ROCK POINTE CROSSING
Transportation Impact Analysis
Rutledge Pike (SR 1)
Knoxville, TN

A Transportation Impact Analysis for Rock Pointe Crossing

Submitted to

Knoxville – Knox County
Planning Commission

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Submitted By:

FULGHUM MACINDOE & ASSOCIATES, INC.

10330 HARDIN VALLEY ROAD SUITE 201 KNOXVILLE, TN 37932 T 865.690.6419 F 865.690.6448 www.fulghummacindoe.com

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Executive Summary

Southern Shores Development, LLC is proposing a new roadway that will connect McCalla Avenue at Rutledge Pike (SR 1) to Spring Hill Road. The proposed Rock Pointe Crossing development is located on Rutledge Pike (SR 1) south of Interstate 40 in Knox County, Tennessee. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2025.

FMA made some assumptions about future land uses along Rock Pointe Drive. The full buildout of the development assumes a convenience market w/ a gasoline station, non-climate controlled self-storage, climate controlled self-storage, a general office building and a construction equipment rental store (i.e. Sunbelt Rentals).

Traffic from the Rock Pointe Crossing development will enter/exit the roadway network via Rutledge Pike (SR 1) at Rock Pointe Drive and at the signalized intersection of Rutledge Pike (SR 1) at Spring Hill Road. As a part of the Rock Pointe Crossing construction the intersection of Rutledge Pike (SR 1) at McCalla Avenue will be closed and replaced by the intersection of Rutledge Pike (SR 1) at Rock Pointe Drive. All proposed new development will access directly onto Rock Pointe Drive.

In order to maintain or provide an acceptable level-of-service for each of the intersections studied, some recommendations are presented.

Rutledge Pike @ Timothy Avenue / I-40E Interchange
After the full buildout of the Rock Pointe Crossing development the signalized intersection of Rutledge Pike (SR 1) at Timothy Ave / I-40 E Interchange will operate at a LOS D during both the AM and PM peak hours using the existing signal timing provided from the City of Knoxville. The traffic from the Rock Pointe Crossing development will only cause a minor increase in delay to the signalized intersection; therefore there are no recommended improvements.

Rutledge Pike @ McCalla Avenue / Rock Pointe Drive
As a part of the Rock Pointe Crossing roadway project the section of McCalla Avenue at the intersection of Rutledge Pike (SR 1) will be renamed Rock Pointe Drive. At the intersection of Rutledge Pike (SR 1) at Rock Pointe Drive the westbound approach will operate at a LOS B during both the AM and PM peak hours and the southbound left turn lane will operate at a LOS A during both the AM and PM peak hours after the full buildout of the Rock Pointe Crossing development.

A northbound right turn lane is not warranted after the completion of the Rock Pointe Crossing development and the existing southbound left turn lane with a

storage length of 115 feet will provide an adequate length based on Harmelink turn lane recommendations and the queue analysis for the unsignalized intersection.

The need for a traffic control signal was analyzed using the "Manual of Uniform Traffic Control Devices" (MUTCD) published by the Federal Highway Administration in 2009. The intersection of Rutledge Pike (SR 1) at Rock Pointe Drive does not meet the conditions for Warrant 1, Eight-Hour Vehicular Volume, but does meet the conditions for Warrant 2, Four-Hour Vehicular Volume and Warrant 3, Peak Hour. FMA recommends re-evaluating the need for a traffic signal after the land uses for the parcels along Rock Pointe Drive are finalized.

Rutledge Pike @ Spring Hill Road

After the full buildout of the Rock Pointe Crossing development the signalized intersection of Rutledge Pike (SR 1) at Spring Hill Road will operate at a LOS C during the AM peak hour and a LOS A during the PM peak hour using the existing signal timing provided from the City of Knoxville.

An intersection LOS C is considered an acceptable amount of delay for a signalized intersection; however consideration should be made for adding a separate westbound left turn lane in the future to improve the overall function of the intersection. The analysis of the existing and background conditions indicated that the westbound approach is currently at or near capacity.

Sight Distance

The sight distance was measured at the existing intersection of Rutledge Pike (SR 1) at McCalla Avenue and at the proposed intersections along Rock Pointe Drive. All studied intersections are expected to meet the minimum sight distance requirements stated in the AASHTO "Geometric Design of Highways and Streets" and comply with City of Knoxville requirements.

1 Introduction

1.1 Project Description

This report provides a summary of a transportation impact analysis that was performed for the Rock Pointe Crossing development. The concept plan proposes a new roadway that will connect McCalla Avenue at Rutledge Pike (SR 1) to Spring Hill Road. The proposed development is located on Rutledge Pike (SR 1) south of Interstate 40 in Knox County, Tennessee. The location of the site is shown in Figure 1.

FMA made some assumptions about future land uses along Rock Pointe Drive. The full buildout of the development assumes a convenience market w/ a gasoline station, non-climate controlled self-storage, climate controlled self-storage, a general office building and a construction equipment rental store (i.e. Sunbelt Rentals). Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2025.

Traffic from the Rock Pointe Crossing development will enter/exit the roadway network via Rutledge Pike (SR 1) at Rock Pointe Drive and at the signalized intersection of Rutledge Pike (SR 1) at Spring Hill Road. As a part of the Rock Pointe Crossing construction the intersection of Rutledge Pike (SR 1) at McCalla Avenue will be closed and replaced by the intersection of Rutledge Pike (SR 1) at Rock Pointe Drive. All proposed new development will access directly onto Rock Pointe Drive.

Rock Pointe Drive will begin at the existing intersection of McCalla Avenue at Rutledge Pike (SR 1) and will end at the intersection with Spring Hill Road at station 31+92. The proposed width of Rock Pointe Drive is 32 feet and the concept plan layout shows sidewalks on both sides of the road. The existing intersection of Rutledge Pike (SR 1) at McCalla Avenue is approximately 580 feet south of the signalized intersection at the I-40E Interchange and 270 feet north of the intersection of Shoney's Driveway.

The proposed roadway layout is shown in Figure 2.

The purpose of this analysis is to evaluate the impacts to the traffic conditions caused by the proposed development.

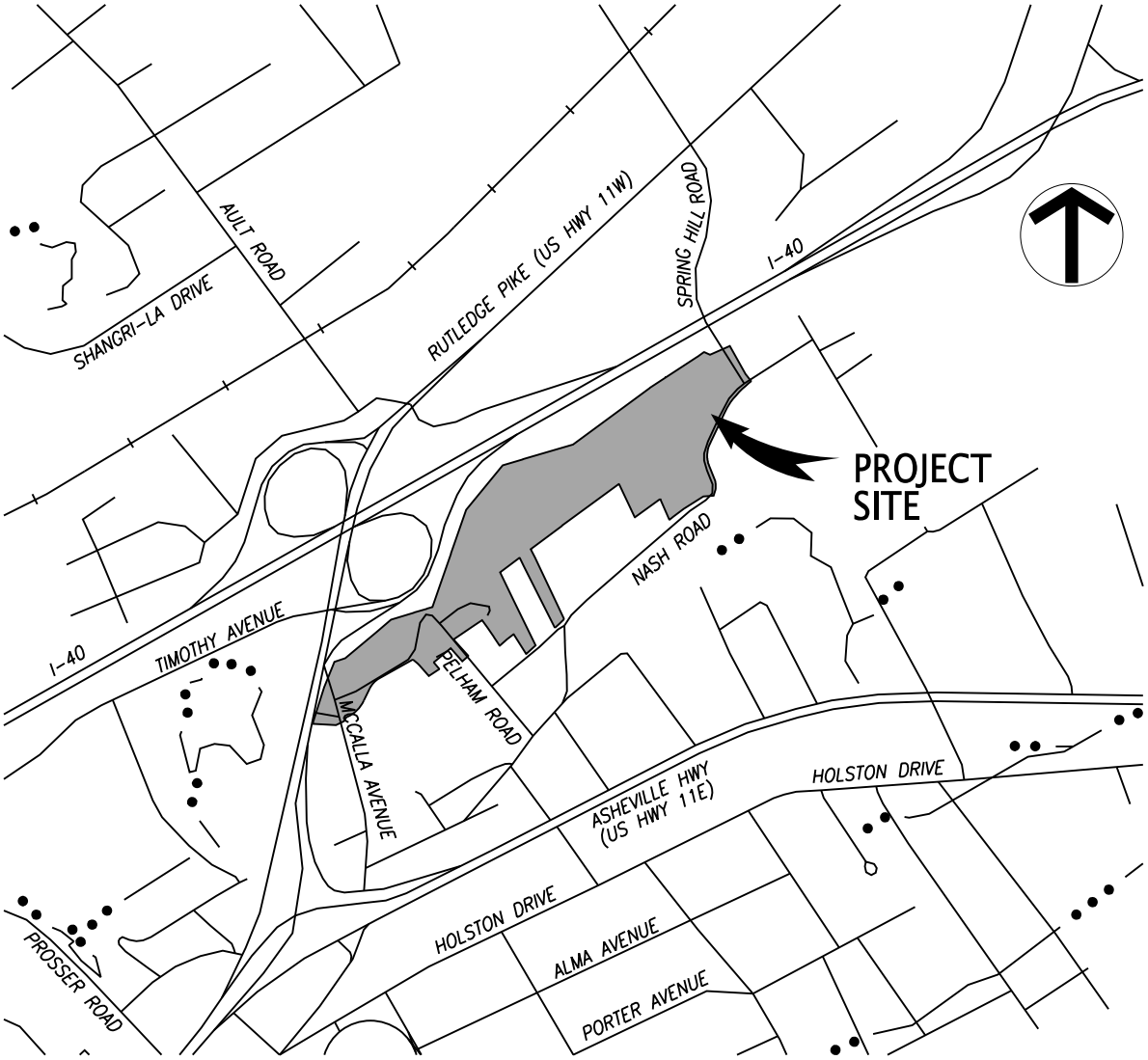


Figure 1: Location Map

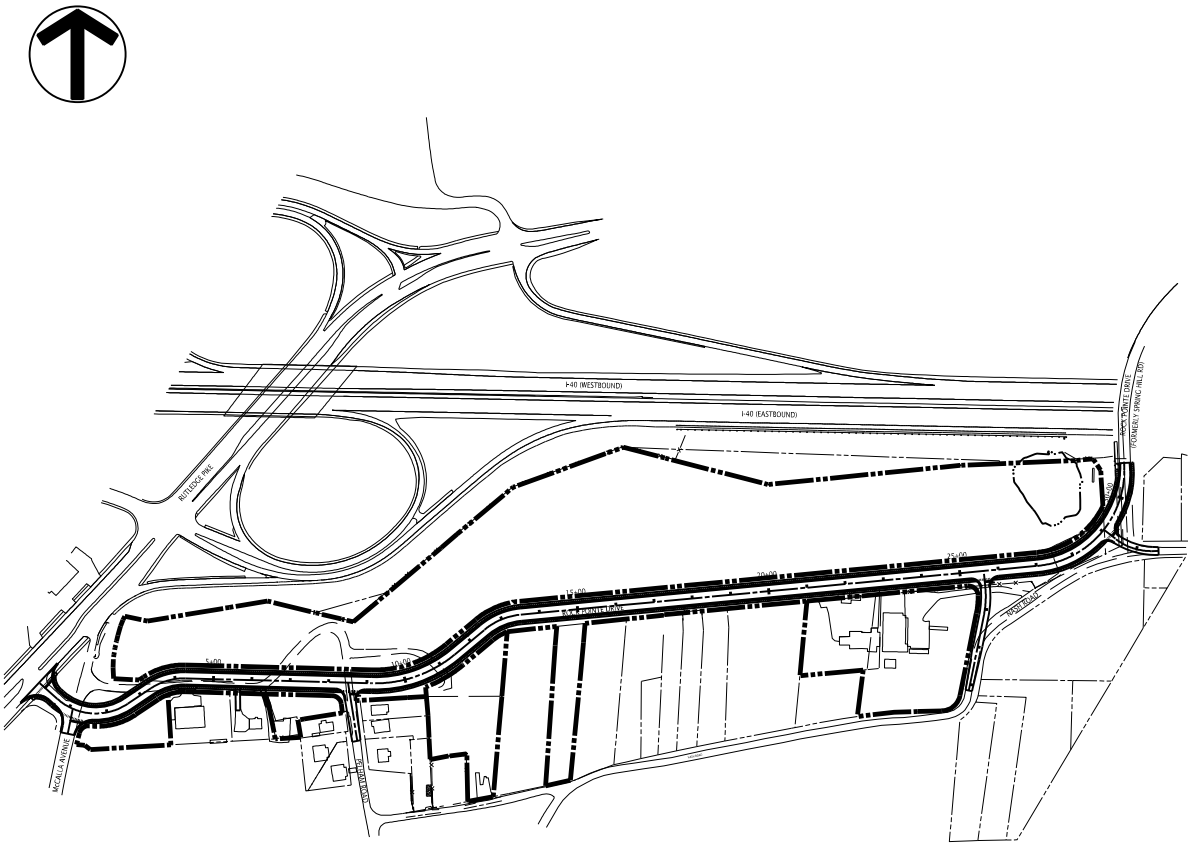


Figure 2: Site Plan

1.2 Existing Site Conditions

Rutledge Pike (SR 1) is a four-lane road at the intersection with McCalla Avenue. At the intersection with McCalla Avenue there is an existing southbound left turn lane with a 115 foot storage length and a 70 foot taper length. Knoxville-Knox County Planning classifies Rutledge Pike (SR 1) as a Major Arterial with a 112 foot right-of-way per the Major Road Plan and the Tennessee Department of Transportation classifies Rutledge Pike (SR 1) as a Principal Arterial and is labeled State Route 1 as a part of the National Highway System. The posted speed limit on Rutledge Pike (SR 1) is 45 mph.

McCalla Avenue is a two-lane road at the intersection with Rutledge Pike (SR 1). The existing width of McCalla Avenue at Rutledge Pike (SR 1) is approximately 30 feet. Knoxville-Knox County Planning does not classify this segment of McCalla Avenue; therefore it is considered a local street. The posted speed limit on McCalla Avenue is 30 mph.

Pelham Road is a two-lane road at the intersection with McCalla Avenue. The existing width of Pelham Road east of McCalla Avenue is approximately 17 feet. Knoxville-Knox County Planning does not classify Pelham Road; therefore, it is considered a local street. The posted speed limit on Pelham Road is 25 mph.

Nash Road is a two-lane road in the vicinity of the development. Knoxville-Knox County Planning does not classify Nash Road; therefore it is considered a local street. The posted speed limit on Nash Road is 25 mph.

Spring Hill Road is a two-lane road at the intersection with Nash Road. Knoxville-Knox County Planning does not classify Spring Hill Road south of Rutledge Pike (SR 1); therefore it is considered a local street. The posted speed limit on Spring Hill Road north of Rutledge Pike (SR 1) is 30 mph.

Aerial photos of the existing intersections are included in Attachment 1.

1.3 Transit Network

The Knoxville Area Transit (KAT) operates in the vicinity of the proposed development.

Route 33 (MLK Jr. Avenue) stops include Knoxville Station – Platform N, Austin East High School and Knoxville Center Mall. Traveling along Martin Luther King Jr Avenue, Rutledge Pike (SR 1) and Washington Pike this route provides headways of approximately 60 minutes on Weekdays, Saturdays and Sundays.

The nearest KAT stop along Rutledge Pike (SR 1) northbound is currently located near the intersection of McCalla Avenue at the existing Shoney's Restaurant. The nearest southbound KAT stop is across the street at the Kenjo Gas Station.

A map of KAT bus route 33 is included in Attachment 10.

1.4 Pedestrian & Bicycle Network

There are existing sidewalks along northbound Rutledge Pike (SR 1) and southbound Rutledge Pike (SR 1) south of the intersection with Timothy Avenue / I-40E Interchange.

There are designated bike lanes on both sides of the street starting west of the intersection of Timothy Avenue at Rutledge Pike (SR 1) and continuing from Prosser Road along E Magnolia Avenue. The "Knoxville Bicycle Map 2017" classifies McCalla Avenue, Pelham Road, Nash Road and Spring Hill Road as local/neighborhood streets which are generally comfortable for biking.

A copy of the Knoxville Bicycle Map 2017 is included in Attachment 10.

2 Existing Traffic Volumes

Due to the altered traffic patterns from COVID-19 FMA did not collect any new turning movement counts for the Rock Pointe Crossing transportation impact analysis.

The City of Knoxville Traffic Engineering Department conducted a turning movement count at the intersection of Rutledge Pike (SR 1) at Spring Hill Road in September 2012. The AM peak hour occurred between 7:15 a.m. and 8:15 a.m. and the PM peak hour occurred between 4:45 p.m. and 5:45 p.m. A copy of the 2012 turning movement counts are included in Attachment 2.

In order to calculate existing traffic conditions for the year 2020 FMA assumed a 1.5% growth rate. The growth rate was determined by analyzing the nearby TDOT count station on Rutledge Pike (SR 1). The ADT trend line growth charts for the TDOT count station are included in Attachment 3 and Figure 3 shows the projected 2020 traffic volumes at the intersection of Rutledge Pike (SR 1) at Spring Hill Road including both the AM and PM peak hour traffic volumes.

