mercy Health Drive</b>								
Eastbound Left-Thru-Right	D	25.5	D	32.1	D	28.1	E	35.9
Eastbound Approach	D	25.5	D	32.1	D	28.1	E	35.9
Westbound Left-Thru	E	36.7	F	75.5	F	51.8	F	119.7
Westbound Right	B	10.6	B	12.8	B	11.0	B	13.3
Westbound Approach	D	25.9	C	24.6	D	29.7	E	38.0
Northbound Left	A	9.9	B	10.1	A	9.8	B	10.0
Northbound Approach	A	0.5	A	0.3	A	0.5	A	0.3
Southbound Left	A	9.2	A	9.9	A	9.4	B	10.1
Southbound Approach	A	0.2	A	0.7	A	0.6	A	1.0
<b>E. Galbraith Road / Kenwood Town Centre Drive / Sycamore Executive Center Drive</b>								
Eastbound Left	A	8.2	A	8.7	A	8.1	A	8.6
Eastbound Approach	A	0.5	A	0.2	A	0.5	A	0.2
Westbound Left	A	8.8	A	8.8	A	8.9	A	8.9
Westbound Approach	A	0.2	A	0.1	A	0.4	A	0.3
Northbound Left-Thru	D	25.2	F	58.0	D	27.6	F	71.9
Northbound Right	B	12.3	B	12.5	B	12.6	B	12.8
Northbound Approach	C	23.6	E	44.4	C	20.7	F	51.1
Southbound Left-Thru	C	23.6	D	31.2	D	25.5	D	33.6
Southbound Right	B	10.2	B	12.3	B	10.2	B	12.2
Southbound Approach	C	19.2	C	17.9	C	20.4	C	18.5

Note: Orange highlighted cells indicate a Level of Service E.  
 Red highlighted cells indicate a Level of Service F  
 Gray shaded cells indicate a movement that does not exist in the analysis scenario.

Table 2: HCS Intersection Capacity Analysis Summary (Cont.) Opening Year 2020 'No-Build' vs. 'Build' Conditions – Unsignalized Intersections								
Intersection / Movement	'No-Build' Conditions				'Build' Conditions			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
<b>Kenwood Towne Centre Drive from Kenwood Road / Towne Centre Ring Road</b>								
Eastbound Left	A	7.3	A	7.3	A	7.4	A	7.4
<i>Eastbound Approach</i>	A	4.7	A	1.9	A	6.2	A	3.7
Westbound Left	A	7.3	A	7.4	A	7.3	A	7.4
<i>Westbound Approach</i>	A	1.8	A	1.9	A	1.8	A	1.9
Northbound Left-Thru	A	9.5	B	11.1	B	10.9	B	13.4
Northbound Thru-Right	A	8.4	A	8.4	A	8.4	A	8.4
<i>Northbound Approach</i>	A	9.4	B	11.0	B	10.7	B	13.3
Southbound Left-Thru	A	9.7	B	10.6	B	10.9	B	11.9
Southbound Thru-Right	A	8.4	A	8.5	A	8.5	A	8.6
<i>Southbound Approach</i>	A	9.2	B	10.1	A	9.3	B	10.5
<b>Kenwood Town Centre Drive from E Galbraith Road / Towne Centre Ring Road</b>								
Eastbound Left-Right	A	8.8	B	10.3	A	9.1	B	10.9
<i>Eastbound Approach</i>	A	8.8	B	10.3	A	9.1	B	10.9
Northbound Left	A	7.3	A	7.6	A	7.4	A	7.7
<i>Northbound Approach</i>	A	1.1	A	3.1	A	5.3	A	4.2
<b>Towne Centre Ring Road / Parking Garage Access / South Site Drive</b>								
Eastbound Left-Thru-Right	A	8.4	A	9.2	A	8.6	A	8.8
<i>Eastbound Approach</i>	A	8.4	A	9.2	A	8.6	A	8.8
Westbound Left-Thru-Right	A	8.7	A	9.2	A	9.1	B	9.9
<i>Westbound Approach</i>	A	8.7	A	9.2	A	9.1	B	9.9
Northbound Left	A	7.3	A	7.4				
<i>Northbound Approach</i>	A	1.0	A	0.0				
Southbound Left	A	7.3	A	7.4	A	7.4	A	7.5
<i>Southbound Approach</i>	A	1.1	A	1.0	A	1.0	A	0.0

Note: Orange highlighted cells indicate a Level of Service E.  
 Red highlighted cells indicate a Level of Service F  
 Gray shaded cells indicate a movement that does not exist in the analysis scenario.

Table 2: HCS Intersection Capacity Analysis Summary (Cont.) Opening Year 2020 'No-Build' vs. 'Build' Conditions – Unsignalized Intersections								
Intersection / Movement	'No-Build' Conditions				'Build' Conditions			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
<b>Towne Centre Ring Road / North Site Drive</b>								
Eastbound Left-Right	Intersection does not exist in the 'No-Build' condition				B	10.1	B	10.5
Eastbound Approach					B	10.1	B	10.5
Northbound Left					A	7.5	A	7.6
Northbound Approach					A	5.9	A	2.9

Note: Orange highlighted cells indicate a Level of Service E.  
 Red highlighted cells indicate a Level of Service F  
 Gray shaded cells indicate a movement that does not exist in the analysis scenario.

As shown in **Table 2** on the previous pages, the results for the internal unsignalized intersections indicate that they will be expected to provide acceptable Levels-of-Service under both the Opening Year 2020 'No-Build' and 'Build' traffic conditions during the AM and PM peak hours with all movements operating at LOS B or better. This indicates that these intersections and the internal ring road have sufficient capacity to accommodate the additional Chick-fil-A traffic, but they are generally overbuilt to handle the general traffic increases that occur during the holiday shopping period.

The analysis results from the external unsignalized intersections found that left turn movements from the stop-controlled side streets will be expected to operate at LOS E or F during the peak hours, which is typical along heavily traveled roadways such as Kenwood Road and E. Galbraith Road. It should be noted that this poor operation will continue to occur with or without the proposed Chick-fil-A, as no geometric improvements can be implemented to mitigate the deficiency when both side street approaches already provide two (2) outbound lanes to separate left-turning and right-turning vehicles leaving Kenwood Towne Centre. While drivers will have alternative means of egress at adjacent signalized intersections to the south and to the east, both intersections will be evaluated for traffic signal warrants to determine whether signalization should be considered at either location.

*Opening Year 2020 Traffic Signal Warrant Analysis*

Utilizing the Opening Year 2020 'No-Build' and 'Build' traffic volumes, as specified in Section 402-2 of the ODOT Traffic Engineering Manual (TEM), traffic signal warrant analyses were performed for the two (2) external unsignalized study intersections. The nine (9) traffic signal warrants provided in the 2012 Ohio Manual of Uniform Traffic Control Devices (OMUTCD) define the minimum conditions under which installing traffic control signals is justified. Due to the availability of only peak hour turning movement traffic count data, OMUTCD Warrant # 3 was deemed applicable for the Opening Year 2020 warrant analyses. The Peak Hour Vehicular Volume warrant (Warrant #3) is intended for application when traffic conditions are such that for one hour of the day, minor street traffic suffers undue delay in entering or crossing the major street. The Peak Hour Vehicular

Volume warrant is satisfied when the minimum required volumes on the major and highest volume minor approach are met for any one hour period (any for consecutive 15 – minute periods) on an average day.

**Table 3** summarizes the results the results of the traffic signal warrant analysis for the Opening Year 2020 ‘No-Build’ and ‘Build’ traffic conditions. See **Appendix E** for the Traffic Signal Warrant printouts.

Table 3: Traffic Signal Warrant Analysis Summary Opening Year 2020 ‘No-Build’ and ‘Build’ Conditions		
Intersection	‘No-Build’ Conditions	‘Build’ Conditions
Kenwood Road / Kenwood Towne Centre Drive / Mercy Health Drive	Satisfied	Satisfied
E. Galbraith Road / Kenwood Town Centre Drive / Sycamore Executive Center Drive	Not Satisfied	Not Satisfied

As shown in **Table 3** on the previous page, the E. Galbraith Road / Kenwood Town Centre Drive / Sycamore Executive Center Drive intersection does not warrant a traffic signal in the Opening Year 2020 ‘No-Build’ or ‘Build’ traffic conditions. However, the Kenwood Road / Kenwood Towne Centre Drive / Mercy Health Drive intersection was found to warrant a traffic signal under both the ‘No-Build’ and ‘Build’ traffic conditions, indicating that there is already a pre-existing need at this intersection even without the proposed Chick-fil-A. While meeting a traffic signal warrant does not require a traffic signal to be installed, it is a potential option that the County could consider to improve the existing Level-of-Service deficiencies.

*Design Year 2040 Capacity Analysis*

**Table 4** summarizes the results of the capacity analysis for signalized intersection within the study area using Design Year 2040 ‘No-Build’ and ‘Build’ traffic conditions for the signalized intersection E Galbraith Road / Kenwood Road. See **Appendix D** for the HCS Intersection Capacity Analysis printouts.

Table 4: HCS Intersection Capacity Analysis Summary Design Year 2040 'No-Build' vs. 'Build' Conditions – Signalized Intersections								
Intersection / Movement	'No-Build' Conditions				'Build' Conditions			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
<b>Kenwood Road / E. Galbraith Road Intersection</b>								
Eastbound Left	C	23.8	C	30.5	C	23.8	C	30.7
Eastbound Thru	D	40.4	D	44.7	D	40.4	D	45.1
Eastbound Right	C	24.5	C	27.2	C	24.5	C	27.2
<i>Eastbound Approach</i>	C	32.3	D	35.3	C	32.5	D	35.6
Westbound Left	C	24.5	C	26.5	C	24.6	C	26.6
Westbound Thru	D	36.4	D	46.2	D	36.5	D	46.4
Westbound Right	C	23.4	C	30.5	C	23.4	C	30.6
<i>Westbound Approach</i>	C	30.0	D	36.4	C	30.1	D	36.6
Northbound Left	E	72.9	F	102.3	E	78.1	F	106.8
Northbound Thru	D	37.7	E	59.9	D	38.1	E	61.3
Northbound Thru-Right	D	37.9	E	60.8	D	38.3	E	62.2
<i>Northbound Approach</i>	D	46.3	E	68.9	D	47.9	E	71.0
Southbound Left	F	278.7	F	313.9	F	288.0	F	321.5
Southbound Thru	F	77.0	E	71.6	F	79.1	E	73.5
Southbound Thru-Right	F	78.8	E	73.1	F	81.0	E	75.1
<i>Southbound Approach</i>	F	140.0	F	139.0	F	144.3	F	142.4
<b>Intersection Total</b>	<b>F</b>	<b>82.0</b>	<b>E</b>	<b>78.9</b>	<b>F</b>	<b>84.2</b>	<b>F</b>	<b>80.7</b>

Note: Orange highlighted cells indicate a Level of Service E.  
Red highlighted cells indicate a Level of Service F

As shown in **Table 4**, the Kenwood Road / E. Galbraith Road intersection will be expected to degrade to an overall unacceptable Level-of-Service by the Design Year 2040 during both the AM and PM peak period due to the anticipated background traffic growth (projected to be 3% per year). However, when comparing the 'No-Build' and 'Build' conditions, the results confirm that the Chick-fil-A traffic will not cause any LOS degradation and will generally have a limited impact on the vehicular delay at the intersection.

**Table 5** summarizes the HCS Intersection Capacity Analysis and details the Levels-of-Service and delay experienced under the Design Year 2040 'No-Build' vs. 'Build' traffic conditions for the unsignalized intersections within the study area. See **Appendix D** for the HCS analysis printouts.

Table 5: HCS Intersection Capacity Analysis Summary Design Year 2040 'No-Build' vs. 'Build' Conditions – Unsignalized Intersections								
Intersection / Movement	'No-Build' Conditions				'Build' Conditions			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
<b>Kenwood Road / Kenwood Towne Centre Drive / Mercy Health Drive</b>								
Eastbound Left-Thru-Right	F	153.8	F	1006.5	F	198.4	F	1335.7
Eastbound Approach	F	153.8	F	1006.5	F	198.4	F	1335.7
Westbound Left-Thru	F	243.3	F	1835.6	F	692.0	F	2881.5
Westbound Right	B	12.8	C	21.6	B	13.4	C	24.0
Westbound Approach	F	141.0	F	358.8	F	332.7	F	641.0
Northbound Left	B	13.2	B	13.6	B	13.0	B	13.5
Northbound Approach	A	0.7	A	0.4	A	0.6	A	0.4
Southbound Left	B	11.2	B	13.5	B	11.6	B	14.2
Southbound Approach	A	0.3	A	0.9	A	0.6	A	1.2
<b>E. Galbraith Road / Kenwood Town Centre Drive / Sycamore Executive Center Drive</b>								
Eastbound Left	A	8.9	A	9.9	A	8.9	A	9.9
Eastbound Approach	A	0.5	A	0.2	A	0.5	A	0.2
Westbound Left	B	10.3	B	10.2	B	10.5	B	10.4
Westbound Approach	A	0.2	A	0.1	A	0.4	A	0.3
Northbound Left-Thru	F	83.6	F	1182.7	F	115.5	F	1366.5
Northbound Right	C	16.7	C	18.1	C	17.6	C	19.0
Northbound Approach	F	75.9	F	835.1	F	76.4	F	917.3
Southbound Left-Thru	F	61.3	F	148.8	F	69.8	F	176.1
Southbound Right	B	11.8	C	17.2	B	11.7	C	17.1
Southbound Approach	E	46.4	F	57.4	F	52.4	F	65.6

Note: Orange highlighted cells indicate a Level of Service E.  
 Red highlighted cells indicate a Level of Service F  
 Gray shaded cells indicate a movement that does not exist in the analysis scenario.



Table 5: HCS Intersection Capacity Analysis Summary (Cont.) Design Year 2040 'No-Build' vs. 'Build' Conditions – Unsignalized Intersections								
Intersection / Movement	'No-Build' Conditions				'Build' Conditions			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
<b>Kenwood Towne Centre Drive from Kenwood Road / Towne Centre Ring Road</b>								
Eastbound Left	A	7.3	A	7.3	A	7.4	A	7.4
Eastbound Approach	A	4.7	A	1.9	A	5.9	A	3.3
Westbound Left	A	7.3	A	7.5	A	7.3	A	7.5
Westbound Approach	A	2.1	A	1.9	A	2.1	A	1.9
Northbound Left-Thru	B	10.0	B	14.4	B	11.7	C	20.2
Northbound Thru-Right	A	8.4	A	8.4	A	8.4	A	8.4
Northbound Approach	A	9.9	B	14.2	B	11.4	C	19.8
Southbound Left-Thru	B	10.3	B	12.2	B	11.6	B	14.1
Southbound Thru-Right	A	8.4	A	8.6	A	8.6	A	8.7
Southbound Approach	A	9.6	B	11.3	A	9.7	B	12.1
<b>Kenwood Town Centre Drive from E Galbraith Road / Towne Centre Ring Road</b>								
Eastbound Left-Right	A	9.0	B	12.4	A	9.4	B	13.5
Eastbound Approach	A	9.0	B	12.4	A	9.4	B	13.5
Northbound Left	A	7.3	A	7.8	A	7.4	A	7.9
Northbound Approach	A	1.1	A	3.3	A	4.7	A	4.1
<b>Towne Centre Ring Road / Parking Garage Access / South Site Drive</b>								
Eastbound Left-Thru-Right	A	8.5	A	9.7	A	8.7	A	8.9
Eastbound Approach	A	8.5	A	9.7	A	8.7	A	8.9
Westbound Left-Thru-Right	A	8.8	A	9.8	A	9.3	B	10.5
Westbound Approach	A	8.8	A	9.8	A	9.3	B	10.5
Northbound Left	A	7.3	A	7.5				
Northbound Approach	A	1.1	A	0.0				
Southbound Left	A	7.3	A	7.5	A	7.5	A	7.6
Southbound Approach	A	0.7	A	0.0	A	0.7	A	0.0
<b>Towne Centre Ring Road / North Site Drive</b>								
Eastbound Left-Right	Intersection does not exist in the 'No-Build' condition				B	10.3	B	11.1
Eastbound Approach					B	10.3	B	11.1
Northbound Left					A	7.6	A	7.7
Northbound Approach					A	5.3	A	2.2

Note: Orange highlighted cells indicate a Level of Service E.  
 Red highlighted cells indicate a Level of Service F  
 Gray shaded cells indicate a movement that does not exist in the analysis scenario.

As shown in **Table 5** on the previous pages, the results for the internal unsignalized intersections indicate that they will continue to provide acceptable Levels-of-Service under both the Design Year 2040 'No-Build' and 'Build' traffic conditions during the AM and PM peak hours with all movements operating at LOS C or better. This once again indicates that these intersections and the internal ring road have sufficient capacity to accommodate the additional Chick-fil-A traffic as well as other general traffic increases that occur during the holiday shopping period.

The analysis results from the external unsignalized intersections found that left turn movements from the stop-controlled side streets will experience further increases in delay as volumes continue to grow along Kenwood Road and E. Galbraith Road. Similar to the Opening Year 2020 results, this poor operation will continue to occur with or without the proposed Chick-fil-A. In the long term, both intersections will likely need to be signalized or have outbound left turn movements restricted should the traffic volumes reach the projected levels.

## **VII. Summary and Recommendations:**

This Traffic Impact Study is being prepared at the request of the Hamilton County Engineer's Office in association with the proposed construction of a Chick-fil-A restaurant to be located at the Kenwood Towne Centre in Hamilton County, Ohio. The purpose of this particular Traffic Impact Study is to analyze the vehicular operating conditions of the roadways in the vicinity of the proposed development; both before and after its construction to determine what, if any, impact the proposed Chick-fil-A will have on the surrounding roadway network.

In Summary,

1. The proposed development will be a Chick-fil-A restaurant consisting of a total of 4,975 square feet (SF) of gross floor area. The proposed restaurant will utilize two (2) driveways that access the Towne Centre Ring Road. The South Site Drive will only allow right turns out of the property, while the North Site Drive will allow full access movement in and out of the property. Note that no direct access to either Kenwood Road or E. Galbraith Road will be provided.
2. The proposed Chick-fil-a is expected to generate 200 trips ends during the AM peak hour (102 entering and 98 exiting) and 163 trip ends during the PM peak hour (85 entering and 78 exiting). Approximately half of these trips will comprise of pass-by traffic which represents vehicles already traveling by the site on the adjacent roadways.
3. The capacity analysis found that all movements and approaches at the signalized intersection of Kenwood Road and E. Galbraith Road to be operating at acceptable Levels-of-Service under both the Opening Year 2020 'No-Build' and 'Build' traffic conditions. Due to the projected background traffic growth, the intersection is expected to experience some Level-of-Service deficiencies under the Design Year 2040 conditions, but the analysis confirmed that the Chick-fil-A traffic will not cause any degradation under either scenario.
4. The capacity analysis found that all internal unsignalized intersections located along the Kenwood Towne Centre Ring Road will operate at LOS C or better under both the Opening Year 2020 and Design Year 2040 'No-Build' and 'Build' conditions. These findings confirm that the internal intersections have sufficient capacity to accommodate the additional Chick-fil-A traffic and will continue to have excess capacity to better handle the seasonal traffic increases associated with holiday shopping periods.
5. The capacity analysis found that the unsignalized stop-controlled side streets located along Kenwood Road and E. Galbraith Road would be expected to continue operating at LOS E or F during the peak hours, which is typical along heavily traveled roadways. This poor operation will continue to occur with or without the proposed Chick-fil-A, as no geometric improvements can be implemented to mitigate the deficiency when both side street approaches already provide two (2) outbound lanes to separate left-turning and right-turning vehicles leaving Kenwood Towne Centre.

6. A traffic signal warrant analysis found that a traffic signal is currently warranted at the Kenwood Road / Kenwood Towne Centre Drive / Mercy Health Drive intersection based on the Opening Year 2020 'No-Build' conditions. While a traffic signal was not found to be warranted at the E. Galbraith Road / Kenwood Town Centre Drive / Sycamore Executive Center Drive under the Opening Year 2020 conditions, it likely will meet warrants at some point in the future based on the growth projections of this area.

Based on the information and analyses in this study, GPD Group recommends the following:

1. The proposed development should be constructed as planned utilizing the two (2) proposed driveways located along the Kenwood Towne Centre Ring Road as currently shown on the preliminary site plan.
2. Hamilton County should monitor traffic conditions at both the Kenwood Road / Kenwood Towne Centre Drive / Mercy Health Drive and E. Galbraith Road / Kenwood Town Centre Drive / Sycamore Executive Center Drive intersection to determine whether signalization or left turn restrictions should be implemented should traffic volumes continue to grow in this area.

## **FIGURES**

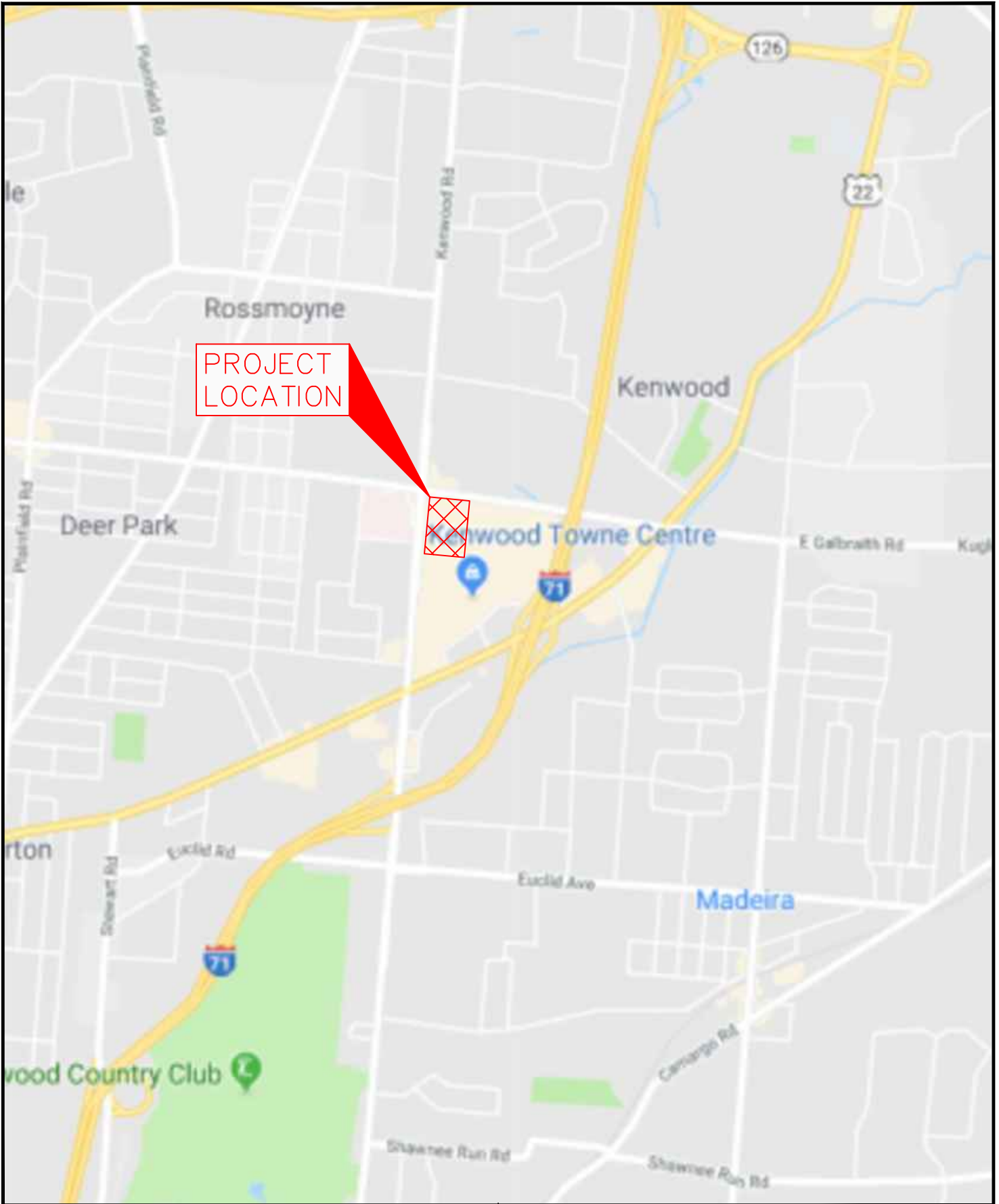
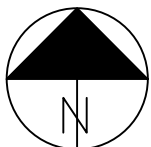


FIGURE 1

PROJECT LOCATION MAP

JULY 2019



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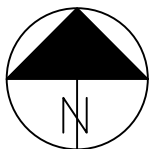


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PROJECT  
LOCATION

CAD FILE: G:\2019\201923\16\_KENWOOD\_OH (SITE)\TRAFFIC\FIGURES\FIGURE 2.DWG  
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FIGURE 2

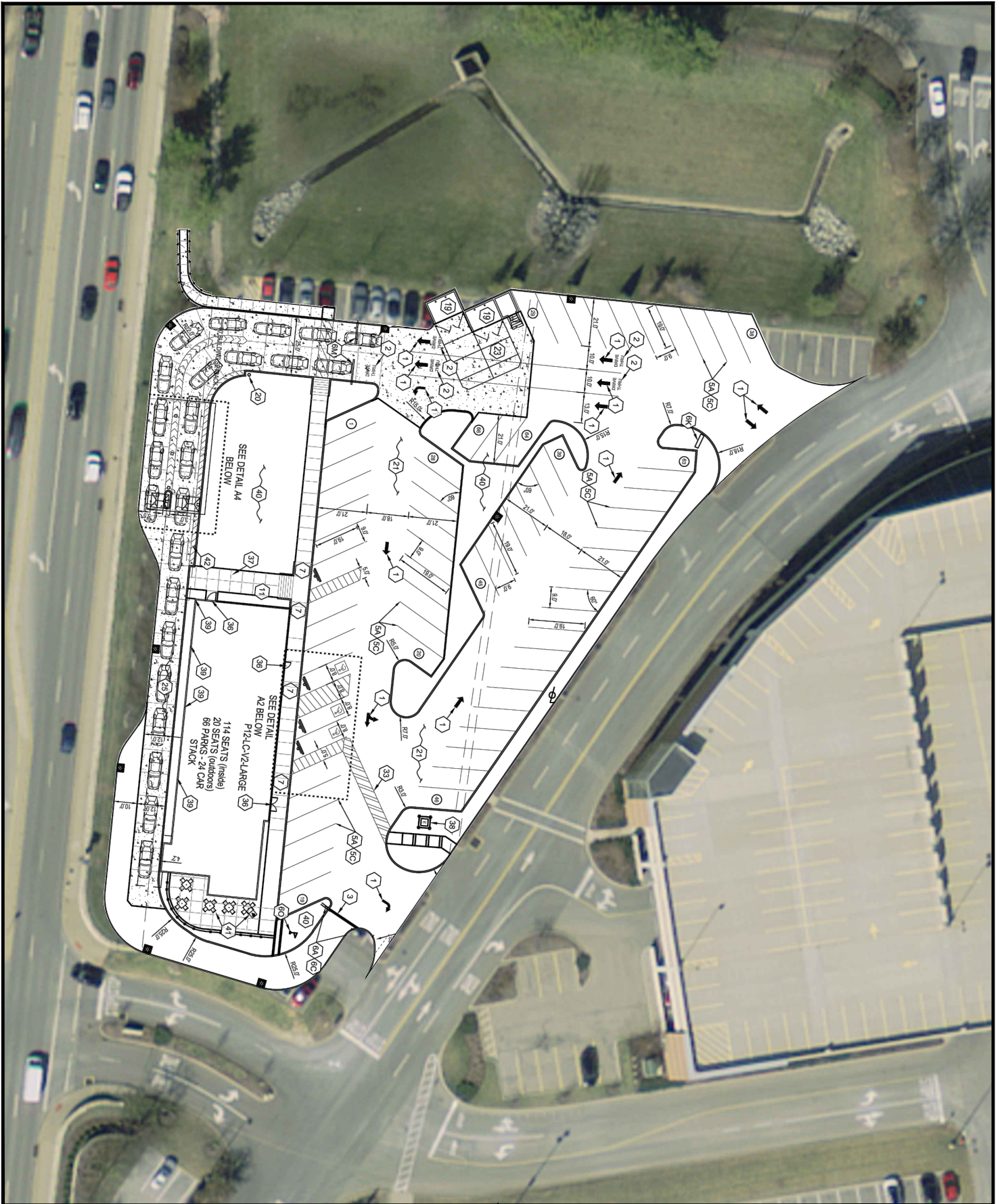
AERIAL PHOTOGRAPH

JULY 2019

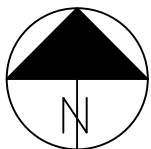


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TECHNICIAN: B BOWEN



CAD FILE: G:\2019\2019223\16\_KENWOOD\_OH (SITE)\TRAFFIC\FIGURES\FIGURE 3.DWG  
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FIGURE 3

PRELIMINARY SITE PLAN

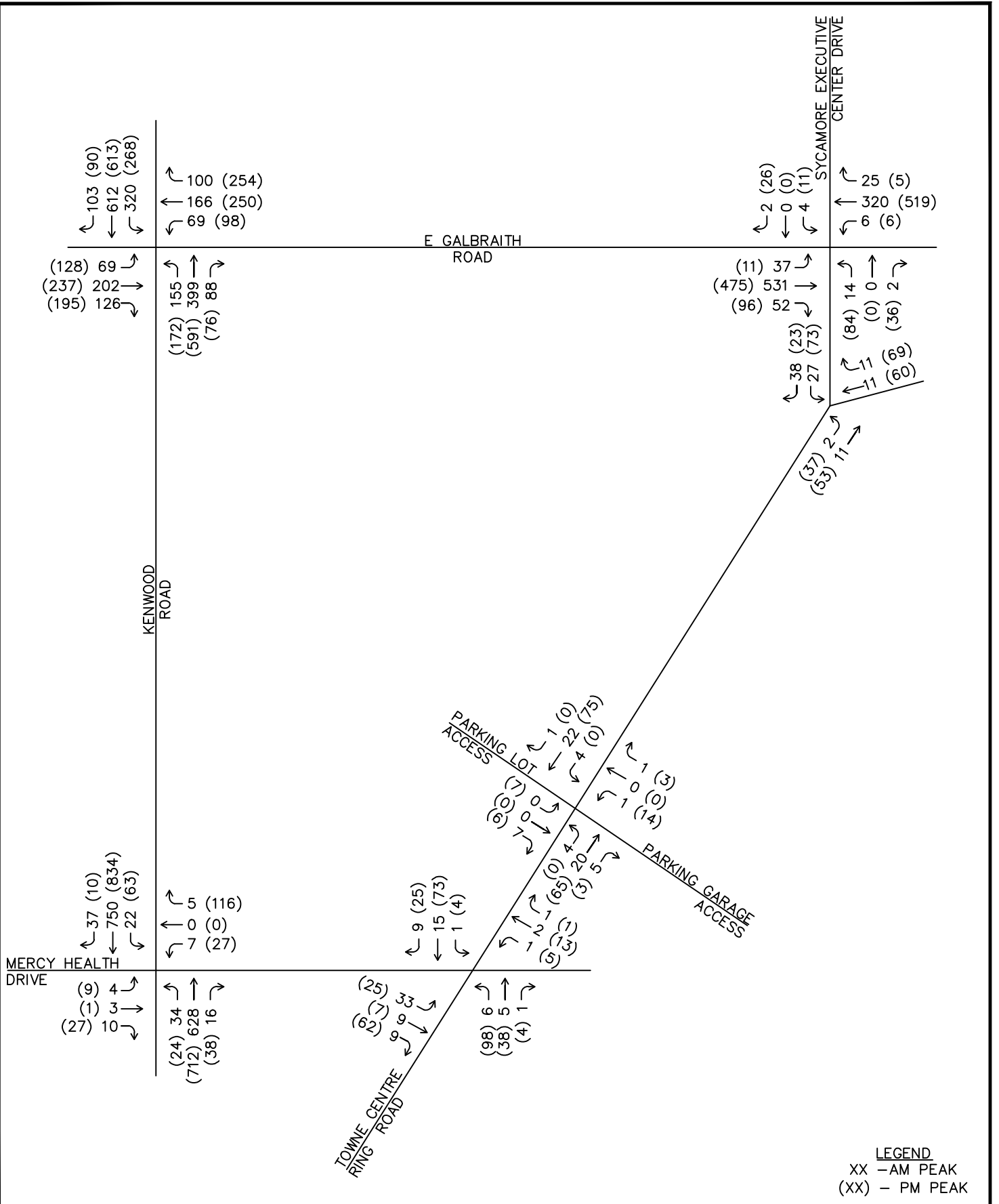
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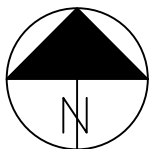
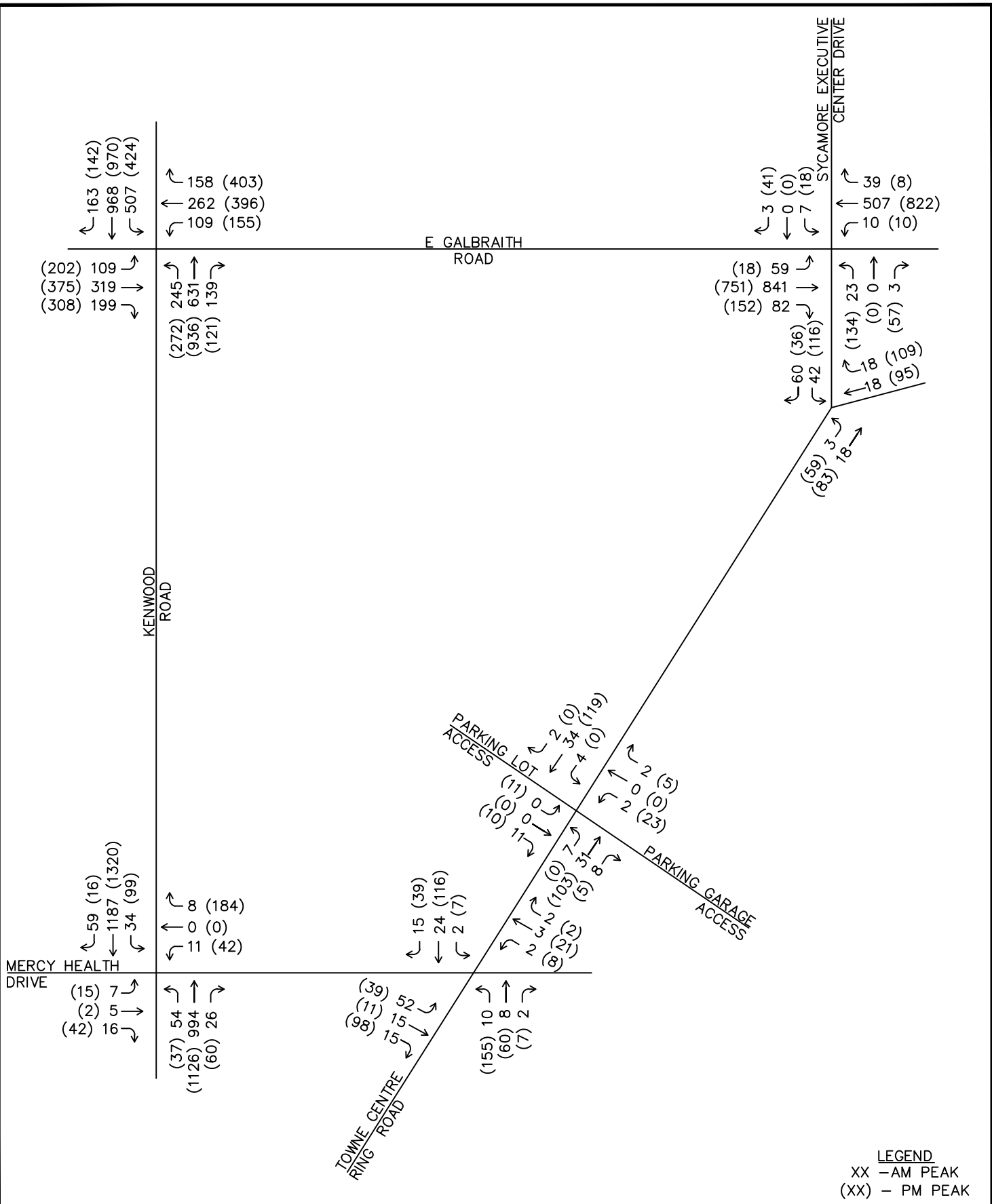
FIGURE 4  
 OPENING YEAR 2020  
 'NO-BUILD'  
 PEAK HOUR TRAFFIC VOLUMES  
 JULY 2019