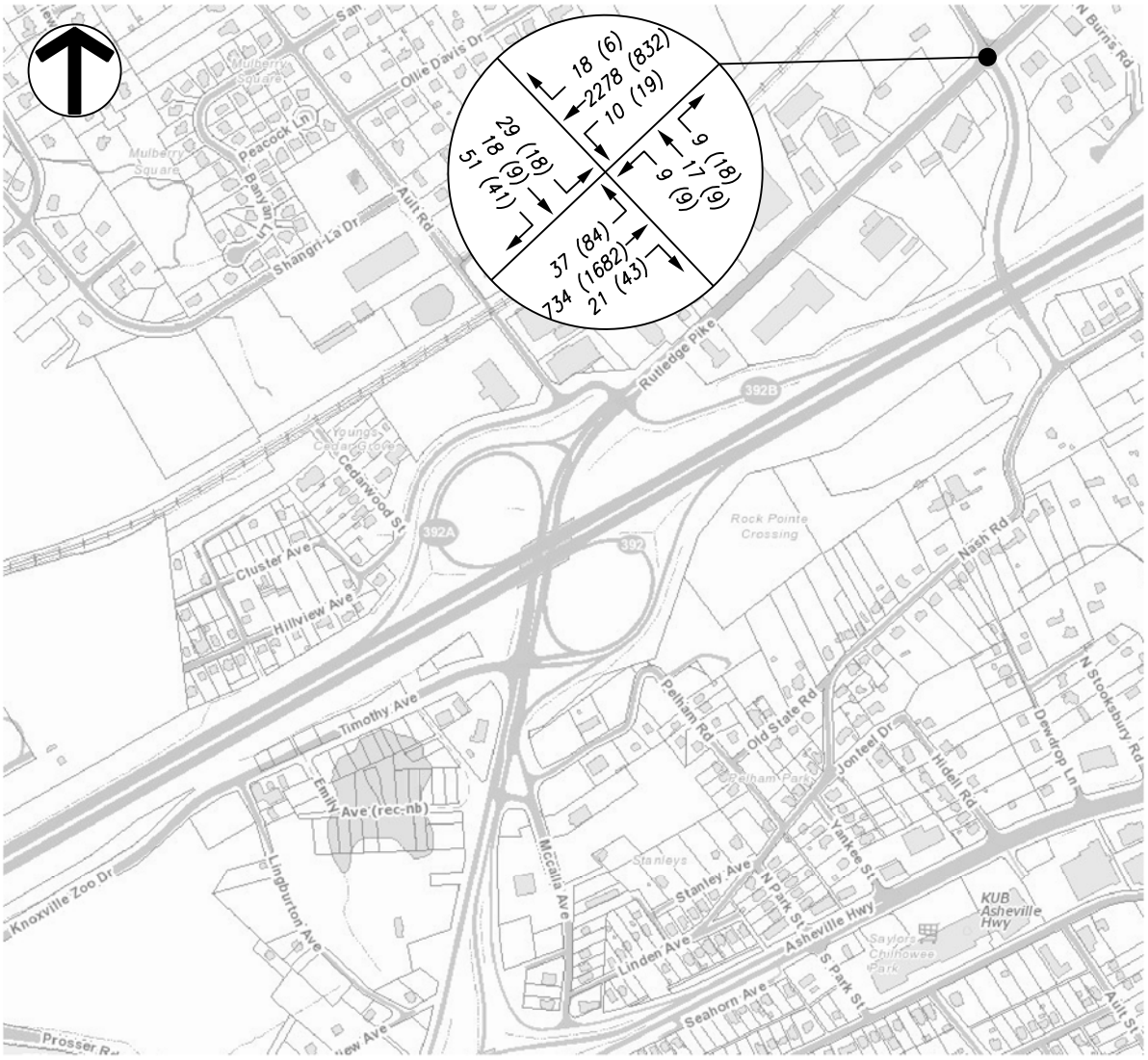
Gresham Smith & Partners collected turning movement counts on January 21, 2020 from 6:00 a.m. to 6:00 p.m. as part of a larger study "Magnolia Avenue / Rutledge Pike / Asheville Highway Interchange Study" Traffic Data and Projection Summary. Out of the thirteen count locations collected by Gresham Smith & Partners only three locations were within the scope of the proposed Rock Pointe Crossing development. The intersection of Rutledge Pike (SR 1) at the I-40E Interchange, the intersection of McCalla Drive at Linden Avenue, the Rutledge Pike (SR 1) Westbound Ramp and the Rutledge Pike (SR 1) Southbound Ramp.

The peak hour varied depending on the studied intersection. At the intersection of Rutledge Pike (SR 1) at the I-40E Interchange the AM peak hour occurred between 7:15 a.m. and 8:15 a.m. and the PM peak hour occurred between 4:45 p.m. and 5:45 p.m. At the intersection of Rutledge Pike (SR 1) at the Westbound Ramp the AM peak hour occurred between 7:15 a.m. and 8:15 a.m. and the PM peak hour occurred between 4:30 p.m. and 5:30 p.m. At the intersection of Rutledge Pike (SR 1) at the Southbound Ramp the AM peak hour occurred between 7:15 a.m. and 8:15 a.m. and the PM peak hour occurred between 5:00 p.m. and 6:00 p.m. At the intersection of McCalla Avenue at Linden Avenue the AM peak hour occurred between 8:00 a.m. and 9:00 a.m. and the PM peak hour occurred between 4:15 p.m. and 5:15 p.m. A copy of the 2020 field collected counts are included in Attachment 2.

In addition to the traffic counts Gresham Smith & Partners also estimated traffic volumes at the intersection of Rutledge Pike (SR 1) at McCalla Avenue for the year 2025. In order to calculate 2020 existing traffic conditions for the intersection of Rutledge Pike (SR 1) at McCalla Avenue FMA assumed a 1.5% growth Rate. The growth rate was determined by analyzing the nearby TDOT count station on Rutledge Pike (SR 1). The ADT trend line growth charts for the TDOT count station are included in Attachment 3 and the 2025 Existing Geometry Turning Movements are included in Attachment 2.

The traffic at the existing intersection of McCalla Avenue at Pelham Road was estimated using a combination of the field data collected at the intersection of McCalla Avenue at Linden Avenue and the estimated traffic at the intersection of Rutledge Pike (SR 1) at McCalla Avenue. FMA assumed a trip distribution of 90% traffic entering/exiting from McCalla Avenue to Rutledge Pike (SR 1).

Figure 4 shows the traffic volumes from both the City of Knoxville 2012 traffic counts and the 2020 Gresham Smith & Partners traffic counts including both the AM and PM peak hour traffic volumes.



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← 5 (16) TURNING MOVEMENT VOLUME AM (PM)

Figure 3: COK 2020 Existing Peak Hour Traffic

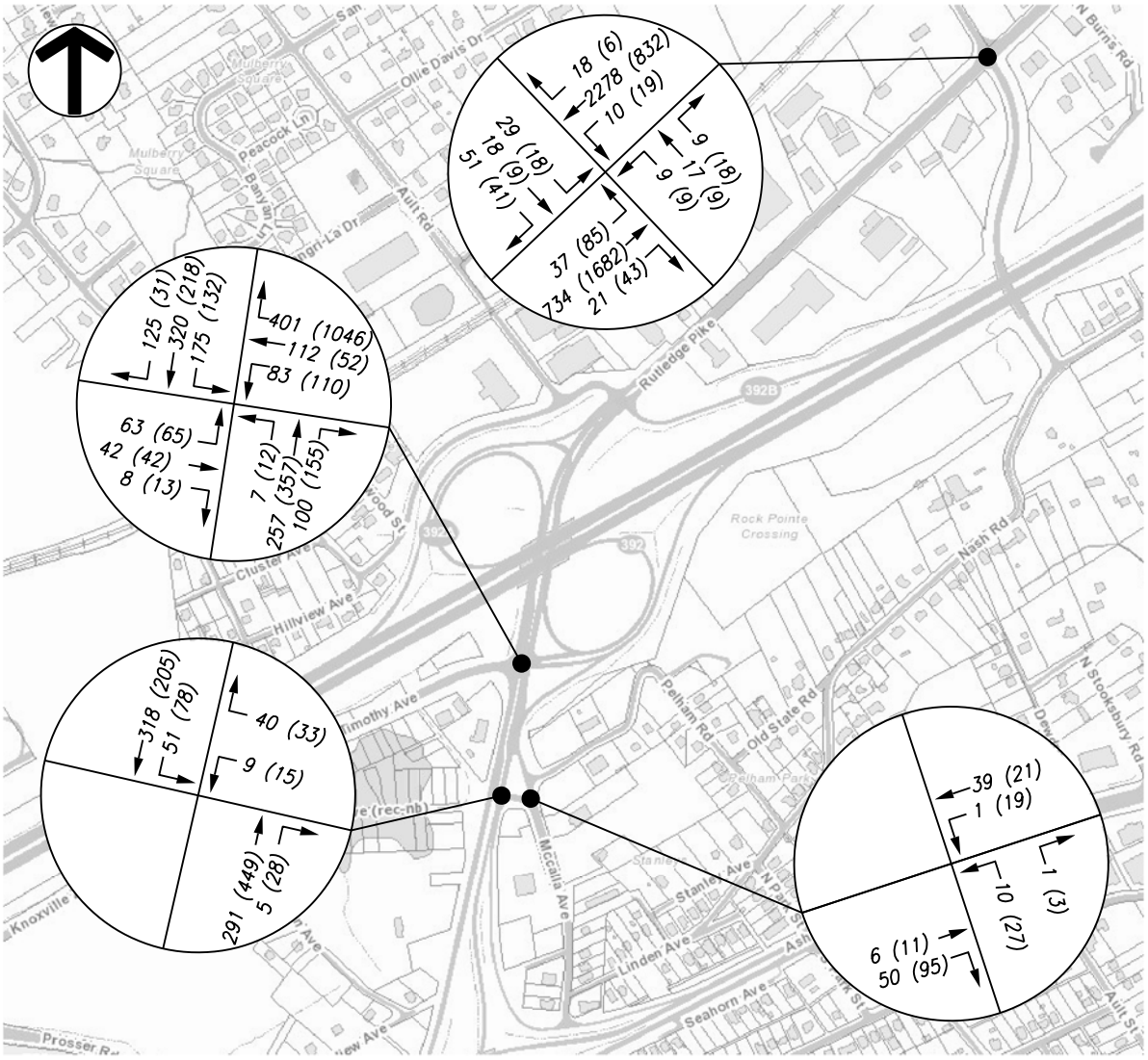


Figure 4: Combined 2020 Existing Peak Hour Traffic

3 Background Growth

The Tennessee Department of Transportation (TDOT) maintains a count station in the vicinity of the proposed development.

TDOT count station number 000358 is located on Rutledge Pike (SR 1) south of the intersection with McCalla Avenue. The annual growth rate for this station over the last ten years is approximately 0.45% and the 2018 ADT was 10,214 vehicles per day.

For the purpose of this study, an annual growth rate of 1.5% was assumed for traffic at all of the studied intersections until full occupancy is reached in 2025. Attachment 3 shows the trend line growth charts for the TDOT count station.

Figure 5 shows the projected 2025 background peak hour traffic volumes at the intersection of Rutledge Pike (SR 1) at Spring Hill Road after applying the background growth rate to the 2020 existing conditions.

Also included in Figure 5 are the projected background peak hour traffic volumes for the intersections of Rutledge Pike (SR 1) at I-40E Interchange and Rutledge Pike (SR 1) at McCalla Avenue. Gresham Smith & Partners calculated 2025 traffic volumes as part of the "Magnolia Avenue / Rutledge Pike / Asheville Highway Interchange Study" Traffic Data and Projection Summary. Figure 2: 2025 Turning Movements (No-Build / Existing Geometry) is included in Attachment 2.

Gresham Smith & Partners is currently working on an Interchange Study at Magnolia Avenue, Rutledge Pike & Asheville Highway. The traffic projections were developed for two primary concepts, an alternative that either would or would not provide a direct connection to the Burlington Commercial District near the intersection of McCalla Avenue at Magnolia Avenue. No decision has been made regarding this intersection but if a direct connection to the Burlington Commercial District is made and a new intersection at McCalla Avenue at Magnolia Avenue is constructed that has the potential to lesson any existing cut-through traffic on McCalla Avenue. The traffic volumes that FMA referenced in the report were for the no-build scenario which shows the worst case scenario of projected traffic at the intersection of Rutledge Pike (SR 1) at McCalla Avenue.

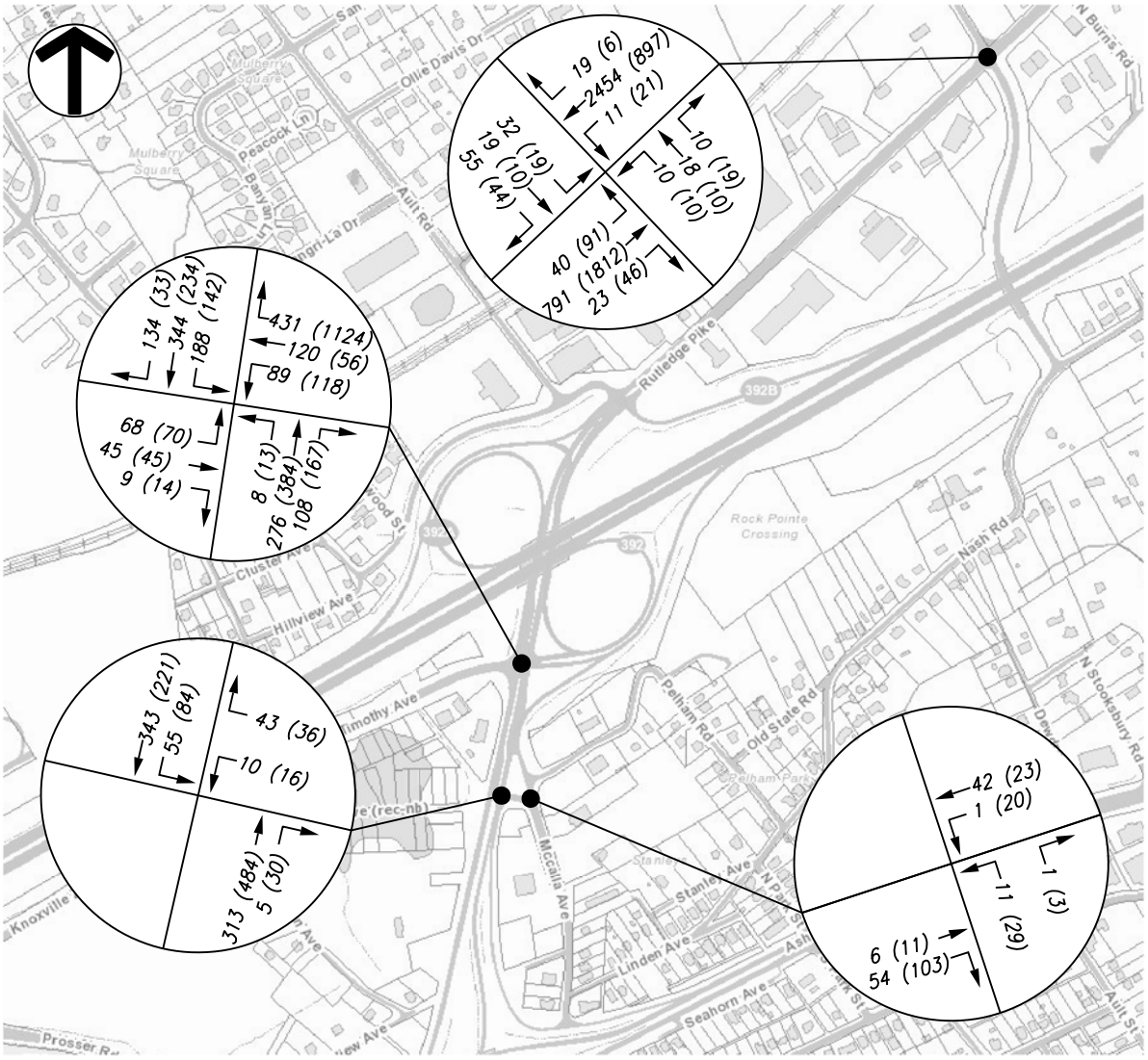


Figure 5: Combined 2025 Background Peak Hour Traffic

4 Trip Generation and Trip Distribution

The Rock Pointe Crossing development proposes a new roadway connection between Rutledge Pike (SR 1) and Spring Hill Road. FMA made some assumptions about future land uses on Rock Pointe Drive in order to estimate the trip generation. FMA assumed a Convenience Market with 16 service stations, a 30,000 SF of non-climate controlled self-storage, a 70,200 SF three-story building of climate controlled self-storage, a 36,510 SF General Office Building and a 12,200 SF Construction Equipment Rental Store (i.e. Sunbelt Rentals). Gasoline/Service Station with Convenience Market (LUC 945), Mini-Warehousing (LUC 151), General Office Building (LUC 710) and Construction Equipment Rental Store (LUC 811) were used to calculate site trips for the development using both the average rates and fitted curve equations when available from the *Trip Generation, 10th Edition,* published by the Institute of Transportation Engineers. The land use worksheets are included in Attachment 4.

A pass-by trip occurs when a proposed development diverts traffic that is already traveling on a street adjacent to the site. The Knoxville-Knox County Planning issued a memo on March 10, 1997 outlining recommended pass-by rates for certain land uses including fast-food restaurants and shopping centers. A pass-by rate reduction of 65% was used for the Convenience Market because the ADT on Rutledge Pike (SR 1) is between 10,000-20,000 vehicle trips per day as referenced in the Knoxville-Knox County Planning Memo.

The total new trips generated by the Rock Pointe Crossing development was estimated to be 1,700 daily trips. The estimated trips are 141 trips during the AM peak hour and 151 trips during the PM peak hour. A trip generation summary is shown in Table 4-1.

Table 4-1
Rock Pointe Crossing
Trip Generation Summary

Land Use	Density	Daily Trips	AM Peak Hour Enter	AM Peak Hour Exit	PM Peak Hour Enter	PM Peak Hour Exit
Gasoline Station w/ Convenience Market (LUC 945)	16 Stations	3,286	102	98	114	110
65% Pass-By Trips		2,136	66	64	74	71
35% New Trips		1,150	36	34	40	38
Mini-Warehouse (LUC 851)	100,200 SF	151	6	4	8	9
General Office Bldg (LUC 710)	36,510 SF	399	52	9	7	37
Sunbelt Rentals (LUC (811)	12,200 SF	N/A	-	-	6	6
Total New Trips		**1,700**	**94**	**47**	**61**	**90**

Spring Hill Road south of Rutledge Pike (SR 1) has a trip distribution of 40% northbound and 60% southbound during the AM peak hour and 35% northbound and 65% southbound during the PM peak hour.

Rutledge Pike (SR 1) at the TDOT count station 000358 has a trip distribution of 30% northbound and 70% southbound during the AM peak hour and 70% northbound and 30% southbound during the PM peak hour.

The trip distribution of the traffic generated by the Rock Pointe Crossing development was determined using the existing traffic volumes along Rutledge Pike (SR 1), Spring Hill Road and McCalla Avenue in combination with the concept plan layout. For the Rock Pointe Crossing development including the non-climate controlled self-storage, climate controlled self-storage, a general office building and a construction equipment rental store (i.e. Sunbelt Rentals) FMA assumed 20% of traffic would enter/exit at the intersection with Rutledge Pike (SR 1) at Rock Pointe Drive, 5% would enter/exit at the intersection with McCalla Avenue and 75% would enter/exit at the signalized intersection of Rutledge Pike (SR 1) at Spring Hill Road.

For the gasoline/service station and convenience market FMA assumed 80% of traffic would enter/exit at the intersection of Rutledge Pike (SR 1) at Rock Pointe

Drive and 20% of traffic would enter/exit at the intersection of Rutledge Pike (SR 1) at Spring Hill Road. Figure 6 shows the peak hour trip distribution for the Rock Pointe Crossing development and Figure 6a shows the peak hour trip distribution for the gasoline/service station with convenience market (LUC 945).

FMA assumed that the 80% of the traffic from the pass-by trips would enter/exit at the intersection of Rutledge Pike (SR 1) at Rock Pointe Drive and 20% would enter/exit at the intersection of Rutledge Pike (SR 1) at Spring Hill Road. Figure 7 shows the pass-by peak hour trip distribution.

Figure 8 shows the peak hour site trips from the development and Figure 9 shows the peak hour pass-by trips from the development. Figure 10 shows the combined peak hour site traffic and Figure 11 shows the peak hour full buildout traffic.

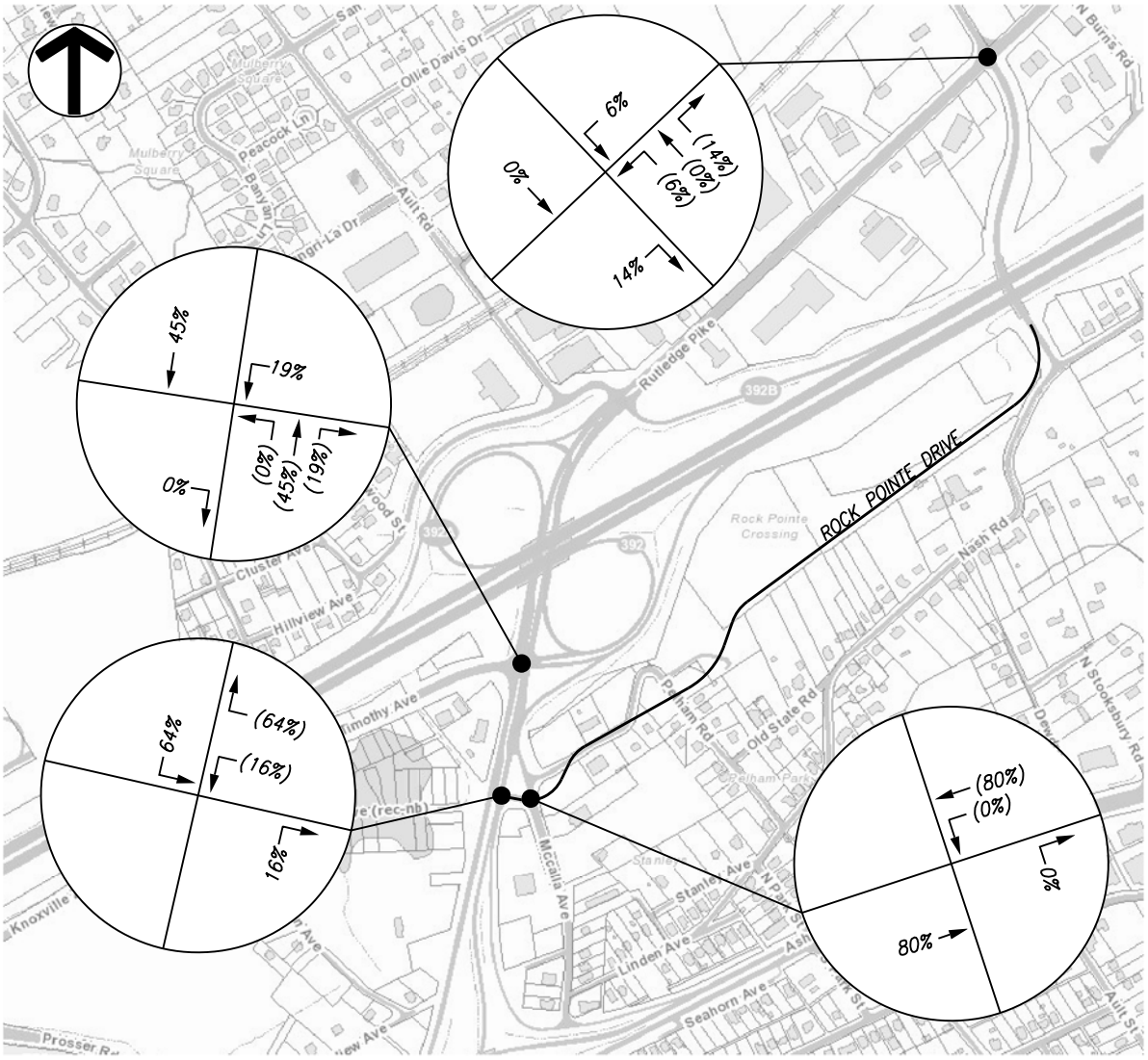


Figure 6: LUC 945 Peak Hour Trip Distribution

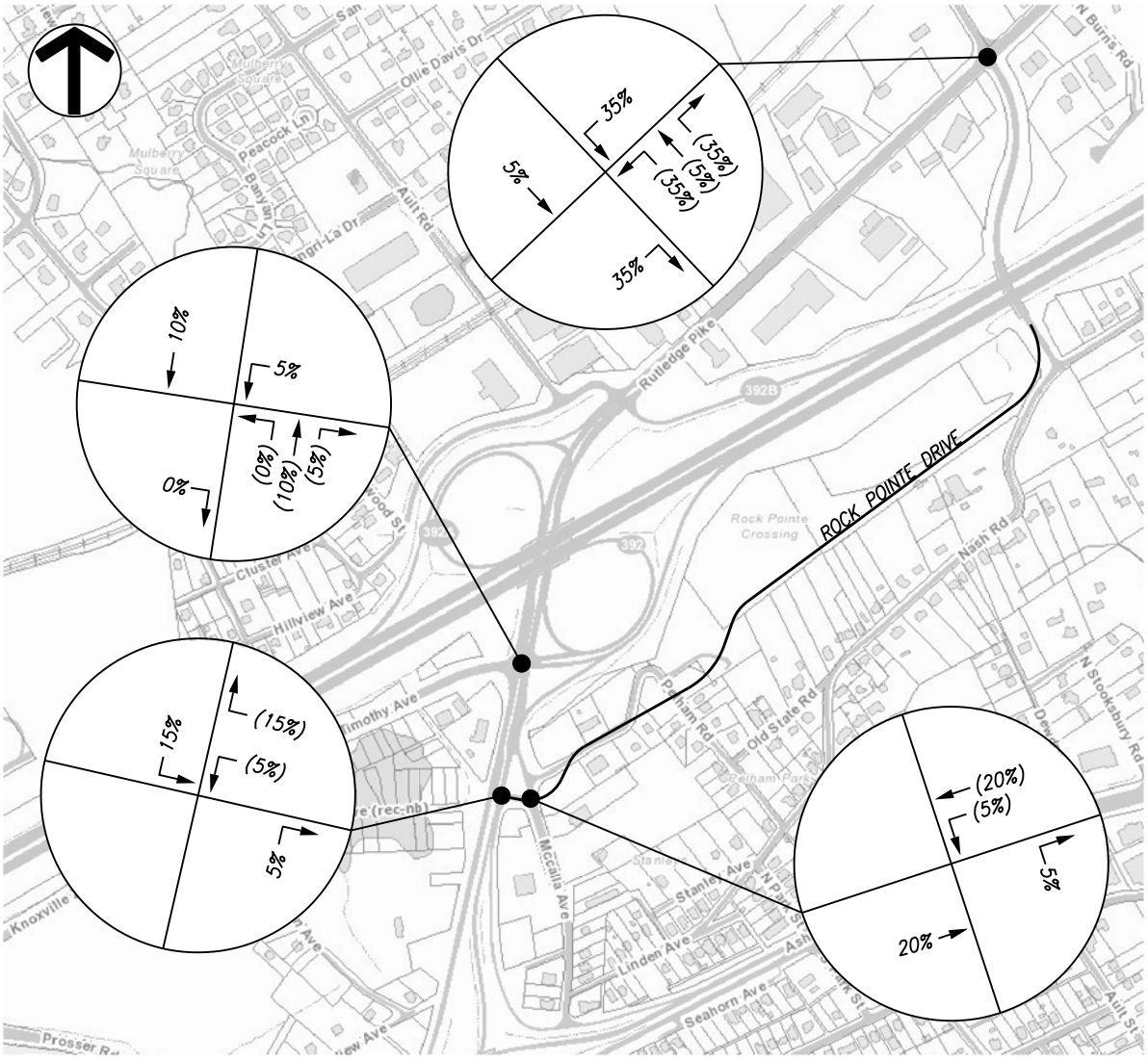
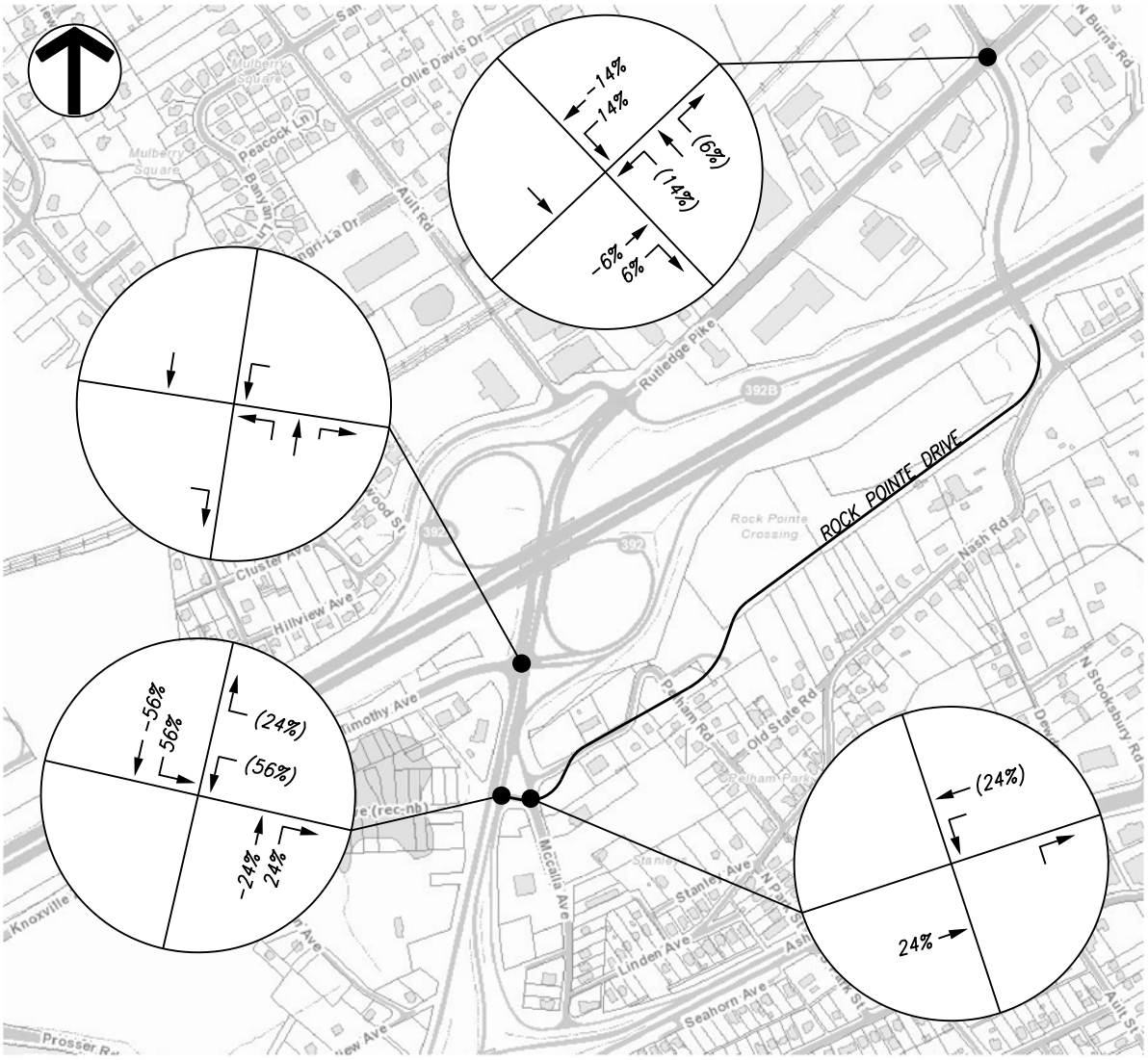


Figure 6a: Rock Pointe Crossing Peak Hour Trip Distribution



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← 50% (50%) TRIP DISTRIBUTION ENTERING (EXITING)