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FIGURE 5  
 DESIGN YEAR 2040  
 'NO-BUILD'  
 PEAK HOUR TRAFFIC VOLUMES

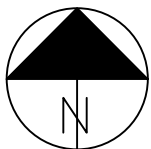
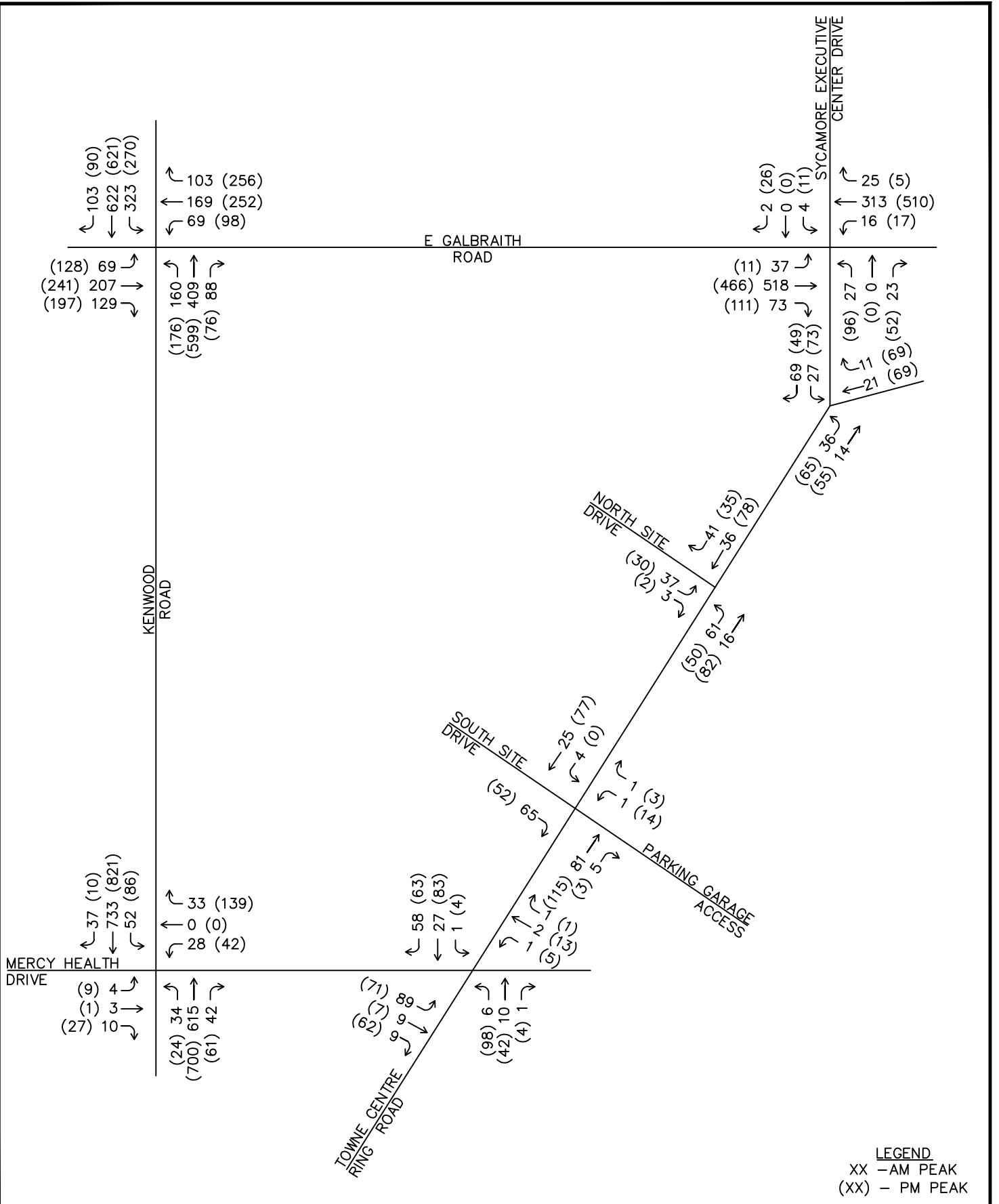
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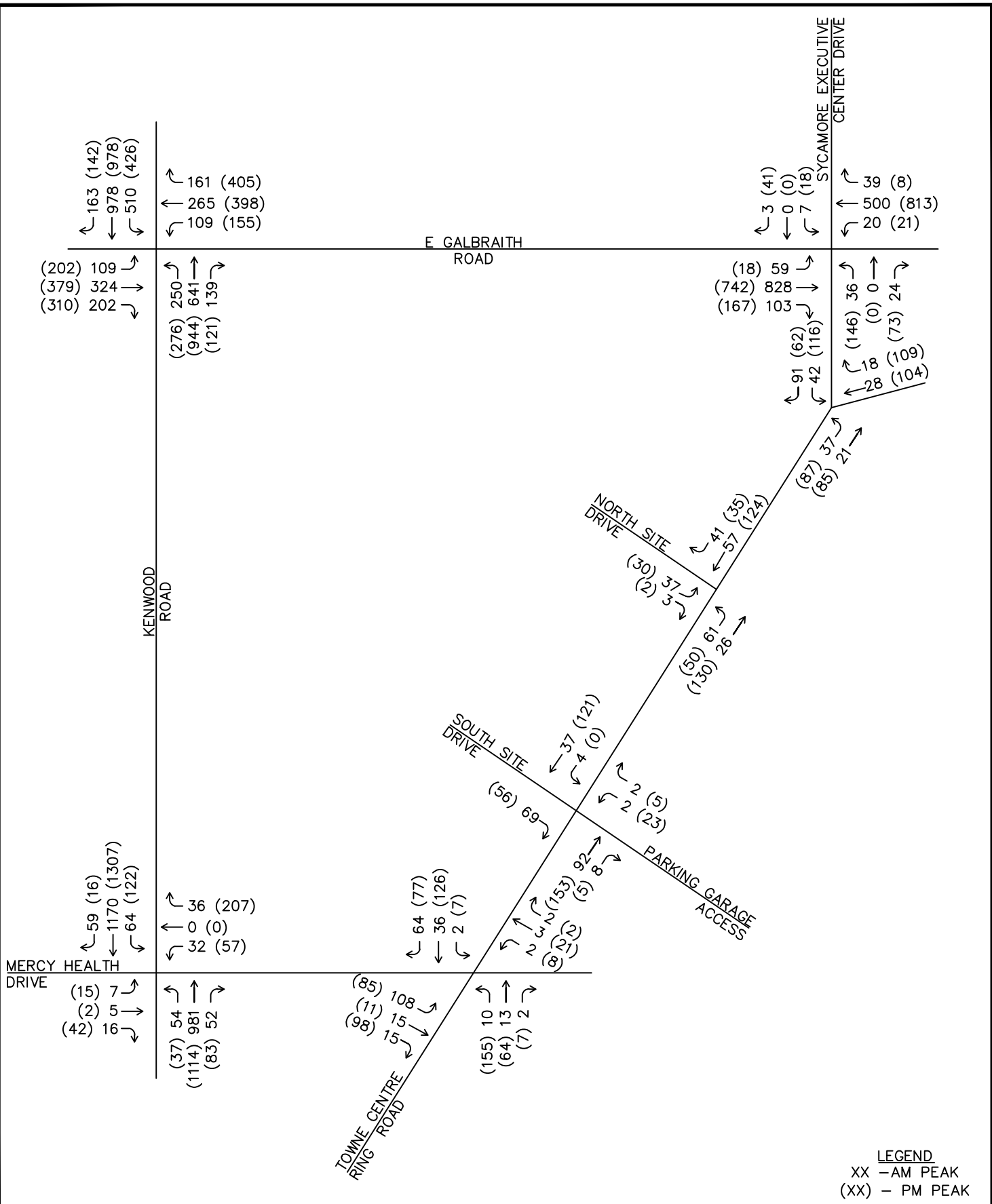


FIGURE 7  
 DESIGN YEAR 2040  
 'BUILD'  
 PEAK HOUR TRAFFIC VOLUMES  
 JULY 2019



TECHNICIAN: B BOWEN

**APPENDIX A**  
**TURNING MOVEMENT COUNTS**



**Cummins Consulting Services, PLLC**  
 2216 Young Drive, Suite 1 Lexington, Kentucky 40505  
 Office: (859) 785-1500 www.ccsdata.com  
**"15 Years ... and still Counting"**

60 Degrees - Partly Cloudy  
 Schools in Session

File Name : Golbraith\_Road\_at\_Entrance\_2\_633012\_03-20-2019  
 Site Code : Site 3 - Wednesday  
 Start Date : 3/20/2019  
 Page No : 1

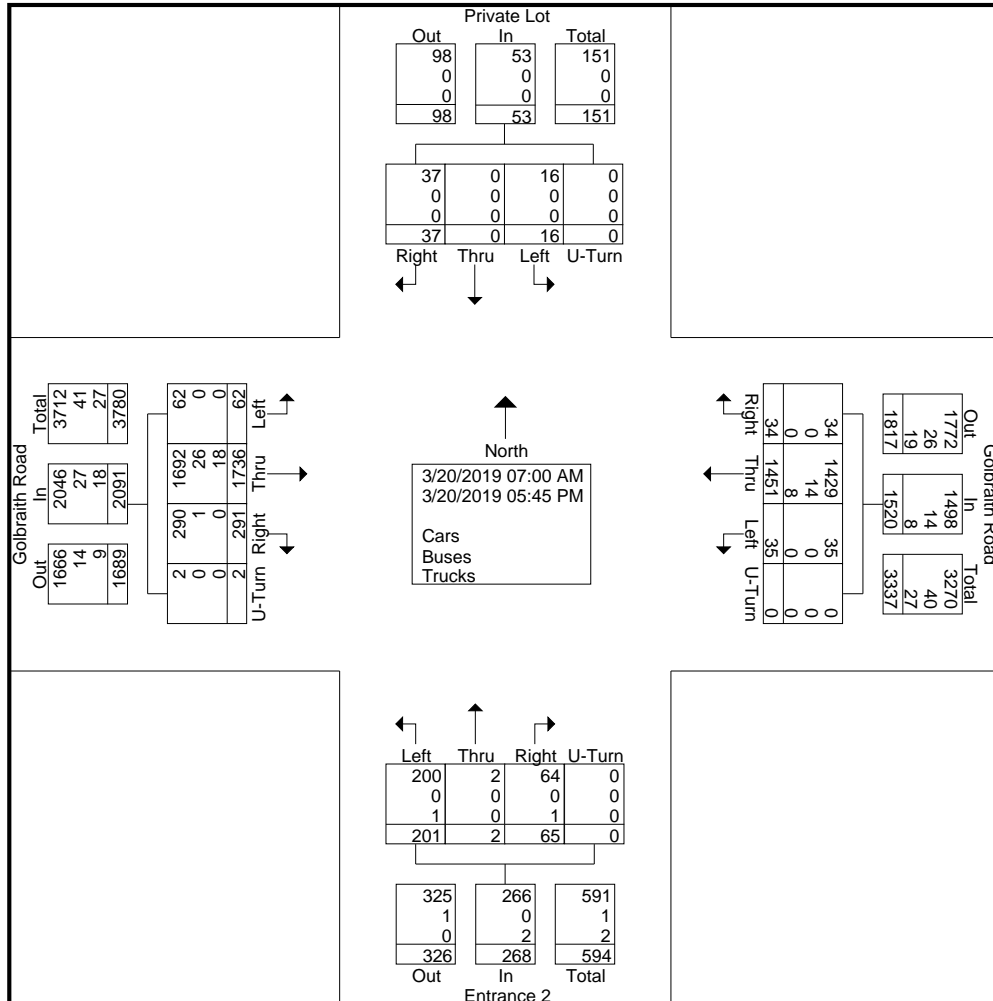
Groups Printed- Cars - Buses - Trucks

Start Time	Private Lot From North					Golbraith Road From East					Entrance 2 From South					Golbraith Road From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
07:00 AM	0	0	0	0	0	1	52	5	0	58	0	0	6	0	6	12	58	4	0	74	138
07:15 AM	0	0	0	0	0	2	49	3	0	54	1	0	2	0	3	17	90	0	0	107	164
07:30 AM	0	0	0	0	0	0	78	5	0	83	0	0	3	0	3	9	109	6	0	124	210
07:45 AM	0	0	0	0	0	5	87	2	0	94	0	0	4	0	4	22	131	11	0	164	262
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>266</b>	<b>15</b>	<b>0</b>	<b>289</b>	<b>1</b>	<b>0</b>	<b>15</b>	<b>0</b>	<b>16</b>	<b>60</b>	<b>388</b>	<b>21</b>	<b>0</b>	<b>469</b>	<b>774</b>
08:00 AM	1	0	1	0	2	4	80	2	0	86	1	0	3	0	4	12	142	8	0	162	254
08:15 AM	0	0	2	0	2	8	66	2	0	76	1	0	3	0	4	12	125	8	0	145	227
08:30 AM	1	0	1	0	2	7	78	0	0	85	0	0	4	0	4	4	118	9	0	131	222
08:45 AM	1	0	0	0	1	2	66	1	0	69	2	0	2	0	4	13	107	4	1	125	199
<b>Total</b>	<b>3</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>7</b>	<b>21</b>	<b>290</b>	<b>5</b>	<b>0</b>	<b>316</b>	<b>4</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>16</b>	<b>41</b>	<b>492</b>	<b>29</b>	<b>1</b>	<b>563</b>	<b>902</b>
04:00 PM	2	0	0	0	2	0	123	2	0	125	9	1	29	0	39	20	96	0	0	116	282
04:15 PM	4	0	1	0	5	0	87	2	0	89	7	0	22	0	29	22	96	1	0	119	242
04:30 PM	5	0	2	0	7	0	122	1	0	123	13	0	25	0	38	20	113	2	1	136	304
04:45 PM	6	0	3	0	9	4	113	1	0	118	8	0	26	0	34	25	106	3	0	134	295
<b>Total</b>	<b>17</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>23</b>	<b>4</b>	<b>445</b>	<b>6</b>	<b>0</b>	<b>455</b>	<b>37</b>	<b>1</b>	<b>102</b>	<b>0</b>	<b>140</b>	<b>87</b>	<b>411</b>	<b>6</b>	<b>1</b>	<b>505</b>	<b>1123</b>
05:00 PM	10	0	5	0	15	1	163	1	0	165	8	1	12	0	21	24	128	2	0	154	355
05:15 PM	4	0	1	0	5	0	106	3	0	109	6	0	19	0	25	24	114	4	0	142	281
05:30 PM	2	0	0	0	2	0	97	1	0	98	4	0	30	0	34	25	112	0	0	137	271
05:45 PM	1	0	0	0	1	0	84	4	0	88	5	0	11	0	16	30	91	0	0	121	226
<b>Total</b>	<b>17</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>23</b>	<b>1</b>	<b>450</b>	<b>9</b>	<b>0</b>	<b>460</b>	<b>23</b>	<b>1</b>	<b>72</b>	<b>0</b>	<b>96</b>	<b>103</b>	<b>445</b>	<b>6</b>	<b>0</b>	<b>554</b>	<b>1133</b>
<b>Grand Total</b>	<b>37</b>	<b>0</b>	<b>16</b>	<b>0</b>	<b>53</b>	<b>34</b>	<b>1451</b>	<b>35</b>	<b>0</b>	<b>1520</b>	<b>65</b>	<b>2</b>	<b>201</b>	<b>0</b>	<b>268</b>	<b>291</b>	<b>1736</b>	<b>62</b>	<b>2</b>	<b>2091</b>	<b>3932</b>
Apprch %	69.8	0	30.2	0		2.2	95.5	2.3	0		24.3	0.7	75	0		13.9	83	3	0.1		
Total %	0.9	0	0.4	0	1.3	0.9	36.9	0.9	0	38.7	1.7	0.1	5.1	0	6.8	7.4	44.2	1.6	0.1	53.2	
Cars	37	0	16	0	53	34	1429	35	0	1498	64	2	200	0	266	290	1692	62	2	2046	3863
% Cars	100	0	100	0	100	100	98.5	100	0	98.6	98.5	100	99.5	0	99.3	99.7	97.5	100	100	97.8	98.2
Buses	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	1	26	0	0	27	41
% Buses	0	0	0	0	0	0	1	0	0	0.9	0	0	0	0	0	0.3	1.5	0	0	1.3	1
Trucks	0	0	0	0	0	0	8	0	0	8	1	0	1	0	2	0	18	0	0	18	28
% Trucks	0	0	0	0	0	0	0.6	0	0	0.5	1.5	0	0.5	0	0.7	0	1	0	0	0.9	0.7



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File Name : Golbraith\_Road\_at\_Entrance\_2\_633012\_03-20-2019  
 Site Code : Site 3 - Wednesday  
 Start Date : 3/20/2019  
 Page No : 2

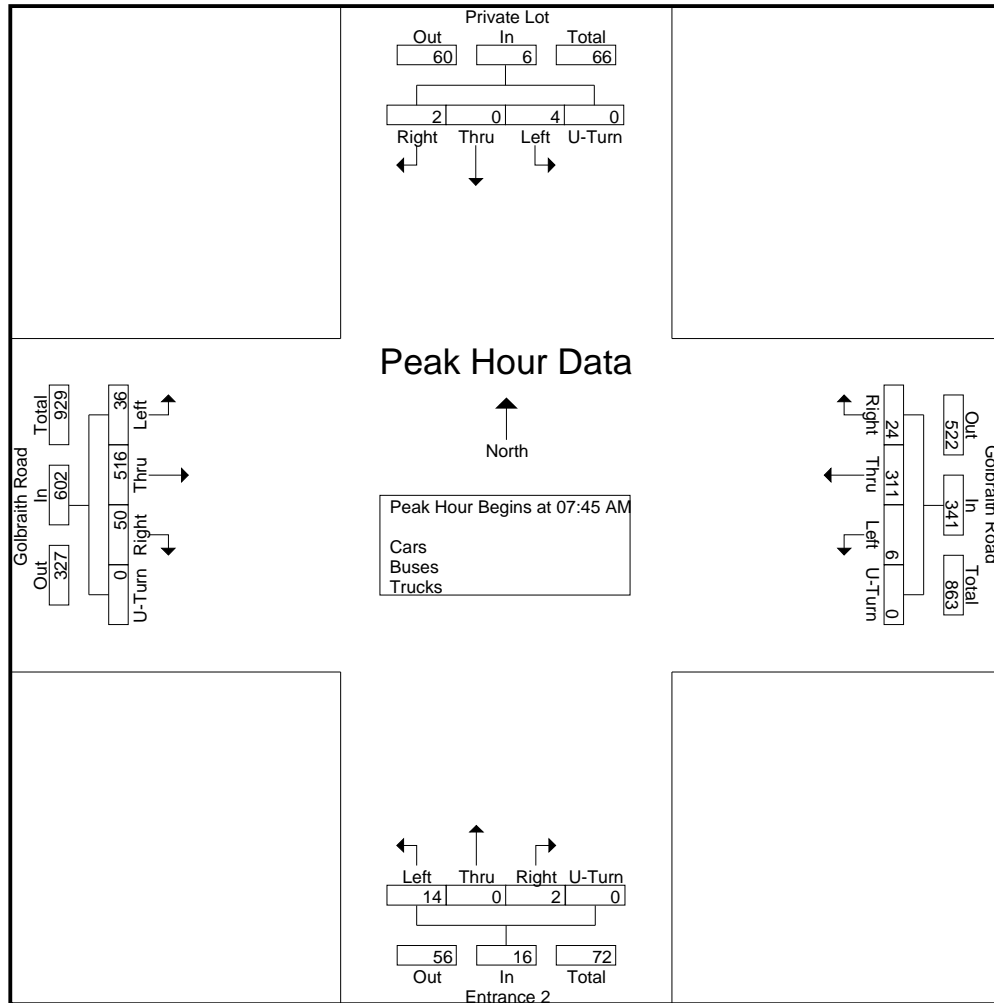




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File Name : Golbraith\_Road\_at\_Entrance\_2\_633012\_03-20-2019  
 Site Code : Site 3 - Wednesday  
 Start Date : 3/20/2019  
 Page No : 3

Start Time	Private Lot From North				Golbraith Road From East				Entrance 2 From South				Golbraith Road From West					Int. Total			
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total						
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	0	0	0	5	87	2	0	94	0	0	4	0	4	22	131	11	0	164	262
08:00 AM	1	0	1	0	2	4	80	2	0	86	1	0	3	0	4	12	142	8	0	162	254
08:15 AM	0	0	2	0	2	8	66	2	0	76	1	0	3	0	4	12	125	8	0	145	227
08:30 AM	1	0	1	0	2	7	78	0	0	85	0	0	4	0	4	4	118	9	0	131	222
Total Volume	2	0	4	0	6	24	311	6	0	341	2	0	14	0	16	50	516	36	0	602	965
% App. Total	33.3	0	66.7	0		7	91.2	1.8	0		12.5	0	87.5	0		8.3	85.7	6	0		
PHF	.500	.000	.500	.000	.750	.750	.894	.750	.000	.907	.500	.000	.875	.000	1.00	.568	.908	.818	.000	.918	.921







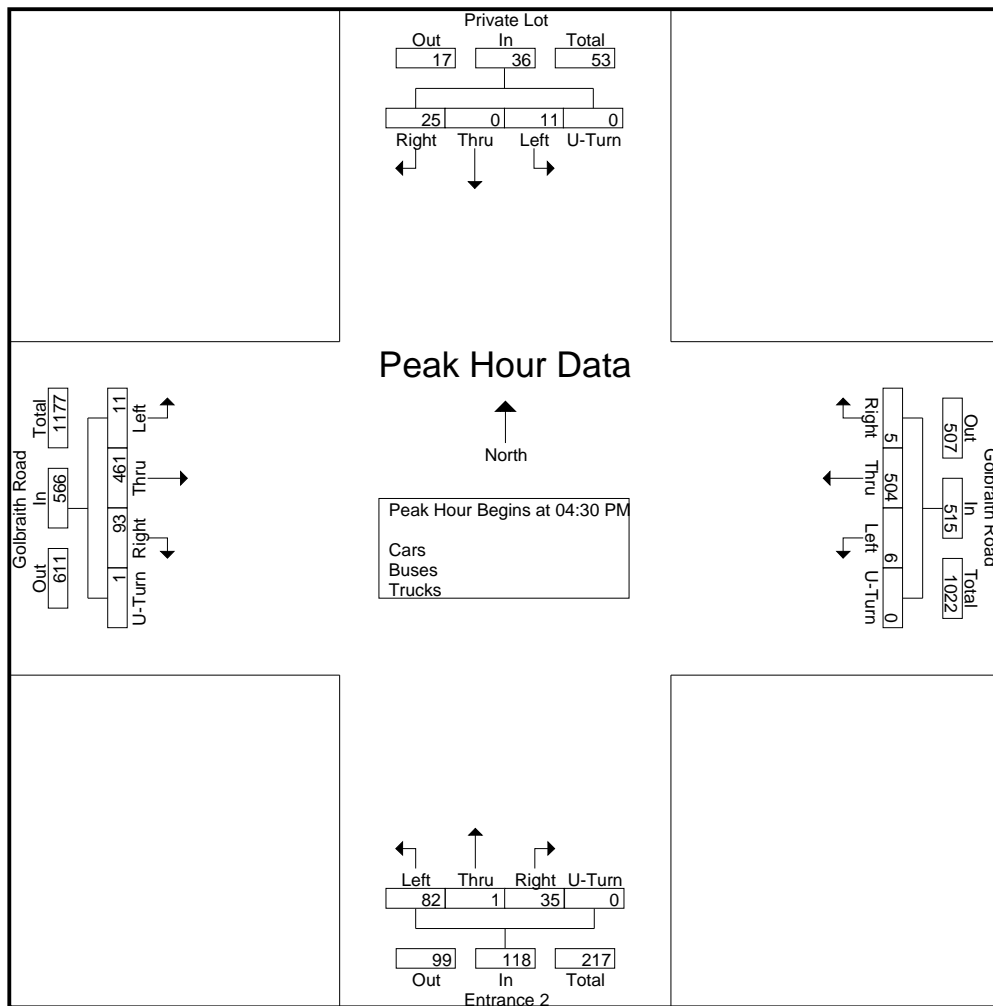
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File Name : Golbraith\_Road\_at\_Entrance\_2\_633012\_03-20-2019  
 Site Code : Site 3 - Wednesday  
 Start Date : 3/20/2019  
 Page No : 4

Start Time	Private Lot From North					Golbraith Road From East					Entrance 2 From South					Golbraith Road From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
04:30 PM	5	0	2	0	7	0	122	1	0	123	13	0	25	0	38	20	113	2	1	136	304
04:45 PM	6	0	3	0	9	4	113	1	0	118	8	0	26	0	34	25	106	3	0	134	295
05:00 PM	10	0	5	0	15	1	163	1	0	165	8	1	12	0	21	24	128	2	0	154	355
05:15 PM	4	0	1	0	5	0	106	3	0	109	6	0	19	0	25	24	114	4	0	142	281
Total Volume	25	0	11	0	36	5	504	6	0	515	35	1	82	0	118	93	461	11	1	566	1235
% App. Total	69.4	0	30.6	0		1	97.9	1.2	0		29.7	0.8	69.5	0		16.4	81.4	1.9	0.2		
PHF	.625	.000	.550	.000	.600	.313	.773	.500	.000	.780	.673	.250	.788	.000	.776	.930	.900	.688	.250	.919	.870

Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1  
 Peak Hour for Entire Intersection Begins at 04:30 PM





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60 Degrees - Partly Cloudy  
 Schools in Session

File Name : Kenwood\_Road\_at\_Entrance\_1\_633008\_03-20-2019  
 Site Code : Site 1 - Wednesday  
 Start Date : 3/20/2019  
 Page No : 1

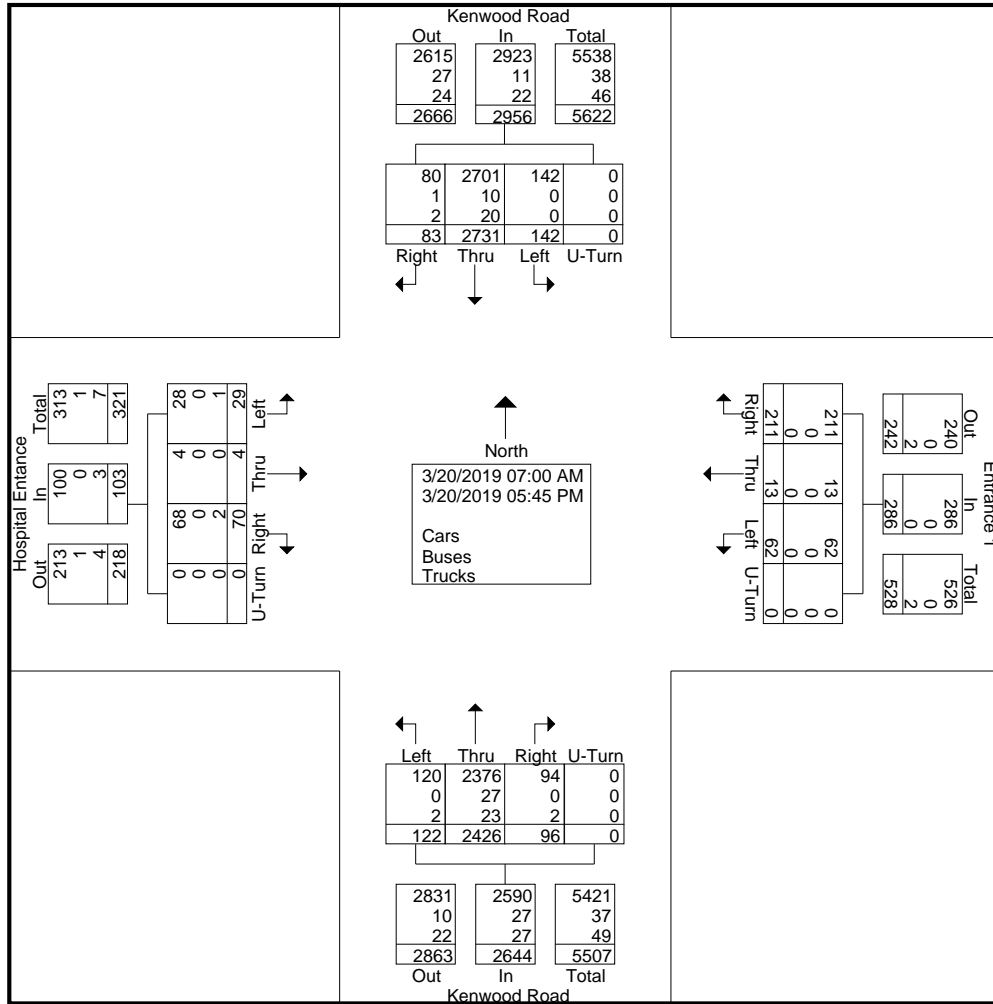
Groups Printed- Cars - Buses - Trucks

Start Time	Kenwood Road From North					Entrance 1 From East					Kenwood Road From South					Hospital Entrance From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
07:00 AM	5	88	2	0	95	1	4	2	0	7	10	88	13	0	111	1	0	3	0	4	217
07:15 AM	7	134	2	0	143	0	0	3	0	3	9	128	8	0	145	2	0	0	0	2	293
07:30 AM	10	184	2	0	196	0	3	0	0	3	2	126	9	0	137	2	2	2	0	6	342
07:45 AM	11	207	6	0	224	2	1	0	0	3	8	171	11	0	190	2	0	2	0	4	421
<b>Total</b>	<b>33</b>	<b>613</b>	<b>12</b>	<b>0</b>	<b>658</b>	<b>3</b>	<b>8</b>	<b>5</b>	<b>0</b>	<b>16</b>	<b>29</b>	<b>513</b>	<b>41</b>	<b>0</b>	<b>583</b>	<b>7</b>	<b>2</b>	<b>7</b>	<b>0</b>	<b>16</b>	<b>1273</b>
08:00 AM	6	188	7	0	201	2	1	0	0	3	2	169	7	0	178	4	1	0	0	5	387
08:15 AM	9	149	6	0	164	1	2	0	0	3	4	144	6	0	154	2	0	0	0	2	323
08:30 AM	5	122	2	0	129	2	0	0	0	2	2	153	8	0	163	4	0	2	0	6	300
08:45 AM	8	152	2	0	162	2	0	1	0	3	7	121	15	0	143	3	0	0	0	3	311
<b>Total</b>	<b>28</b>	<b>611</b>	<b>17</b>	<b>0</b>	<b>656</b>	<b>7</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>11</b>	<b>15</b>	<b>587</b>	<b>36</b>	<b>0</b>	<b>638</b>	<b>13</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>16</b>	<b>1321</b>
04:00 PM	4	148	4	0	156	26	1	12	0	39	4	157	8	0	169	8	0	2	0	10	374
04:15 PM	5	179	18	0	202	18	0	9	0	27	1	149	7	0	157	5	0	3	0	8	394
04:30 PM	1	182	15	0	198	17	1	2	0	20	4	157	2	0	163	8	0	3	0	11	392
04:45 PM	0	189	15	0	204	23	0	5	0	28	8	200	9	0	217	4	0	3	0	7	456
<b>Total</b>	<b>10</b>	<b>698</b>	<b>52</b>	<b>0</b>	<b>760</b>	<b>84</b>	<b>2</b>	<b>28</b>	<b>0</b>	<b>114</b>	<b>17</b>	<b>663</b>	<b>26</b>	<b>0</b>	<b>706</b>	<b>25</b>	<b>0</b>	<b>11</b>	<b>0</b>	<b>36</b>	<b>1616</b>
05:00 PM	4	207	17	0	228	32	0	6	0	38	14	155	3	0	172	12	0	4	0	16	454
05:15 PM	1	200	18	0	219	31	0	8	0	39	9	165	6	0	180	5	0	1	0	6	444
05:30 PM	5	214	11	0	230	27	0	7	0	34	6	171	5	0	182	5	1	1	0	7	453
05:45 PM	2	188	15	0	205	27	0	7	0	34	6	172	5	0	183	3	0	3	0	6	428
<b>Total</b>	<b>12</b>	<b>809</b>	<b>61</b>	<b>0</b>	<b>882</b>	<b>117</b>	<b>0</b>	<b>28</b>	<b>0</b>	<b>145</b>	<b>35</b>	<b>663</b>	<b>19</b>	<b>0</b>	<b>717</b>	<b>25</b>	<b>1</b>	<b>9</b>	<b>0</b>	<b>35</b>	<b>1779</b>
<b>Grand Total</b>	<b>83</b>	<b>2731</b>	<b>142</b>	<b>0</b>	<b>2956</b>	<b>211</b>	<b>13</b>	<b>62</b>	<b>0</b>	<b>286</b>	<b>96</b>	<b>2426</b>	<b>122</b>	<b>0</b>	<b>2644</b>	<b>70</b>	<b>4</b>	<b>29</b>	<b>0</b>	<b>103</b>	<b>5989</b>
Apprch %	2.8	92.4	4.8	0		73.8	4.5	21.7	0		3.6	91.8	4.6	0		68	3.9	28.2	0		
Total %	1.4	45.6	2.4	0	49.4	3.5	0.2	1	0	4.8	1.6	40.5	2	0	44.1	1.2	0.1	0.5	0	1.7	
Cars	80	2701	142	0	2923	211	13	62	0	286	94	2376	120	0	2590	68	4	28	0	100	5899
% Cars	96.4	98.9	100	0	98.9	100	100	100	0	100	97.9	97.9	98.4	0	98	97.1	100	96.6	0	97.1	98.5
Buses	1	10	0	0	11	0	0	0	0	0	0	27	0	0	27	0	0	0	0	0	38
% Buses	1.2	0.4	0	0	0.4	0	0	0	0	0	0	1.1	0	0	1	0	0	0	0	0	0.6
Trucks	2	20	0	0	22	0	0	0	0	0	2	23	2	0	27	2	0	1	0	3	52
% Trucks	2.4	0.7	0	0	0.7	0	0	0	0	0	2.1	0.9	1.6	0	1	2.9	0	3.4	0	2.9	0.9



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 Start Date : 3/20/2019  
 Page No : 2

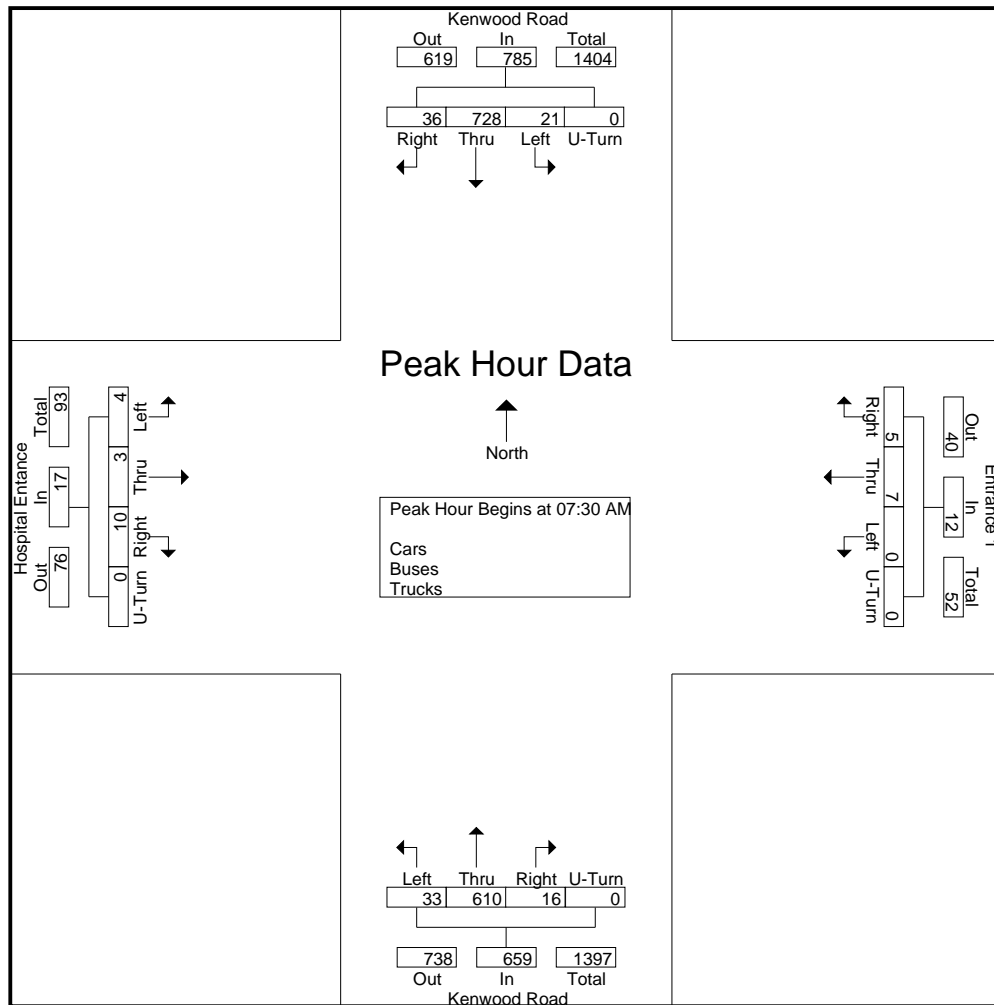




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 Page No : 3

Start Time	Kenwood Road From North				Entrance 1 From East				Kenwood Road From South				Hospital Entance From West				Int. Total				
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right		Thru	Left	U-Turn	App. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	10	184	2	0	196	0	3	0	0	3	2	126	9	0	137	2	2	2	0	6	342
07:45 AM	11	207	6	0	224	2	1	0	0	3	8	171	11	0	190	2	0	2	0	4	421
08:00 AM	6	188	7	0	201	2	1	0	0	3	2	169	7	0	178	4	1	0	0	5	387
08:15 AM	9	149	6	0	164	1	2	0	0	3	4	144	6	0	154	2	0	0	0	2	323
Total Volume	36	728	21	0	785	5	7	0	0	12	16	610	33	0	659	10	3	4	0	17	1473
% App. Total	4.6	92.7	2.7	0		41.7	58.3	0	0		2.4	92.6	5	0		58.8	17.6	23.5	0		
PHF	.818	.879	.750	.000	.876	.625	.583	.000	.000	1.00	.500	.892	.750	.000	.867	.625	.375	.500	.000	.708	.875





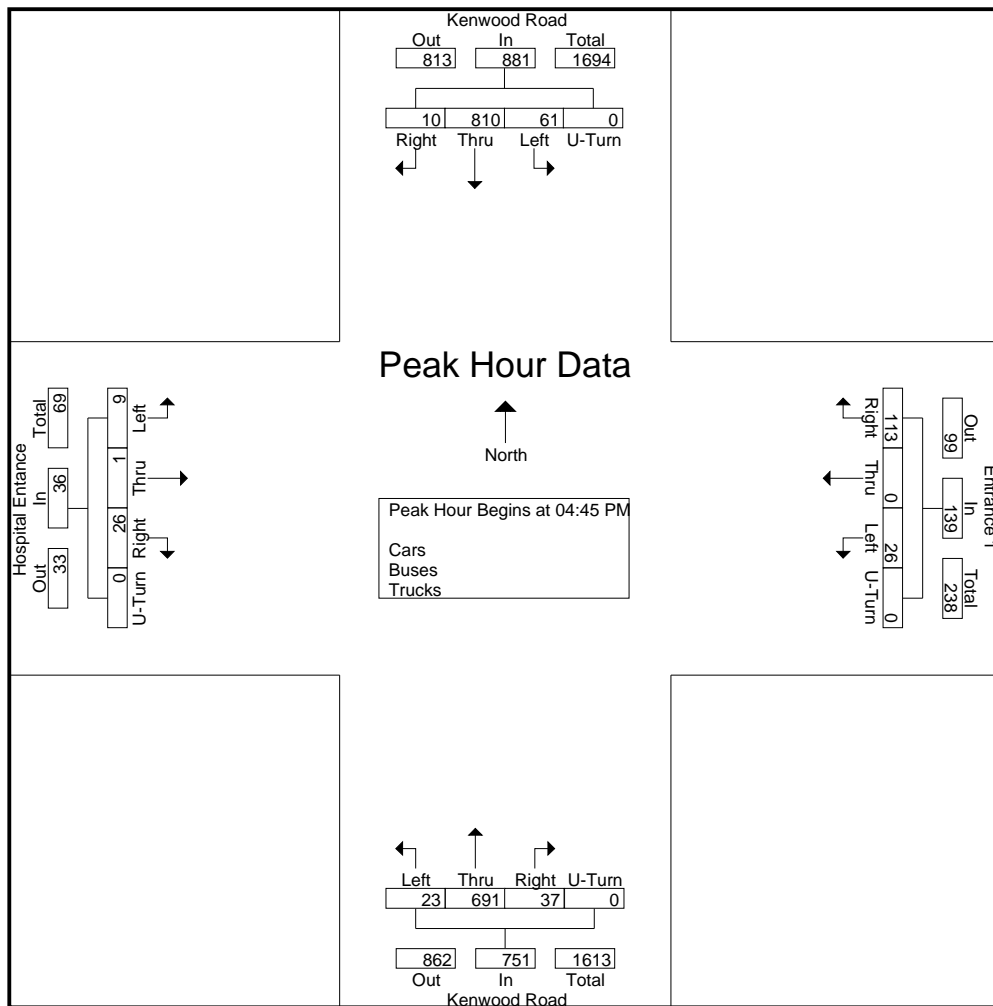
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 Page No : 4

Start Time	Kenwood Road From North					Entrance 1 From East					Kenwood Road From South					Hospital Entrance From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
04:45 PM	0	189	15	0	204	23	0	5	0	28	8	200	9	0	217	4	0	3	0	7	456
05:00 PM	4	207	17	0	228	32	0	6	0	38	14	155	3	0	172	12	0	4	0	16	454
05:15 PM	1	200	18	0	219	31	0	8	0	39	9	165	6	0	180	5	0	1	0	6	444
05:30 PM	5	214	11	0	230	27	0	7	0	34	6	171	5	0	182	5	1	1	0	7	453
Total Volume	10	810	61	0	881	113	0	26	0	139	37	691	23	0	751	26	1	9	0	36	1807
% App. Total	1.1	91.9	6.9	0		81.3	0	18.7	0		4.9	92	3.1	0		72.2	2.8	25	0		
PHF	.500	.946	.847	.000	.958	.883	.000	.813	.000	.891	.661	.864	.639	.000	.865	.542	.250	.563	.000	.563	.991

Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1  
 Peak Hour for Entire Intersection Begins at 04:45 PM





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60 Degrees - Partly Cloudy  
 Schools in Session

File Name : Kenwood\_Road\_at\_Golbraith\_Road\_633011\_03-20-2019  
 Site Code : Site 2 - Wednesday  
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 Page No : 1

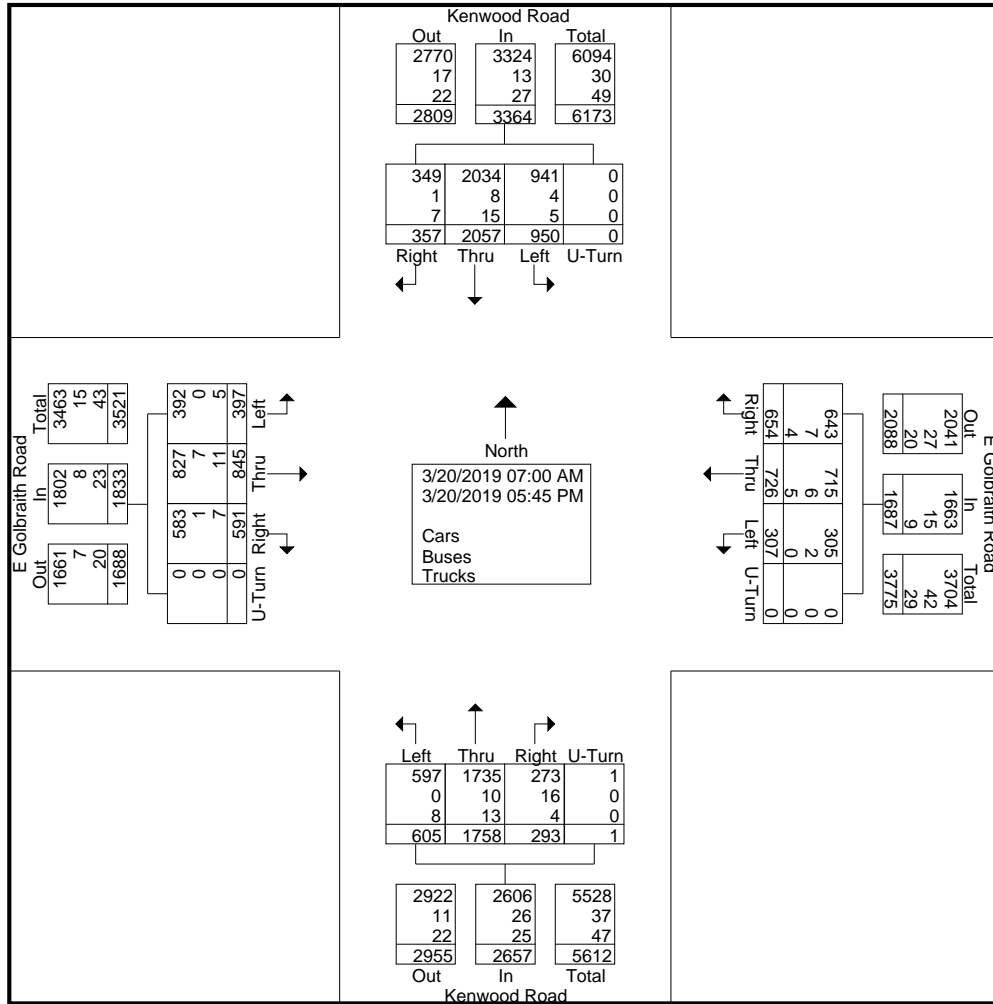
Groups Printed- Cars - Buses - Trucks

Start Time	Kenwood Road From North					E Golbraith Road From East					Kenwood Road From South					E Golbraith Road From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
07:00 AM	23	67	32	0	122	19	28	11	0	58	14	46	24	0	84	16	30	13	0	59	323
07:15 AM	12	110	53	0	175	14	26	11	0	51	14	79	41	0	134	25	39	8	0	72	432
07:30 AM	23	147	73	0	243	23	34	18	0	75	15	79	36	0	130	30	33	19	0	82	530
07:45 AM	14	176	94	0	284	27	51	14	0	92	17	106	37	0	160	37	56	20	0	113	649
Total	72	500	252	0	824	83	139	54	0	276	60	310	138	0	508	108	158	60	0	326	1934
08:00 AM	30	144	72	0	246	26	41	16	0	83	38	104	41	0	183	36	50	11	0	97	609
08:15 AM	33	127	72	0	232	21	35	19	0	75	15	98	36	0	149	19	57	17	0	93	549
08:30 AM	23	84	55	0	162	25	40	16	0	81	23	95	37	0	155	27	56	20	0	103	501
08:45 AM	31	107	65	0	203	14	28	28	0	70	19	67	35	0	121	25	39	19	0	83	477
Total	117	462	264	0	843	86	144	79	0	309	95	364	149	0	608	107	202	67	0	376	2136
04:00 PM	14	81	30	0	125	73	53	21	0	147	19	140	32	1	192	60	65	40	0	165	629
04:15 PM	20	135	47	0	202	47	49	22	0	118	10	106	40	0	156	40	64	37	0	141	617
04:30 PM	26	126	53	0	205	76	53	20	0	149	19	133	23	0	175	54	63	38	0	155	684
04:45 PM	20	135	56	0	211	61	54	19	0	134	19	168	46	0	233	47	57	28	0	132	710
Total	80	477	186	0	743	257	209	82	0	548	67	547	141	1	756	201	249	143	0	593	2640
05:00 PM	31	142	64	0	237	79	81	33	0	193	16	117	42	0	175	57	75	43	0	175	780
05:15 PM	20	150	67	0	237	56	60	22	0	138	24	136	40	0	200	45	47	20	0	112	687
05:30 PM	16	168	73	0	257	51	48	21	0	120	15	153	39	0	207	40	51	33	0	124	708
05:45 PM	21	158	44	0	223	42	45	16	0	103	16	131	56	0	203	33	63	31	0	127	656
Total	88	618	248	0	954	228	234	92	0	554	71	537	177	0	785	175	236	127	0	538	2831
Grand Total	357	2057	950	0	3364	654	726	307	0	1687	293	1758	605	1	2657	591	845	397	0	1833	9541
Apprch %	10.6	61.1	28.2	0		38.8	43	18.2	0		11	66.2	22.8	0		32.2	46.1	21.7	0		
Total %	3.7	21.6	10	0	35.3	6.9	7.6	3.2	0	17.7	3.1	18.4	6.3	0	27.8	6.2	8.9	4.2	0	19.2	
Cars	349	2034	941	0	3324	643	715	305	0	1663	273	1735	597	1	2606	583	827	392	0	1802	9395
% Cars	97.8	98.9	99.1	0	98.8	98.3	98.5	99.3	0	98.6	93.2	98.7	98.7	100	98.1	98.6	97.9	98.7	0	98.3	98.5
Buses	1	8	4	0	13	7	6	2	0	15	16	10	0	0	26	1	7	0	0	8	62
% Buses	0.3	0.4	0.4	0	0.4	1.1	0.8	0.7	0	0.9	5.5	0.6	0	0	1	0.2	0.8	0	0	0.4	0.6
Trucks	7	15	5	0	27	4	5	0	0	9	4	13	8	0	25	7	11	5	0	23	84
% Trucks	2	0.7	0.5	0	0.8	0.6	0.7	0	0	0.5	1.4	0.7	1.3	0	0.9	1.2	1.3	1.3	0	1.3	0.9



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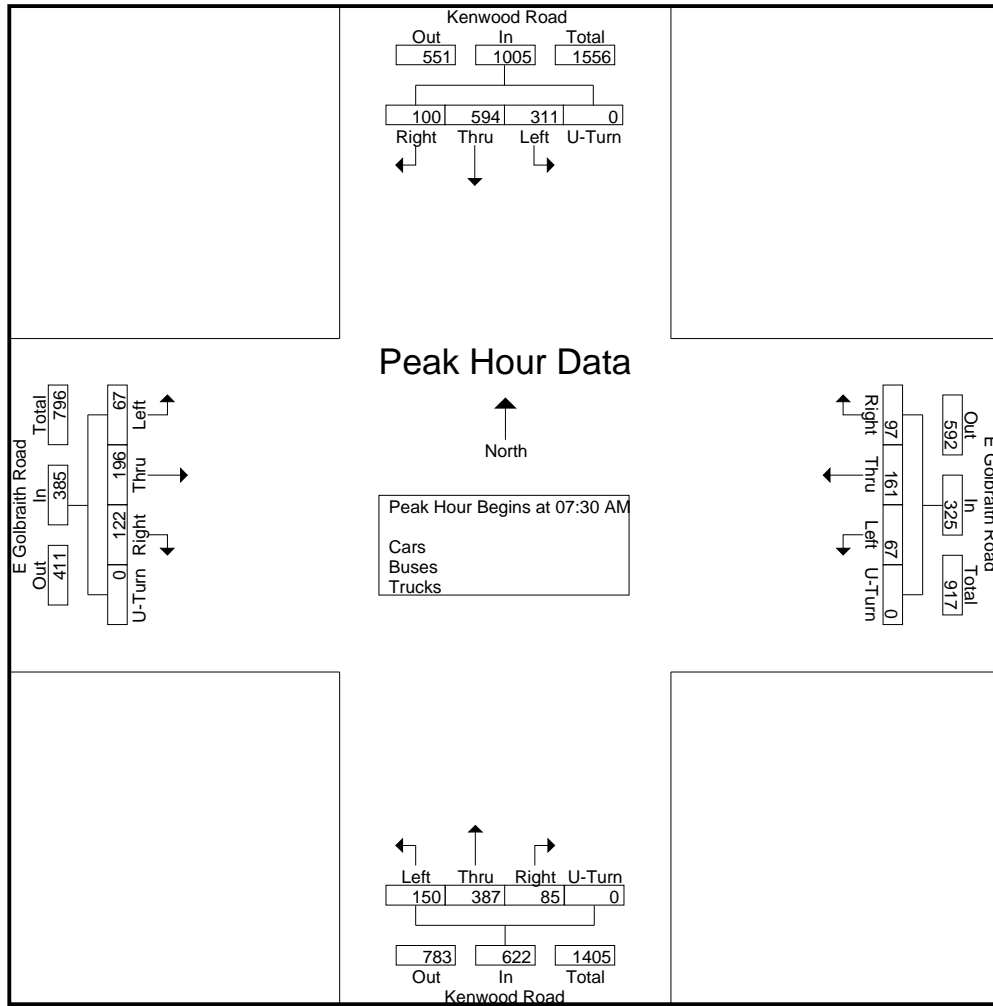




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Start Time	Kenwood Road From North					E Golbraith Road From East					Kenwood Road From South					E Golbraith Road From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	23	147	73	0	243	23	34	18	0	75	15	79	36	0	130	30	33	19	0	82	530
07:45 AM	14	<b>176</b>	<b>94</b>	0	<b>284</b>	<b>27</b>	<b>51</b>	14	0	<b>92</b>	17	<b>106</b>	37	0	160	<b>37</b>	<b>56</b>	<b>20</b>	0	<b>113</b>	<b>649</b>
08:00 AM	30	144	72	0	246	26	41	16	0	83	<b>38</b>	104	<b>41</b>	0	<b>183</b>	36	50	11	0	97	609
08:15 AM	<b>33</b>	127	72	0	232	21	35	<b>19</b>	0	75	15	98	36	0	149	19	<b>57</b>	17	0	93	549
Total Volume	100	594	311	0	1005	97	161	67	0	325	85	387	150	0	622	122	196	67	0	385	2337
% App. Total	10	59.1	30.9	0		29.8	49.5	20.6	0		13.7	62.2	24.1	0		31.7	50.9	17.4	0		
PHF	.758	.844	.827	.000	.885	.898	.789	.882	.000	.883	.559	.913	.915	.000	.850	.824	.860	.838	.000	.852	.900





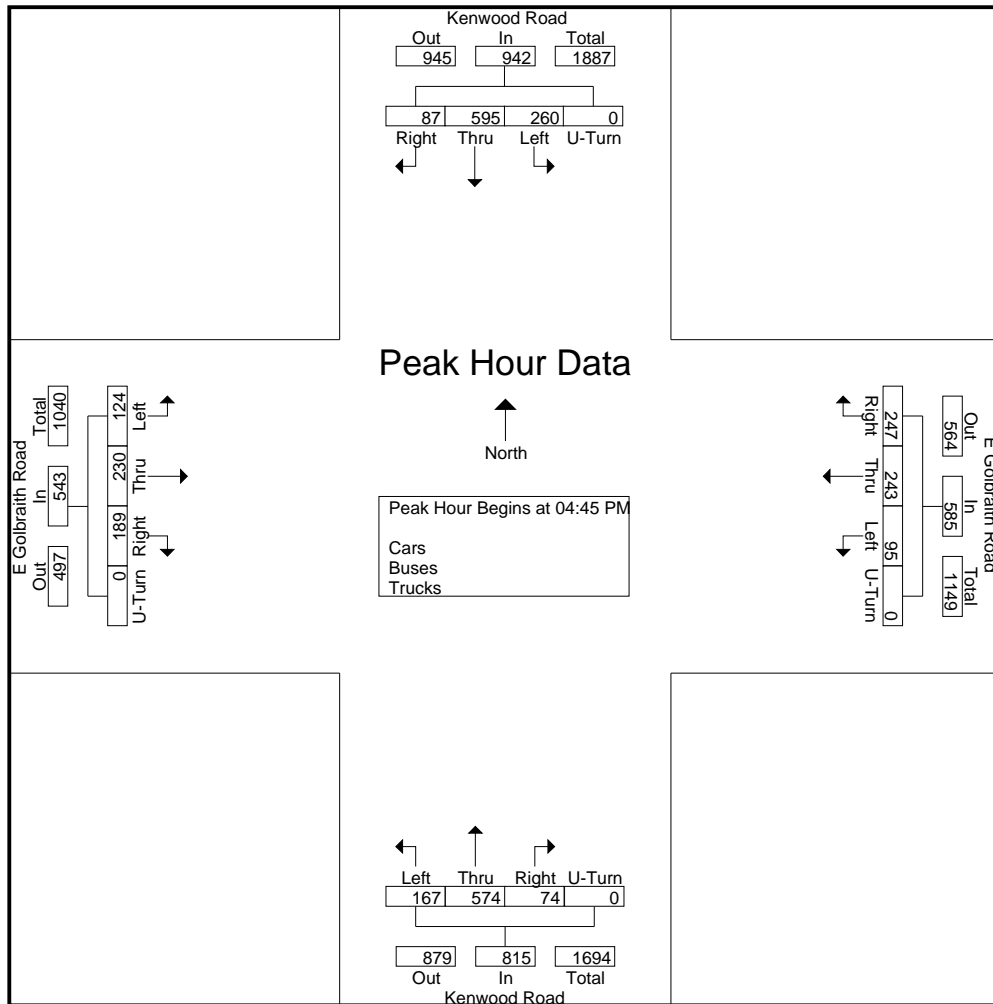


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File Name : Kenwood\_Road\_at\_Golbraith\_Road\_633011\_03-20-2019  
 Site Code : Site 2 - Wednesday  
 Start Date : 3/20/2019  
 Page No : 4

Start Time	Kenwood Road From North					E Golbraith Road From East					Kenwood Road From South					E Golbraith Road From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
04:45 PM	20	135	56	0	211	61	54	19	0	134	19	168	46	0	233	47	57	28	0	132	710
05:00 PM	31	142	64	0	237	79	81	33	0	193	16	117	42	0	175	57	75	43	0	175	780
05:15 PM	20	150	67	0	237	56	60	22	0	138	24	136	40	0	200	45	47	20	0	112	687
05:30 PM	16	168	73	0	257	51	48	21	0	120	15	153	39	0	207	40	51	33	0	124	708
Total Volume	87	595	260	0	942	247	243	95	0	585	74	574	167	0	815	189	230	124	0	543	2885
% App. Total	9.2	63.2	27.6	0		42.2	41.5	16.2	0		9.1	70.4	20.5	0		34.8	42.4	22.8	0		
PHF	.702	.885	.890	.000	.916	.782	.750	.720	.000	.758	.771	.854	.908	.000	.874	.829	.767	.721	.000	.776	.925

Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1  
 Peak Hour for Entire Intersection Begins at 04:45 PM





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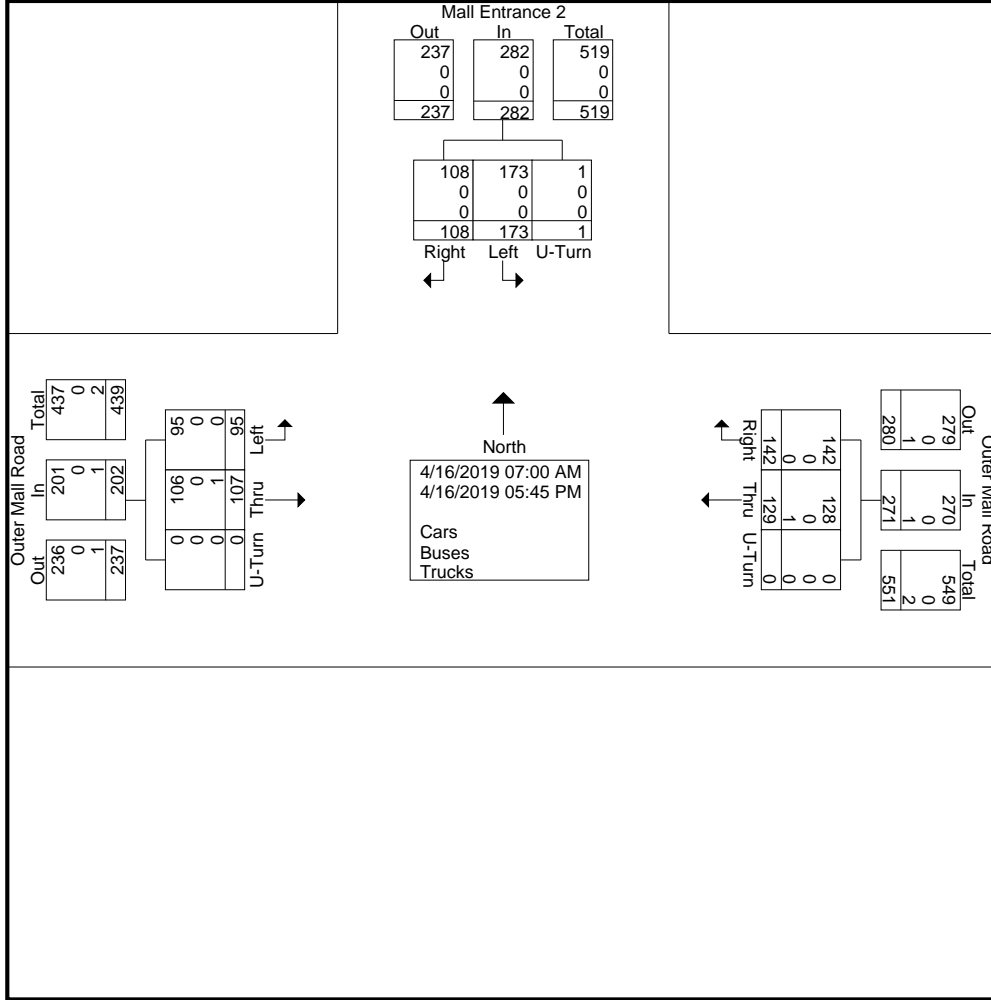
File Name : Mall\_Entrance\_2\_644217\_04-16-2019  
 Site Code : Site 1 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 1

Groups Printed- Cars - Buses - Trucks

Start Time	Mall Entrance 2 From North				Outer Mall Road From East				Outer Mall Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
07:00 AM	10	4	0	14	6	2	0	8	3	0	0	3	25
07:15 AM	11	1	0	12	2	4	0	6	0	2	0	2	20
07:30 AM	13	2	0	15	4	1	0	5	1	1	0	2	22
07:45 AM	6	6	0	12	6	4	0	10	2	0	0	2	24
Total	40	13	0	53	18	11	0	29	6	3	0	9	91
08:00 AM	8	11	0	19	1	3	0	4	3	0	0	3	26
08:15 AM	10	7	0	17	0	3	0	3	5	1	0	6	26
08:30 AM	1	6	0	7	1	2	0	3	6	2	0	8	18
08:45 AM	4	5	1	10	0	0	0	0	1	2	0	3	13
Total	23	29	1	53	2	8	0	10	15	5	0	20	83
04:00 PM	6	16	0	22	17	13	0	30	4	17	0	21	73
04:15 PM	8	16	0	24	11	11	0	22	12	13	0	25	71
04:30 PM	5	11	0	16	9	13	0	22	12	11	0	23	61
04:45 PM	4	17	0	21	18	15	0	33	7	10	0	17	71
Total	23	60	0	83	55	52	0	107	35	51	0	86	276
05:00 PM	3	13	0	16	25	20	0	45	15	15	0	30	91
05:15 PM	6	23	0	29	10	9	0	19	15	8	0	23	71
05:30 PM	7	15	0	22	20	14	0	34	9	6	0	15	71
05:45 PM	6	20	0	26	12	15	0	27	12	7	0	19	72
Total	22	71	0	93	67	58	0	125	51	36	0	87	305
Grand Total	108	173	1	282	142	129	0	271	107	95	0	202	755
Apprch %	38.3	61.3	0.4		52.4	47.6	0		53	47	0		
Total %	14.3	22.9	0.1	37.4	18.8	17.1	0	35.9	14.2	12.6	0	26.8	
Cars	108	173	1	282	142	128	0	270	106	95	0	201	753
% Cars	100	100	100	100	100	99.2	0	99.6	99.1	100	0	99.5	99.7
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Trucks	0	0	0	0	0	1	0	1	1	0	0	1	2
% Trucks	0	0	0	0	0	0.8	0	0.4	0.9	0	0	0.5	0.3



File Name : Mall\_Entrance\_2\_644217\_04-16-2019  
 Site Code : Site 1 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 2

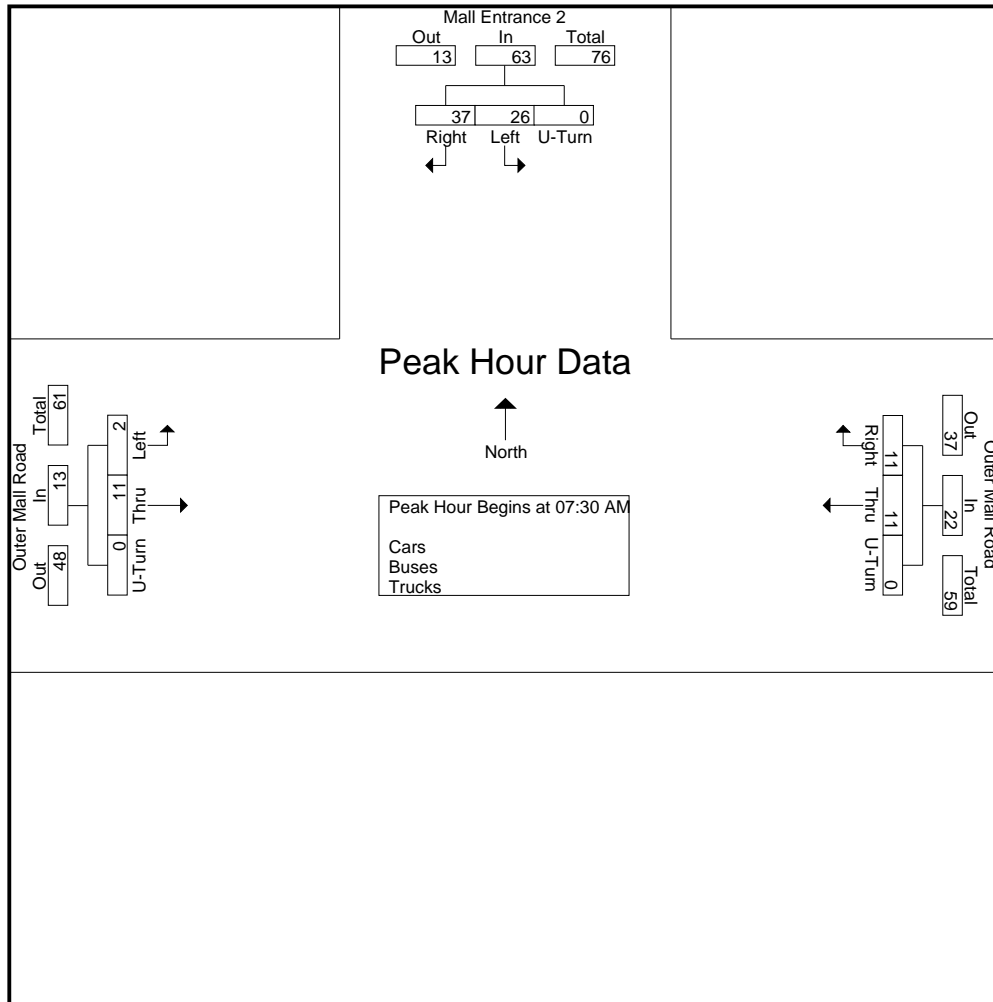




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File Name : Mall\_Entrance\_2\_644217\_04-16-2019  
 Site Code : Site 1 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 3