Figure 7: Pass-By Peak Hour Trip Distribution

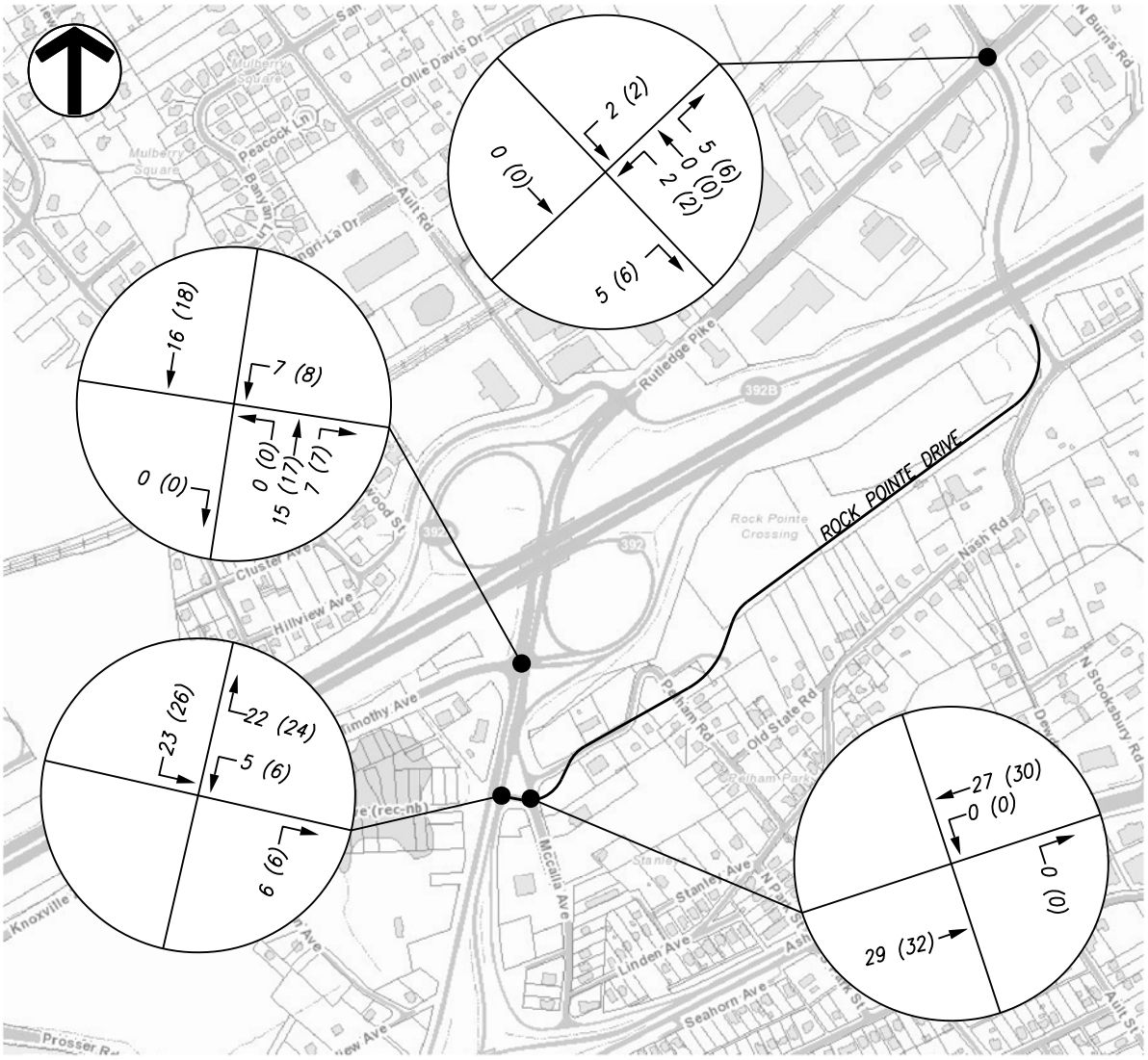

Figure 8: LUC 945 Rock Pointe Crossing Site Trips

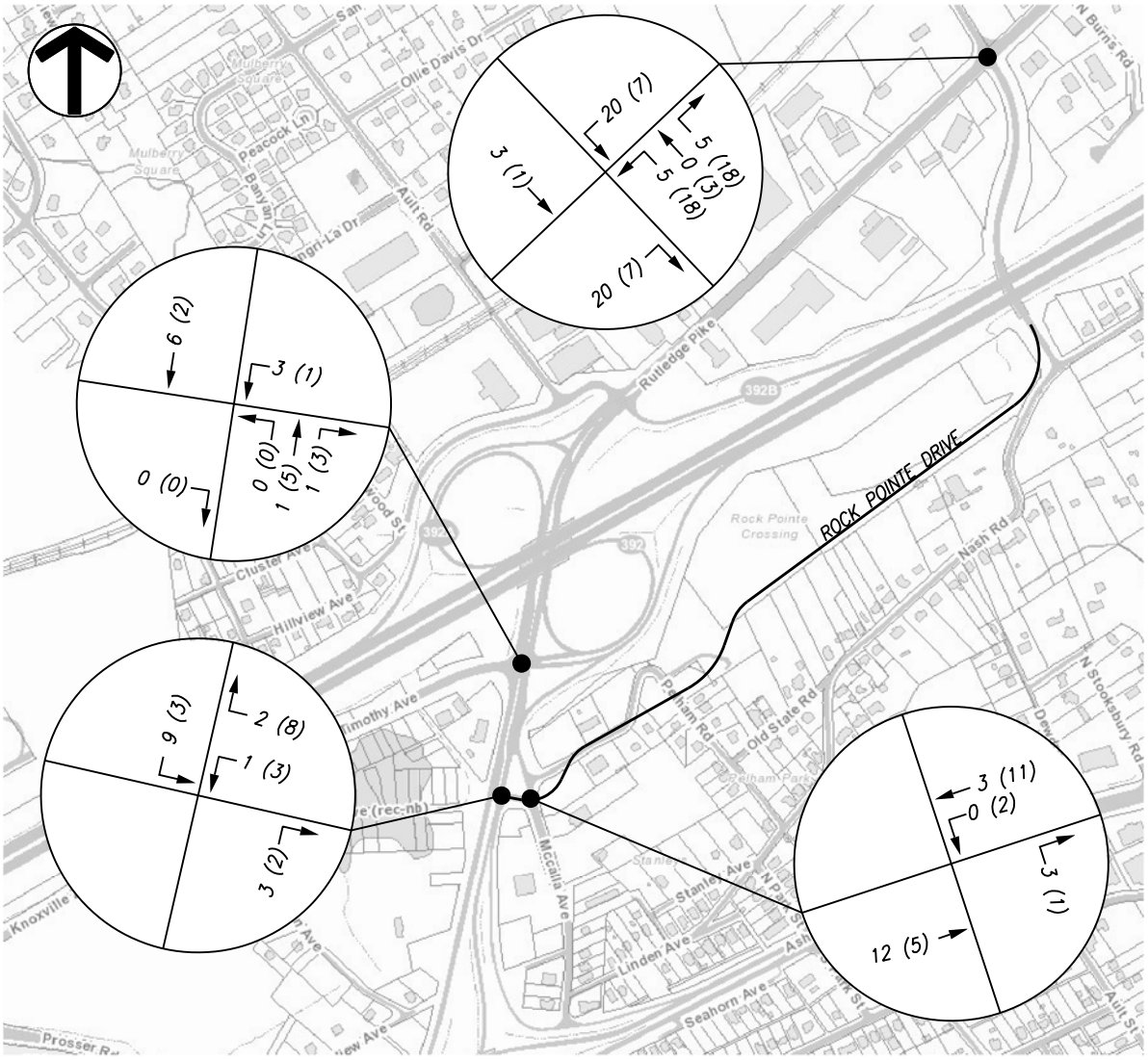

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Figure 8a: Rock Pointe Crossing Site Trips

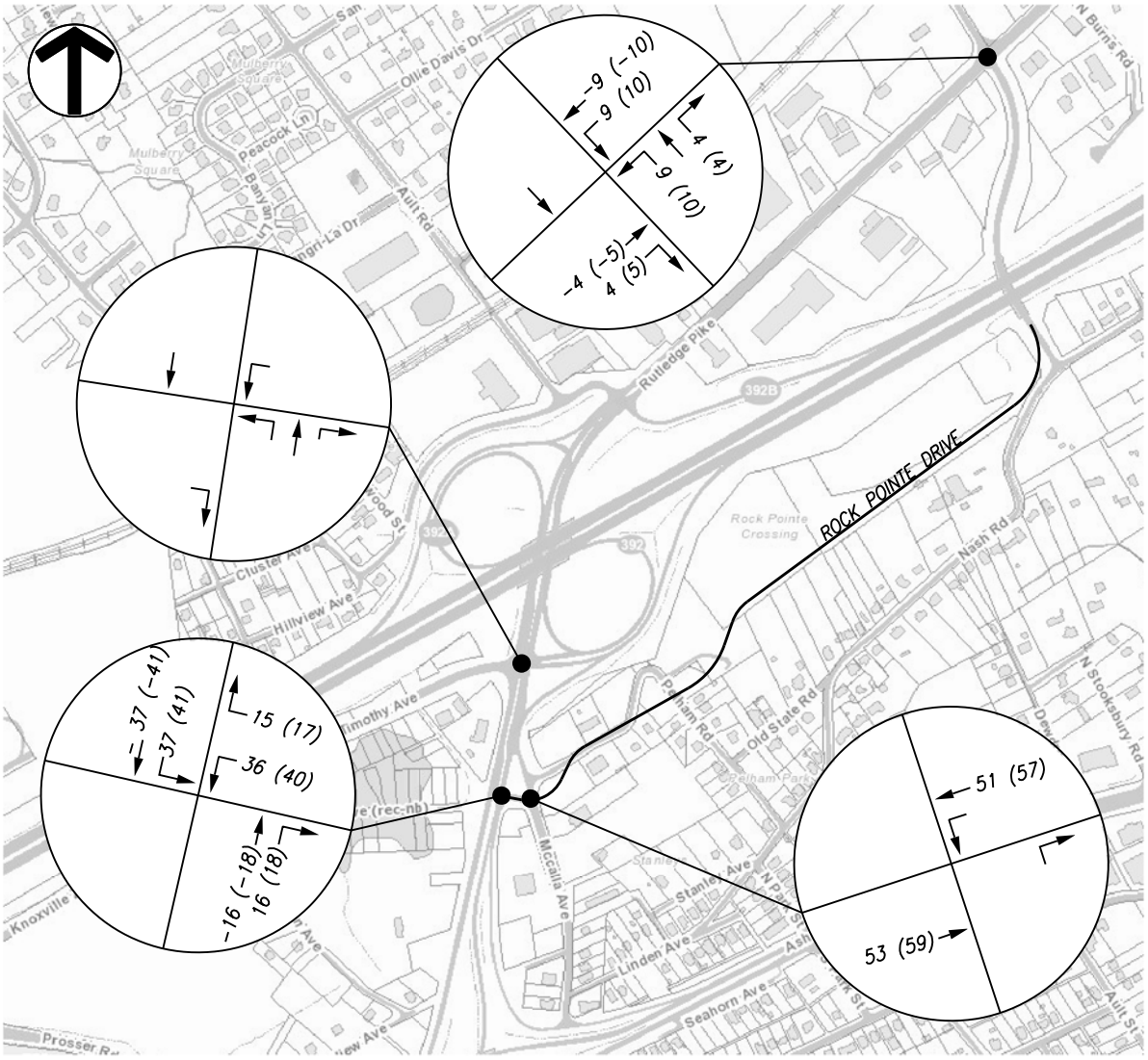


Figure 9: Rock Pointe Crossing Pass-By Trips

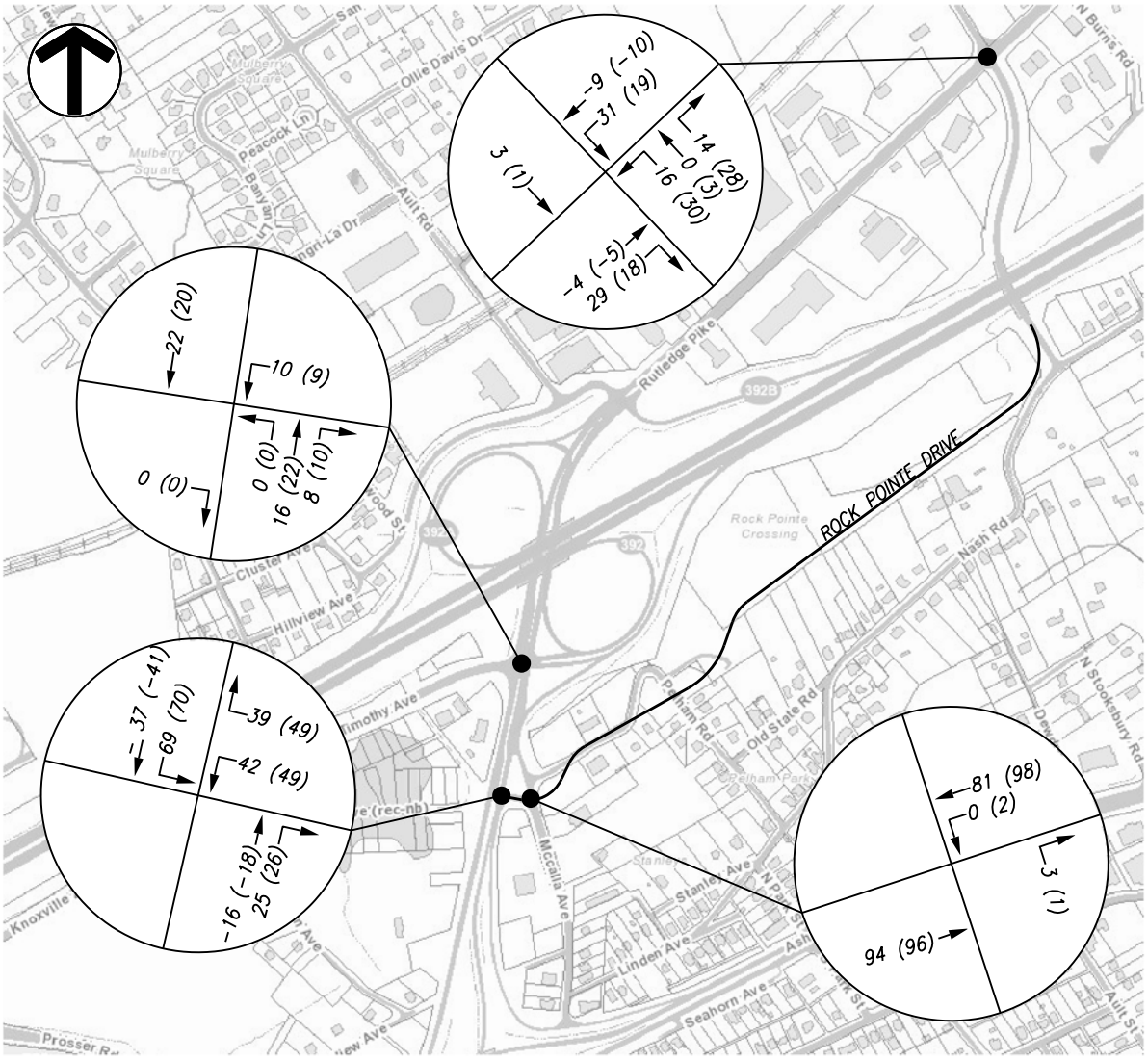


Figure 10: Combined Peak Hour Site Traffic

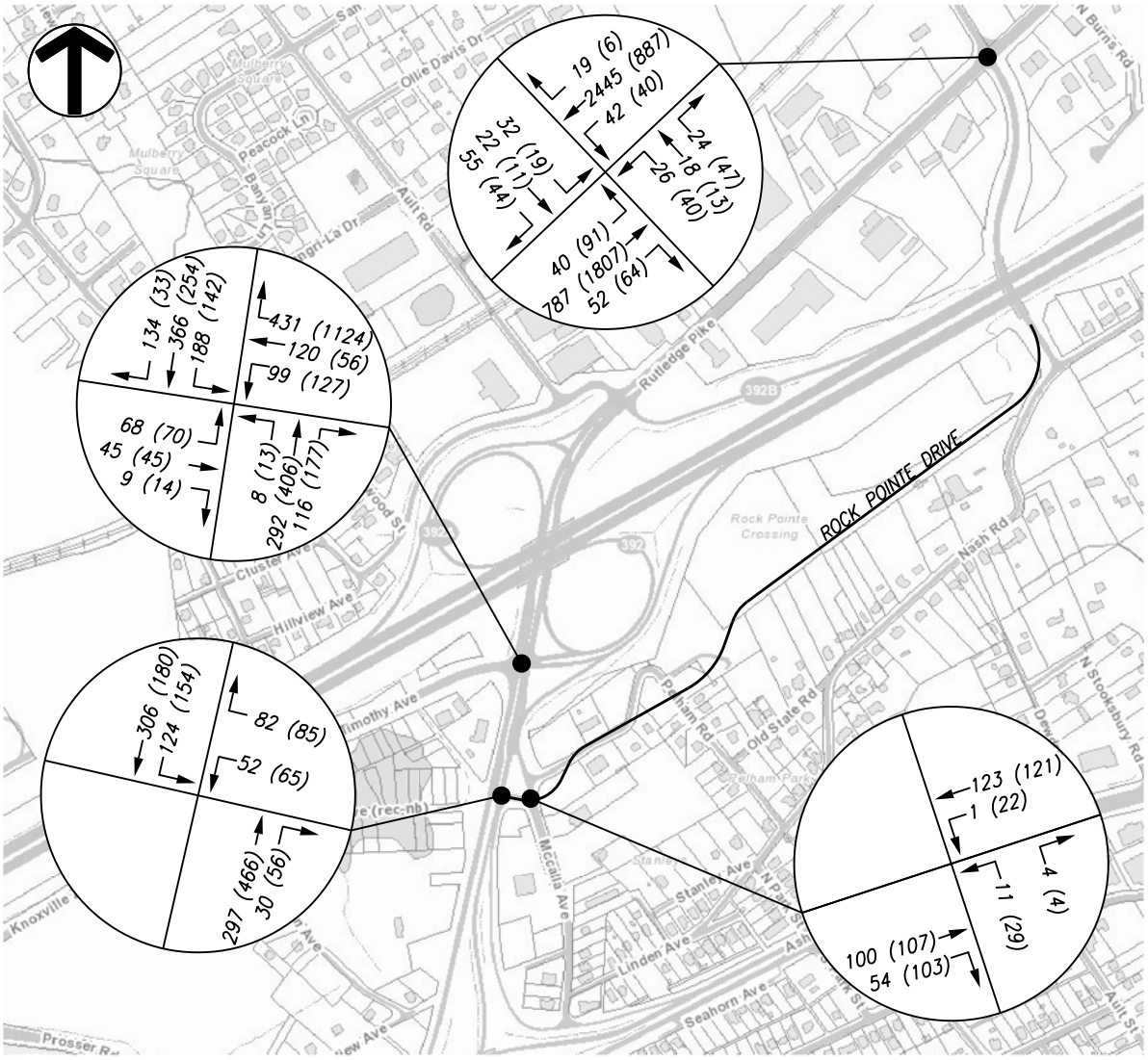


Figure 11: Full Buildout Peak Hour Traffic

5 Projected Capacity and Level of Service

Rutledge Pike (SR 1) at McCalla Avenue / Rock Pointe Crossing and Rock Pointe Crossing at McCalla Avenue are both two-way stop controlled intersections. The existing intersections of Rutledge Pike (SR 1) at I-40E Interchange and Rutledge Pike (SR 1) at Spring Hill Road are signalized.