Start Time	Mall Entrance 2 From North				Outer Mall Road From East				Outer Mall Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	13	2	0	15	4	1	0	5	1	1	0	2	22
07:45 AM	6	6	0	12	6	4	0	10	2	0	0	2	24
08:00 AM	8	11	0	19	1	3	0	4	3	0	0	3	26
08:15 AM	10	7	0	17	0	3	0	3	5	1	0	6	26
Total Volume	37	26	0	63	11	11	0	22	11	2	0	13	98
% App. Total	58.7	41.3	0		50	50	0		84.6	15.4	0		
PHF	.712	.591	.000	.829	.458	.688	.000	.550	.550	.500	.000	.542	.942

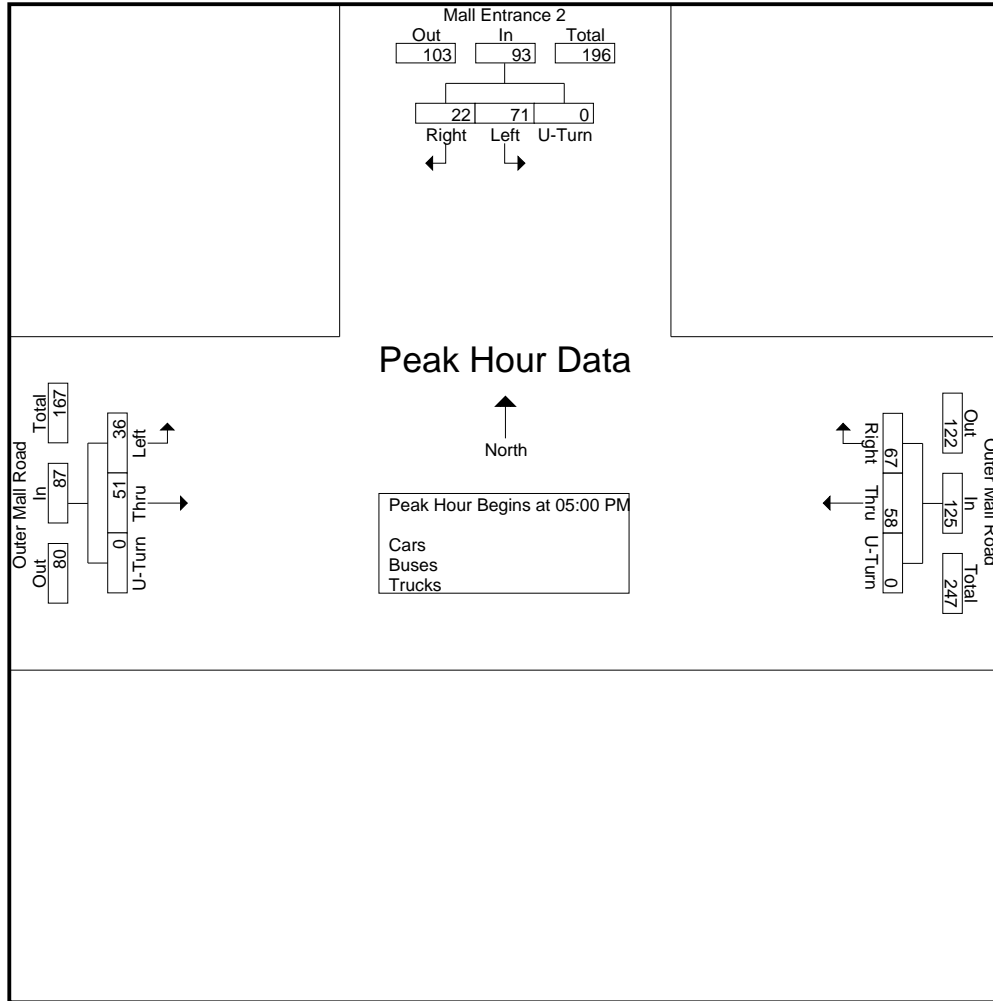




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File Name : Mall\_Entrance\_2\_644217\_04-16-2019  
 Site Code : Site 1 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 4

Start Time	Mall Entrance 2 From North				Outer Mall Road From East				Outer Mall Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	3	13	0	16	25	20	0	45	15	15	0	30	91
05:15 PM	6	23	0	29	10	9	0	19	15	8	0	23	71
05:30 PM	7	15	0	22	20	14	0	34	9	6	0	15	71
05:45 PM	6	20	0	26	12	15	0	27	12	7	0	19	72
Total Volume	22	71	0	93	67	58	0	125	51	36	0	87	305
% App. Total	23.7	76.3	0		53.6	46.4	0		58.6	41.4	0		
PHF	.786	.772	.000	.802	.670	.725	.000	.694	.850	.600	.000	.725	.838





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 Schools in Session

File Name : Outer\_Mall\_Road\_at\_Mall\_Entrance\_644230\_04-16-2019  
 Site Code : Site 3 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 1

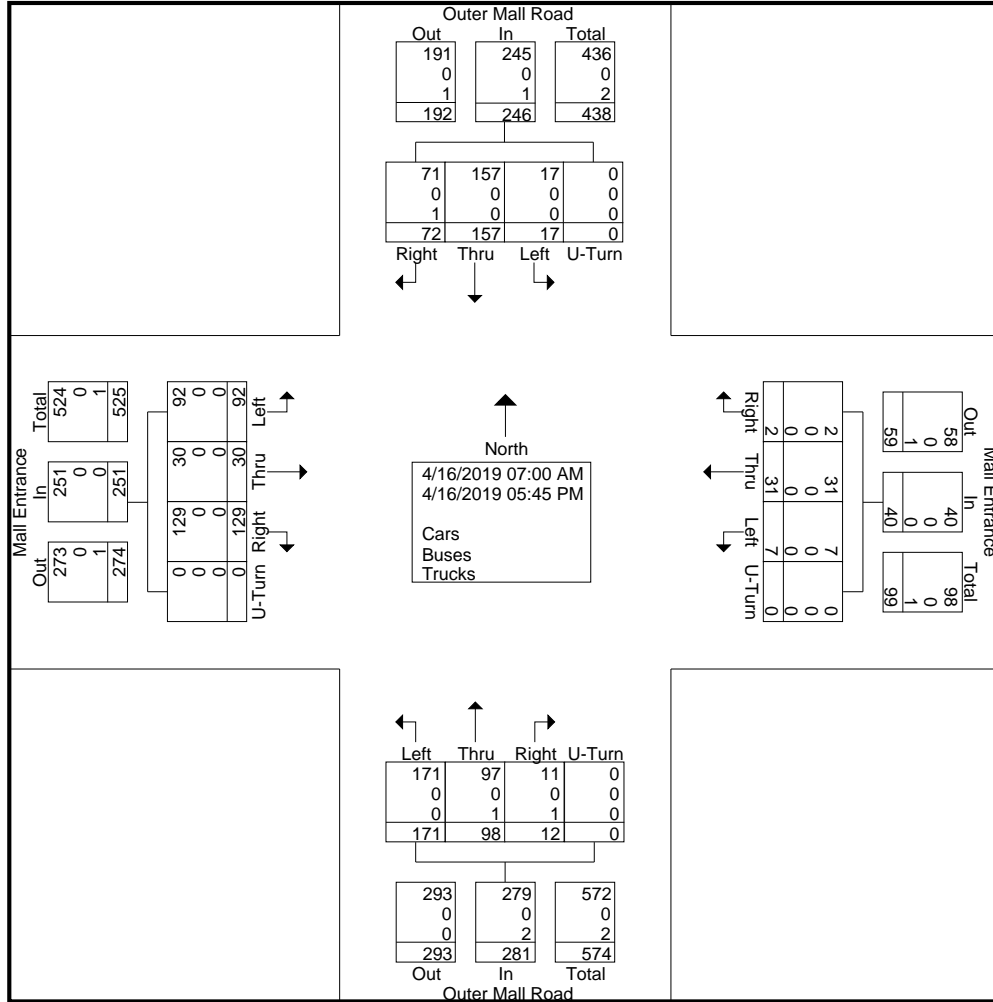
Groups Printed- Cars - Buses - Trucks

Start Time	Outer Mall Road From North					Mall Entrance From East					Outer Mall Road From South					Mall Entrance From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
07:00 AM	3	2	0	0	5	0	1	1	0	2	1	1	1	0	3	2	2	14	0	18	28
07:15 AM	3	2	0	0	5	0	1	0	0	1	0	2	0	0	2	2	3	8	0	13	21
07:30 AM	2	5	0	0	7	0	0	0	0	0	0	0	3	0	3	1	1	4	0	6	16
07:45 AM	1	6	1	0	8	1	0	0	0	1	0	2	2	0	4	4	3	6	0	13	26
<b>Total</b>	<b>9</b>	<b>15</b>	<b>1</b>	<b>0</b>	<b>25</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>5</b>	<b>6</b>	<b>0</b>	<b>12</b>	<b>9</b>	<b>9</b>	<b>32</b>	<b>0</b>	<b>50</b>	<b>91</b>
08:00 AM	2	5	0	0	7	0	0	0	0	0	0	3	1	0	4	5	0	4	0	9	20
08:15 AM	2	3	0	0	5	0	0	0	0	0	1	6	0	0	7	6	3	5	0	14	26
08:30 AM	1	2	0	0	3	0	0	0	0	0	1	5	1	0	7	1	1	4	0	6	16
08:45 AM	0	2	0	0	2	0	0	0	0	0	0	4	3	0	7	5	0	0	0	5	14
<b>Total</b>	<b>5</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>18</b>	<b>5</b>	<b>0</b>	<b>25</b>	<b>17</b>	<b>4</b>	<b>13</b>	<b>0</b>	<b>34</b>	<b>76</b>
04:00 PM	11	17	3	0	31	0	6	0	0	6	0	6	17	0	23	8	3	4	0	15	75
04:15 PM	9	15	3	0	27	0	4	1	0	5	2	9	16	0	27	16	4	6	0	26	85
04:30 PM	10	12	3	0	25	0	1	0	0	1	2	10	17	0	29	6	1	7	0	14	69
04:45 PM	6	13	3	0	22	0	3	0	0	3	0	10	26	0	36	12	4	2	0	18	79
<b>Total</b>	<b>36</b>	<b>57</b>	<b>12</b>	<b>0</b>	<b>105</b>	<b>0</b>	<b>14</b>	<b>1</b>	<b>0</b>	<b>15</b>	<b>4</b>	<b>35</b>	<b>76</b>	<b>0</b>	<b>115</b>	<b>42</b>	<b>12</b>	<b>19</b>	<b>0</b>	<b>73</b>	<b>308</b>
05:00 PM	11	21	0	0	32	0	4	3	0	7	0	10	17	0	27	16	1	9	0	26	92
05:15 PM	4	13	0	0	17	0	0	1	0	1	2	12	23	0	37	16	1	7	0	24	79
05:30 PM	3	24	1	0	28	1	6	1	0	8	2	5	29	0	36	16	1	6	0	23	95
05:45 PM	4	15	3	0	22	0	5	0	0	5	1	13	15	0	29	13	2	6	0	21	77
<b>Total</b>	<b>22</b>	<b>73</b>	<b>4</b>	<b>0</b>	<b>99</b>	<b>1</b>	<b>15</b>	<b>5</b>	<b>0</b>	<b>21</b>	<b>5</b>	<b>40</b>	<b>84</b>	<b>0</b>	<b>129</b>	<b>61</b>	<b>5</b>	<b>28</b>	<b>0</b>	<b>94</b>	<b>343</b>
<b>Grand Total</b>	<b>72</b>	<b>157</b>	<b>17</b>	<b>0</b>	<b>246</b>	<b>2</b>	<b>31</b>	<b>7</b>	<b>0</b>	<b>40</b>	<b>12</b>	<b>98</b>	<b>171</b>	<b>0</b>	<b>281</b>	<b>129</b>	<b>30</b>	<b>92</b>	<b>0</b>	<b>251</b>	<b>818</b>
Apprch %	29.3	63.8	6.9	0		5	77.5	17.5	0		4.3	34.9	60.9	0		51.4	12	36.7	0		
Total %	8.8	19.2	2.1	0	30.1	0.2	3.8	0.9	0	4.9	1.5	12	20.9	0	34.4	15.8	3.7	11.2	0	30.7	
Cars	71	157	17	0	245	2	31	7	0	40	11	97	171	0	279	129	30	92	0	251	815
% Cars	98.6	100	100	0	99.6	100	100	100	0	100	91.7	99	100	0	99.3	100	100	100	0	100	99.6
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trucks	1	0	0	0	1	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	3
% Trucks	1.4	0	0	0	0.4	0	0	0	0	0	8.3	1	0	0	0.7	0	0	0	0	0	0.4



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File Name : Outer\_Mall\_Road\_at\_Mall\_Entrance\_644230\_04-16-2019  
 Site Code : Site 3 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 2

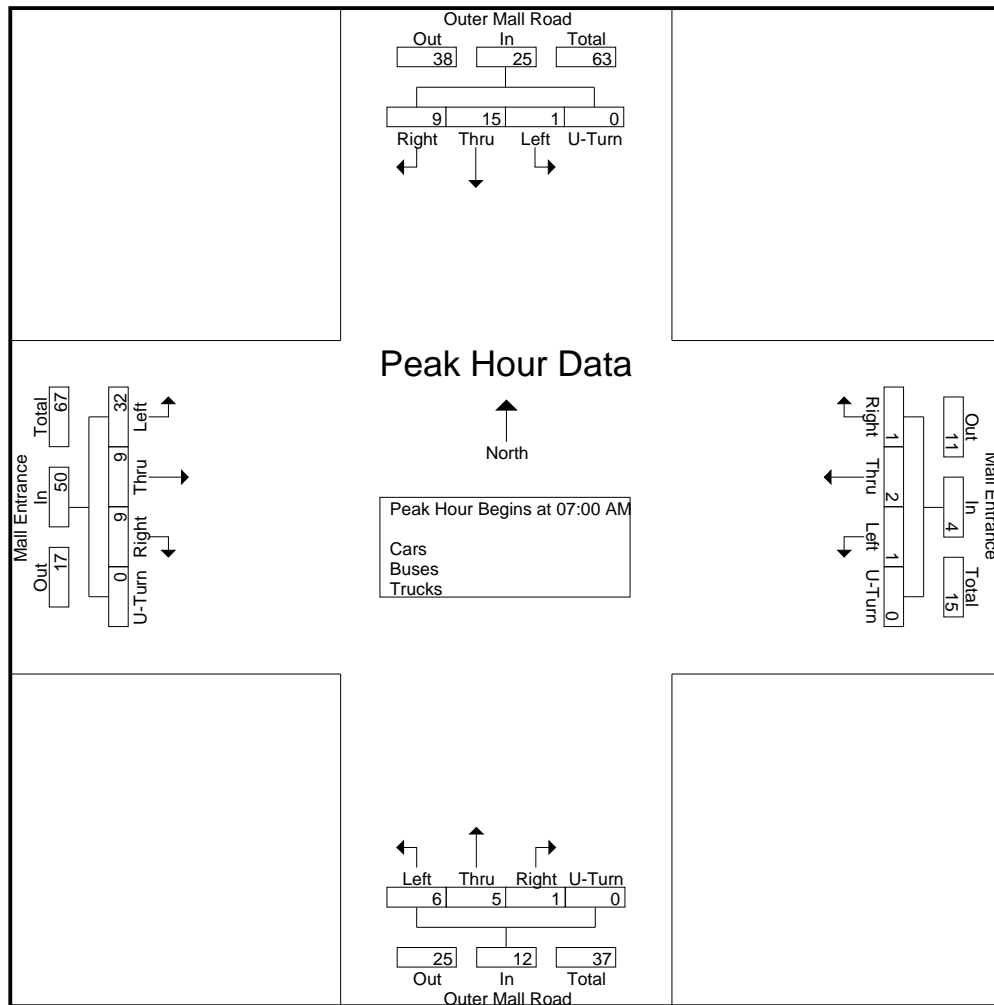




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File Name : Outer\_Mall\_Road\_at\_Mall\_Entrance\_644230\_04-16-2019  
 Site Code : Site 3 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 3

Start Time	Outer Mall Road From North					Mall Entrance From East					Outer Mall Road From South					Mall Entrance From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	3	2	0	0	5	0	1	1	0	2	1	1	1	0	3	2	2	14	0	18	28
07:15 AM	3	2	0	0	5	0	1	0	0	1	0	2	0	2	2	3	8	0	13	21	
07:30 AM	2	5	0	0	7	0	0	0	0	0	0	0	3	3	1	1	4	0	6	16	
07:45 AM	1	6	1	0	8	1	0	0	0	1	0	2	2	4	4	3	6	0	13	26	
Total Volume	9	15	1	0	25	1	2	1	0	4	1	5	6	12	9	9	32	0	50	91	
% App. Total	36	60	4	0		25	50	25	0		8.3	41.7	50	0		18	18	64	0		
PHF	.750	.625	.250	.000	.781	.250	.500	.250	.000	.500	.250	.625	.500	.750	.563	.750	.571	.000	.694	.813	





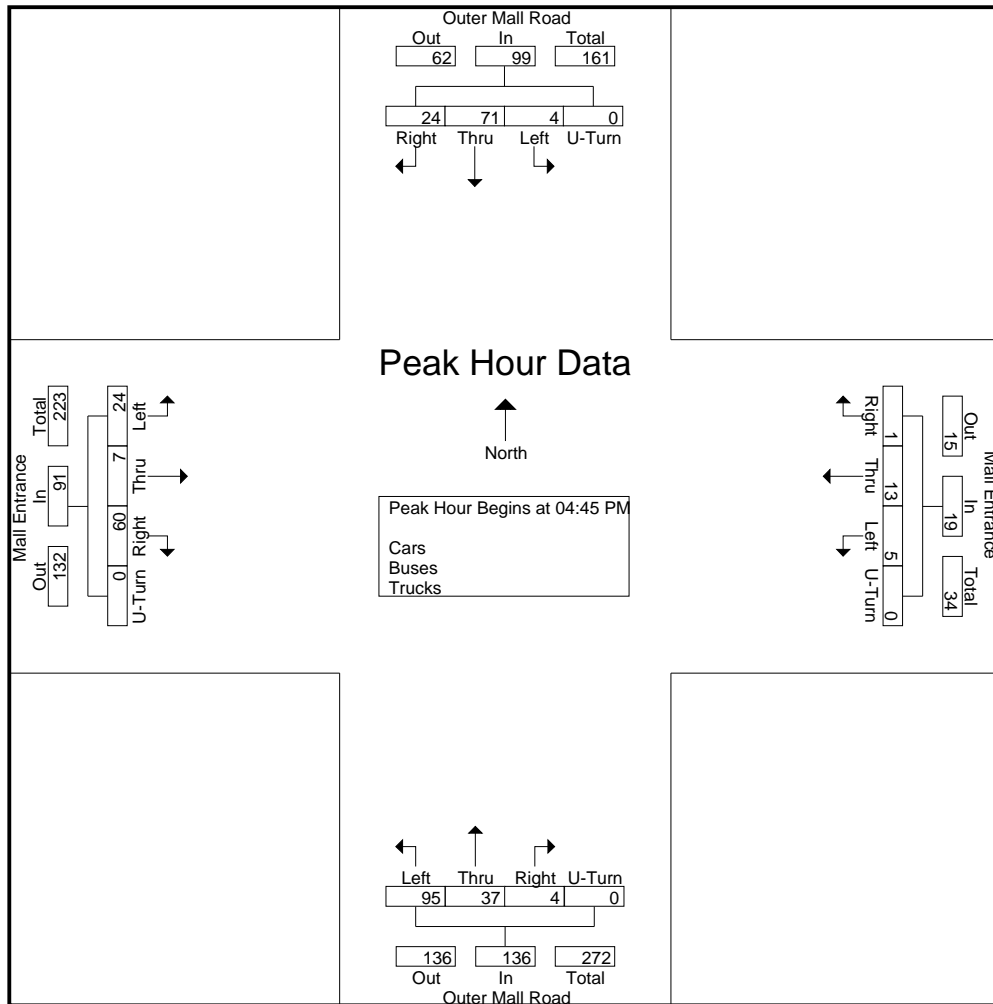


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File Name : Outer\_Mall\_Road\_at\_Mall\_Entrance\_644230\_04-16-2019  
 Site Code : Site 3 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 4

Start Time	Outer Mall Road From North					Mall Entrance From East					Outer Mall Road From South					Mall Entrance From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
04:45 PM	6	13	3	0	22	0	3	0	0	3	0	10	26	0	36	12	4	2	0	18	79
05:00 PM	11	21	0	0	32	0	4	3	0	7	0	10	17	0	27	16	1	9	0	26	92
05:15 PM	4	13	0	0	17	0	0	1	0	1	2	12	23	0	37	16	1	7	0	24	79
05:30 PM	3	24	1	0	28	1	6	1	0	8	2	5	29	0	36	16	1	6	0	23	95
Total Volume	24	71	4	0	99	1	13	5	0	19	4	37	95	0	136	60	7	24	0	91	345
% App. Total	24.2	71.7	4	0		5.3	68.4	26.3	0		2.9	27.2	69.9	0		65.9	7.7	26.4	0		
PHF	.545	.740	.333	.000	.773	.250	.542	.417	.000	.594	.500	.771	.819	.000	.919	.938	.438	.667	.000	.875	.908

Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1  
 Peak Hour for Entire Intersection Begins at 04:45 PM





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70 Degrees - Sunny  
 Schools in Session

File Name : Outer\_Mall\_Road\_at\_Parking\_Lot\_Entrance\_644221\_04-16-2019  
 Site Code : Site 2 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 1

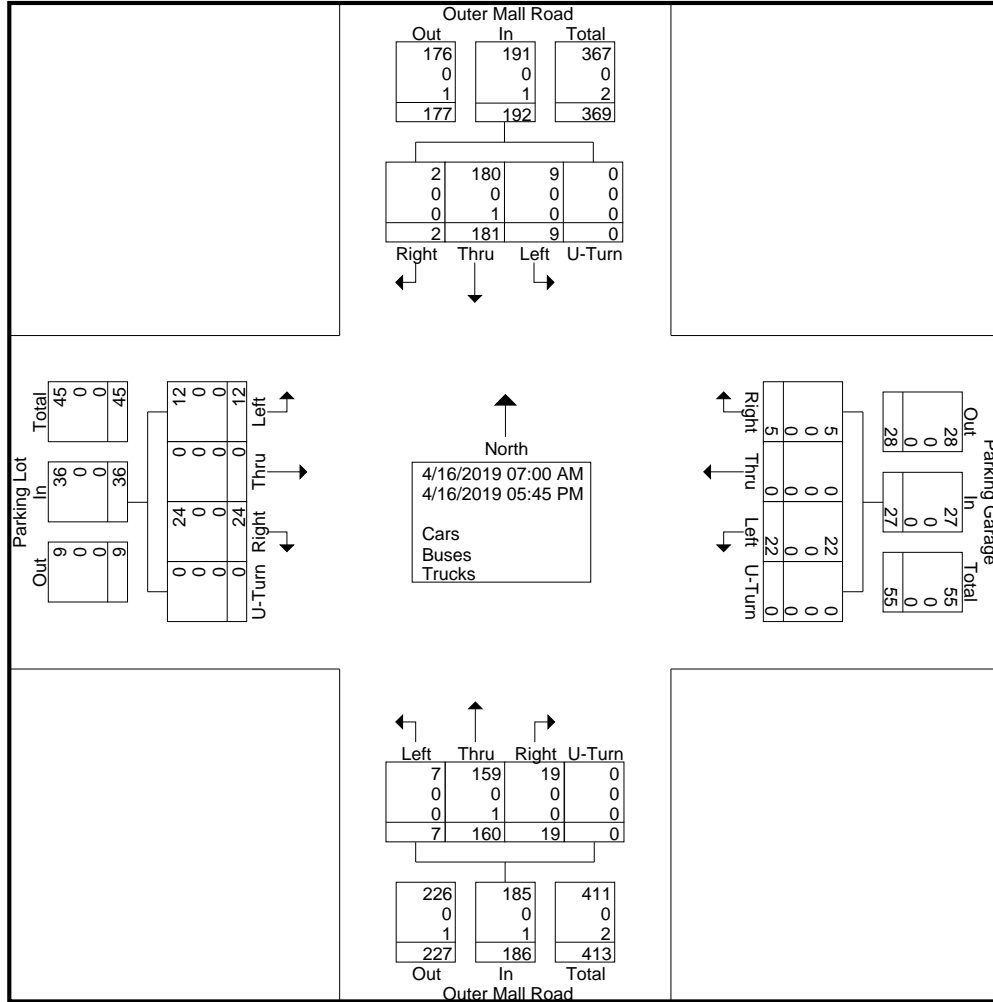
Groups Printed- Cars - Buses - Trucks

Start Time	Outer Mall Road From North					Parking Garage From East					Outer Mall Road From South					Parking Lot From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
07:00 AM	1	3	0	0	4	0	0	0	0	0	1	6	2	0	9	2	0	1	0	3	16
07:15 AM	0	4	2	0	6	0	0	0	0	0	1	5	0	0	6	1	0	1	0	2	14
07:30 AM	0	5	1	0	6	1	0	0	0	1	2	2	0	0	4	2	0	0	0	2	13
07:45 AM	0	7	1	0	8	0	0	1	0	1	1	5	0	0	6	1	0	0	0	1	16
<b>Total</b>	<b>1</b>	<b>19</b>	<b>4</b>	<b>0</b>	<b>24</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>5</b>	<b>18</b>	<b>2</b>	<b>0</b>	<b>25</b>	<b>6</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>8</b>	<b>59</b>
08:00 AM	1	6	1	0	8	0	0	0	0	0	0	6	1	0	7	2	0	0	0	2	17
08:15 AM	0	3	1	0	4	0	0	0	0	0	2	6	3	0	11	2	0	0	0	2	17
08:30 AM	0	3	0	0	3	0	0	0	0	0	0	9	0	0	9	1	0	0	0	1	13
08:45 AM	0	2	1	0	3	0	0	0	0	0	1	3	0	0	4	0	0	0	0	0	7
<b>Total</b>	<b>1</b>	<b>14</b>	<b>3</b>	<b>0</b>	<b>18</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>24</b>	<b>4</b>	<b>0</b>	<b>31</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>54</b>
04:00 PM	0	19	1	0	20	0	0	2	0	2	1	8	1	0	10	3	0	2	0	5	37
04:15 PM	0	19	0	0	19	1	0	4	0	5	3	12	0	0	15	1	0	3	0	4	43
04:30 PM	0	17	0	0	17	0	0	3	0	3	2	18	0	0	20	1	0	1	0	2	42
04:45 PM	0	16	0	0	16	1	0	3	0	4	0	12	0	0	12	1	0	1	0	2	34
<b>Total</b>	<b>0</b>	<b>71</b>	<b>1</b>	<b>0</b>	<b>72</b>	<b>2</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>14</b>	<b>6</b>	<b>50</b>	<b>1</b>	<b>0</b>	<b>57</b>	<b>6</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>13</b>	<b>156</b>
05:00 PM	0	21	0	0	21	1	0	4	0	5	1	21	0	0	22	3	0	2	0	5	53
05:15 PM	0	13	1	0	14	0	0	1	0	1	1	18	0	0	19	2	0	0	0	2	36
05:30 PM	0	23	0	0	23	0	0	3	0	3	1	12	0	0	13	2	0	1	0	3	42
05:45 PM	0	20	0	0	20	1	0	1	0	2	2	17	0	0	19	0	0	0	0	0	41
<b>Total</b>	<b>0</b>	<b>77</b>	<b>1</b>	<b>0</b>	<b>78</b>	<b>2</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>11</b>	<b>5</b>	<b>68</b>	<b>0</b>	<b>0</b>	<b>73</b>	<b>7</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>10</b>	<b>172</b>
<b>Grand Total</b>	<b>2</b>	<b>181</b>	<b>9</b>	<b>0</b>	<b>192</b>	<b>5</b>	<b>0</b>	<b>22</b>	<b>0</b>	<b>27</b>	<b>19</b>	<b>160</b>	<b>7</b>	<b>0</b>	<b>186</b>	<b>24</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>36</b>	<b>441</b>
Apprch %	1	94.3	4.7	0		18.5	0	81.5	0		10.2	86	3.8	0		66.7	0	33.3	0		
Total %	0.5	41	2	0	43.5	1.1	0	5	0	6.1	4.3	36.3	1.6	0	42.2	5.4	0	2.7	0	8.2	
Cars	2	180	9	0	191	5	0	22	0	27	19	159	7	0	185	24	0	12	0	36	439
% Cars	100	99.4	100	0	99.5	100	0	100	0	100	100	99.4	100	0	99.5	100	0	100	0	100	99.5
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trucks	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
% Trucks	0	0.6	0	0	0.5	0	0	0	0	0	0	0.6	0	0	0.5	0	0	0	0	0	0.5



**Cummins Consulting Services, PLLC**  
 2216 Young Drive, Suite 1 Lexington, Kentucky 40505  
 Office: (859) 785-1500 www.ccsdata.com  
**"15 Years ... and still Counting"**

File Name : Outer\_Mall\_Road\_at\_Parking\_Lot\_Entrance\_644221\_04-16-2019  
 Site Code : Site 2 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 2

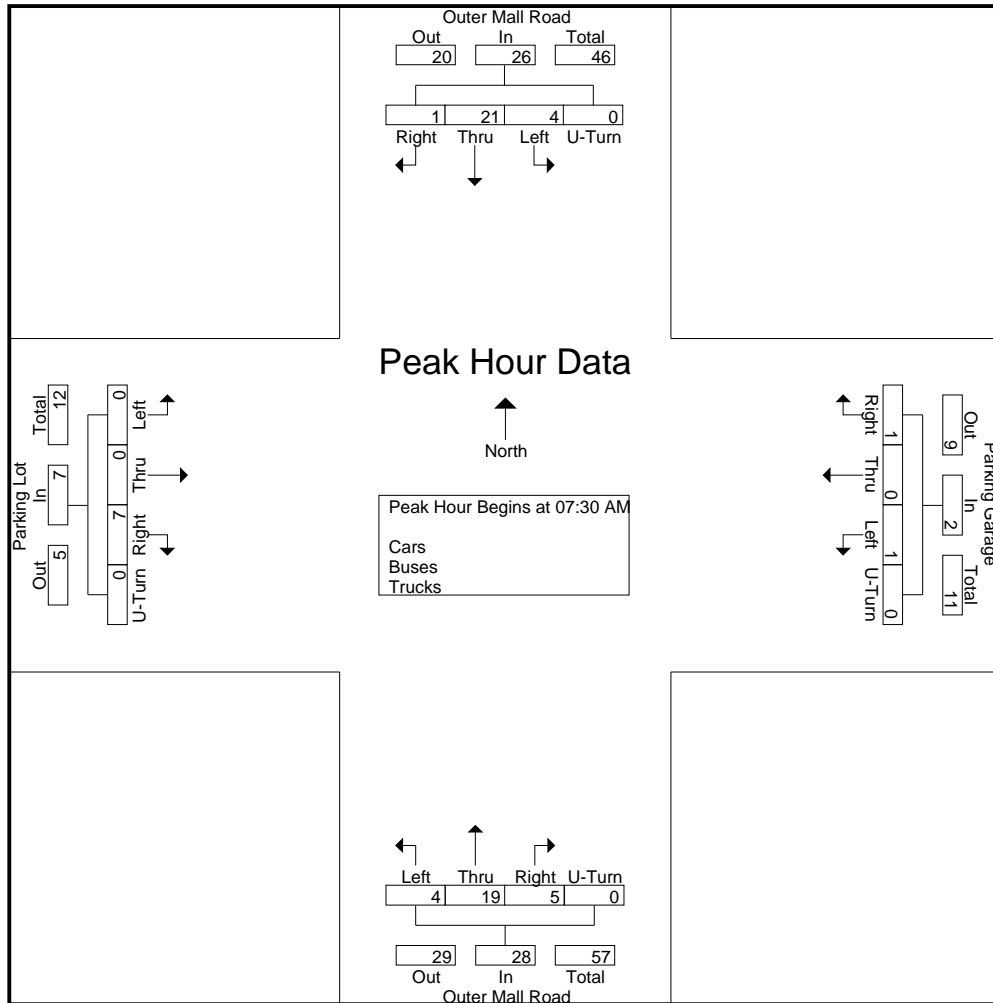




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File Name : Outer\_Mall\_Road\_at\_Parking\_Lot\_Entrance\_644221\_04-16-2019  
 Site Code : Site 2 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 3

Start Time	Outer Mall Road From North					Parking Garage From East					Outer Mall Road From South					Parking Lot From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	5	1	0	6	1	0	0	0	1	2	2	0	0	4	2	0	0	0	2	13
07:45 AM	0	7	1	0	8	0	0	1	0	1	1	5	0	0	6	1	0	0	0	1	16
08:00 AM	1	6	1	0	8	0	0	0	0	0	0	6	1	0	7	2	0	0	0	2	17
08:15 AM	0	3	1	0	4	0	0	0	0	0	2	6	3	0	11	2	0	0	0	2	17
Total Volume	1	21	4	0	26	1	0	1	0	2	5	19	4	0	28	7	0	0	0	7	63
% App. Total	3.8	80.8	15.4	0		50	0	50	0		17.9	67.9	14.3	0		100	0	0	0		
PHF	.250	.750	1.00	.000	.813	.250	.000	.250	.000	.500	.625	.792	.333	.000	.636	.875	.000	.000	.000	.875	.926

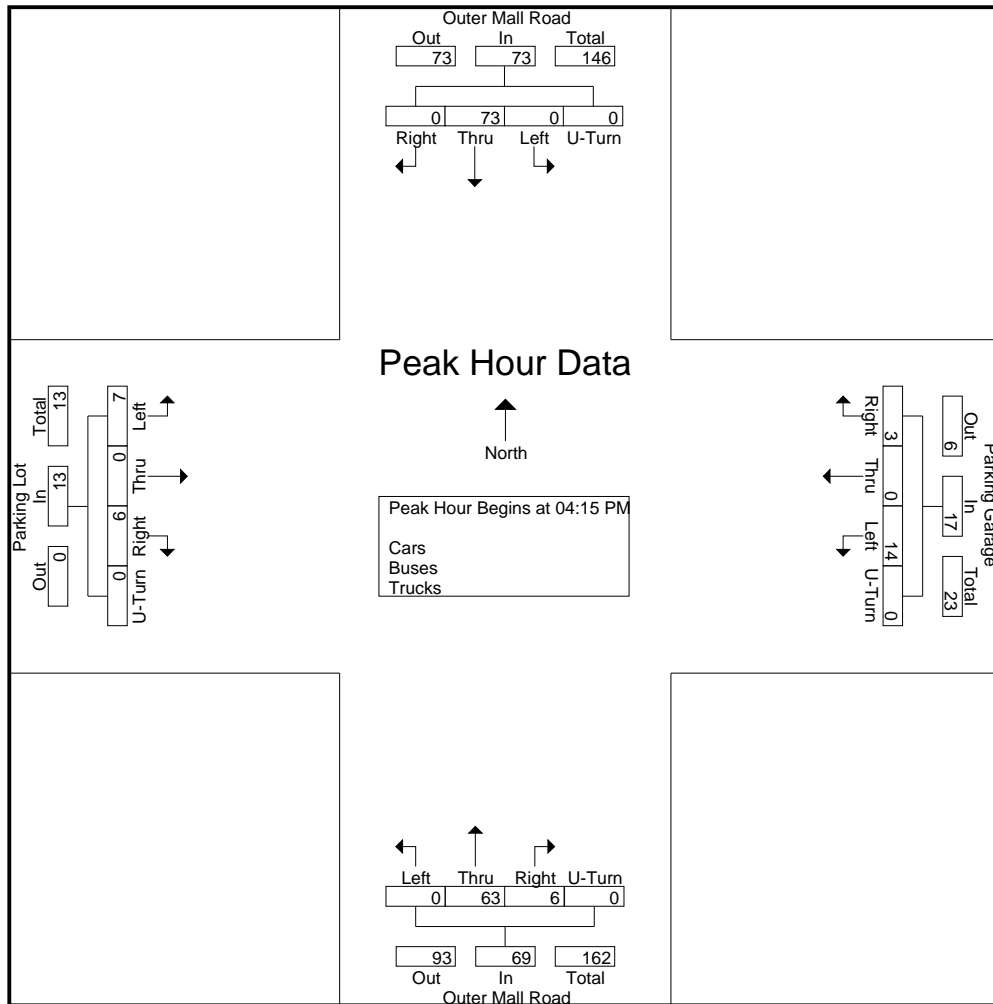




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File Name : Outer\_Mall\_Road\_at\_Parking\_Lot\_Entrance\_644221\_04-16-2019  
 Site Code : Site 2 - Tuesday  
 Start Date : 4/16/2019  
 Page No : 4

Start Time	Outer Mall Road From North					Parking Garage From East					Outer Mall Road From South					Parking Lot From West					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	19	0	0	19	1	0	4	0	5	3	12	0	0	15	1	0	3	0	4	43
04:30 PM	0	17	0	0	17	0	0	3	0	3	2	18	0	0	20	1	0	1	0	2	42
04:45 PM	0	16	0	0	16	1	0	3	0	4	0	12	0	0	12	1	0	1	0	2	34
05:00 PM	0	21	0	0	21	1	0	4	0	5	1	21	0	0	22	3	0	2	0	5	53
Total Volume	0	73	0	0	73	3	0	14	0	17	6	63	0	0	69	6	0	7	0	13	172
% App. Total	0	100	0	0		17.6	0	82.4	0		8.7	91.3	0	0		46.2	0	53.8	0		
PHF	.000	.869	.000	.000	.869	.750	.000	.875	.000	.850	.500	.750	.000	.000	.784	.500	.000	.583	.000	.650	.811



**APPENDIX B**  
**ITE TRIP GENERATION CALCULATIONS**

## ITE Trip Generation Procedure

---

### Land Use 934 (Fast-Food Restaurant with Drive-Through Window)

Trip Generations per 1000 Sq. Feet Gross Floor Area  
Setting / Location: General Urban / Suburban

#### **Weekday Trip Generation and Trip Distribution**

Trip Generation Formula:  $T = 470.95 * (X)$   
where: T = Number of Trips Generated  
X = 1000 Sq. Feet Gross Floor Area

Gross Floor Area: 4,975

Total Trip Ends in the Average Weekday: 2,343

Distribution Percentages of Entering and Exiting Trips, From ITE Trip Generation Manual, 10th Edition

Entering Trip Percentage: 50%  
Exiting Trip Percentage: 50%  
Number of Entering Trips: 1,172  
Number of Exiting Trips: 1,171

#### **AM Peak Trip Generation and Trip Distribution (Peak Hour of Adjacent Street)**

Trip Generation Formula:  $T = 40.19 * (X)$   
Total Trip Ends in the AM Peak Hour: 200

Pass-By Rate from ITE Trip Generation Handbook, An ITE Recommended Practice

Pass-By Rate: 49.00%

Primary Trips: 102  
Pass-By Trips: 98

Distribution Percentages of Entering and Exiting Trips, From ITE Trip Generation Manual, 10th Edition

Entering Trip Percentage: 51%  
Exiting Trip Percentage: 49%

Entering Primary Trips: 52  
Exiting Primary Trips: 50

Entering Pass-by Trips: 50  
Exiting Pass-by Trips: 48

#### **PM Peak Trip Generation and Trip Distribution (Peak Hour of Adjacent Street)**

Trip Generation Formula:  $T = 32.67 * (X)$   
Total Trip Ends in the PM Peak Hour: 163

Pass-By Rate from ITE Trip Generation Handbook, An ITE Recommended Practice

Pass-By Rate: 50.00%

Primary Trips: 81  
Pass-By Trips: 82

Distribution Percentages of Entering and Exiting Trips, From ITE Trip Generation Manual, 10th Edition

Entering Trip Percentage: 52%  
Exiting Trip Percentage: 48%

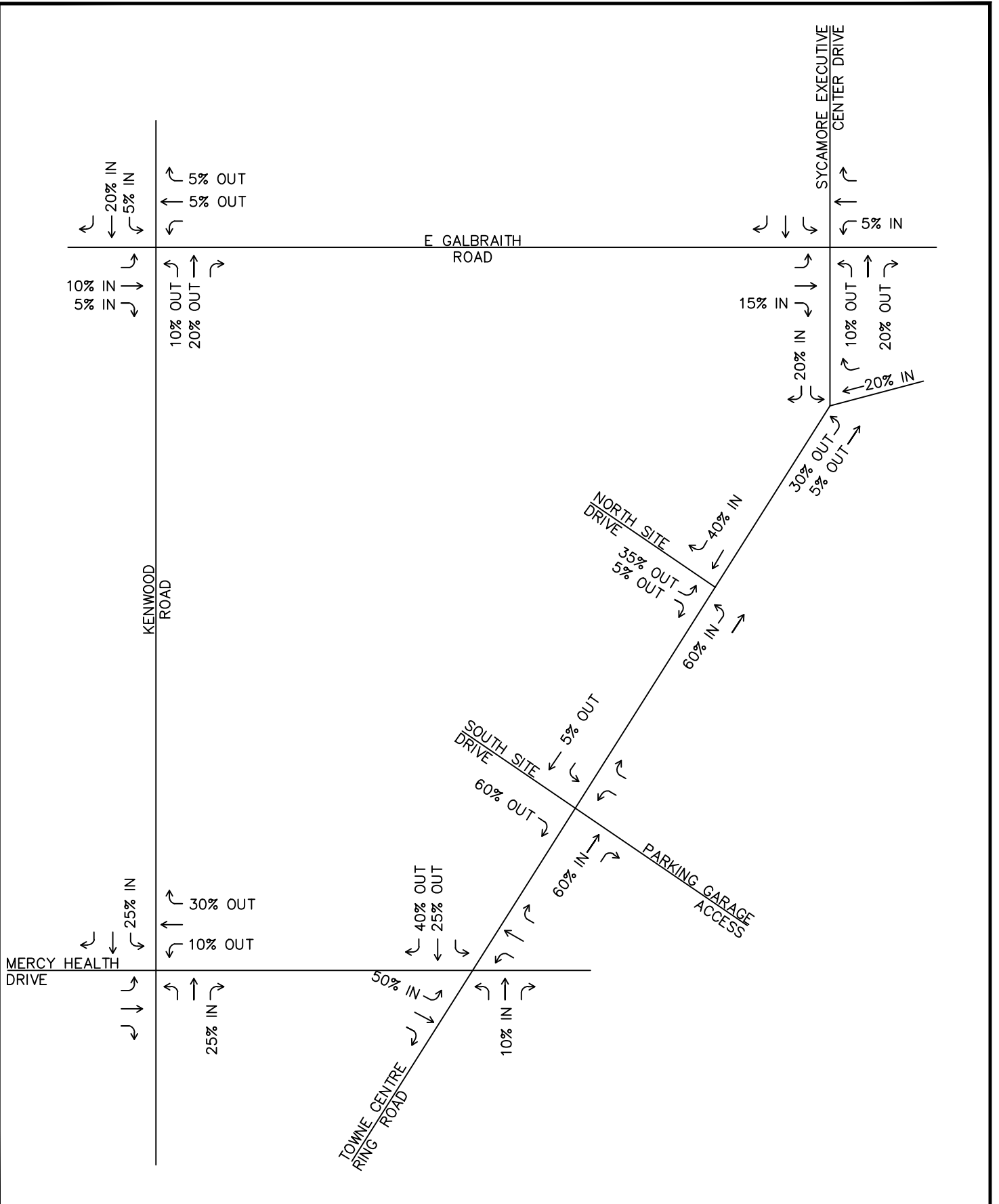
Entering Primary Trips: 42  
Exiting Primary Trips: 39

Entering Pass-by Trips: 43  
Exiting Pass-by Trips: 39

**APPENDIX C**  
**SITE TRIP DISTRIBUTION AND ASSIGNMENT**



CAD FILE: G:\2019\2019223\16\_KENWOOD\_OH (SITE)\TRAFFIC\FIGURES\PRIMARY TRIP DISTRIBUTION.DWG  
 DATE: 7/11/2019 TIME: 5:01:40 PM



N.T.S.

APPENDIX C

PRIMARY TRIP DISTRIBUTION

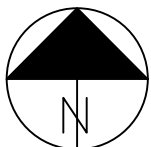
JULY 2019



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TECHNICIAN: BBOWEN

CAD FILE: C:\2019\2019223\16\_KENWOOD\_OH\_(SITE)\TRAFFIC\FIGURES\PRIMARY TRIP DISTRIBUTION.DWG  
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N.T.S.

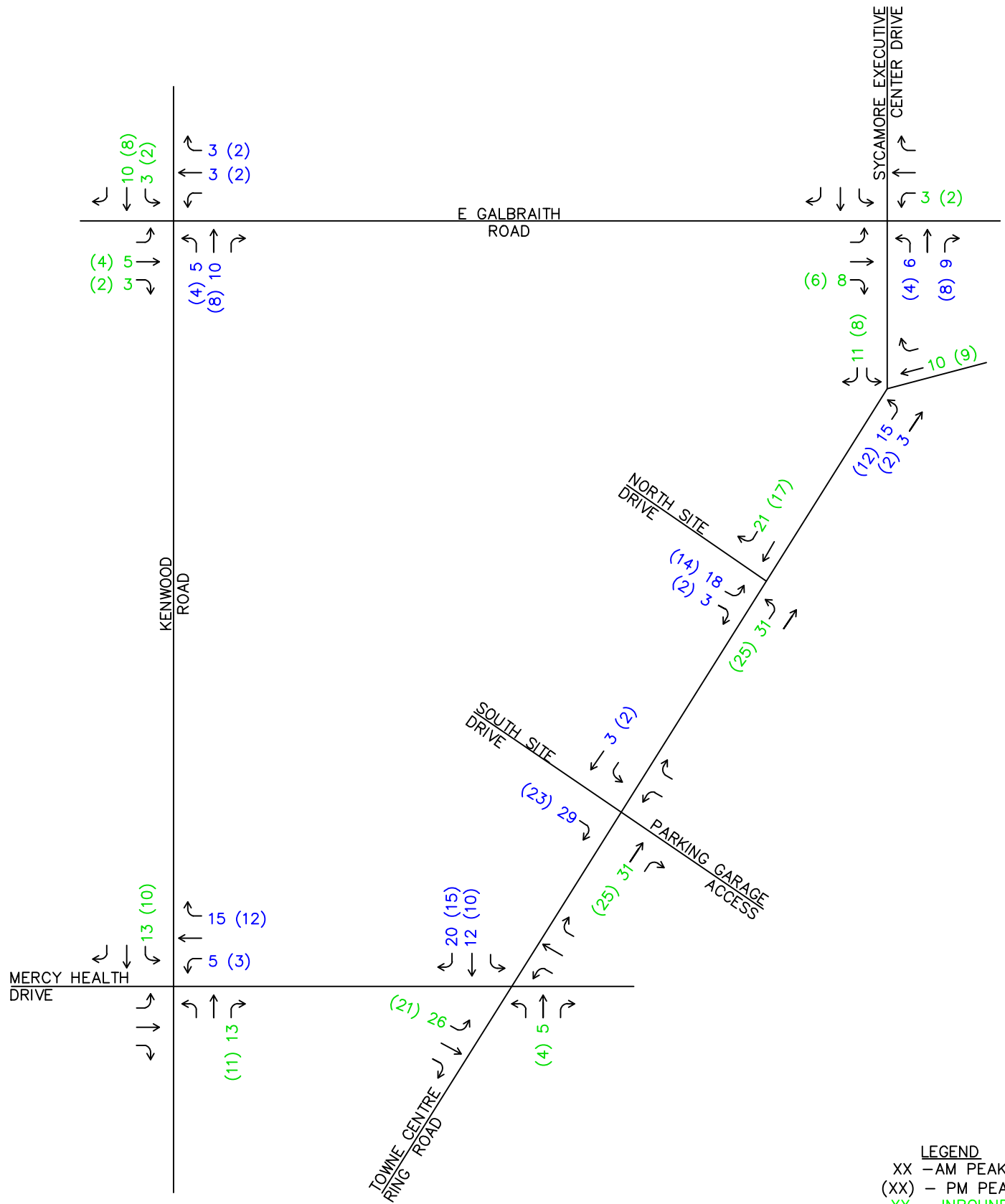
APPENDIX C

PRIMARY TRIP ASSIGNMENT

JULY 2019



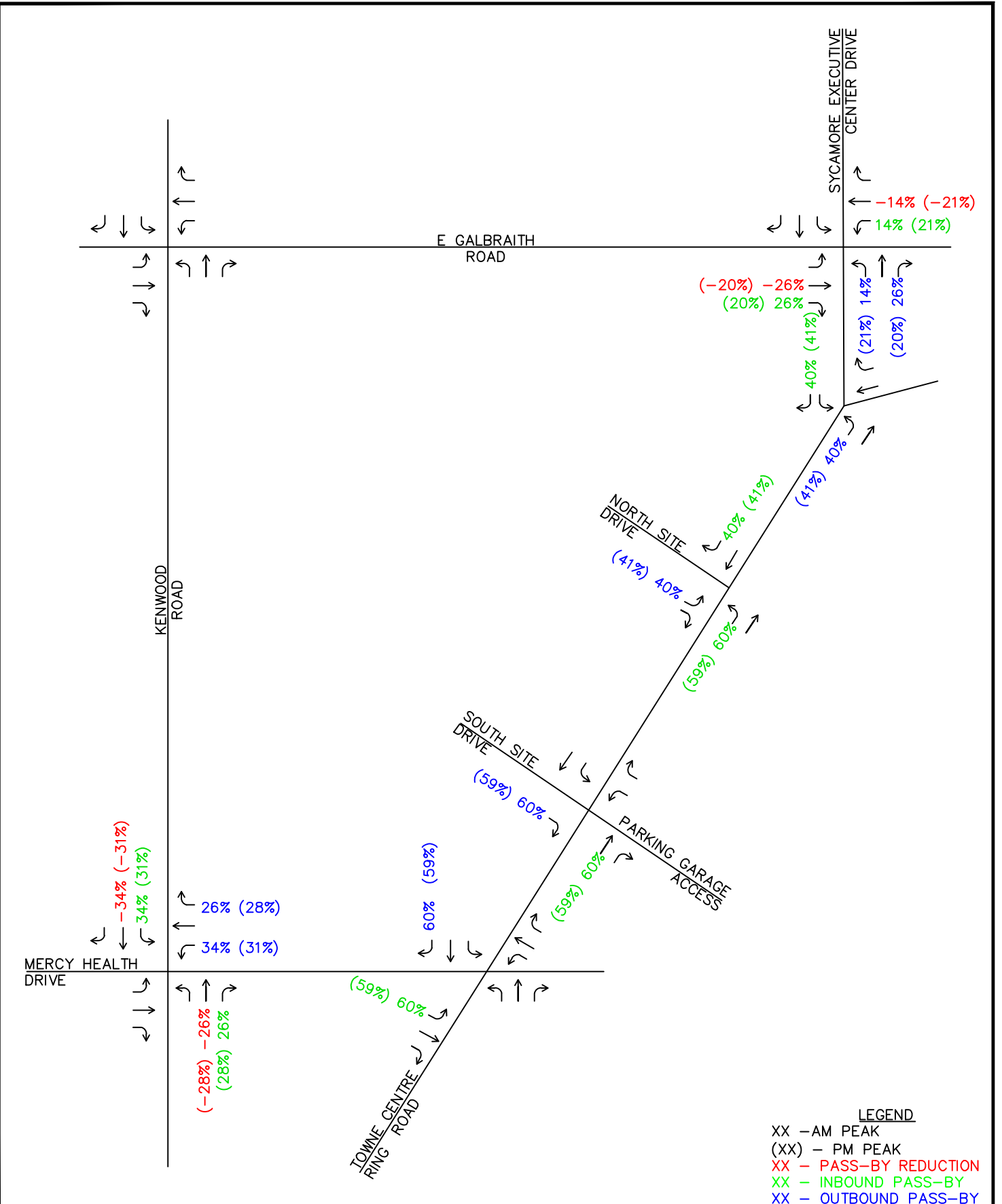
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LEGEND  
 XX - AM PEAK  
 (XX) - PM PEAK  
 XX - INBOUND  
 XX - OUTBOUND

TECHNICIAN: B BOWEN

CAD FILE: C:\2019\2019223\16\_KENWOOD\_OH\_(SITE)\TRAFFIC\FIGURES\PRIMARY TRIP DISTRIBUTION.DWG  
 DATE: 7/11/2019 TIME: 5:07:02 PM



**LEGEND**  
 XX - AM PEAK  
 (XX) - PM PEAK  
 XX - PASS-BY REDUCTION  
 XX - INBOUND PASS-BY  
 XX - OUTBOUND PASS-BY



APPENDIX C

PASS-BY TRIP DISTRIBUTION

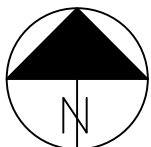
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TECHNICIAN: BBOWEN

CAD FILE: C:\2019\201923\16\_KENWOOD\_OH\_(SITE)\TRAFFIC\FIGURES\PRIMARY TRIP DISTRIBUTION.DWG  
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N.T.S.

APPENDIX C

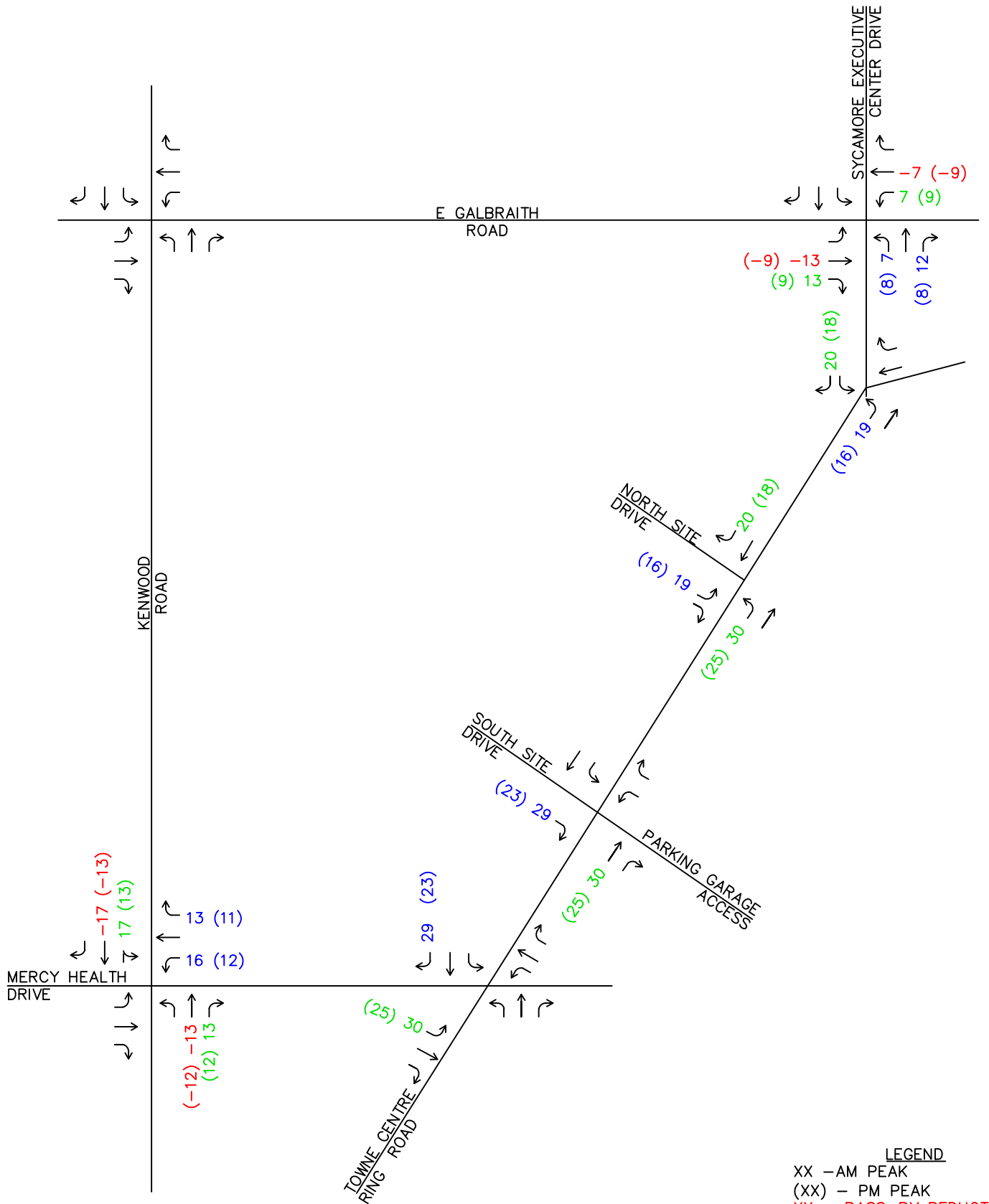
PASS-BY TRIP ASSIGNMENT

JULY 2019

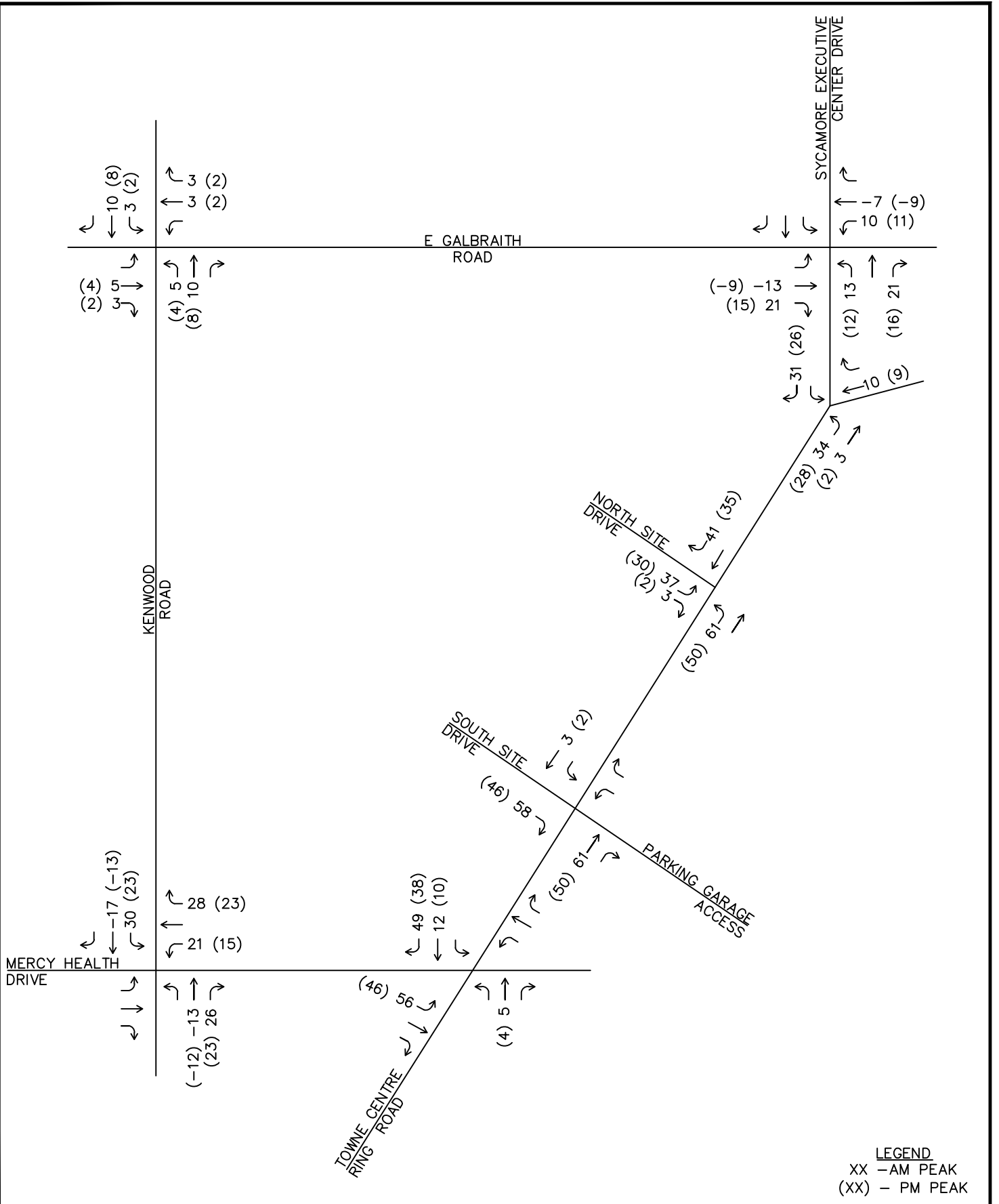


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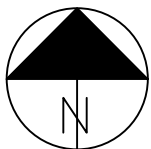
- LEGEND**
- XX - AM PEAK
  - (XX) - PM PEAK
  - XX - PASS-BY REDUCTION
  - XX - INBOUND PASS-BY
  - XX - OUTBOUND PASS-BY



CAD FILE: G:\2019\2019223\16\_KENWOOD\_OH (SITE)\TRAFFIC\FIGURES\PRIMARY TRIP DISTRIBUTION.DWG  
 DATE: 7/11/2019 TIME: 5:20:28 PM



**LEGEND**  
 XX - AM PEAK  
 (XX) - PM PEAK



N.T.S.

APPENDIX C

COMBINED TRIP ASSIGNMENT

JULY 2019



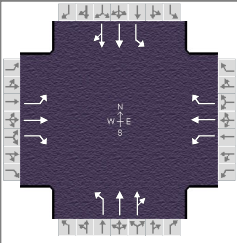
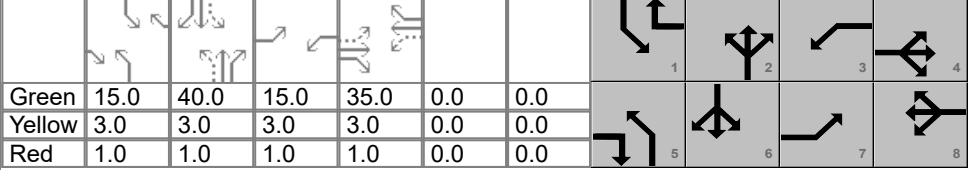
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TECHNICIAN: B BOWEN

**APPENDIX D**  
**HCS INTERSECTION CAPACITY ANALYSIS**

**OPENING YEAR 2020 'NO-BUILD' CONDITIONS**

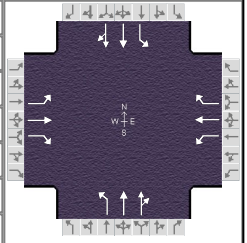
## HCS7 Signalized Intersection Results Summary

General Information						Intersection Information												
Agency	GPD Group					Duration, h	0.25											
Analyst	A. Libert		Analysis Date	5/7/2019		Area Type	Other											
Jurisdiction	Kenwood		Time Period	AM Peak		PHF	0.92											
Urban Street	Kenwood Road		Analysis Year	2020		Analysis Period	1 > 7:00											
Intersection	E Galbraith Road		File Name	1. Kenwood - Galbraith - 2020 No-Build AM.xus														
Project Description	'No-Build'																	
Demand Information						EB			WB			NB			SB			
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R	
Demand ( v ), veh/h						69	202	126	69	166	100	155	399	88	320	612	103	
Signal Information																		
Cycle, s	121.0	Reference Phase	2															
Offset, s	0	Reference Point	End			Green	15.0	40.0	15.0	35.0	0.0	0.0						
Uncoordinated	Yes	Simult. Gap E/W	On			Yellow	3.0	3.0	3.0	3.0	0.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On			Red	1.0	1.0	1.0	1.0	0.0	0.0						
Timer Results						EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase						7	4	3	8	5	2	1	6					
Case Number						1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0					
Phase Duration, s						19.0	39.0	19.0	39.0	19.0	44.0	19.0	44.0					
Change Period, ( Y+R <sub>c</sub> ), s						4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0					
Max Allow Headway ( MAH ), s						3.1	4.3	3.1	4.3	3.1	3.1	3.1	3.1					
Queue Clearance Time ( g <sub>s</sub> ), s						5.1	13.2	5.1	11.0	8.8	15.7	17.0	23.5					
Green Extension Time ( g <sub>e</sub> ), s						0.1	2.5	0.1	2.5	0.1	2.6	0.0	2.5					
Phase Call Probability						1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00					
Max Out Probability						0.00	0.01	0.00	0.00	0.03	0.00	1.00	0.03					
Movement Group Results						EB			WB			NB			SB			
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement						7	4	14	3	8	18	5	2	12	1	6	16	
Adjusted Flow Rate ( v ), veh/h						75	220	137	75	180	109	168	271	258	348	398	379	
Adjusted Saturation Flow Rate ( s ), veh/h/ln						1810	1900	1610	1810	1900	1610	1810	1900	1781	1810	1900	1804	
Queue Service Time ( g <sub>s</sub> ), s						3.1	11.2	6.6	3.1	9.0	5.1	6.8	13.5	13.7	15.0	21.5	21.5	
Cycle Queue Clearance Time ( g <sub>c</sub> ), s						3.1	11.2	6.6	3.1	9.0	5.1	6.8	13.5	13.7	15.0	21.5	21.5	
Green Ratio ( g/C )						0.41	0.29	0.41	0.41	0.29	0.41	0.45	0.33	0.33	0.45	0.33	0.33	
Capacity ( c ), veh/h						526	550	665	496	550	665	380	628	589	462	628	596	
Volume-to-Capacity Ratio ( X )						0.143	0.400	0.206	0.151	0.328	0.163	0.444	0.432	0.438	0.753	0.634	0.635	
Back of Queue ( Q ), ft/ln ( 50 th percentile)						32.5	131.4	63.1	32.5	104	48.6	71.2	154.2	146.9	182.7	251.2	239.4	
Back of Queue ( Q ), veh/ln ( 50 th percentile)						1.3	5.3	2.5	1.3	4.2	1.9	2.8	6.2	5.9	7.3	10.0	9.6	
Queue Storage Ratio ( RQ ) ( 50 th percentile)						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay ( d <sub>1</sub> ), s/veh						22.3	34.6	22.8	22.5	33.8	22.3	22.9	31.6	31.7	24.6	34.3	34.3	
Incremental Delay ( d <sub>2</sub> ), s/veh						0.0	0.7	0.2	0.1	0.1	0.0	0.3	0.2	0.2	6.1	1.6	1.7	
Initial Queue Delay ( d <sub>3</sub> ), s/veh						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay ( d ), s/veh						22.3	35.2	23.0	22.6	33.9	22.4	23.2	31.8	31.9	30.7	35.9	36.0	
Level of Service ( LOS )						C	D	C	C	C	C	C	C	C	C	D	D	
Approach Delay, s/veh / LOS						29.1	C		28.1	C		29.8	C		34.4	C		
Intersection Delay, s/veh / LOS						31.4						C						
Multimodal Results						EB			WB			NB			SB			
Pedestrian LOS Score / LOS						2.29	B		2.29	B		2.12	B		2.12	B		
Bicycle LOS Score / LOS						1.20	A		1.09	A		1.06	A		1.42	A		



## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	GPD Group			Duration, h	0.25		
Analyst	A. Libert	Analysis Date	5/7/2019	Area Type	Other		
Jurisdiction	Kenwood	Time Period	PM Peak	PHF	0.92		
Urban Street	Kenwood Road	Analysis Year	2020	Analysis Period	1 > 7:00		
Intersection	E Galbraith Road	File Name	1. Kenwood - Galbraith - 2020 No-Build PM.xus				
Project Description	'No-Build'						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( $v$ ), veh/h	128	237	195	98	250	254	172	591	76	268	613	90

Signal Information												
Cycle, s	121.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	15.0	40.0	15.0	35.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	3.0	3.0	3.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	19.0	39.0	19.0	39.0	19.0	44.0	19.0	44.0
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.1	4.1	3.1	4.1	3.1	3.1	3.1	3.1
Queue Clearance Time ( $g_s$ ), s	7.9	15.5	6.4	16.7	9.6	21.6	14.7	23.0
Green Extension Time ( $g_e$ ), s	0.1	3.7	0.1	3.7	0.2	2.9	0.0	2.9
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.01	0.05	0.00	0.06	0.10	0.03	1.00	0.04