Unsignalized intersection capacity analyses were performed using the Highway Capacity Software (HCS7) for the AM and PM peak hours to evaluate the traffic conditions at the intersections of Rutledge Pike (SR 1) at McCalla Avenue / Rock Pointe Crossing and Rock Pointe Crossing at McCalla Avenue for the existing, background and full buildout conditions.

Signalized intersection capacity analyses were performed using the Highway Capacity Software (HCS7) at the intersections of Rutledge Pike (SR 1) at I-40E Interchange and Rutledge Pike (SR 1) at Spring Hill Road. Existing signal timing was provided by the City of Knoxville and is included in Attachment 5.

The results from the analyses are expressed with a term "level of service" (LOS), which is based on the amount of delay experienced at the intersection. The LOS index ranges from LOS A, indicating excellent traffic conditions with minimal delay, to LOS F indicating very congested conditions with excessive delay. LOS D generally is considered the minimum acceptable condition in urban areas. The existing, background and full buildout HCS7 worksheets are included in Attachments 6, 7 and 8.

Table 5-1 shows the results of the capacity analyses.

Table 5-1
Intersection Analysis
Level of Service (LOS) Summary

		Delay (sec)/LOS
Rutledge Pike (SR 1) @ 1-40E Interchange (Existing 2020)		
AM Peak	Intersection	36.7 / D
PM Peak	Intersection	40.0 / D
Rutledge Pike (SR 1) @ McCalla Avenue (Existing 2020)		
AM Peak	WB Approach SB Left Turn	9.8 / A 8.0 / A
PM Peak	WB Approach SB Left Turn	10.9 / B 8.8 / A
McCalla Avenue @ Pelham Road (Existing 2020)		
AM Peak	WB Approach NB Approach	7.3 / A 8.9 / A
PM Peak	WB Approach NB Approach	7.5 / A 9.3 / A
Rutledge Pike (SR 1) @ Spring Hill Road (Existing 2020)		
AM Peak	Intersection	9.3 / A
PM Peak	Intersection	5.4 / A
Rutledge Pike (SR 1) @ 1-40E Interchange (Background 2025)		
AM Peak	Intersection	37.3 / D
PM Peak	Intersection	40.6 / D
Rutledge Pike (SR 1) @ McCalla Avenue (Background 2025)		
AM Peak	WB Approach SB Left Turn	9.9 / A 8.1 / A
PM Peak	WB Approach SB Left Turn	11.1 / B 8.9 / A

McCalla Avenue @ Pelham Road (Background 2025)		
AM Peak	WB Approach	7.3 / A
	NB Approach	8.9 / A
PM Peak	WB Approach	7.5 / A
	NB Approach	9.4 / A
Rutledge Pike (SR 1) @ Spring Hill Road (Background 2025)		
AM Peak	Intersection	15.5 / B
PM Peak	Intersection	6.6 / A
Rutledge Pike (SR 1) @ 1-40E Interchange (Full Buildout 2025)		
AM Peak	Intersection	37.4 / D
PM Peak	Intersection	40.7 / D
Rutledge Pike (SR 1) @ Rock Pointe Crossing (Full Buildout 2025)		
AM Peak	WB Approach	11.7 / B
	SB Left Turn	8.4 / A
PM Peak	WB Approach	13.6 / B
	SB Left Turn	9.3 / A
Rock Pointe Drive @ McCalla Avenue (Full Buildout 2025)		
AM Peak	WB Approach	7.6 / A
	NB Approach	9.9 / A
PM Peak	WB Approach	7.7 / A
	NB Approach	10.8 / B
Rutledge Pike (SR 1) @ Spring Hill Road (Full Buildout 2025)		
AM Peak	Intersection	20.7 / C
PM Peak	Intersection	8.7 / A

6 Turn Lane Warrant Analysis

The intersection of Rutledge Pike (SR 1) at Rock Pointe Drive was evaluated to determine if a right turn lane or a left turn lane are warranted.

Per TDOT Roadway Design Guidelines revised March 2, 2020 "exclusive right-turn lanes shall be considered when the right-turn volume exceeds 300 vph and the adjacent thru-lane volume also exceeds 300 vphpl." The right turn lane volume at the intersection of Rutledge Pike (SR 1) at Rock Pointe Drive as shown on Figure 11: Full Buildout Peak Hour Site Traffic is 30 vehicles turning right during the AM peak hour and 56 vehicles turning right during the PM peak hour; therefore a right turn lane is not warranted for this intersection.

There is an existing left turn lane on Rutledge Pike (SR 1) at the proposed intersection with Rock Pointe Drive. The existing southbound left turn lane has a 115 foot storage length and a 70 foot taper. Figure 6, Warrant for 40% Left-Turn Storage Lanes at 40 mph and Figure 12, Warrant for 40% Left-Turn Storage Lanes at 50 mph referenced from the Harmelink Guide and the TDOT Roadway Design Guidelines revised March 2, 2020 were used to determine the need for left turn lane storage at the intersection of Rutledge Pike (SR 1) at Rock Pointe Drive. Based on the Harmelink figures the existing storage of 115 feet is adequate during both the AM and PM peak hours. A copy of the Harmelink figures are included in Attachment 9.

7 Signal Warrant Analysis

The intersection of Rutledge Pike (SR 1) at Rock Pointe Drive was evaluated to determine if a traffic signal is warranted for the full buildout conditions. The "Manual of Uniform Traffic Control Devices" (MUTCD) published by the Federal Highway Administration in 2009 was used to determine if the intersection met a warrant for a signal. The volume based warrants including Warrant 1, Eight-Hour Vehicular Volume, Warrant 2, Four-Hour Vehicular Volume and Warrant 3, Peak Hour were evaluated based on existing, background and full buildout conditions. The traffic signal warrant worksheet is included in Attachment 11.

The intersection of Rutledge Pike (SR 1) at Rock Pointe Drive does not meet the conditions for Warrant 1, Eight-Hour Vehicular Volume, but does meet the conditions for Warrant 2, Four-Hour Vehicular Volume and Warrant 3, Peak Hour.

8 Conclusions and Recommendations

8.1 Rutledge Pike @ Timothy Ave/I-40E Interchange

The existing traffic conditions at the signalized intersection of Rutledge Pike (SR 1) at Timothy Ave / I-40 E Interchange operate at a LOS D during both the AM and PM peak hours using the existing signal timing provided from the City of Knoxville.

The background traffic conditions at the signalized intersection of Rutledge Pike (SR 1) at Timothy Ave / I-40 E Interchange operate at a LOS D during both the AM and PM peak hours using the existing signal timing provided from the City of Knoxville.

After the full buildout of the Rock Pointe Crossing development the signalized intersection of Rutledge Pike (SR 1) at Timothy Ave / I-40 E Interchange will operate at a LOS D during both the AM and PM peak hours using the existing signal timing provided from the City of Knoxville. The traffic from the Rock Pointe Crossing development will only cause a minor increase in delay to the signalized intersection; therefore there are no recommended improvements.

8.2 Rutledge Pike @ McCalla Avenue / Rock Pointe Drive

The existing, background and full buildout conditions at the unsignalized intersection of Rutledge Pike (SR 1) at McCalla Avenue / Rock Pointe Drive were analyzed using the Highway Capacity Software (HCS7).

The existing traffic conditions for the westbound approach currently operate at a LOS A during the AM peak hour and a LOS B during the PM peak hour and the

southbound left turn lane operates at a LOS A during both the AM and PM peak hours.

The background traffic conditions for the westbound approach will operate at a LOS A during the AM peak hour and a LOS B during the PM peak hour and the southbound left turn lane will operate at a LOS A during both the AM and PM peak hours.

As a part of the Rock Pointe Crossing roadway project the section of McCalla Avenue at the intersection of Rutledge Pike (SR 1) will be renamed Rock Pointe Drive. At the intersection of Rutledge Pike (SR 1) at Rock Pointe Drive the westbound approach will operate at a LOS B during both the AM and PM peak hours and the southbound left turn lane will operate at a LOS A during both the AM and PM peak hours after the full buildout of the Rock Pointe Crossing development.

A northbound right turn lane is not warranted at the intersection of Rutledge Pike (SR 1) at Rock Pointe Drive per TDOT Roadway Design Guidelines revised March 2, 2020.

The unsignalized intersection capacity analyses shows a 95% queue length at the full buildout for the existing southbound left turn lane of less than one car length during the AM peak hour and two car lengths during the PM peak hour; therefore the existing left turn storage length of 115 feet will be adequate and no change is necessary. With a 115 foot storage length the existing turn lane has the capacity to hold either four passenger vehicles or one passenger vehicle and one interstate semitrailer.

The need for a traffic control signal was analyzed using the "Manual of Uniform Traffic Control Devices" (MUTCD) published by the Federal Highway Administration in 2009. The intersection of Rutledge Pike (SR 1) at Rock Pointe Drive does not meet the conditions for Warrant 1, Eight-Hour Vehicular Volume, but does meet the conditions for Warrant 2, Four-Hour Vehicular Volume and Warrant 3, Peak Hour. According to the MUTCD the "satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal."

Consideration also needs to be made for the 60% of right turns from Rock Pointe Drive onto Rutledge Pike (SR 1) during both the AM and PM peak hours. If any portion of the right turn traffic is subtracted from the minor street traffic Warrant 3, Peak Hour will no longer be met. FMA recommends re-evaluating the need for a traffic signal after the land uses for the parcels along Rock Pointe Drive are finalized.

8.3 McCalla Avenue @ Pelham Road / Rock Pointe Drive

The existing, background and full buildout conditions at the unsignalized intersection of Rock Pointe Drive at McCalla Avenue were analyzed using the Highway Capacity Software (HCS7).

The existing traffic conditions for the westbound approach currently operate at a LOS A during both the AM and PM peak hours and the northbound approach operates at a LOS A during both the AM and PM peak hours.

The background traffic conditions for the westbound approach operate at a LOS A during both the AM and PM peak hours and the northbound approach operates at a LOS A during both the AM and PM peak hours.

As a part of the Rock Pointe Crossing roadway project the section of Pelham Road at the intersection with McCalla Avenue will be renamed Rock Pointe Drive. The full buildout traffic conditions for the westbound approach operate at a LOS A during both the AM and PM peak hours and the northbound approach operates at a LOS A during the AM peak hour and LOS B during the PM peak hour.

8.4 Rutledge Pike @ Spring Hill Road

The existing traffic conditions at the signalized intersection of Rutledge Pike (SR 1) at Spring Hill Road operate at a LOS A during both the AM and PM peak hours using the existing signal timing provided from the City of Knoxville.

The background traffic conditions at the signalized intersection of Rutledge Pike (SR 1) at Spring Hill Road operate at LOS B during the AM peak hour and a LOS A during the PM peak hour using the existing signal timing provided from the City of Knoxville.

After the full buildout of the Rock Pointe Crossing development the signalized intersection of Rutledge Pike (SR 1) at Spring Hill Road will operate at a LOS C during the AM peak hour and a LOS A during the PM peak hour using the existing signal timing provided from the City of Knoxville.

An intersection LOS C is considered an acceptable amount of delay for a signalized intersection; however consideration should be made for adding a separate westbound left turn lane in the future to improve the overall function of the intersection. The analysis shows that the existing and background conditions have a volume to capacity ratio of 0.9 or higher during the AM peak hour which indicates that the westbound approach is currently at or near capacity. The westbound left

turn lane will go from operating at a LOS B during the background conditions to a LOS F after the full buildout of the Rock Pointe Crossing development during the AM peak hour and will operate at a LOS A during both the background and full buildout conditions during the PM peak hour.

8.5 Rock Pointe Drive

Rock Pointe Drive will be built as a part of the Rock Pointe Crossing development. A 30 mph design speed was used and AASHTO's "A Policy on Geometric Design of Highways and Streets" seventh edition dated 2018 was referenced in determining the design criteria for the roadway project.

Rock Pointe Drive will begin at the existing intersection of McCalla Avenue at Rutledge Pike (SR 1) and will end at the intersection with Spring Hill Road at station 31+92. The proposed width of Rock Pointe Drive is 36 feet including a 2 foot shoulder, 5 foot bike lane and 11 foot travel lane in each direction. The concept plan layout also shows 5 foot sidewalks on both sides of the road and a 70 foot right-of-way. The existing intersection of Rutledge Pike (SR 1) at McCalla Avenue is approximately 580 feet south of the signalized intersection at the I-40E Interchange and 270 feet north of the intersection of Shoney's Driveway.

FMA recommends four (4) stop signs be installed at the new intersections along Rock Pointe Drive. A stop sign should be installed on northbound McCalla Avenue, on northbound Pelham Road, on northbound Nash Road and on westbound Nash Road.

8.6 Sight Distance

The Knoxville-Knox County Subdivision Regulations amended through February 13, 2020 were referenced in determining the minimum sight distance requirements for the studied intersections. The subdivision regulations state in Section 3.04.J.5 that within the City of Knoxville "the minimum sight distance at an intersection (in both directions along the major street) shall be measured using intersection sight distance identified in AASHTO Geometric Design of Highways and Streets."

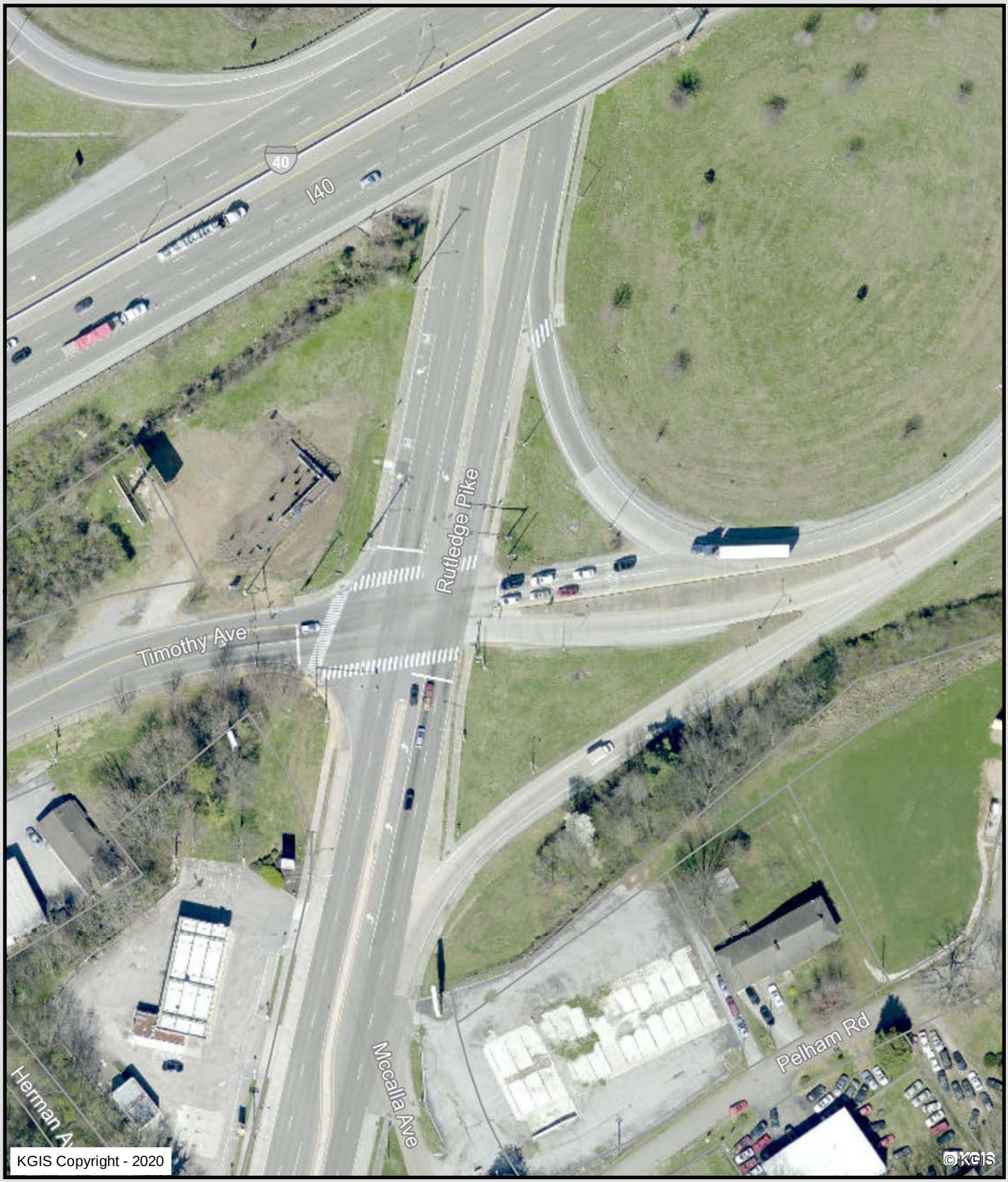
Rutledge Pike (SR 1) is a four-lane highway with a posted speed limit of 45 mph. Based on the concept plan layout the existing intersection of Rutledge Pike (SR 1) at McCalla Avenue will be in the approximate location as the proposed intersection of Rutledge Pike (SR 1) at Rock Pointe Drive. Per AASHTO the required stopping sight distance is 360 feet and the required intersection sight distance is 530 feet for a left turn and 463 feet for a right turn at the intersection with Rock Pointe Drive. FMA measured the sight distance at the existing intersection of Rutledge Pike (SR 1) at McCalla Avenue in May 2020. At 15 feet from the edge of pavement the sight distance at the existing intersection is greater than 1,000 feet northbound and 625

feet southbound. This intersection is in compliance with AASHTO and the City of Knoxville sight distance requirements and no change is necessary.

The design speed for Rock Pointe Drive is 30 mph. At the intersection with McCalla Avenue and both intersections with Nash Road the required stopping sight distance is 200 feet and the required intersection sight distance is 335 feet for a left turn and 290 feet for a right turn for a road with a 30 mph design speed and a less than 3% grade per AASHTO requirements. The intersection sight triangles show a clear line of sight for the proposed intersections of Rock Pointe Drive at McCalla Avenue, and both intersections of Rock Pointe Drive at Nash Road; therefore the intersections are in compliance with AASHTO and the City of Knoxville sight distance requirements and no change is necessary. The intersection sight triangles are included in Attachment 12.

At the proposed intersection of Rock Pointe Drive at Pelham Road the design speed is 30 mph and the proposed grade is 10%. The required stopping sight distance for a road with a 10% grade is 117 feet traveling uphill and 231 feet traveling downhill. The required intersection sight distance is 393 feet for a left turn and 318 feet for a right turn per AASHTO requirements. The intersection sight triangles show a clear line of sight for the proposed intersection of Rock Pointe Drive at Pelham Road; therefore the intersection is in compliance with AASHTO and the City of Knoxville sight distance requirements and no change is necessary. The intersection sight triangles are included in Attachment 12.

Attachment 1
Aerial Photo



Rutledge Pike at I-40 E Interchange

Knoxville - Knox County - KUB Geographic Information System

Printed: 5/16/2020 at 12:02:20 PM

0 50 100 200

ft

Rutledge Pike at McCalla

Knoxville - Knox County - KUB Geographic Information System

Printed: 5/16/2020 at 12:00:58 PM

0 50 100 200

ft

Rutledge Pike at Spring Hill Rd

Printed: 5/16/2020 at 12:03:42 PM

0 50 100 200

ft

Knoxville - Knox County - KUB Geographic Information System

Attachment 2
Traffic Counts

City of Knoxville

Traffic Engineering
1400 Loraine St
Knoxville, TN 37921

Rutledge Pk at Spring Hill Rd
Counted by: Daniel Dyer
Weather: Cool
Time: 7am - 9am

File Name : Rutledge_Spring Hill_1
Site Code : 00000000
Start Date : 9/19/2012
Page No : 1

Groups Printed- Unshifted

	Spring Hill Rd Southbound					Rutledge Pk Westbound					Spring Hill Rd Northbound					Rutledge Pk Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00 AM	12	0	2	0	14	4	246	0	0	250	4	2	0	0	6	6	131	16	0	153	423
07:15 AM	10	8	1	0	19	3	514	1	0	518	3	4	5	0	12	4	150	9	0	163	712
07:30 AM	11	4	10	0	25	7	561	5	0	573	2	5	1	0	8	5	152	10	0	167	773
07:45 AM	12	2	7	0	21	4	515	2	0	521	2	3	1	0	6	6	191	10	0	207	755
Total	45	14	20	0	79	18	1836	8	0	1862	11	14	7	0	32	21	624	45	0	690	2663
08:00 AM	12	2	8	0	22	2	432	1	0	435	1	3	1	0	5	4	159	4	0	167	629
08:15 AM	10	2	2	0	14	3	497	2	0	502	2	0	4	0	6	0	156	7	0	163	685
08:30 AM	7	2	3	0	12	3	207	1	0	211	0	3	2	0	5	7	115	11	0	133	361
08:45 AM	10	3	4	0	17	3	232	1	0	236	1	0	1	0	2	2	128	2	0	132	387
Total	39	9	17	0	65	11	1368	5	0	1384	4	6	8	0	18	13	558	24	0	595	2062
Grand Total	84	23	37	0	144	29	3204	13	0	3246	15	20	15	0	50	34	1182	69	0	1285	4725
Apprch %	58.3	16	25.7	0		0.9	98.7	0.4	0		30	40	30	0		2.6	92	5.4	0		
Total %	1.8	0.5	0.8	0	3	0.6	67.8	0.3	0	68.7	0.3	0.4	0.3	0	1.1	0.7	25	1.5	0	27.2	

City of Knoxville

Traffic Engineering
1400 Loraine St
Knoxville, TN 37921

File Name : Rutledge_Spring Hill_1
Site Code : 00000000
Start Date : 9/19/2012
Page No : 2

	Spring Hill Rd Southbound					Rutledge Pk Westbound					Spring Hill Rd Northbound					Rutledge Pk Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	10	**8**	1	0	19	3	514	1	0	518	**3**	4	**5**	0	**12**	4	150	9	0	163	712
07:30 AM	11	4	**10**	0	**25**	**7**	**561**	**5**	0	**573**	2	**5**	1	0	8	5	152	**10**	0	167	**773**
07:45 AM	**12**	2	7	0	21	4	515	2	0	521	2	3	1	0	6	**6**	**191**	10	0	**207**	755
08:00 AM	12	2	8	0	22	2	432	1	0	435	1	3	1	0	5	4	159	4	0	167	629
Total Volume	45	16	26	0	87	16	2022	9	0	2047	8	15	8	0	31	19	652	33	0	704	2869
% App. Total	51.7	18.4	29.9	0		0.8	98.8	0.4	0		25.8	48.4	25.8	0		2.7	92.6	4.7	0		
PHF	.938	.500	.650	.000	.870	.571	.901	.450	.000	.893	.667	.750	.400	.000	.646	.792	.853	.825	.000	.850	.928

City of Knoxville

Traffic Engineering
1400 Loraine St
Knoxville, TN 37921

Rutledge Pk at Spring Hill Rd
Counted by: Daniel Dyer
Weather: Sunny
Time: 11am - 1pm

File Name : Rutledge_Spring Hill_2
Site Code : 00000000
Start Date : 9/19/2012
Page No : 1

Groups Printed- Unshifted

	Spring Hill Rd Southbound					Rutledge Pk Westbound					Spring Hill Rd Northbound					Rutledge Pk Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
11:00 AM	7	1	1	0	9	2	103	5	0	110	6	1	2	0	9	4	129	7	0	140	268
11:15 AM	6	3	1	0	10	2	179	3	0	184	3	2	1	0	6	4	119	9	0	132	332
11:30 AM	5	5	1	0	11	2	199	3	0	204	4	1	5	0	10	0	204	10	0	214	439
11:45 AM	14	6	4	0	24	4	252	4	0	260	3	5	0	0	8	5	181	8	0	194	486
Total	32	15	7	0	54	10	733	15	0	758	16	9	8	0	33	13	633	34	0	680	1525
12:00 PM	7	4	3	0	14	1	188	3	0	192	0	2	2	0	4	6	145	9	0	160	370
12:15 PM	7	2	0	0	9	0	169	4	0	173	1	2	2	0	5	5	128	7	0	140	327
12:30 PM	7	10	3	0	20	1	168	2	0	171	4	1	3	2	10	5	148	11	0	164	365
12:45 PM	8	2	7	0	17	1	114	2	0	117	1	6	1	0	8	4	123	12	0	139	281
Total	29	18	13	0	60	3	639	11	0	653	6	11	8	2	27	20	544	39	0	603	1343
Grand Total	61	33	20	0	114	13	1372	26	0	1411	22	20	16	2	60	33	1177	73	0	1283	2868
Apprch %	53.5	28.9	17.5	0		0.9	97.2	1.8	0		36.7	33.3	26.7	3.3		2.6	91.7	5.7	0		
Total %	2.1	1.2	0.7	0	4	0.5	47.8	0.9	0	49.2	0.8	0.7	0.6	0.1	2.1	1.2	41	2.5	0	44.7	

City of Knoxville

Traffic Engineering
1400 Loraine St
Knoxville, TN 37921

File Name : Rutledge_Spring Hill_2
Site Code : 00000000
Start Date : 9/19/2012
Page No : 2

	Spring Hill Rd Southbound					Rutledge Pk Westbound					Spring Hill Rd Northbound					Rutledge Pk Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:15 AM																					
11:15 AM	6	3	1	0	10	2	179	3	0	184	3	2	1	0	6	4	119	9	0	132	332
11:30 AM	5	5	1	0	11	2	199	3	0	204	**4**	1	**5**	0	**10**	0	**204**	**10**	0	**214**	439
11:45 AM	**14**	**6**	**4**	0	**24**	**4**	**252**	**4**	0	**260**	3	**5**	0	0	8	5	181	8	0	194	**486**
12:00 PM	7	4	3	0	14	1	188	3	0	192	0	2	2	0	4	**6**	145	9	0	160	370
Total Volume	32	18	9	0	59	9	818	13	0	840	10	10	8	0	28	15	649	36	0	700	1627
% App. Total	54.2	30.5	15.3	0		1.1	97.4	1.5	0		35.7	35.7	28.6	0		2.1	92.7	5.1	0		
PHF	.571	.750	.563	.000	.615	.563	.812	.813	.000	.808	.625	.500	.400	.000	.700	.625	.795	.900	.000	.818	.837

City of Knoxville

Traffic Engineering
1400 Loraine St
Knoxville, TN 37921

Rutledge Pk at Spring Hill Rd
Counted by: Daniel Dyer
Weather: Rain
Time: 4pm - 6pm

File Name : Rutledge_Spring Hill_3
Site Code : 00000000
Start Date : 9/17/2012
Page No : 1

Groups Printed- Unshifted

	Spring Hill Rd Southbound					Rutledge Pk Westbound					Spring Hill Rd Northbound					Rutledge Pk Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
04:00 PM	8	0	2	0	10	3	178	4	0	185	9	1	5	0	15	6	237	12	0	255	465
04:15 PM	17	3	3	0	23	2	123	4	0	129	4	2	5	0	11	6	238	14	0	258	421
04:30 PM	9	5	2	0	16	3	154	0	0	157	3	7	3	0	13	7	234	22	0	263	449
04:45 PM	7	3	1	0	11	0	175	2	0	177	4	2	1	0	7	11	352	15	0	378	573
Total	41	11	8	0	60	8	630	10	0	648	20	12	14	0	46	30	1061	63	0	1154	1908
05:00 PM	11	1	7	0	19	2	208	4	0	214	1	1	3	0	5	6	378	22	0	406	644
05:15 PM	9	1	4	0	14	1	171	3	0	175	7	3	1	0	11	10	447	27	0	484	684
05:30 PM	9	3	4	0	16	2	185	8	0	195	4	2	3	0	9	11	316	11	0	338	558
05:45 PM	4	1	0	0	5	0	90	4	0	94	4	6	5	0	15	3	170	14	0	187	301
Total	33	6	15	0	54	5	654	19	0	678	16	12	12	0	40	30	1311	74	0	1415	2187
Grand Total	74	17	23	0	114	13	1284	29	0	1326	36	24	26	0	86	60	2372	137	0	2569	4095
Apprch %	64.9	14.9	20.2	0		1	96.8	2.2	0		41.9	27.9	30.2	0		2.3	92.3	5.3	0		
Total %	1.8	0.4	0.6	0	2.8	0.3	31.4	0.7	0	32.4	0.9	0.6	0.6	0	2.1	1.5	57.9	3.3	0	62.7	