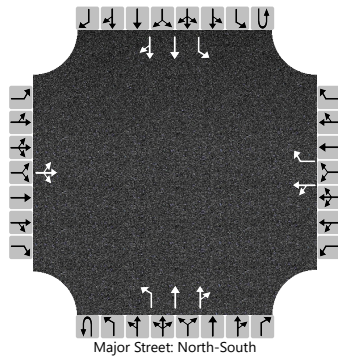
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( $v$ ), veh/h	139	258	212	107	272	276	187	369	356	291	390	374
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1810	1900	1610	1810	1900	1610	1810	1900	1824	1810	1900	1814
Queue Service Time ( $g_s$ ), s	5.9	13.5	10.8	4.4	14.4	14.7	7.6	19.6	19.6	12.7	21.0	21.0
Cycle Queue Clearance Time ( $g_c$ ), s	5.9	13.5	10.8	4.4	14.4	14.7	7.6	19.6	19.6	12.7	21.0	21.0
Green Ratio ( $g/C$ )	0.41	0.29	0.41	0.41	0.29	0.41	0.45	0.33	0.33	0.45	0.33	0.33
Capacity ( $c$ ), veh/h	457	550	665	468	550	665	384	628	603	396	628	600
Volume-to-Capacity Ratio ( $X$ )	0.304	0.469	0.319	0.228	0.494	0.415	0.487	0.588	0.590	0.735	0.622	0.623
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	62.8	158.1	103.1	47.1	165.5	138.9	79.9	226.5	218.5	148.4	244.3	234.4
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	2.5	6.3	4.1	1.9	6.6	5.6	3.2	9.1	8.7	5.9	9.8	9.4
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	23.8	35.4	24.0	23.2	35.7	25.1	23.0	33.7	33.7	24.6	34.1	34.1
Incremental Delay ( $d_2$ ), s/veh	0.1	0.9	0.4	0.1	0.3	0.2	0.4	1.0	1.0	6.1	1.4	1.5
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	24.0	36.2	24.4	23.3	35.9	25.3	23.4	34.6	34.7	30.8	35.5	35.6
Level of Service (LOS)	C	D	C	C	D	C	C	C	C	C	D	D
Approach Delay, s/veh / LOS	29.3	C		29.4	C		32.4	C		34.3	C	
Intersection Delay, s/veh / LOS	31.8						C					

Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Kenwood Drive		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	Kenwood Towne Centre		
Analysis Year	2020			North/South Street	Kenwood Drive		
Time Analyzed	AM Peak 'No-Build'			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A TIS						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	1	0	1	2	0	0	1	2	0
Configuration			LTR			LT		R		L	T	TR		L	T	TR
Volume (veh/h)		4	3	10		7	0	5	0	34	628	16	0	22	750	37
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

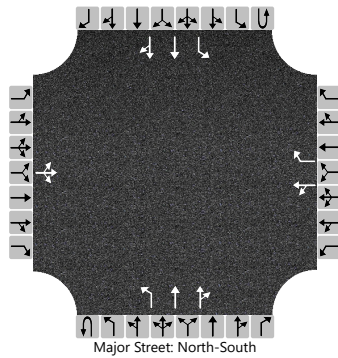
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			18			8		5		37				24		
Capacity, c (veh/h)			194			121		643		774				886		
v/c Ratio			0.10			0.06		0.01		0.05				0.03		
95% Queue Length, Q <sub>95</sub> (veh)			0.3			0.2		0.0		0.2				0.1		
Control Delay (s/veh)			25.5			36.7		10.6		9.9				9.2		
Level of Service (LOS)			D			E		B		A				A		
Approach Delay (s/veh)	25.5				25.9				0.5				0.2			
Approach LOS	D				D											

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Kenwood Drive		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	Kenwood Towne Centre		
Analysis Year	2020			North/South Street	Kenwood Drive		
Time Analyzed	PM Peak 'No-Build'			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A TIS						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	1	0	1	2	0	0	1	2	0
Configuration			LTR			LT		R		L	T	TR		L	T	TR
Volume (veh/h)		9	1	27		27	0	116	0	24	712	38	0	63	834	10
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized						No										
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

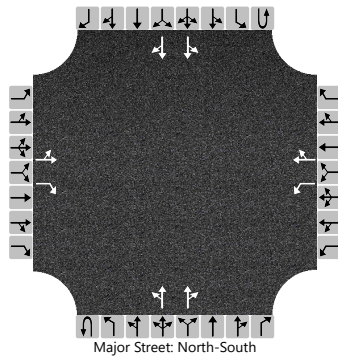
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			40			29		126		26				68			
Capacity, c (veh/h)			173			79		590		733				802			
v/c Ratio			0.23			0.37		0.21		0.04				0.09			
95% Queue Length, Q <sub>95</sub> (veh)			0.9			1.4		0.8		0.1				0.3			
Control Delay (s/veh)			32.1			75.5		12.8		10.1				9.9			
Level of Service (LOS)			D			F		B		B				A			
Approach Delay (s/veh)		32.1				24.6				0.3				0.7			
Approach LOS		D				C											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Towne Centre Ring Road
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Centre Drive
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	AM Peak 'No-Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	1		1	1	0	0	0	2	0	0	0	2	0	
Configuration		LT		R		L		TR		LT		TR		LT		TR	
Volume (veh/h)		33	9	9		1	2	1		6	5	1		1	15	9	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No															
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

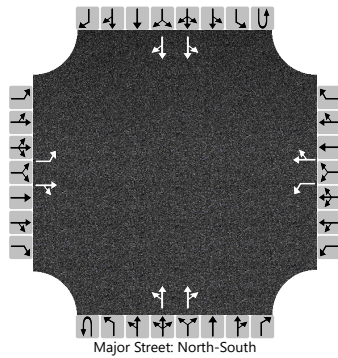
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		46		10		1		3		7				1			
Capacity, c (veh/h)		924		1061		944		904		1579				1605			
v/c Ratio		0.05		0.01		0.00		0.00		0.00				0.00			
95% Queue Length, Q <sub>95</sub> (veh)		0.2		0.0		0.0		0.0		0.0				0.0			
Control Delay (s/veh)		9.1		8.4		8.8		9.0		7.3				7.2			
Level of Service (LOS)		A		A		A		A		A				A			
Approach Delay (s/veh)		9.0				9.0				3.6				0.3			
Approach LOS		A				A											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Towne Centre Ring Road
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Centre Drive
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	PM Peak 'No-Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		1	1	0		1	1	0	0	0	2	0	0	0	2	0	
Configuration		L		TR		L		TR		LT		TR		LT		TR	
Volume (veh/h)		25	7	62		5	13	1		98	38	4		4	73	25	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized																	
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

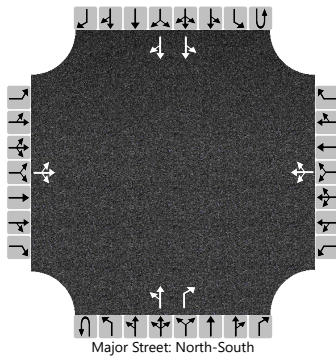
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		27		75		5		15		107				4			
Capacity, c (veh/h)		539		914		537		531		1475				1553			
v/c Ratio		0.05		0.08		0.01		0.03		0.07				0.00			
95% Queue Length, Q <sub>95</sub> (veh)		0.2		0.3		0.0		0.1		0.2				0.0			
Control Delay (s/veh)		12.0		9.3		11.8		12.0		7.6				7.3			
Level of Service (LOS)		B		A		B		B		A				A			
Approach Delay (s/veh)		10.0				11.9				5.4				0.3			
Approach LOS		B				B											

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Ring Road / Garage		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	South Drive / Parking Gar		
Analysis Year	2020			North/South Street	Towne Centre Ring Road		
Time Analyzed	AM Peak 'No-Build			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-fil-A TIS						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0		0	1	1		0	2	0
Configuration			LTR				LTR			LT		R		LT		TR
Volume (veh/h)		0	0	7		1	0	1		4	20	5		4	22	1
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized									No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

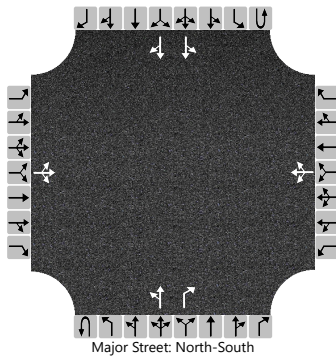
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			8				2				4				4	
Capacity, c (veh/h)			1061				984				1581				1578	
v/c Ratio			0.01				0.00				0.00				0.00	
95% Queue Length, Q <sub>95</sub> (veh)			0.0				0.0				0.0				0.0	
Control Delay (s/veh)			8.4				8.7				7.3				7.3	
Level of Service (LOS)			A				A				A				A	
Approach Delay (s/veh)	8.4				8.7				1.0				1.1			
Approach LOS	A				A											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Ring Road / Garage
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	South Drive / Parking Gar
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	PM Peak 'No-Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	1	0	0	2	0
Configuration			LTR				LTR			LT		R		LT		TR
Volume (veh/h)		7	0	6		14	0	3		0	65	3		0	75	0
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized										No						
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

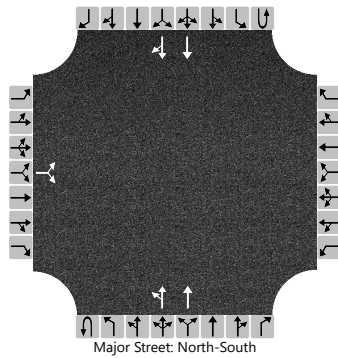
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			14				18			0				0			
Capacity, c (veh/h)			882				867			1507				1516			
v/c Ratio			0.02				0.02			0.00				0.00			
95% Queue Length, Q <sub>95</sub> (veh)			0.0				0.1			0.0				0.0			
Control Delay (s/veh)			9.2				9.2			7.4				7.4			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.2				9.2				0.0				0.0			
Approach LOS		A				A											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Galbraith Entrance / Ring
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Towne Centre Entrance
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	AM 'No-Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		27		38						2	11				11	11
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

## Delay, Queue Length, and Level of Service

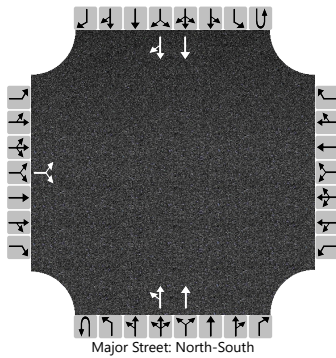
Flow Rate, v (veh/h)			71							2						
Capacity, c (veh/h)			1026							1582						
v/c Ratio			0.07							0.00						
95% Queue Length, Q <sub>95</sub> (veh)			0.2							0.0						
Control Delay (s/veh)			8.8							7.3						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		8.8								1.1						
Approach LOS		A														



# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Galbraith Entrance / Ring
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Towne Centre Entrance
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	PM 'No-Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		73		23						37	53				60	69
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

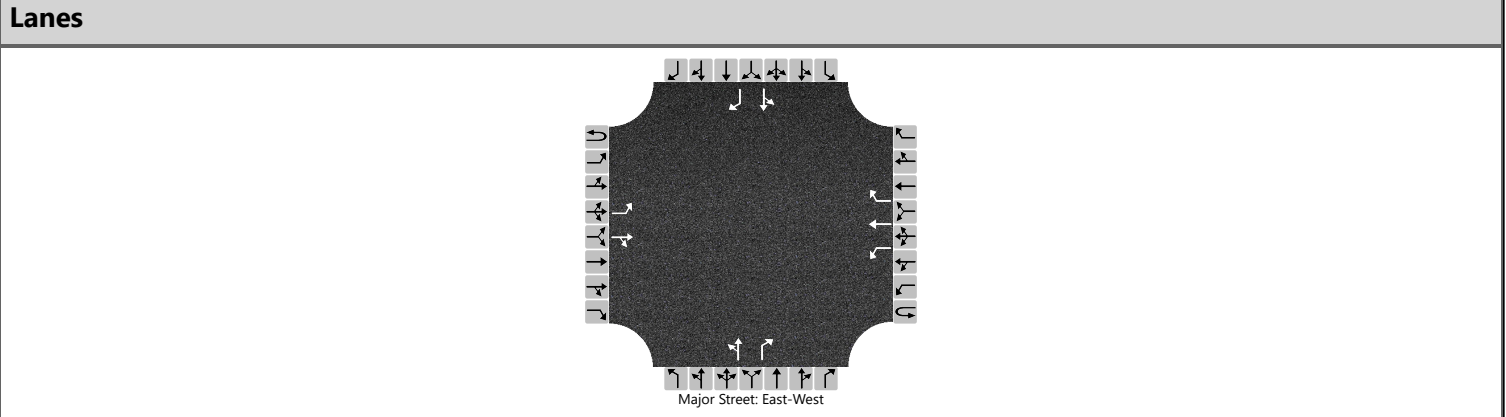
Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			104							40						
Capacity, c (veh/h)			779							1433						
v/c Ratio			0.13							0.03						
95% Queue Length, Q <sub>95</sub> (veh)			0.5							0.1						
Control Delay (s/veh)			10.3							7.6						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.3								3.1						
Approach LOS		B								A						

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Galbraith / Towne Centre		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	E Galbraith Road		
Analysis Year	2020			North/South Street	Kenwood Towne Centre Driv		
Time Analyzed	AM 'No-Build'			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A						



**Vehicle Volumes and Adjustments**

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	1	0	0	1	1	1		0	1	1		0	1	1
Configuration		L		TR		L	T	R		LT		R		LT		R
Volume (veh/h)		37	531	52		6	320	25		14	0	2		4	0	2
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No				No				No			
Median Type   Storage	Undivided															

**Critical and Follow-up Headways**

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

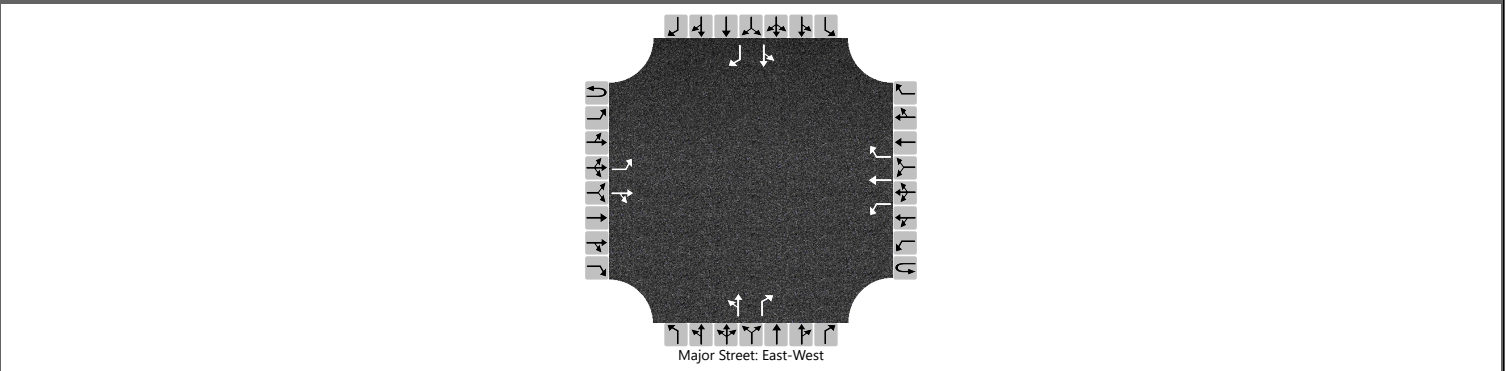
**Delay, Queue Length, and Level of Service**

Flow Rate, v (veh/h)		40				7				15		2		4		2	
Capacity, c (veh/h)		1178				944				194		496		198		693	
v/c Ratio		0.03				0.01				0.08		0.00		0.02		0.00	
95% Queue Length, Q <sub>95</sub> (veh)		0.1				0.0				0.3		0.0		0.1		0.0	
Control Delay (s/veh)		8.2				8.8				25.2		12.3		23.6		10.2	
Level of Service (LOS)		A				A				D		B		C		B	
Approach Delay (s/veh)		0.5				0.2				23.6				19.2			
Approach LOS										C				C			

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Galbraith / Towne Centre		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	E Galbraith Road		
Analysis Year	2020			North/South Street	Kenwood Towne Centre Driv		
Time Analyzed	PM 'No-Build'			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	1		0	1	1		0	1	1
Configuration		L		TR		L	T	R		LT		R		LT		R
Volume (veh/h)		11	475	96		6	519	5		84	0	36		11	0	26
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No				No				No			
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

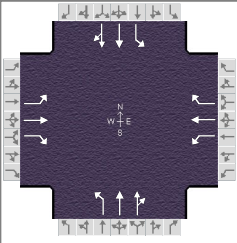
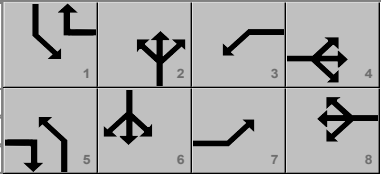
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		12				7				91		39		12		28	
Capacity, c (veh/h)		998				955				154		520		149		523	
v/c Ratio		0.01				0.01				0.59		0.08		0.08		0.05	
95% Queue Length, Q <sub>95</sub> (veh)		0.0				0.0				3.1		0.2		0.3		0.2	
Control Delay (s/veh)		8.7				8.8				58.0		12.5		31.2		12.3	
Level of Service (LOS)		A				A				F		B		D		B	
Approach Delay (s/veh)		0.2				0.1				44.4				17.9			
Approach LOS										E				C			

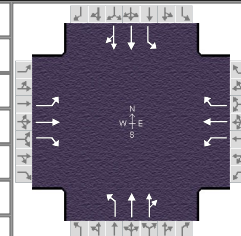
**OPENING YEAR 2020 'BUILD' CONDITIONS**

## HCS7 Signalized Intersection Results Summary

General Information						Intersection Information												
Agency	GPD Group					Duration, h	0.25											
Analyst	A. Libert		Analysis Date	5/7/2019		Area Type	Other											
Jurisdiction	Kenwood		Time Period	AM Peak		PHF	0.92											
Urban Street	Kenwood Road		Analysis Year	2020		Analysis Period	1 > 7:00											
Intersection	E Galbraith Road		File Name	1. Kenwood - Galbraith - 2020 Build AM.xus														
Project Description	'Build'																	
Demand Information						EB			WB			NB			SB			
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R	
Demand ( v ), veh/h						69	207	129	69	169	103	160	409	88	323	622	103	
Signal Information																		
Cycle, s	121.0	Reference Phase	2															
Offset, s	0	Reference Point	End			Green	15.0	40.0	15.0	35.0	0.0	0.0						
Uncoordinated	Yes	Simult. Gap E/W	On			Yellow	3.0	3.0	3.0	3.0	0.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On			Red	1.0	1.0	1.0	1.0	0.0	0.0						
Timer Results						EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase						7	4	3	8	5	2	1	6					
Case Number						1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0					
Phase Duration, s						19.0	39.0	19.0	39.0	19.0	44.0	19.0	44.0					
Change Period, ( Y+R <sub>c</sub> ), s						4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0					
Max Allow Headway ( MAH ), s						3.1	4.3	3.1	4.3	3.1	3.1	3.1	3.1					
Queue Clearance Time ( g <sub>s</sub> ), s						5.1	13.6	5.1	11.2	9.0	16.0	17.0	23.9					
Green Extension Time ( g <sub>e</sub> ), s						0.1	2.5	0.1	2.6	0.1	2.6	0.0	2.5					
Phase Call Probability						1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00					
Max Out Probability						0.00	0.01	0.00	0.00	0.05	0.00	1.00	0.04					
Movement Group Results						EB			WB			NB			SB			
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement						7	4	14	3	8	18	5	2	12	1	6	16	
Adjusted Flow Rate ( v ), veh/h						75	225	140	75	184	112	174	277	263	351	404	384	
Adjusted Saturation Flow Rate ( s ), veh/h/ln						1810	1900	1610	1810	1900	1610	1810	1900	1783	1810	1900	1805	
Queue Service Time ( g <sub>s</sub> ), s						3.1	11.6	6.8	3.1	9.2	5.3	7.0	13.8	14.0	15.0	21.9	21.9	
Cycle Queue Clearance Time ( g <sub>c</sub> ), s						3.1	11.6	6.8	3.1	9.2	5.3	7.0	13.8	14.0	15.0	21.9	21.9	
Green Ratio ( g/C )						0.41	0.29	0.41	0.41	0.29	0.41	0.45	0.33	0.33	0.45	0.33	0.33	
Capacity ( c ), veh/h						524	550	665	492	550	665	377	628	590	458	628	597	
Volume-to-Capacity Ratio ( X )						0.143	0.409	0.211	0.152	0.334	0.168	0.462	0.441	0.446	0.767	0.643	0.644	
Back of Queue ( Q ), ft/ln ( 50 th percentile)						32.5	135.2	64.8	32.5	106.1	50.1	73.8	158	150.3	187	256	244.2	
Back of Queue ( Q ), veh/ln ( 50 th percentile)						1.3	5.4	2.6	1.3	4.2	2.0	3.0	6.3	6.0	7.5	10.2	9.8	
Queue Storage Ratio ( RQ ) ( 50 th percentile)						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay ( d <sub>1</sub> ), s/veh						22.3	34.7	22.8	22.5	33.8	22.4	23.1	31.7	31.8	24.9	34.4	34.4	
Incremental Delay ( d <sub>2</sub> ), s/veh						0.0	0.7	0.2	0.1	0.1	0.0	0.3	0.2	0.2	6.9	1.7	1.9	
Initial Queue Delay ( d <sub>3</sub> ), s/veh						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay ( d ), s/veh						22.3	35.4	23.0	22.6	34.0	22.4	23.4	31.9	32.0	31.8	36.2	36.3	
Level of Service ( LOS )						C	D	C	C	C	C	C	C	C	C	D	D	
Approach Delay, s/veh / LOS						29.2	C		28.2	C		29.9	C		34.9	C		
Intersection Delay, s/veh / LOS						31.7						C						
Multimodal Results						EB			WB			NB			SB			
Pedestrian LOS Score / LOS																		
Bicycle LOS Score / LOS																		

## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	GPD Group			Duration, h	0.25		
Analyst	A. Libert	Analysis Date	5/7/2019	Area Type	Other		
Jurisdiction	Kenwood	Time Period	PM Peak	PHF	0.92		
Urban Street	Kenwood Road	Analysis Year	2020	Analysis Period	1 > 7:00		
Intersection	E Galbraith Road	File Name	1. Kenwood - Galbraith - 2020 Build PM.xus				
Project Description	'Build'						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( v ), veh/h	128	241	197	98	252	256	176	599	76	270	621	90

Signal Information													
Cycle, s	121.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	15.0	40.0	15.0	35.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	3.0	3.0	3.0	0.0	0.0			
				Red	1.0	1.0	1.0	1.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	19.0	39.0	19.0	39.0	19.0	44.0	19.0	44.0
Change Period, ( Y+R <sub>c</sub> ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( MAH ), s	3.1	4.1	3.1	4.1	3.1	3.1	3.1	3.1
Queue Clearance Time ( g <sub>s</sub> ), s	7.9	15.8	6.4	16.8	9.8	21.9	14.8	23.3
Green Extension Time ( g <sub>e</sub> ), s	0.1	3.8	0.1	3.7	0.2	3.0	0.0	2.9
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.01	0.05	0.00	0.06	0.12	0.04	1.00	0.05

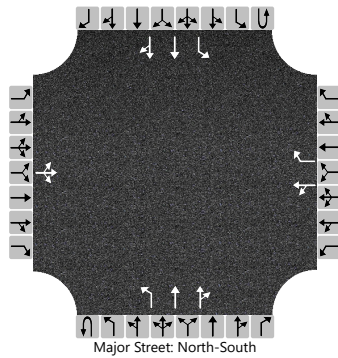
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( v ), veh/h	139	262	214	107	274	278	191	374	360	293	395	378
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1810	1900	1610	1810	1900	1610	1810	1900	1825	1810	1900	1815
Queue Service Time ( g <sub>s</sub> ), s	5.9	13.8	10.9	4.4	14.5	14.8	7.8	19.8	19.9	12.8	21.2	21.3
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	5.9	13.8	10.9	4.4	14.5	14.8	7.8	19.8	19.9	12.8	21.2	21.3
Green Ratio ( g/C )	0.41	0.29	0.41	0.41	0.29	0.41	0.45	0.33	0.33	0.45	0.33	0.33
Capacity ( c ), veh/h	456	550	665	464	550	665	382	628	603	394	628	600
Volume-to-Capacity Ratio ( X )	0.305	0.477	0.322	0.229	0.498	0.418	0.501	0.595	0.597	0.745	0.629	0.630
Back of Queue ( Q ), ft/ln ( 50 th percentile)	62.8	161.2	104.3	47.1	167.2	140.2	82.1	230	221.9	151.1	248.2	238
Back of Queue ( Q ), veh/ln ( 50 th percentile)	2.5	6.4	4.2	1.9	6.7	5.6	3.3	9.2	8.9	6.0	9.9	9.5
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( d <sub>1</sub> ), s/veh	23.8	35.4	24.0	23.3	35.7	25.2	23.2	33.8	33.8	24.8	34.2	34.2
Incremental Delay ( d <sub>2</sub> ), s/veh	0.1	0.9	0.4	0.1	0.3	0.2	0.4	1.1	1.1	6.7	1.5	1.6
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( d ), s/veh	24.0	36.4	24.4	23.4	36.0	25.3	23.6	34.8	34.9	31.5	35.7	35.9
Level of Service ( LOS )	C	D	C	C	D	C	C	C	C	C	D	D
Approach Delay, s/veh / LOS	29.4	C		29.4	C		32.5	C		34.6	C	
Intersection Delay, s/veh / LOS	32.0						C					

Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Kenwood Drive		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	Kenwood Towne Centre		
Analysis Year	2020			North/South Street	Kenwood Drive		
Time Analyzed	AM Peak 'Build'			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A TIS						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	1	0	1	2	0	0	1	2	0	
Configuration			LTR			LT		R		L	T	TR		L	T	TR	
Volume (veh/h)		4	3	10		28	0	33	0	34	615	42	0	52	733	37	
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized						No											
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

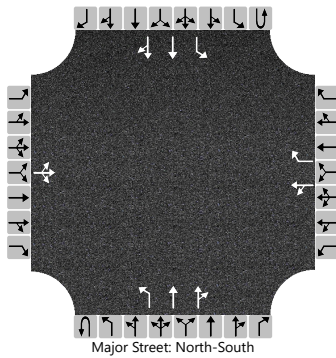
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			18		30		36		37				57				
Capacity, c (veh/h)			174		106		637		786				875				
v/c Ratio			0.11		0.29		0.06		0.05				0.06				
95% Queue Length, Q <sub>95</sub> (veh)			0.3		1.1		0.2		0.1				0.2				
Control Delay (s/veh)			28.1		51.8		11.0		9.8				9.4				
Level of Service (LOS)			D		F		B		A				A				
Approach Delay (s/veh)		28.1				29.7				0.5				0.6			
Approach LOS		D				D											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Kenwood Drive
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Towne Centre
Analysis Year	2020	North/South Street	Kenwood Drive
Time Analyzed	PM Peak 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	1	0	1	2	0	0	1	2	0
Configuration			LTR			LT		R		L	T	TR		L	T	TR
Volume (veh/h)		9	1	27		42	0	139	0	24	700	61	0	86	821	10
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

## Delay, Queue Length, and Level of Service

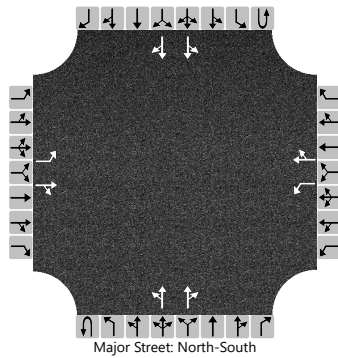
Flow Rate, v (veh/h)			40			46		151		26				93		
Capacity, c (veh/h)			156			71		585		742				793		
v/c Ratio			0.26			0.64		0.26		0.04				0.12		
95% Queue Length, Q <sub>95</sub> (veh)			1.0			2.8		1.0		0.1				0.4		
Control Delay (s/veh)			35.9			119.7		13.3		10.0				10.1		
Level of Service (LOS)			E			F		B		B				B		
Approach Delay (s/veh)	35.9				38.0				0.3				1.0			
Approach LOS	E				E											



# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Towne Centre Ring Road
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Centre Drive
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	AM Peak 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	1	0		1	1	0	0	0	2	0	0	0	2	0
Configuration		L		TR		L		TR		LT		TR		LT		TR
Volume (veh/h)		89	9	9		1	2	1		6	10	1		1	27	58
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

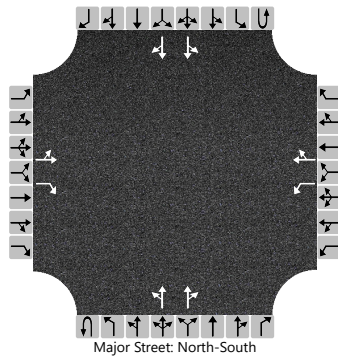
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		97		20		1		3		7				1		
Capacity, c (veh/h)		886		890		925		845		1493				1598		
v/c Ratio		0.11		0.02		0.00		0.00		0.00				0.00		
95% Queue Length, Q <sub>95</sub> (veh)		0.4		0.1		0.0		0.0		0.0				0.0		
Control Delay (s/veh)		9.6		9.1		8.9		9.3		7.4				7.3		
Level of Service (LOS)		A		A		A		A		A				A		
Approach Delay (s/veh)		9.5				9.2				2.6				0.1		
Approach LOS		A				A										

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Towne Centre Ring Road
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Centre Drive
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	PM Peak 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	1		1	1	0	0	0	2	0	0	0	2	0	
Configuration		LT		R		L		TR		LT		TR		LT		TR	
Volume (veh/h)		70	7	62		5	13	1		98	42	4		4	83	63	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No															
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

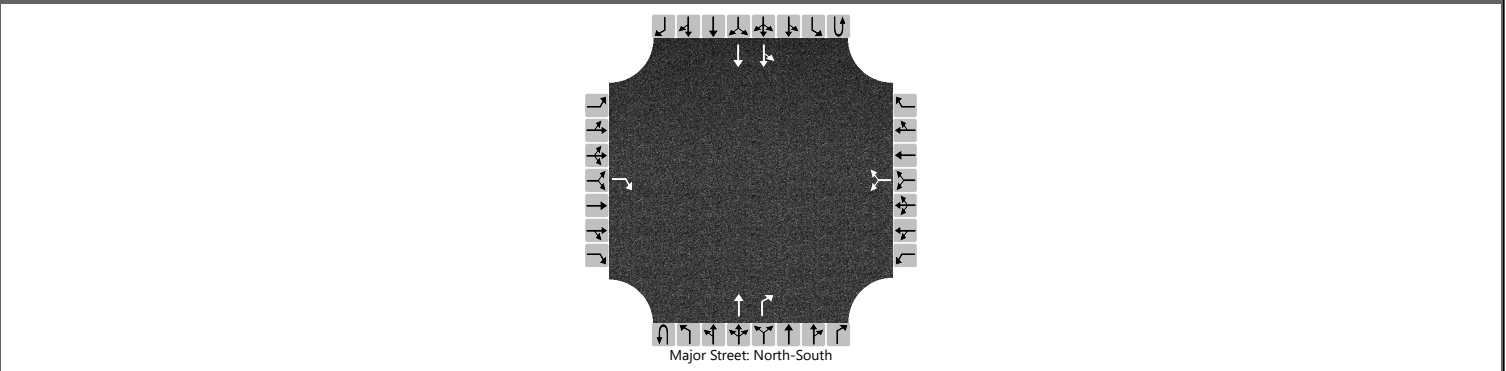
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		84		67		5		15		107				4			
Capacity, c (veh/h)		506		962		525		493		1411				1547			
v/c Ratio		0.17		0.07		0.01		0.03		0.08				0.00			
95% Queue Length, Q <sub>95</sub> (veh)		0.6		0.2		0.0		0.1		0.2				0.0			
Control Delay (s/veh)		13.5		9.0		11.9		12.5		7.8				7.3			
Level of Service (LOS)		B		A		B		B		A				A			
Approach Delay (s/veh)		11.5				12.4				5.3				0.2			
Approach LOS		B				B											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Ring Road / Garage
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	South Drive / Parking Gar
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	AM Peak 'Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	1	0	0	0	1	1	0	0	2	0
Configuration				R			LR				T	R		LT	T	
Volume (veh/h)				65		1		1			81	5		4	25	
Percent Heavy Vehicles (%)				3		3		3						3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9		7.5		6.9							4.1		
Critical Headway (sec)				6.96		7.56		6.96							4.16		
Base Follow-Up Headway (sec)				3.3		3.5		3.3							2.2		
Follow-Up Headway (sec)				3.33		3.53		3.33							2.23		

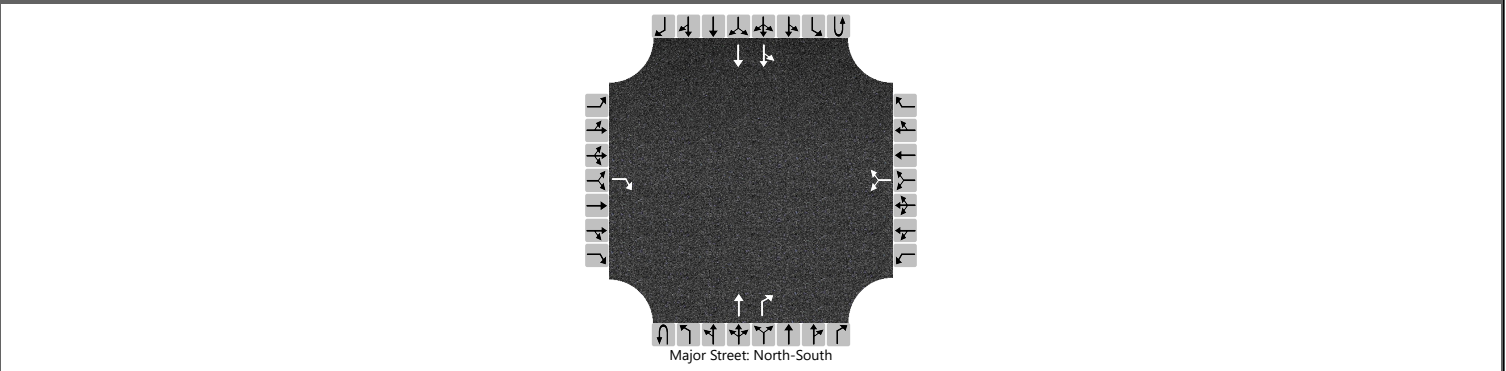
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				71				2							4		
Capacity, c (veh/h)				1060				865							1491		
v/c Ratio				0.07				0.00							0.00		
95% Queue Length, Q <sub>95</sub> (veh)				0.2				0.0							0.0		
Control Delay (s/veh)				8.6				9.2							7.4		
Level of Service (LOS)				A				A							A		
Approach Delay (s/veh)	8.6				9.2								1.0				
Approach LOS	A				A												

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Ring Road / Garage
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	South Drive / Parking Gar
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	PM Peak 'Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	1	0	0	0	1	1	0	0	2	0
Configuration				R			LR				T	R		LT	T	
Volume (veh/h)				52		14		3			115	3		0	77	
Percent Heavy Vehicles (%)				3		3		3						3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9		7.5		6.9							4.1		
Critical Headway (sec)				6.96		7.56		6.96							4.16		
Base Follow-Up Headway (sec)				3.3		3.5		3.3							2.2		
Follow-Up Headway (sec)				3.33		3.53		3.33							2.23		

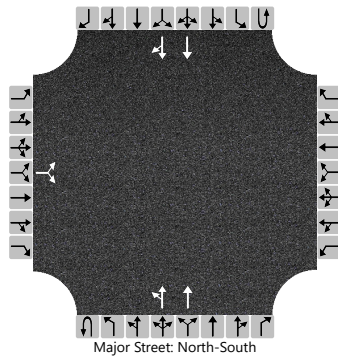
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				57		18									0		
Capacity, c (veh/h)				1016		760									1448		
v/c Ratio				0.06		0.02									0.00		
95% Queue Length, Q <sub>95</sub> (veh)				0.2		0.1									0.0		
Control Delay (s/veh)				8.8		9.9									7.5		
Level of Service (LOS)				A		A									A		
Approach Delay (s/veh)	8.8				9.9								0.0				
Approach LOS	A				A												

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Galbraith Entrance / Ring
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Towne Centre Entrance
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	AM 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0	
Configuration			LR							LT	T				T	TR	
Volume (veh/h)		27		69						36	14					21	11
Percent Heavy Vehicles (%)		3		3						3							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

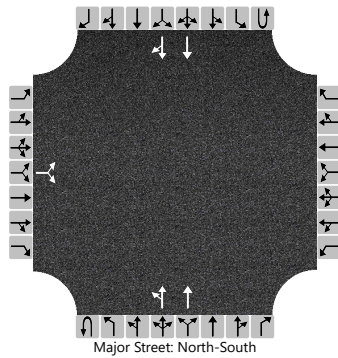
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			104							39						
Capacity, c (veh/h)			985							1568						
v/c Ratio			0.11							0.02						
95% Queue Length, Q <sub>95</sub> (veh)			0.4							0.1						
Control Delay (s/veh)			9.1							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.1								5.3						
Approach LOS		A														

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Galbraith Entrance / Ring
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Towne Centre Entrance
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	PM 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		73		50						65	55					69
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

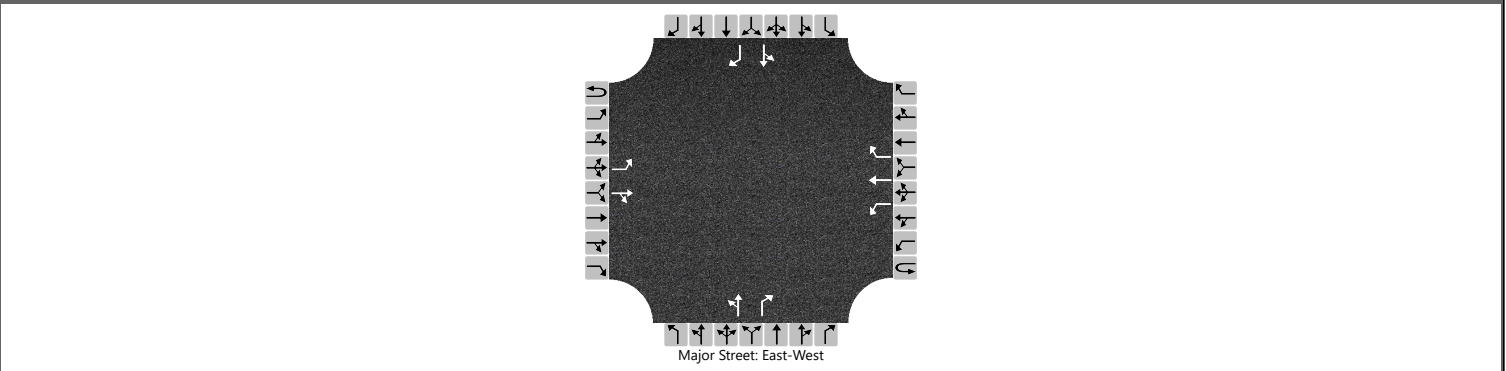
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			134							71						
Capacity, c (veh/h)			747							1421						
v/c Ratio			0.18							0.05						
95% Queue Length, Q <sub>95</sub> (veh)			0.6							0.2						
Control Delay (s/veh)			10.9							7.7						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.9								4.2						
Approach LOS		B								A						

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Galbraith / Towne Centre		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	E Galbraith Road		
Analysis Year	2020			North/South Street	Kenwood Towne Centre Driv		
Time Analyzed	AM 'Build'			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	1		0	1	1		0	1	1
Configuration		L		TR		L	T	R		LT		R		LT		R
Volume (veh/h)		37	518	73		16	313	25		27	0	23		4	0	2
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No				No				No			
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

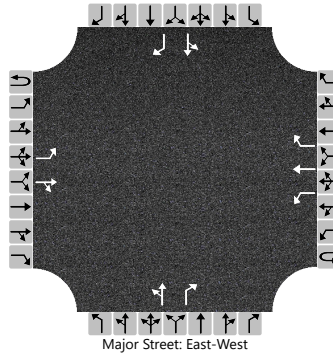
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		40				17				29		25		4		2	
Capacity, c (veh/h)		1186				937				189		497		180		700	
v/c Ratio		0.03				0.02				0.16		0.05		0.02		0.00	
95% Queue Length, Q <sub>95</sub> (veh)		0.1				0.1				0.5		0.2		0.1		0.0	
Control Delay (s/veh)		8.1				8.9				27.6		12.6		25.5		10.2	
Level of Service (LOS)		A				A				D		B		D		B	
Approach Delay (s/veh)		0.5				0.4				20.7				20.4			
Approach LOS										C				C			

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Galbraith / Towne Centre		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	E Galbraith Road		
Analysis Year	2020			North/South Street	Kenwood Towne Centre Driv		
Time Analyzed	PM 'Build'			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A TIS						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6	7	8	9	10	11	12		
Priority																
Number of Lanes	0	1	1	0	0	1	1	1	0	1	1	0	1	1		
Configuration		L		TR		L	T	R		LT		R		LT		R
Volume (veh/h)		11	467	110		17	510	5		96	0	52		11	0	26
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized						No				No				No		
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

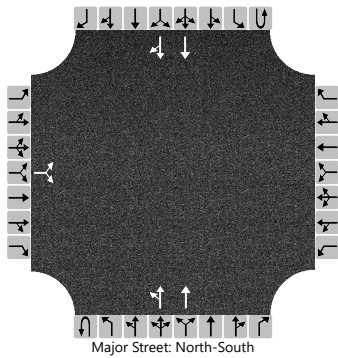
Flow Rate, v (veh/h)		12				18				104		57		12		28
Capacity, c (veh/h)		1006				950				149		521		138		530
v/c Ratio		0.01				0.02				0.70		0.11		0.09		0.05
95% Queue Length, Q <sub>95</sub> (veh)		0.0				0.1				4.1		0.4		0.3		0.2
Control Delay (s/veh)		8.6				8.9				71.9		12.8		33.6		12.2
Level of Service (LOS)		A				A				F		B		D		B
Approach Delay (s/veh)		0.2				0.3				51.1				18.5		
Approach LOS										F				C		



# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	North Site Drive
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/8/2019	East/West Street	North Site Drive
Analysis Year	2020	North/South Street	Towne Centre Ring Road
Time Analyzed	AM Peak 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-a		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0	
Configuration			LR							LT	T				T	TR	
Volume (veh/h)		37		3						61	16					36	41
Percent Heavy Vehicles (%)		3		3						3							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

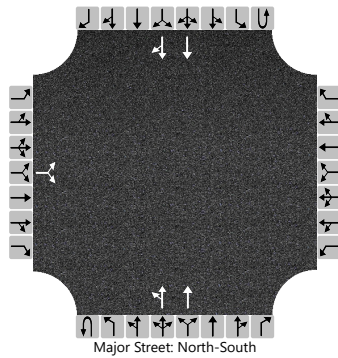
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			43							66						
Capacity, c (veh/h)			746							1504						
v/c Ratio			0.06							0.04						
95% Queue Length, Q <sub>95</sub> (veh)			0.2							0.1						
Control Delay (s/veh)			10.1							7.5						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.1								5.9						
Approach LOS		B														

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	North Site Drive		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/8/2019			East/West Street	North Site Drive		
Analysis Year	2020			North/South Street	Towne Centre Ring Road		
Time Analyzed	PM Peak 'Build'			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-fil-a						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		30		2						50	82				78	35
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

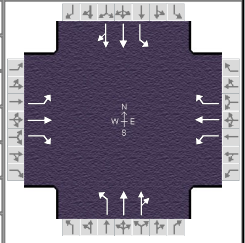
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			35							54						
Capacity, c (veh/h)			693							1455						
v/c Ratio			0.05							0.04						
95% Queue Length, Q <sub>95</sub> (veh)			0.2							0.1						
Control Delay (s/veh)			10.5							7.6						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.5								2.9						
Approach LOS		B														

**DESIGN YEAR 2040 'NO-BUILD' CONDITIONS**

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	GPD Group			Duration, h	0.25		
Analyst	A. Libert	Analysis Date	5/7/2019	Area Type	Other		
Jurisdiction	Kenwood	Time Period	PM Peak	PHF	0.92		
Urban Street	Kenwood Road	Analysis Year	2040	Analysis Period	1 > 7:00		
Intersection	E Galbraith Road	File Name	1. Kenwood - Galbraith - 2040 No Build PM.xus				
Project Description	'No Build'						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( v ), veh/h	202	375	308	155	396	403	272	936	121	424	970	142

Signal Information												
Cycle, s	121.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	15.0	40.0	15.0	35.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	3.0	3.0	3.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

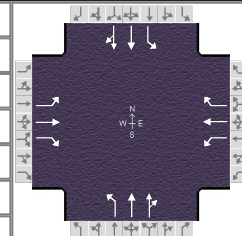
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	19.0	39.0	19.0	39.0	19.0	44.0	19.0	44.0
Change Period, ( Y+R <sub>c</sub> ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( MAH ), s	3.1	4.1	3.1	4.1	3.1	3.1	3.1	3.1
Queue Clearance Time ( g <sub>s</sub> ), s	11.8	25.5	9.3	28.5	17.0	38.2	17.0	42.0
Green Extension Time ( g <sub>e</sub> ), s	0.1	4.6	0.1	3.5	0.0	1.2	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.93	0.59	0.06	0.79	1.00	1.00	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( v ), veh/h	220	408	335	168	430	438	296	586	563	461	650	559
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1810	1900	1610	1810	1900	1610	1810	1900	1823	1810	1900	1629
Queue Service Time ( g <sub>s</sub> ), s	9.8	23.5	18.6	7.3	25.2	26.5	15.0	36.1	36.2	15.0	40.0	40.0
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	9.8	23.5	18.6	7.3	25.2	26.5	15.0	36.1	36.2	15.0	40.0	40.0
Green Ratio ( g/C )	0.41	0.29	0.41	0.41	0.29	0.41	0.45	0.33	0.33	0.45	0.33	0.33
Capacity ( c ), veh/h	347	550	665	362	550	665	284	628	603	291	628	539
Volume-to-Capacity Ratio ( X )	0.633	0.742	0.503	0.466	0.783	0.658	1.042	0.933	0.934	1.582	1.035	1.038
Back of Queue ( Q ), ft/ln ( 50 th percentile)	110.3	291.4	179.2	77.7	314.5	258.6	255	500.8	484.6	693.5	651.5	572.4
Back of Queue ( Q ), veh/ln ( 50 th percentile)	4.4	11.7	7.2	3.1	12.6	10.3	10.2	20.0	19.4	27.7	26.1	22.9
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( d <sub>1</sub> ), s/veh	27.7	38.9	26.3	26.2	39.5	28.6	37.6	39.2	39.2	36.1	40.5	40.5
Incremental Delay ( d <sub>2</sub> ), s/veh	2.9	5.8	0.9	0.3	6.7	1.9	64.7	20.7	21.5	277.8	45.2	48.9
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( d ), s/veh	30.5	44.7	27.2	26.5	46.2	30.5	102.3	59.9	60.8	313.9	85.7	89.4
Level of Service ( LOS )	C	D	C	C	D	C	F	E	E	F	F	F
Approach Delay, s/veh / LOS	35.3	D		36.4	D		68.9	E		149.9	F	
Intersection Delay, s/veh / LOS	82.4						F					

Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	GPD Group			Duration, h	0.25		
Analyst	A. Libert	Analysis Date	5/7/2019	Area Type	Other		
Jurisdiction	Kenwood	Time Period	AM Peak	PHF	0.92		
Urban Street	Kenwood Road	Analysis Year	2040	Analysis Period	1 > 7:00		
Intersection	E Galbraith Road	File Name	1. Kenwood - Galbraith - 2040 No-Build AM.xus				
Project Description	'No-Build'						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( $v$ ), veh/h	109	319	199	109	262	158	245	631	139	507	968	163

Signal Information																
Cycle, s	121.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	Yes	Simult. Gap E/W	On	Green	15.0	40.0	15.0	35.0	0.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	3.0	3.0	3.0	0.0	0.0						
				Red	1.0	1.0	1.0	1.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	19.0	39.0	19.0	39.0	19.0	44.0	19.0	44.0
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.1	4.3	3.1	4.3	3.1	3.1	3.1	3.1
Queue Clearance Time ( $g_s$ ), s	7.0	21.2	7.0	17.2	15.6	25.9	17.0	42.0
Green Extension Time ( $g_e$ ), s	0.1	3.6	0.1	4.0	0.0	4.3	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.00	0.18	0.00	0.09	1.00	0.23	1.00	1.00

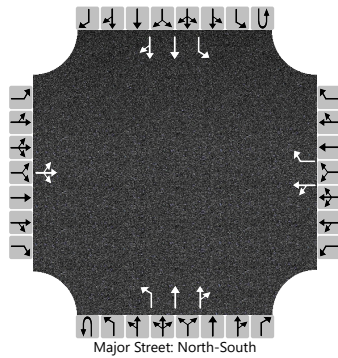
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( $v$ ), veh/h	118	347	216	118	285	172	266	432	405	551	630	600
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1810	1900	1610	1810	1900	1610	1810	1900	1780	1810	1900	1804
Queue Service Time ( $g_s$ ), s	5.0	19.2	11.0	5.0	15.2	8.5	13.6	23.8	23.9	15.0	40.0	40.0
Cycle Queue Clearance Time ( $g_c$ ), s	5.0	19.2	11.0	5.0	15.2	8.5	13.6	23.8	23.9	15.0	40.0	40.0
Green Ratio ( $g/C$ )	0.41	0.29	0.41	0.41	0.29	0.41	0.45	0.33	0.33	0.45	0.33	0.33
Capacity ( $c$ ), veh/h	448	550	665	404	550	665	284	628	589	362	628	596
Volume-to-Capacity Ratio ( $X$ )	0.265	0.631	0.325	0.294	0.518	0.258	0.938	0.687	0.688	1.523	1.002	1.006
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	52.8	230.4	105.5	52.8	175.4	80.1	190.8	282.3	265.6	797.4	613.5	590.1
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	2.1	9.2	4.2	2.1	7.0	3.2	7.6	11.3	10.6	31.9	24.5	23.6
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	23.7	37.4	24.1	24.4	36.0	23.3	36.1	35.1	35.1	29.5	40.5	40.5
Incremental Delay ( $d_2$ ), s/veh	0.1	2.7	0.4	0.1	0.4	0.1	36.8	2.6	2.8	249.2	36.5	38.3
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	23.8	40.1	24.5	24.5	36.4	23.4	72.9	37.7	37.9	278.7	77.0	78.8
Level of Service (LOS)	C	D	C	C	D	C	E	D	D	F	F	F
Approach Delay, s/veh / LOS	32.3	C		30.0	C		46.3	D		140.0	F	
Intersection Delay, s/veh / LOS	82.0						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	2.12	B	2.12	B
Bicycle LOS Score / LOS	1.61	B	1.44	A	1.40	A	1.96	B

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Kenwood Drive
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Towne Centre
Analysis Year	2040	North/South Street	Kenwood Drive
Time Analyzed	AM Peak 'No-Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	1	0	1	2	0	0	1	2	0
Configuration			LTR			LT		R		L	T	TR		L	T	TR
Volume (veh/h)		7	5	16		11	0	8	0	54	994	26	0	34	1187	59
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

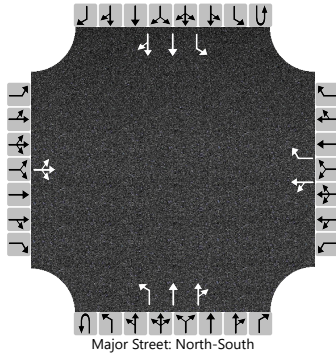
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			30			12		9		59				37		
Capacity, c (veh/h)			50			26		473		499				620		
v/c Ratio			0.61			0.47		0.02		0.12				0.06		
95% Queue Length, Q <sub>95</sub> (veh)			2.4			1.4		0.1		0.4				0.2		
Control Delay (s/veh)			153.8			234.3		12.8		13.2				11.2		
Level of Service (LOS)			F			F		B		B				B		
Approach Delay (s/veh)	153.8				141.0				0.7				0.3			
Approach LOS	F				F											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Kenwood Drive
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Towne Centre
Analysis Year	2040	North/South Street	Kenwood Drive
Time Analyzed	PM Peak 'No-Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	1	0	1	2	0	0	1	2	0
Configuration			LTR			LT		R		L	T	TR		L	T	TR
Volume (veh/h)		15	2	42		42	0	184	0	37	1126	60	0	99	1320	16
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

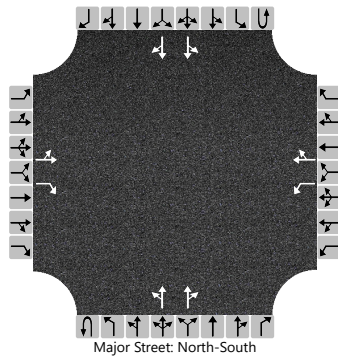
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			64			46		200		40				108		
Capacity, c (veh/h)			26			12		413		457				528		
v/c Ratio			2.50			3.71		0.48		0.09				0.20		
95% Queue Length, Q <sub>95</sub> (veh)			7.9			6.7		2.6		0.3				0.8		
Control Delay (s/veh)			1006.5			1835.6		21.6		13.6				13.5		
Level of Service (LOS)			F			F		C		B				B		
Approach Delay (s/veh)	1006.5				358.8				0.4				0.9			
Approach LOS	F				F											

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Towne Centre Ring Road		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	Kenwood Centre Drive		
Analysis Year	2040			North/South Street	Towne Centre Ring Road		
Time Analyzed	AM Peak 'No-Build'			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-fil-A TIS						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	1		1	1	0	0	0	2	0	0	0	2	0	
Configuration		LT		R		L		TR		LT		TR		LT		TR	
Volume (veh/h)		52	15	15		2	3	2		10	8	2		2	24	15	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No															
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

## Delay, Queue Length, and Level of Service

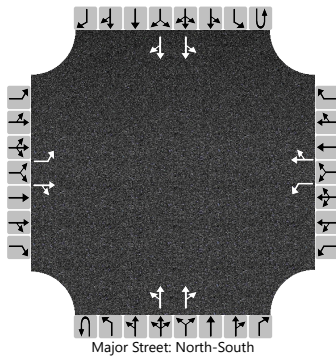
Flow Rate, v (veh/h)		73		16		2		5		11				2			
Capacity, c (veh/h)		882		1048		896		892		1557				1600			
v/c Ratio		0.08		0.02		0.00		0.01		0.01				0.00			
95% Queue Length, Q <sub>95</sub> (veh)		0.3		0.0		0.0		0.0		0.0				0.0			
Control Delay (s/veh)		9.4		8.5		9.0		9.1		7.3				7.3			
Level of Service (LOS)		A		A		A		A		A				A			
Approach Delay (s/veh)		9.3				9.1				3.7				0.4			
Approach LOS		A				A											



# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Towne Centre Ring Road		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	Kenwood Centre Drive		
Analysis Year	2040			North/South Street	Towne Centre Ring Road		
Time Analyzed	PM Peak 'No-Build'			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-fil-A TIS						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		1	1	0		1	1	0	0	0	2	0	0	0	2	0	
Configuration		L		TR		L		TR		LT		TR		LT		TR	
Volume (veh/h)		39	11	98		8	21	2		155	60	7		7	116	39	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized																	
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

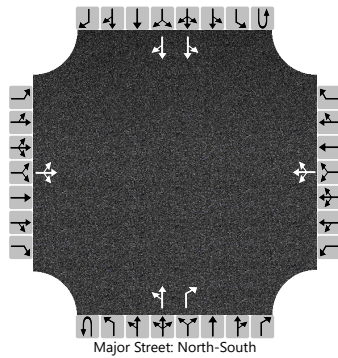
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		42		118		9		25		168				8			
Capacity, c (veh/h)		360		824		358		384		1399				1518			
v/c Ratio		0.12		0.14		0.02		0.07		0.12				0.01			
95% Queue Length, Q <sub>95</sub> (veh)		0.4		0.5		0.1		0.2		0.4				0.0			
Control Delay (s/veh)		16.3		10.1		15.3		15.0		7.9				7.4			
Level of Service (LOS)		C		B		C		C		A				A			
Approach Delay (s/veh)		11.7				15.1				5.6				0.3			
Approach LOS		B				C											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Ring Road / Garage
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	South Drive / Parking Gar
Analysis Year	2040	North/South Street	Towne Centre Ring Road
Time Analyzed	AM Peak 'No-Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	1	0	0	2	0
Configuration			LTR				LTR			LT		R		LT		TR
Volume (veh/h)		0	0	11		2	0	2		7	31	8		4	34	2
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized									No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

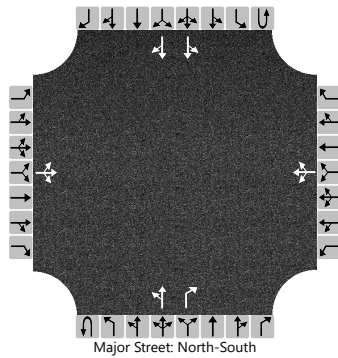
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			12				4			8				4		
Capacity, c (veh/h)			1050				952			1562				1557		
v/c Ratio			0.01				0.00			0.00				0.00		
95% Queue Length, Q <sub>95</sub> (veh)			0.0				0.0			0.0				0.0		
Control Delay (s/veh)			8.5				8.8			7.3				7.3		
Level of Service (LOS)			A				A			A				A		
Approach Delay (s/veh)	8.5				8.8				1.1				0.7			
Approach LOS	A				A											

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Ring Road / Garage		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	South Drive / Parking Gar		
Analysis Year	2040			North/South Street	Towne Centre Ring Road		
Time Analyzed	PM Peak 'No-Build			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-fil-A TIS						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	1	0	0	2	0
Configuration			LTR				LTR			LT		R		LT		TR
Volume (veh/h)		11	0	10		23	0	5		0	103	5		0	119	0
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized										No						
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

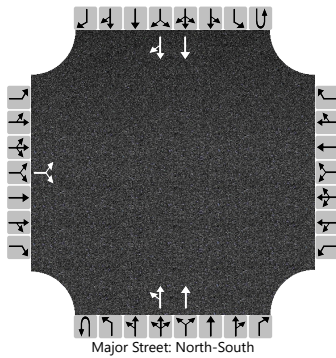
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			23				30			0				0			
Capacity, c (veh/h)			797				782			1447				1461			
v/c Ratio			0.03				0.04			0.00				0.00			
95% Queue Length, Q <sub>95</sub> (veh)			0.1				0.1			0.0				0.0			
Control Delay (s/veh)			9.7				9.8			7.5				7.5			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.7				9.8				0.0				0.0			
Approach LOS		A				A											

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Galbraith Entrance / Ring		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	Towne Centre Entrance		
Analysis Year	2040			North/South Street	Towne Centre Ring Road		
Time Analyzed	AM 'No-Build'			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A TIS						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		42		60						3	18				18	18
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

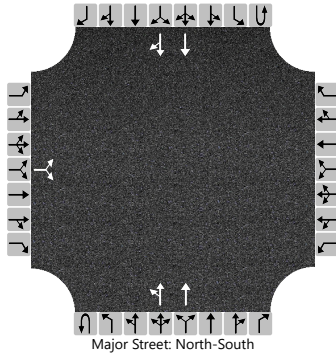
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			111							3						
Capacity, c (veh/h)			1008							1562						
v/c Ratio			0.11							0.00						
95% Queue Length, Q <sub>95</sub> (veh)			0.4							0.0						
Control Delay (s/veh)			9.0							7.3						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.0								1.0						
Approach LOS		A														

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Galbraith Entrance / Ring
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Towne Centre Entrance
Analysis Year	2040	North/South Street	Towne Centre Ring Road
Time Analyzed	PM 'No-Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		116		36						59	83				95	109
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

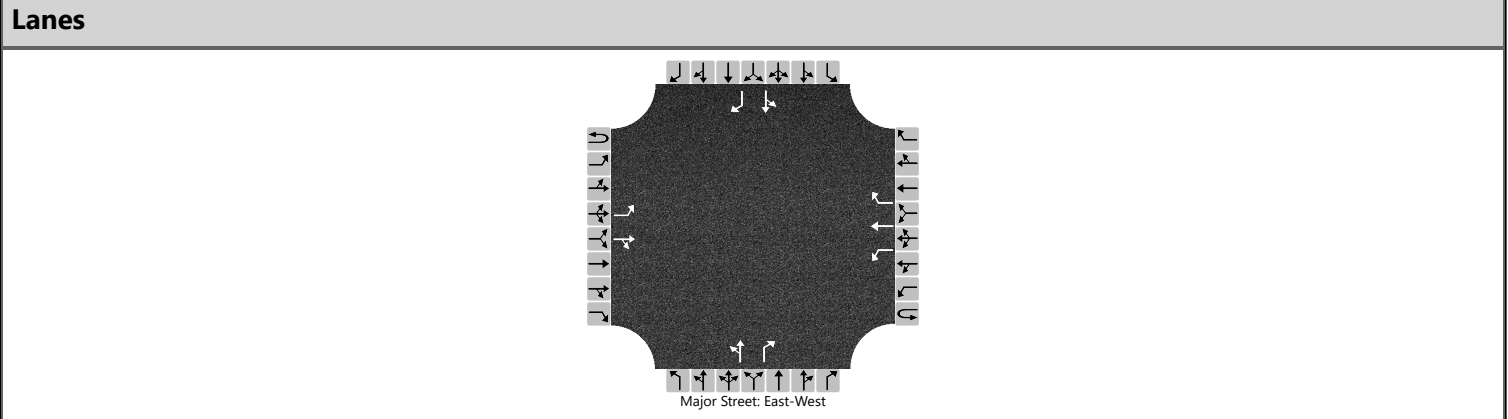
Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			165							64						
Capacity, c (veh/h)			653							1337						
v/c Ratio			0.25							0.05						
95% Queue Length, Q <sub>95</sub> (veh)			1.0							0.2						
Control Delay (s/veh)			12.4							7.8						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		12.4								3.3						
Approach LOS		B								A						

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Galbraith / Towne Centre		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	E Galbraith Road		
Analysis Year	2040			North/South Street	Kenwood Towne Centre Driv		
Time Analyzed	AM 'No-Build'			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A						



**Vehicle Volumes and Adjustments**

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	1		0	1	1		0	1	1
Configuration		L		TR		L	T	R		LT		R		LT		R
Volume (veh/h)		59	841	82		10	507	39		23	0	3		7	0	3
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No				No				No			
Median Type   Storage	Undivided															

**Critical and Follow-up Headways**

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

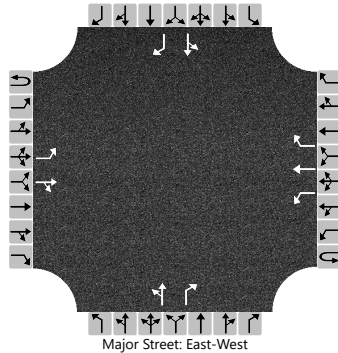
**Delay, Queue Length, and Level of Service**

Flow Rate, v (veh/h)		64				11				25		3		8		3	
Capacity, c (veh/h)		978				686				69		310		71		532	
v/c Ratio		0.07				0.02				0.36		0.01		0.11		0.01	
95% Queue Length, Q <sub>95</sub> (veh)		0.2				0.0				1.4		0.0		0.3		0.0	
Control Delay (s/veh)		8.9				10.3				83.6		16.7		61.3		11.8	
Level of Service (LOS)		A				B				F		C		F		B	
Approach Delay (s/veh)		0.5				0.2				75.9				46.4			
Approach LOS										F				E			

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Galbraith / Towne Centre		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	E Galbraith Road		
Analysis Year	2040			North/South Street	Kenwood Towne Centre Driv		
Time Analyzed	PM 'No-Build'			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12	
Priority																
Number of Lanes	0	1	1	0	0	1	1	1	0	1	1		0	1	1	
Configuration		L		TR		L	T	R		LT		R		LT		R
Volume (veh/h)		18	751	152		10	822	8		134	0	57		18	0	41
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No				No				No			
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

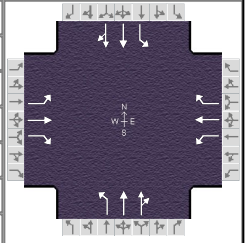
Flow Rate, v (veh/h)		20				11				146		62		20		45
Capacity, c (veh/h)		749				699				45		336		42		339
v/c Ratio		0.03				0.02				3.21		0.18		0.46		0.13
95% Queue Length, Q <sub>95</sub> (veh)		0.1				0.0				16.0		0.7		1.6		0.4
Control Delay (s/veh)		9.9				10.2				1182.7		18.1		148.8		17.2
Level of Service (LOS)		A				B				F		C		F		C
Approach Delay (s/veh)	0.2				0.1				835.1				57.4			
Approach LOS									F				F			

**DESIGN YEAR 2040 'BUILD' CONDITIONS**



# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	GPD Group			Duration, h	0.25		
Analyst	A. Libert	Analysis Date	5/7/2019	Area Type	Other		
Jurisdiction	Kenwood	Time Period	AM Peak	PHF	0.92		
Urban Street	Kenwood Road	Analysis Year	2040	Analysis Period	1 > 7:00		
Intersection	E Galbraith Road	File Name	1. Kenwood - Galbraith - 2040 Build AM.xus				
Project Description	'Build'						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( v ), veh/h	109	324	202	109	265	161	250	641	139	510	978	163

Signal Information													
Cycle, s	121.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On										
Force Mode	Fixed	Simult. Gap N/S	On										
		Green		15.0	40.0	15.0	35.0	0.0	0.0				
		Yellow		3.0	3.0	3.0	3.0	0.0	0.0				
		Red		1.0	1.0	1.0	1.0	0.0	0.0				

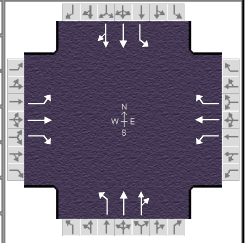
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	19.0	39.0	19.0	39.0	19.0	44.0	19.0	44.0
Change Period, ( Y+R <sub>c</sub> ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( MAH ), s	3.1	4.3	3.1	4.3	3.1	3.1	3.1	3.1
Queue Clearance Time ( g <sub>s</sub> ), s	7.0	21.6	7.0	17.4	16.0	26.2	17.0	42.0
Green Extension Time ( g <sub>e</sub> ), s	0.1	3.7	0.1	4.0	0.0	4.3	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.00	0.20	0.00	0.09	1.00	0.25	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( v ), veh/h	118	352	220	118	288	175	272	437	411	554	635	605
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1810	1900	1610	1810	1900	1610	1810	1900	1782	1810	1900	1805
Queue Service Time ( g <sub>s</sub> ), s	5.0	19.6	11.2	5.0	15.4	8.7	14.0	24.2	24.2	15.0	40.0	40.0
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	5.0	19.6	11.2	5.0	15.4	8.7	14.0	24.2	24.2	15.0	40.0	40.0
Green Ratio ( g/C )	0.41	0.29	0.41	0.41	0.29	0.41	0.45	0.33	0.33	0.45	0.33	0.33
Capacity ( c ), veh/h	445	550	665	400	550	665	284	628	589	359	628	597
Volume-to-Capacity Ratio ( X )	0.266	0.641	0.330	0.296	0.524	0.263	0.957	0.696	0.697	1.545	1.011	1.015
Back of Queue ( Q ), ft/ln ( 50 th percentile)	52.8	235.5	107.4	52.8	177.9	81.8	203	287.5	270.7	814.2	622.9	599.7
Back of Queue ( Q ), veh/ln ( 50 th percentile)	2.1	9.4	4.3	2.1	7.1	3.3	8.1	11.5	10.8	32.6	24.9	24.0
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( d <sub>1</sub> ), s/veh	23.7	37.5	24.1	24.5	36.0	23.4	36.6	35.2	35.2	29.4	40.5	40.5
Incremental Delay ( d <sub>2</sub> ), s/veh	0.1	2.9	0.4	0.2	0.4	0.1	41.5	2.8	3.0	258.6	38.6	40.5
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( d ), s/veh	23.8	40.4	24.5	24.6	36.5	23.4	78.1	38.1	38.3	288.0	79.1	81.0
Level of Service ( LOS )	C	D	C	C	D	C	E	D	D	F	F	F
Approach Delay, s/veh / LOS	32.5 C			30.1 C			47.9 D			144.3 F		
Intersection Delay, s/veh / LOS	84.2						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	2.12	B	2.12	B
Bicycle LOS Score / LOS	1.63	B	1.45	A	1.41	A	1.97	B

## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	GPD Group			Duration, h	0.25		
Analyst	A. Libert	Analysis Date	5/7/2019	Area Type	Other		
Jurisdiction	Kenwood	Time Period	PM Peak	PHF	0.92		
Urban Street	Kenwood Road	Analysis Year	2040	Analysis Period	1 > 7:00		
Intersection	E Galbraith Road	File Name	1. Kenwood - Galbraith - 2040 Build PM.xus				
Project Description	'Build'						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( $v$ ), veh/h	202	379	310	155	398	405	276	944	121	426	978	142

Signal Information												
Cycle, s	121.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	15.0	40.0	15.0	35.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	3.0	3.0	3.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	19.0	39.0	19.0	39.0	19.0	44.0	19.0	44.0
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.1	4.1	3.1	4.1	3.1	3.1	3.1	3.1
Queue Clearance Time ( $g_s$ ), s	11.8	25.8	9.3	28.7	17.0	38.6	17.0	41.6
Green Extension Time ( $g_e$ ), s	0.1	4.5	0.1	3.5	0.0	1.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.93	0.61	0.06	0.81	1.00	1.00	1.00	1.00

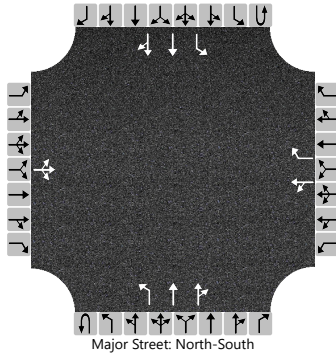
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( $v$ ), veh/h	220	412	337	168	433	440	300	590	567	463	622	596
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1810	1900	1610	1810	1900	1610	1810	1900	1824	1810	1900	1815
Queue Service Time ( $g_s$ ), s	9.8	23.8	18.8	7.3	25.4	26.7	15.0	36.5	36.6	15.0	39.4	39.6
Cycle Queue Clearance Time ( $g_c$ ), s	9.8	23.8	18.8	7.3	25.4	26.7	15.0	36.5	36.6	15.0	39.4	39.6
Green Ratio ( $g/C$ )	0.41	0.29	0.41	0.41	0.29	0.41	0.45	0.33	0.33	0.45	0.33	0.33
Capacity ( $c$ ), veh/h	345	550	665	359	550	665	284	628	603	290	628	600
Volume-to-Capacity Ratio ( $X$ )	0.636	0.750	0.506	0.469	0.787	0.662	1.057	0.940	0.941	1.599	0.990	0.993
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	110.5	296.4	180.9	77.8	317.1	260.7	264	510.5	494.7	704.2	592.4	574.1
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	4.4	11.9	7.2	3.1	12.7	10.4	10.6	20.4	19.8	28.2	23.7	23.0
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	27.7	39.0	26.3	26.3	39.6	28.7	37.6	39.3	39.4	36.4	40.3	40.4
Incremental Delay ( $d_2$ ), s/veh	3.0	6.1	0.9	0.4	6.9	2.0	69.2	21.9	22.8	285.1	33.2	34.7
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	30.7	45.1	27.2	26.6	46.4	30.6	106.8	61.3	62.2	321.5	73.5	75.1
Level of Service (LOS)	C	D	C	C	D	C	F	E	E	F	E	E
Approach Delay, s/veh / LOS	35.6	D		36.6	D		71.0	E		142.4	F	
Intersection Delay, s/veh / LOS	80.7						F					

Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Kenwood Drive
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Towne Centre
Analysis Year	2040	North/South Street	Kenwood Drive
Time Analyzed	AM Peak 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	1	0	1	2	0	0	1	2	0	
Configuration			LTR			LT		R		L	T	TR		L	T	TR	
Volume (veh/h)		7	5	16		32	0	36	0	54	981	52	0	64	1170	59	
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized						No											
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

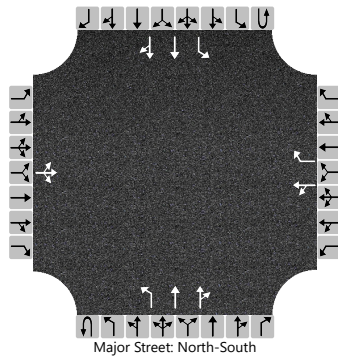
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			30			35		39						70			
Capacity, c (veh/h)			43			21		468						612			
v/c Ratio			0.71			1.63		0.08						0.11			
95% Queue Length, Q <sub>95</sub> (veh)			2.7			4.5		0.3						0.4			
Control Delay (s/veh)			198.4			692.0		13.4						11.6			
Level of Service (LOS)			F			F		B						B			
Approach Delay (s/veh)		198.4				332.7				0.6				0.6			
Approach LOS		F				F											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Kenwood Drive
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Towne Centre
Analysis Year	2040	North/South Street	Kenwood Drive
Time Analyzed	PM Peak 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	1	0	1	2	0	0	1	2	0
Configuration			LTR			LT		R		L	T	TR		L	T	TR
Volume (veh/h)		15	2	42		57	0	207	0	37	1114	83	0	122	1307	16
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

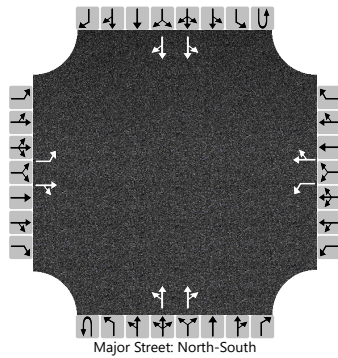
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			64			62		225		40				133		
Capacity, c (veh/h)			21			11		409		463				523		
v/c Ratio			3.10			5.85		0.55		0.09				0.25		
95% Queue Length, Q <sub>95</sub> (veh)			8.3			9.0		3.2		0.3				1.0		
Control Delay (s/veh)			1335.7			2881.5		24.0		13.5				14.2		
Level of Service (LOS)			F			F		C		B				B		
Approach Delay (s/veh)	1335.7				641.0				0.4				1.2			
Approach LOS	F				F											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Towne Centre Ring Road
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Centre Drive
Analysis Year	2040	North/South Street	Towne Centre Ring Road
Time Analyzed	AM Peak 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	1	0		1	1	0	0	0	2	0	0	0	2	0
Configuration		L		TR		L		TR		LT		TR		LT		TR
Volume (veh/h)		108	15	15		2	3	2		10	13	2		2	36	64
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

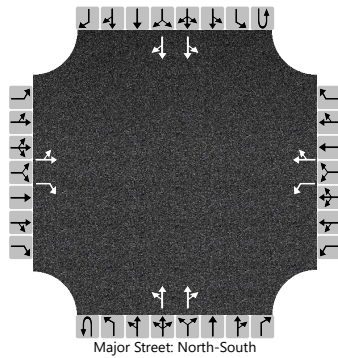
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		117		33		2		5		11				2		
Capacity, c (veh/h)		845		865		877		837		1472				1592		
v/c Ratio		0.14		0.04		0.00		0.01		0.01				0.00		
95% Queue Length, Q <sub>95</sub> (veh)		0.5		0.1		0.0		0.0		0.0				0.0		
Control Delay (s/veh)		9.9		9.3		9.1		9.3		7.5				7.3		
Level of Service (LOS)		A		A		A		A		A				A		
Approach Delay (s/veh)		9.8				9.3				3.0				0.1		
Approach LOS		A				A										

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Towne Centre Ring Road
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Kenwood Centre Drive
Analysis Year	2040	North/South Street	Towne Centre Ring Road
Time Analyzed	PM Peak 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	1		1	1	0	0	0	2	0	0	0	2	0	
Configuration		LT		R		L		TR		LT		TR		LT		TR	
Volume (veh/h)		84	11	98		8	21	2		155	64	7		7	126	77	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No															
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1			
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16			
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2			
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23			

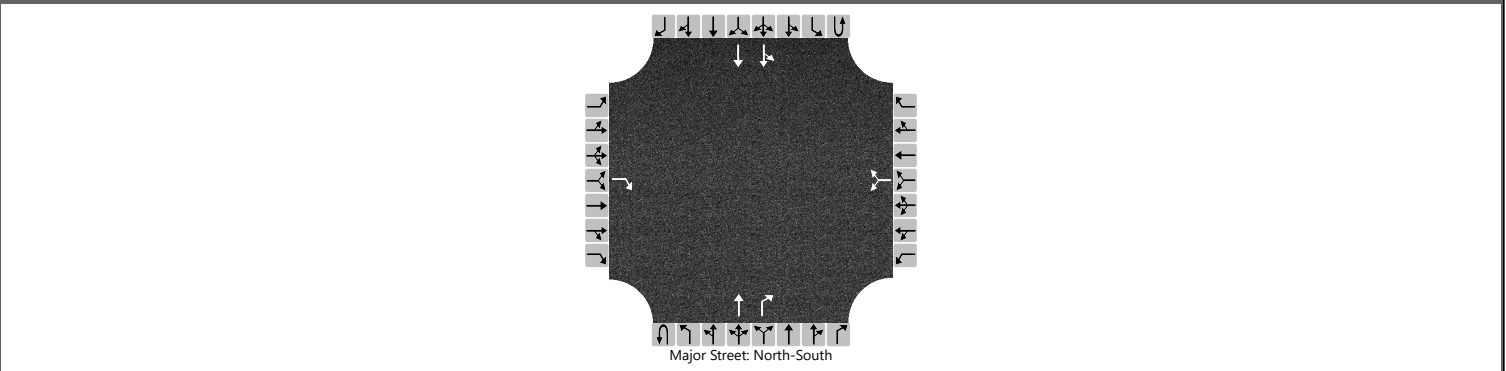
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		103		107		9		25		168					8		
Capacity, c (veh/h)		338		919		348		355		1338					1512		
v/c Ratio		0.31		0.12		0.02		0.07		0.13					0.01		
95% Queue Length, Q <sub>95</sub> (veh)		1.3		0.4		0.1		0.2		0.4					0.0		
Control Delay (s/veh)		20.2		9.4		15.6		15.9		8.1					7.4		
Level of Service (LOS)		C		A		C		C		A					A		
Approach Delay (s/veh)		14.8				15.8				5.6				0.3			
Approach LOS		B				C											

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Ring Road / Garage
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	South Drive / Parking Gar
Analysis Year	2040	North/South Street	Towne Centre Ring Road
Time Analyzed	AM Peak 'Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	1	0	0	0	1	1	0	0	2	0
Configuration				R			LR				T	R		LT	T	
Volume (veh/h)				69		2		2			92	8		4	37	
Percent Heavy Vehicles (%)				3		3		3						3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9		7.5		6.9							4.1		
Critical Headway (sec)				6.96		7.56		6.96							4.16		
Base Follow-Up Headway (sec)				3.3		3.5		3.3							2.2		
Follow-Up Headway (sec)				3.33		3.53		3.33							2.23		

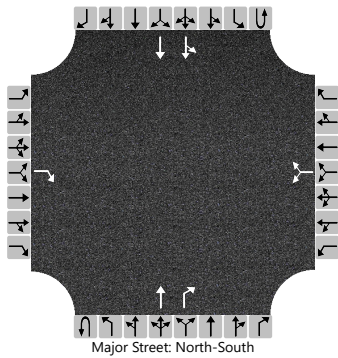
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				75		4									4		
Capacity, c (veh/h)				1050		842									1472		
v/c Ratio				0.07		0.01									0.00		
95% Queue Length, Q <sub>95</sub> (veh)				0.2		0.0									0.0		
Control Delay (s/veh)				8.7		9.3									7.5		
Level of Service (LOS)				A		A									A		
Approach Delay (s/veh)	8.7				9.3								0.7				
Approach LOS	A				A												

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Ring Road / Garage
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	South Drive / Parking Gar
Analysis Year	2040	North/South Street	Towne Centre Ring Road
Time Analyzed	PM Peak 'Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	1	0	0	0	1	1	0	0	2	0
Configuration				R			LR				T	R		LT	T	
Volume (veh/h)				56		23		5			153	5		0	121	
Percent Heavy Vehicles (%)				3		3		3						3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9		7.5		6.9							4.1		
Critical Headway (sec)				6.96		7.56		6.96							4.16		
Base Follow-Up Headway (sec)				3.3		3.5		3.3							2.2		
Follow-Up Headway (sec)				3.33		3.53		3.33							2.23		

## Delay, Queue Length, and Level of Service

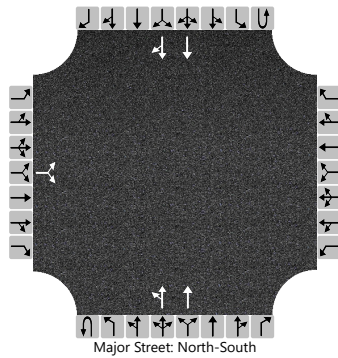
Flow Rate, v (veh/h)				61		30									0		
Capacity, c (veh/h)				981		684									1395		
v/c Ratio				0.06		0.04									0.00		
95% Queue Length, Q <sub>95</sub> (veh)				0.2		0.1									0.0		
Control Delay (s/veh)				8.9		10.5									7.6		
Level of Service (LOS)				A		B									A		
Approach Delay (s/veh)	8.9				10.5								0.0				
Approach LOS	A				B												



# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Galbraith Entrance / Ring
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Towne Centre Entrance
Analysis Year	2040	North/South Street	Towne Centre Ring Road
Time Analyzed	AM 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		42		91						37	21				28	18
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

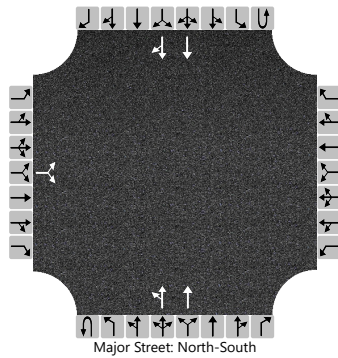
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			145							40						
Capacity, c (veh/h)			961							1547						
v/c Ratio			0.15							0.03						
95% Queue Length, Q <sub>95</sub> (veh)			0.5							0.1						
Control Delay (s/veh)			9.4							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.4								4.7						
Approach LOS		A														

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	A. Libert	Intersection	Galbraith Entrance / Ring
Agency/Co.	GPD Group	Jurisdiction	Kenwood, Ohio
Date Performed	5/7/2019	East/West Street	Towne Centre Entrance
Analysis Year	2040	North/South Street	Towne Centre Ring Road
Time Analyzed	PM 'Build'	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Chick-Fil-A TIS		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound					
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Movement																		
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6		
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0		
Configuration			LR							LT	T				T	TR		
Volume (veh/h)		116		63						87	85				104	109		
Percent Heavy Vehicles (%)		3		3						3								
Proportion Time Blocked																		
Percent Grade (%)		0																
Right Turn Channelized																		
Median Type   Storage		Undivided																

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1							
Critical Headway (sec)		6.86		6.96						4.16							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.53		3.33						2.23							

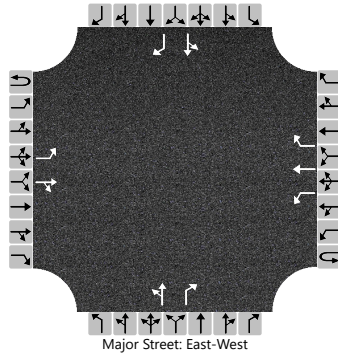
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			195							95							
Capacity, c (veh/h)			618							1326							
v/c Ratio			0.31							0.07							
95% Queue Length, Q <sub>95</sub> (veh)			1.3							0.2							
Control Delay (s/veh)			13.5							7.9							
Level of Service (LOS)			B							A							
Approach Delay (s/veh)		13.5								4.1							
Approach LOS		B								A							

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Galbraith / Towne Centre		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	E Galbraith Road		
Analysis Year	2040			North/South Street	Kenwood Towne Centre Driv		
Time Analyzed	AM 'Build'			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12	
Priority																
Number of Lanes	0	1	1	0	0	1	1	1	0	1	1		0	1	1	
Configuration		L		TR		L	T	R		LT		R		LT		R
Volume (veh/h)		59	828	103		20	500	39		36	0	24		7	0	3
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No				No				No			
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

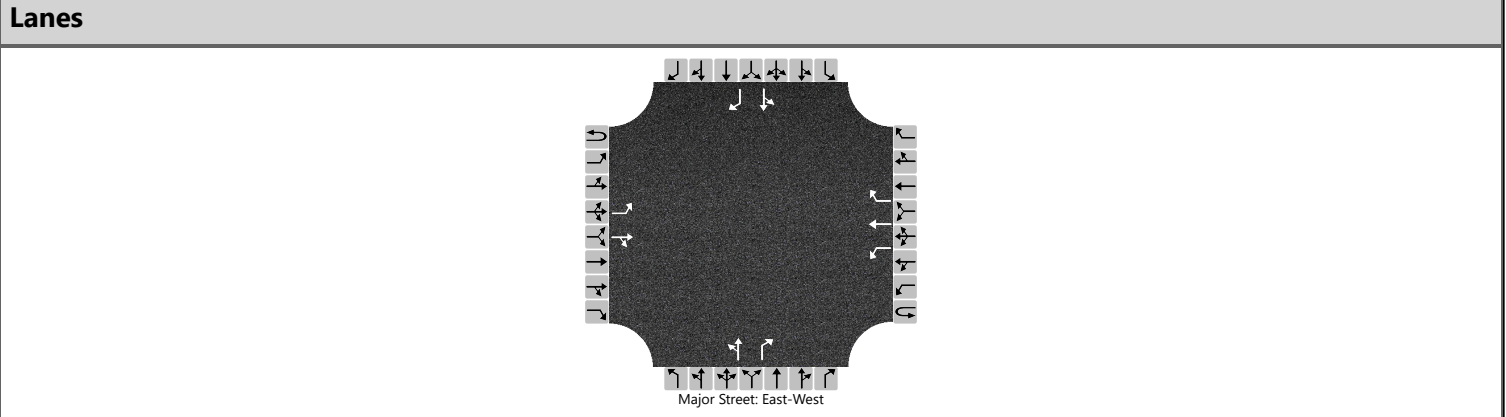
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		64				22				39		26		8		3
Capacity, c (veh/h)		984				681				67		312		63		537
v/c Ratio		0.07				0.03				0.58		0.08		0.12		0.01
95% Queue Length, Q <sub>95</sub> (veh)		0.2				0.1				2.5		0.3		0.4		0.0
Control Delay (s/veh)		8.9				10.5				115.5		17.6		69.8		11.7
Level of Service (LOS)		A				B				F		C		F		B
Approach Delay (s/veh)	0.5				0.4				76.4				52.4			
Approach LOS									F				F			

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	Galbraith / Towne Centre		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/7/2019			East/West Street	E Galbraith Road		
Analysis Year	2040			North/South Street	Kenwood Towne Centre Driv		
Time Analyzed	PM 'Build'			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Chick-Fil-A TIS						



**Vehicle Volumes and Adjustments**

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	1	0	0	1	1	1		0	1	1		0	1	1
Configuration		L		TR		L	T	R		LT		R		LT		R
Volume (veh/h)		18	743	166		21	813	8		146	0	73		18	0	41
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No				No				No			
Median Type   Storage	Undivided															

**Critical and Follow-up Headways**

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

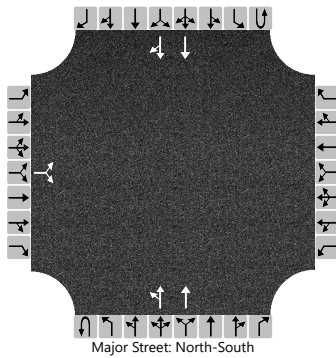
**Delay, Queue Length, and Level of Service**

Flow Rate, v (veh/h)		20				23				159		79		20		45	
Capacity, c (veh/h)		756				695				44		337		38		343	
v/c Ratio		0.03				0.03				3.61		0.24		0.52		0.13	
95% Queue Length, Q <sub>95</sub> (veh)		0.1				0.1				17.7		0.9		1.8		0.4	
Control Delay (s/veh)		9.9				10.4				1366.5		19.0		176.1		17.1	
Level of Service (LOS)		A				B				F		C		F		C	
Approach Delay (s/veh)		0.2				0.3				917.3				65.6			
Approach LOS										F				F			

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	North Site Drive		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/8/2019			East/West Street	North Site Drive		
Analysis Year	2040			North/South Street	Towne Centre Ring Road		
Time Analyzed	AM Peak 'Build'			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-fil-a						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0	
Configuration			LR							LT	T				T	TR	
Volume (veh/h)		37		3						61	26					57	41
Percent Heavy Vehicles (%)		3		3						3							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage		Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

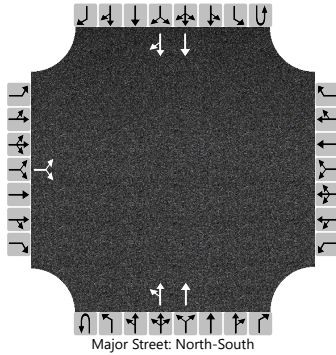
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			43							66							
Capacity, c (veh/h)			716							1475							
v/c Ratio			0.06							0.04							
95% Queue Length, Q <sub>95</sub> (veh)			0.2							0.1							
Control Delay (s/veh)			10.3							7.6							
Level of Service (LOS)			B							A							
Approach Delay (s/veh)		10.3								5.3							
Approach LOS		B															

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	A. Libert			Intersection	North Site Drive		
Agency/Co.	GPD Group			Jurisdiction	Kenwood, Ohio		
Date Performed	5/8/2019			East/West Street	North Site Drive		
Analysis Year	2040			North/South Street	Towne Centre Ring Road		
Time Analyzed	PM Peak 'Build'			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Chick-fil-a						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		30		2						50	130				124	35
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type   Storage		Undivided														

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

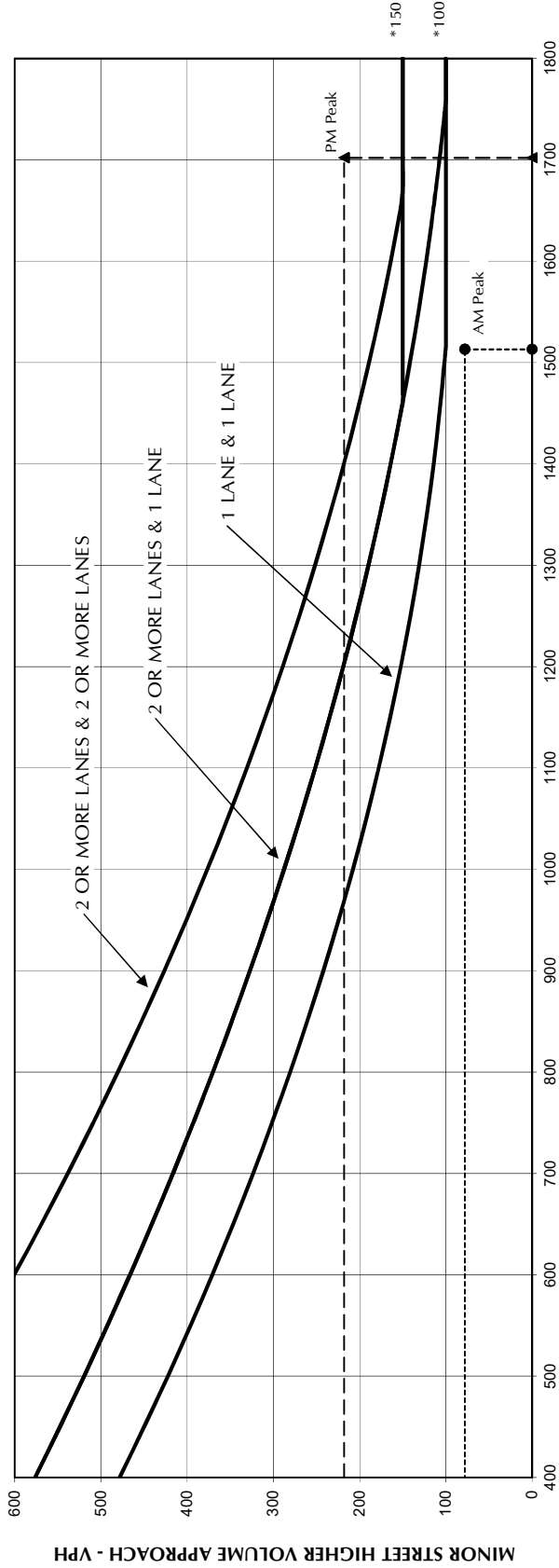
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			35							54							
Capacity, c (veh/h)			621							1394							
v/c Ratio			0.06							0.04							
95% Queue Length, Q <sub>95</sub> (veh)			0.2							0.1							
Control Delay (s/veh)			11.1							7.7							
Level of Service (LOS)			B							A							
Approach Delay (s/veh)		11.1								2.2							
Approach LOS		B															

**APPENDIX E**  
**TRAFFIC SIGNAL WARRANTS**

**Kenwood Road / Mercy Health / Towne Centre Drive Intersection**

**FIGURE 4C-3. Warrant 3, Peak Hour**



**MAJOR STREET - TOTAL OF BOTH APPROACHES - VPH**  
 \*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 with one lane.

Roadway	Lanes	
Major Road	Kenwood Road	2
Minor Road	Mercy Health / Towne	2

Traffic Volume Scenario:  
 Opening Year 2020 'Build' Conditions

AM Peak Hour Volumes	-----●-----
Major Street - Total of Both Approaches =	1513
Minor Street - Higher Volume Approach =	78
Midday Peak Hour Volumes	-----■-----
Major Street - Total of Both Approaches =	N/A
Minor Street - Higher Volume Approach =	N/A
PM Peak Hour Volumes	-----▲-----
Major Street - Total of Both Approaches =	1702
Minor Street - Higher Volume Approach =	218

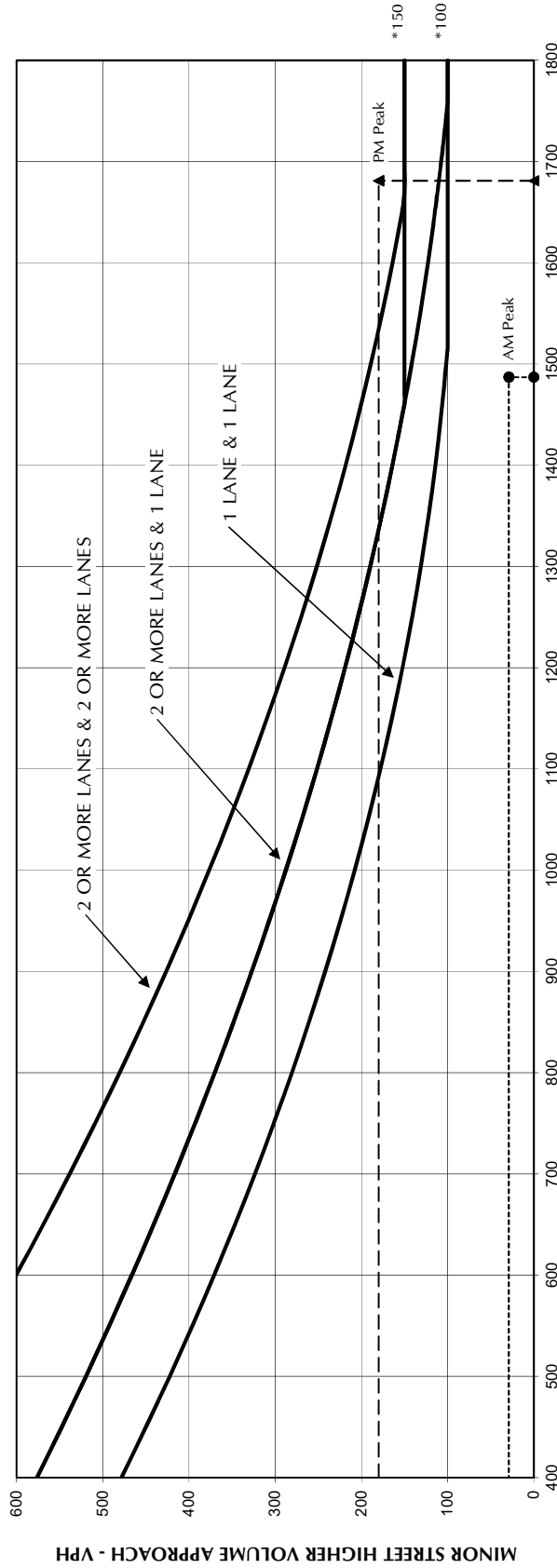
Warrant #3 Met?	<b>Yes</b>
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**Kenwood Road / Mercy Health / Towne Centre Drive Intersection**

**FIGURE 4C-3. Warrant 3, Peak Hour**



**MAJOR STREET- TOTAL OF BOTH APPROACHES - VPH**

\*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 with one lane.

Roadway	Lanes	
Major Road	Kenwood Road	2
Minor Road	Mercy Health / Towne	2

Traffic Volume Scenario:  
Opening Year 2020 'No-Build' Conditions

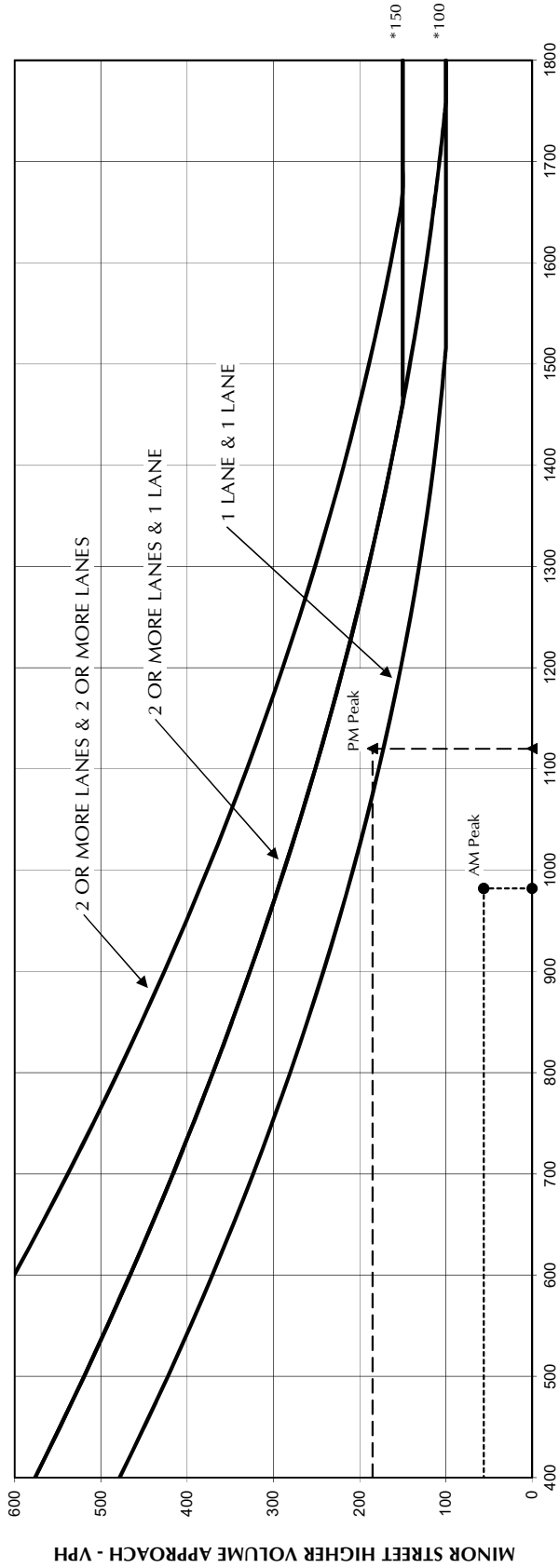
AM Peak Hour Volumes	-----●-----
Major Street - Total of Both Approaches =	1487
Minor Street - Higher Volume Approach =	29
Midday Peak Hour Volumes	-----■-----
Major Street - Total of Both Approaches =	N/A
Minor Street - Higher Volume Approach =	N/A
PM Peak Hour Volumes	-----▲-----
Major Street - Total of Both Approaches =	1681
Minor Street - Higher Volume Approach =	180

Warrant #3 Met?	<b>Yes</b>
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**E Galbraith Road / Towne Centre Drive Intersection**

**FIGURE 4C-3. Warrant 3, Peak Hour**



**MAJOR STREET- TOTAL OF BOTH APPROACHES - VPH**

\*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 with one lane.

Roadway	Lanes	
Major Road	E Galbraith Road	2
Minor Road	Towne Centre Drive	2

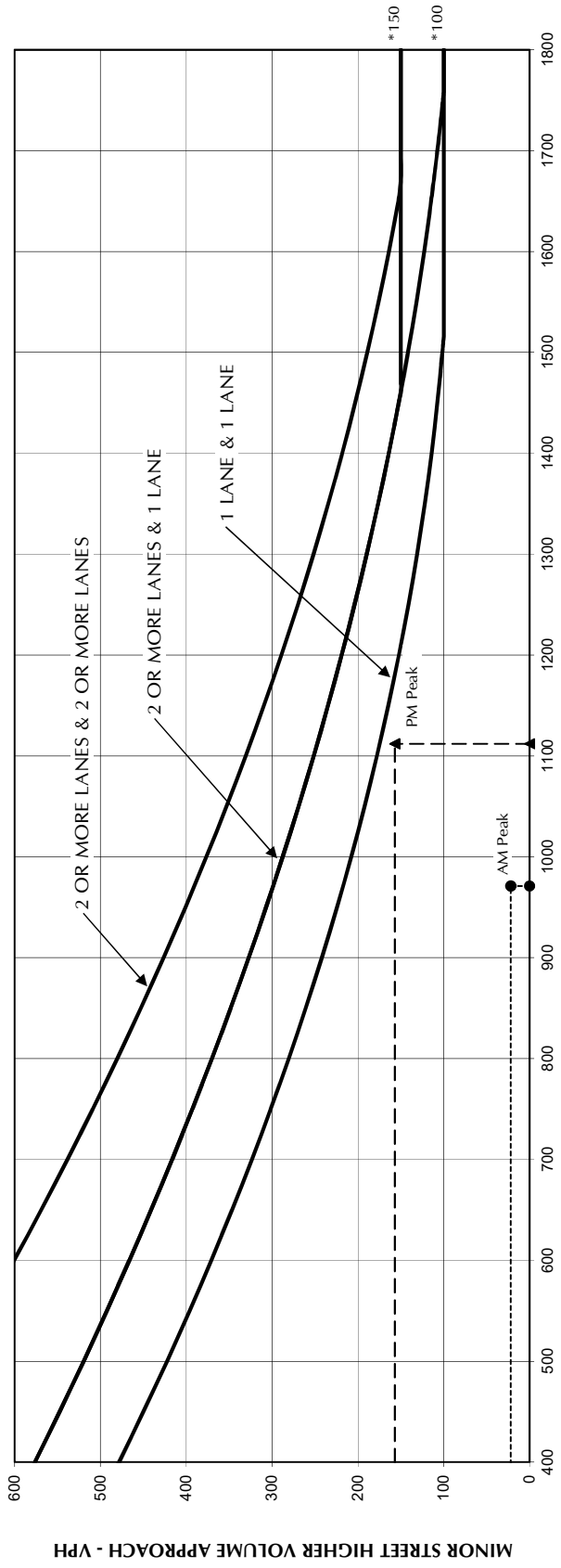
Traffic Volume Scenario:
Opening Year 2020 'Build' Conditions

AM Peak Hour Volumes	Warrant #3 Met?	No
Major Street - Total of Both Approaches = 982		
Minor Street - Higher Volume Approach = 56		
Midday Peak Hour Volumes		
Major Street - Total of Both Approaches = N/A		
Minor Street - Higher Volume Approach = N/A		
PM Peak Hour Volumes		
Major Street - Total of Both Approaches = 1120		
Minor Street - Higher Volume Approach = 185		



**E Galbraith Road / Towne Centre Drive Intersection**

**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 with one lane.

Roadway	Lanes
Major Road E Galbraith Road	2
Minor Road Towne Centre Drive	2

Traffic Volume Scenario:  
Opening Year 2020 'No-Build' Conditions

AM Peak Hour Volumes	-----●-----
Major Street - Total of Both Approaches =	971
Minor Street - Higher Volume Approach =	22
Midday Peak Hour Volumes	-----■-----
Major Street - Total of Both Approaches =	N/A
Minor Street - Higher Volume Approach =	N/A
PM Peak Hour Volumes	-----▲-----
Major Street - Total of Both Approaches =	1112
Minor Street - Higher Volume Approach =	157

Warrant #3 Met? **No**