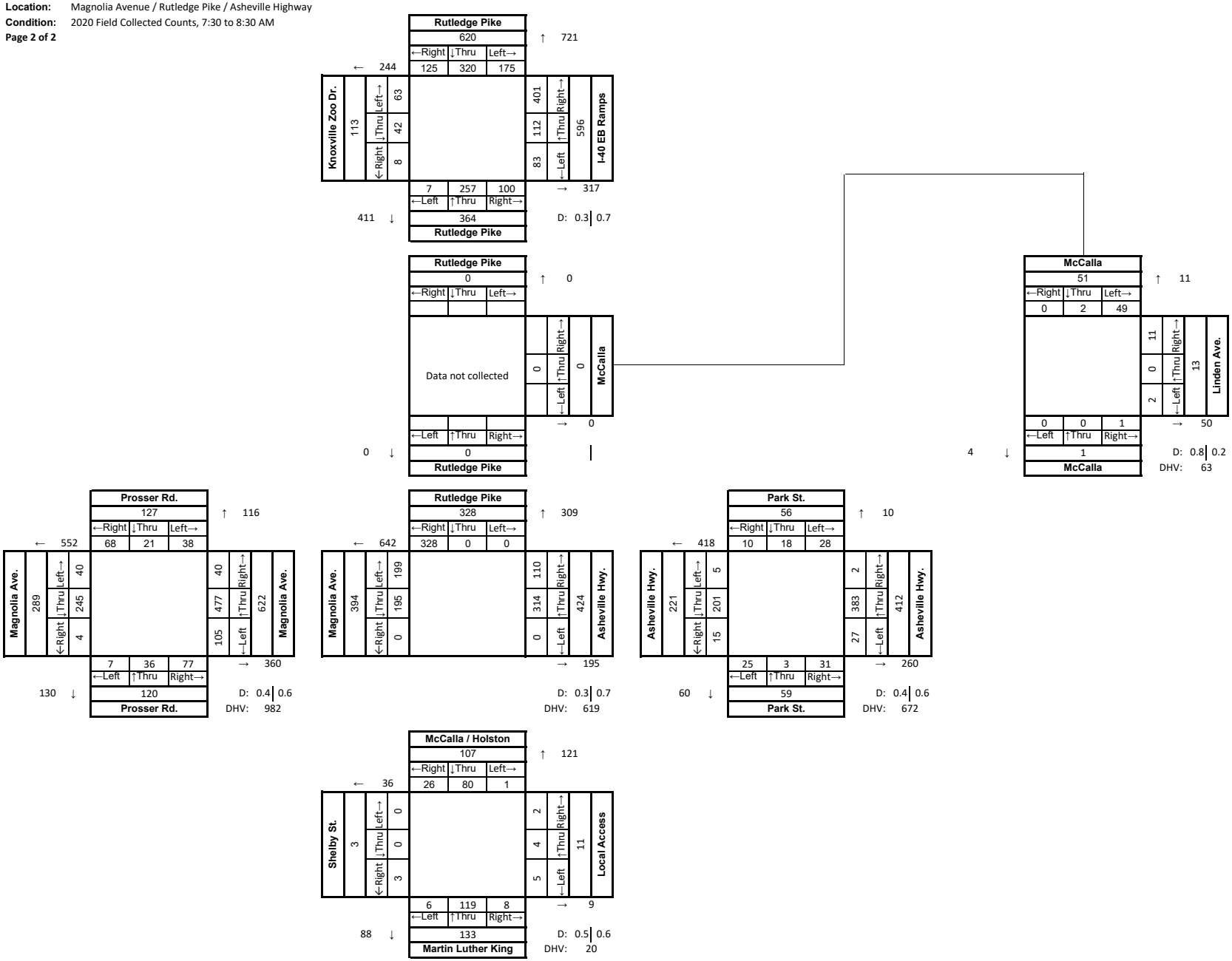
City of Knoxville

Traffic Engineering
1400 Loraine St
Knoxville, TN 37921

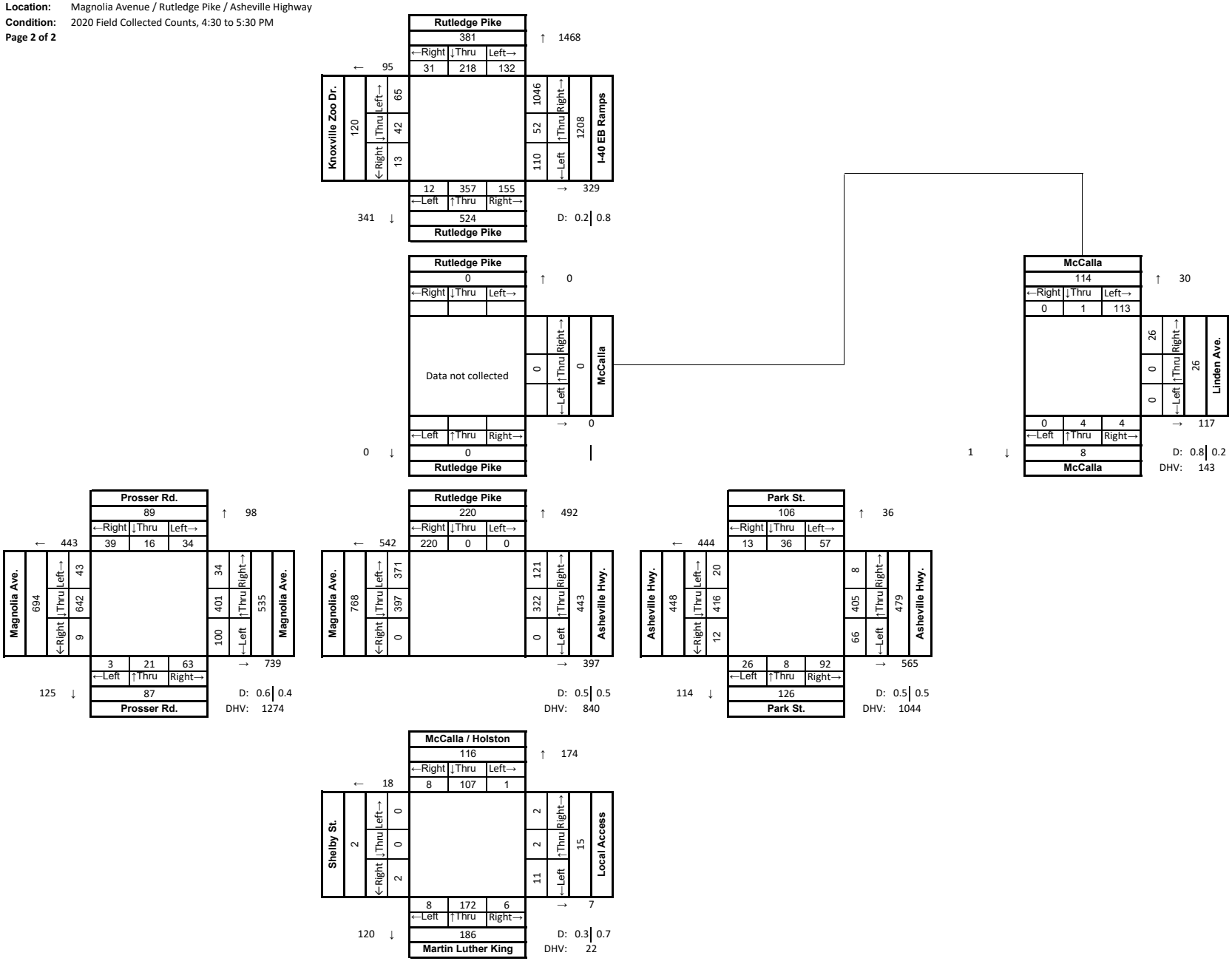
File Name : Rutledge_Spring Hill_3
Site Code : 00000000
Start Date : 9/17/2012
Page No : 2

	Spring Hill Rd Southbound					Rutledge Pk Westbound					Spring Hill Rd Northbound					Rutledge Pk Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	7	**3**	1	0	11	0	175	2	0	177	4	2	1	0	7	**11**	352	15	0	378	573
05:00 PM	**11**	1	**7**	0	**19**	**2**	**208**	4	0	**214**	1	1	**3**	0	5	6	378	22	0	406	644
05:15 PM	9	1	4	0	14	1	171	3	0	175	**7**	**3**	1	0	**11**	10	**447**	**27**	0	**484**	**684**
05:30 PM	9	3	4	0	16	2	185	**8**	0	195	4	2	3	0	9	11	316	11	0	338	558
Total Volume	36	8	16	0	60	5	739	17	0	761	16	8	8	0	32	38	1493	75	0	1606	2459
% App. Total	60	13.3	26.7	0		0.7	97.1	2.2	0		50	25	25	0		2.4	93	4.7	0		
PHF	.818	.667	.571	.000	.789	.625	.888	.531	.000	.889	.571	.667	.667	.000	.727	.864	.835	.694	.000	.830	.899

Location: Magnolia Avenue / Rutledge Pike / Asheville Highway
Condition: 2020 Field Collected Counts, 7:30 to 8:30 AM
Page 2 of 2



Location: Magnolia Avenue / Rutledge Pike / Asheville Highway
Condition: 2020 Field Collected Counts, 4:30 to 5:30 PM
Page 2 of 2



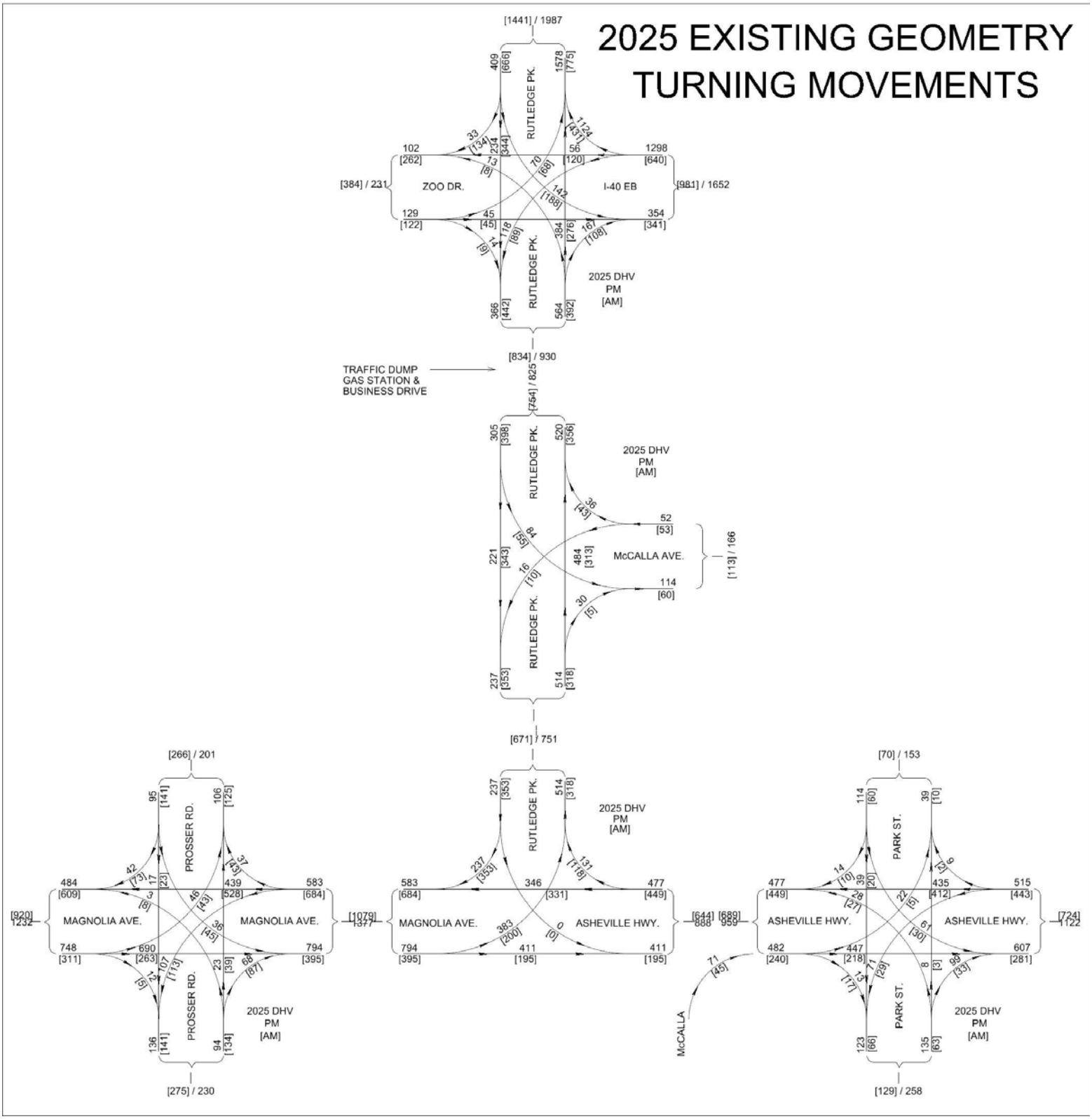
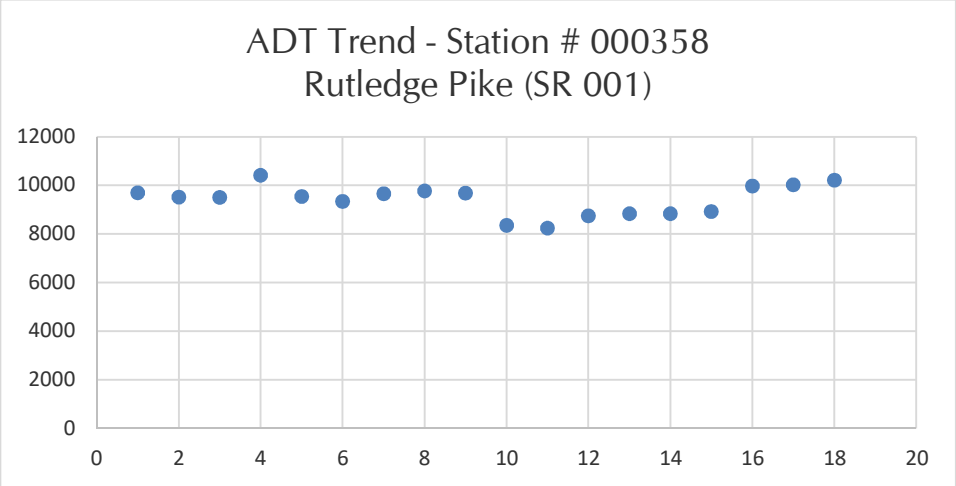


FIGURE 2: 2025 TURNING MOVEMENTS (NO- BUILD / EXISTING GEOMETRY)

Attachment 3
ADT Trends

Year	Adjusted Average Daily Traffic
2001	9693
2002	9521
2003	9512
2004	10418
2005	9544
2006	9347
2007	9666
2008	9776
2009	9681
2010	8359
2011	8250
2012	8749
2013	8838
2014	8840
2015	8928
2016	9978
2017	10023
2018	10214



Most Recent Trend Line Growth

Year	ADT
2008	9776
2018	10214

Annual Percent Growth	**0.45%**

Attachment 4
Trip Generation

Project: Rock Pointe Crossing
Date Conducted: 6/17/2020

Gasoline/Service Station With Convenience Market
LUC 945
16 Vehicle Fueling Stations

Average Daily Traffic
Average Rate = 205.36
T = 205.36*(16)
T = 3286

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.
Average Rate = 12.47
T = 12.47*(16)
T = 200

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
Average Rate = 13.99
T = 13.99 * (16)
T = 224

Total Trips

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	3286	50%	50%	1643	1643
AM Peak Hour	200	51%	49%	102	98
PM Peak Hour	224	51%	49%	114	110

65% Pass-By Trips

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	2136	50%	50%	1068	1068
AM Peak Hour	130	51%	49%	66	64
PM Peak Hour	146	51%	49%	74	71

35% New Trips

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	1150	50%	50%	575	575
AM Peak Hour	70	51%	49%	36	34
PM Peak Hour	78	51%	49%	40	38

Project: Rock Pointe Crossing
Date Conducted: 5/14/2020

Mini-Warehouse (LUC 151)
100,200 SF

Average Daily Traffic
Average Rate = 1.51
T = 1.51*(100.20)
T = 151

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.
Average Rate = 0.10
T = 0.10 * (100.20)
T = 10

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
Average Rate = 0.17
T = 0.17 * (100.2)
T = 17

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours)	151	50%	50%	76	76
AM Peak Hour	10	60%	40%	6	4
PM Peak Hour	17	47%	53%	8	9

Project: Rock Pointe Crossing
Date Conducted: 6/17/2020

General Office Building (LUC 710)
36,510 SF

Average Daily Traffic
Ln(T) = 0.97 Ln(X) + 2.50
Ln(T) = 0.97 Ln(36.51)+2.50
T = 399

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.
T = 0.94(X) + 26.49
T = 0.94(36.51) + 26.49
T = 61

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
Ln(T) = 0.95 Ln(X) + 0.36
Ln(T) = 0.95 Ln(36.51) + 0.36
T = 44

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours)	399	50%	50%	200	200
AM Peak Hour	61	86%	14%	52	9
PM Peak Hour	44	16%	84%	7	37

Project: Rock Pointe Crossing
Date Conducted: 6/17/2020

Construction Equipment Rental Store (LUC 811)
12,200 SF

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
Average Rate = 0.99
T = 0.99 * (12.20)
T = 12

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
PM Peak Hour	12	47%	53%	6	6

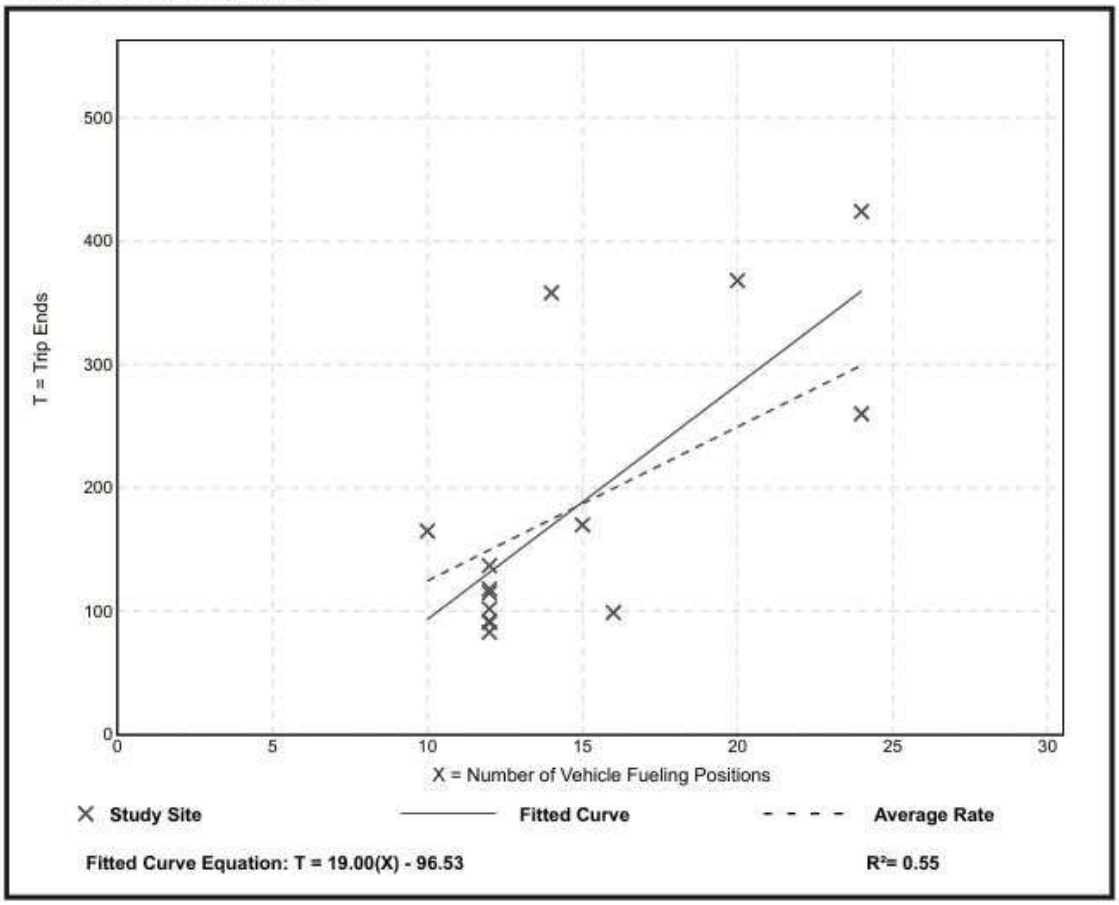
Gasoline/Service Station With Convenience Market
(945)

Vehicle Trip Ends vs: **Vehicle Fueling Positions**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 14
Avg. Num. of Vehicle Fueling Positions: 15
Directional Distribution: 51% entering, 49% exiting

Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
12.47	6.19 - 25.57	5.56

Data Plot and Equation



Fitted Curve Equation: T = 19.00(X) - 96.53

R^2= 0.55

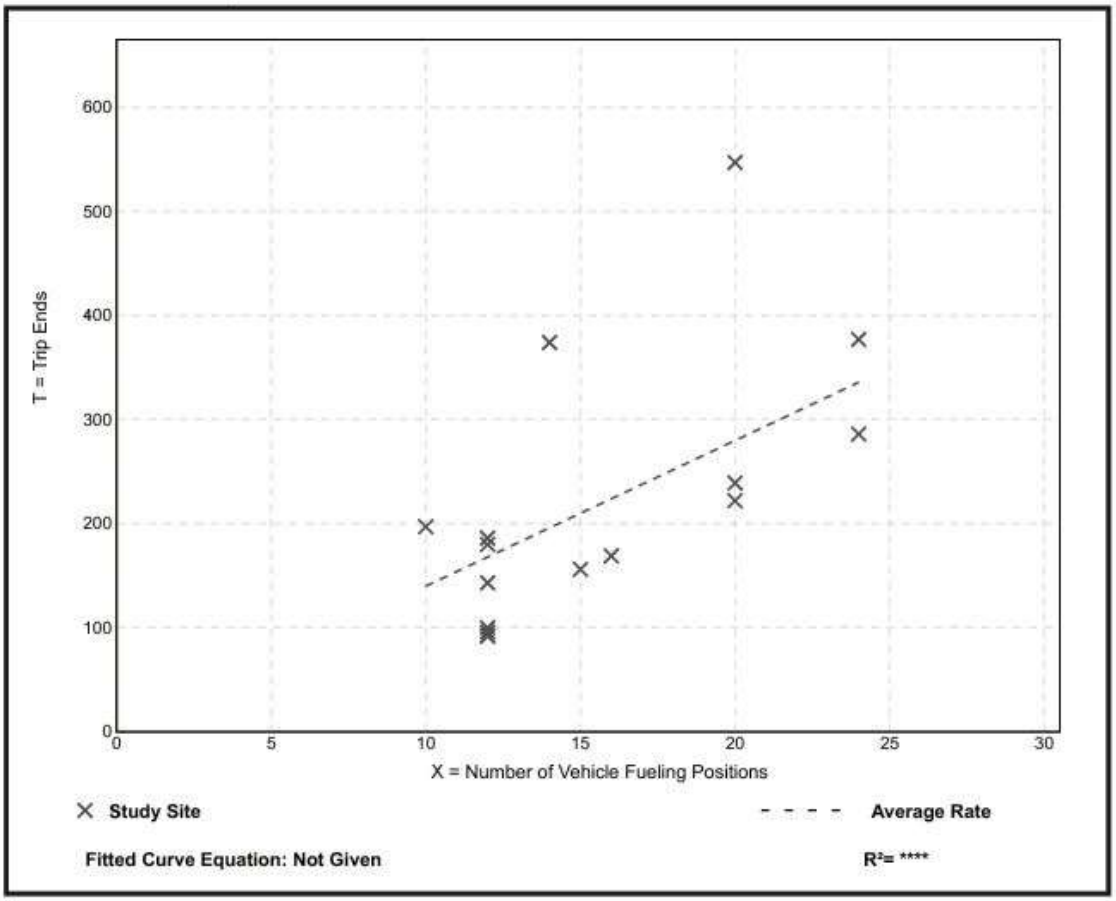
Gasoline/Service Station With Convenience Market
(945)

Vehicle Trip Ends vs: **Vehicle Fueling Positions**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 16
Avg. Num. of Vehicle Fueling Positions: 15
Directional Distribution: 51% entering, 49% exiting

Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
13.99	7.67 - 27.35	6.18

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= ****

Gasoline/Service Station With Convenience Market
(945)

Vehicle Trip Ends vs: **Vehicle Fueling Positions**
On a: **Weekday**

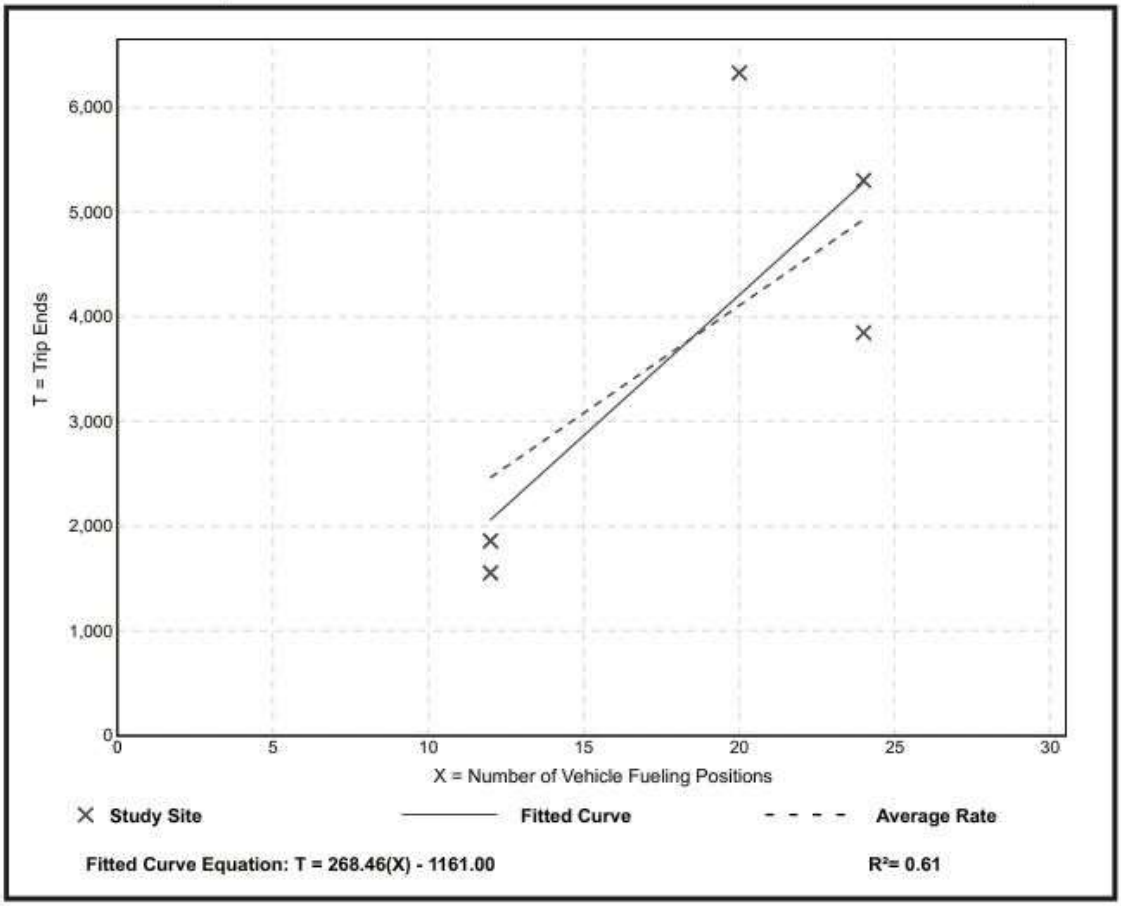
Setting/Location: **General Urban/Suburban**
Number of Studies: 5
Avg. Num. of Vehicle Fueling Positions: 18
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
205.36	129.50 - 316.45	73.80

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: T = 268.46(X) - 1161.00

R^2= 0.61

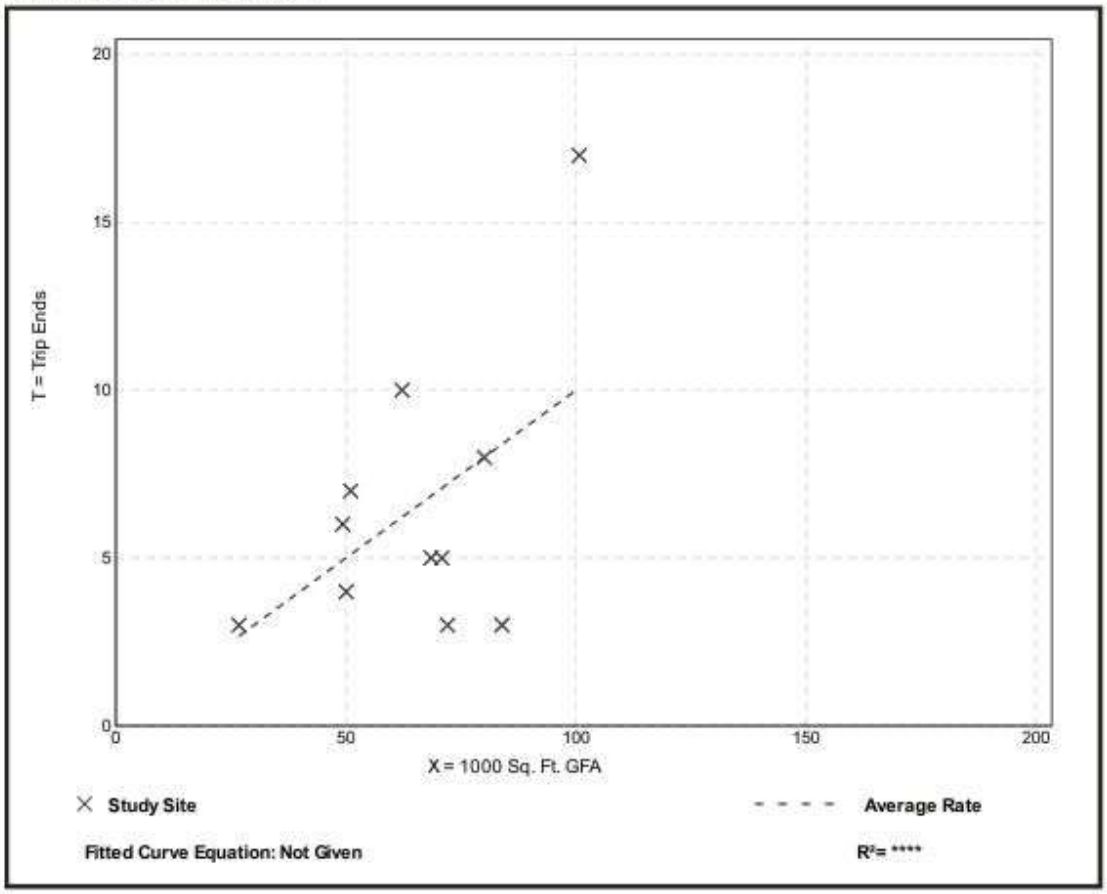
Mini-Warehouse
(151)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 11
1000 Sq. Ft. GFA: 65
Directional Distribution: 60% entering, 40% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.10	0.04 - 0.17	0.05

Data Plot and Equation



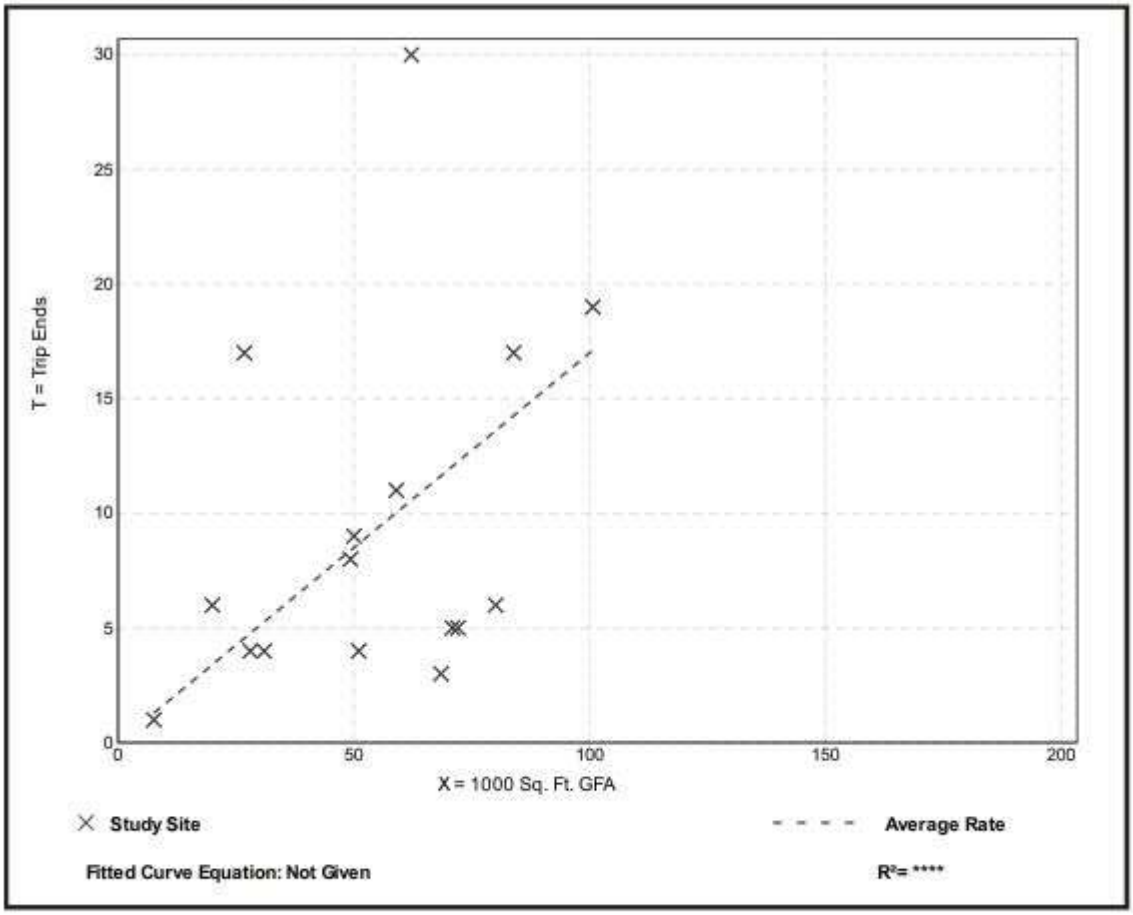
Mini-Warehouse
(151)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 16
1000 Sq. Ft. GFA: 54
Directional Distribution: 47% entering, 53% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.17	0.04 - 0.64	0.14

Data Plot and Equation



Mini-Warehouse
(151)

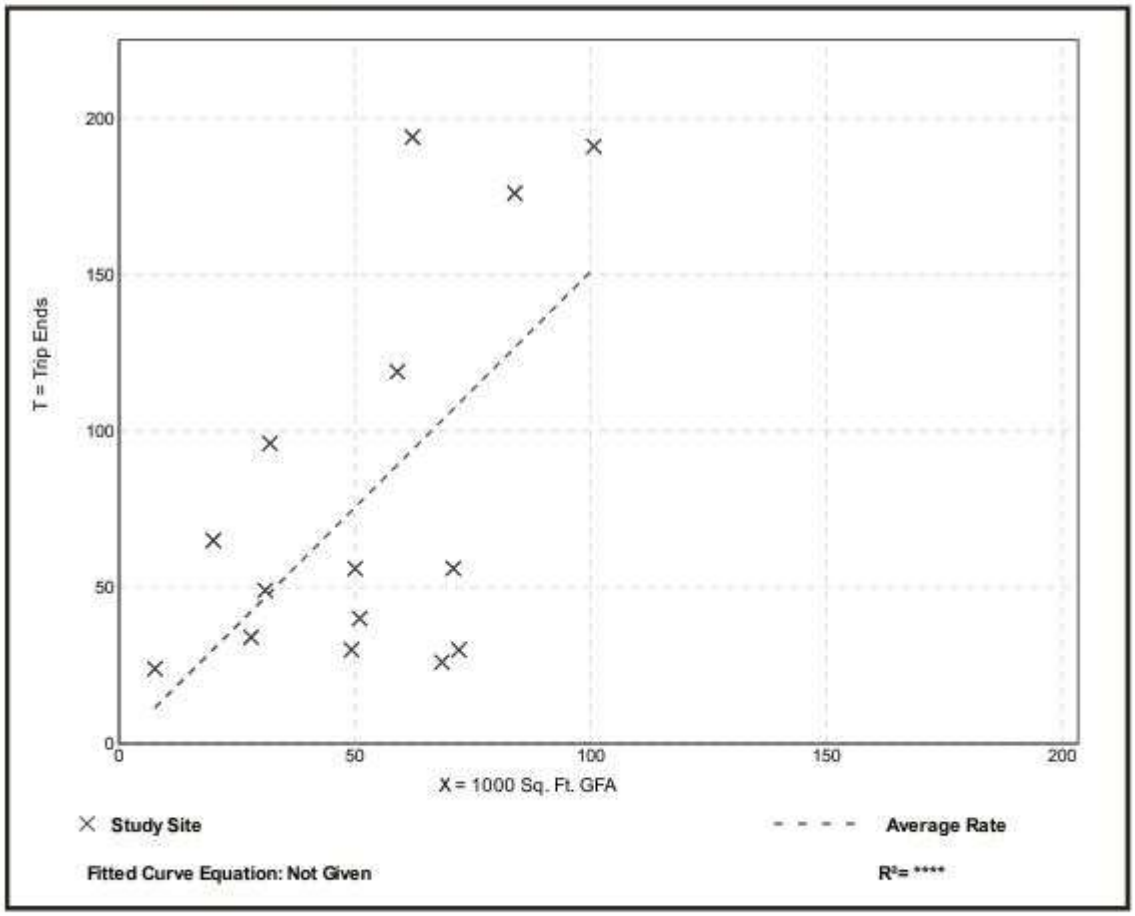
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 15
1000 Sq. Ft. GFA: 52
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.51	0.38 - 3.25	0.95

Data Plot and Equation



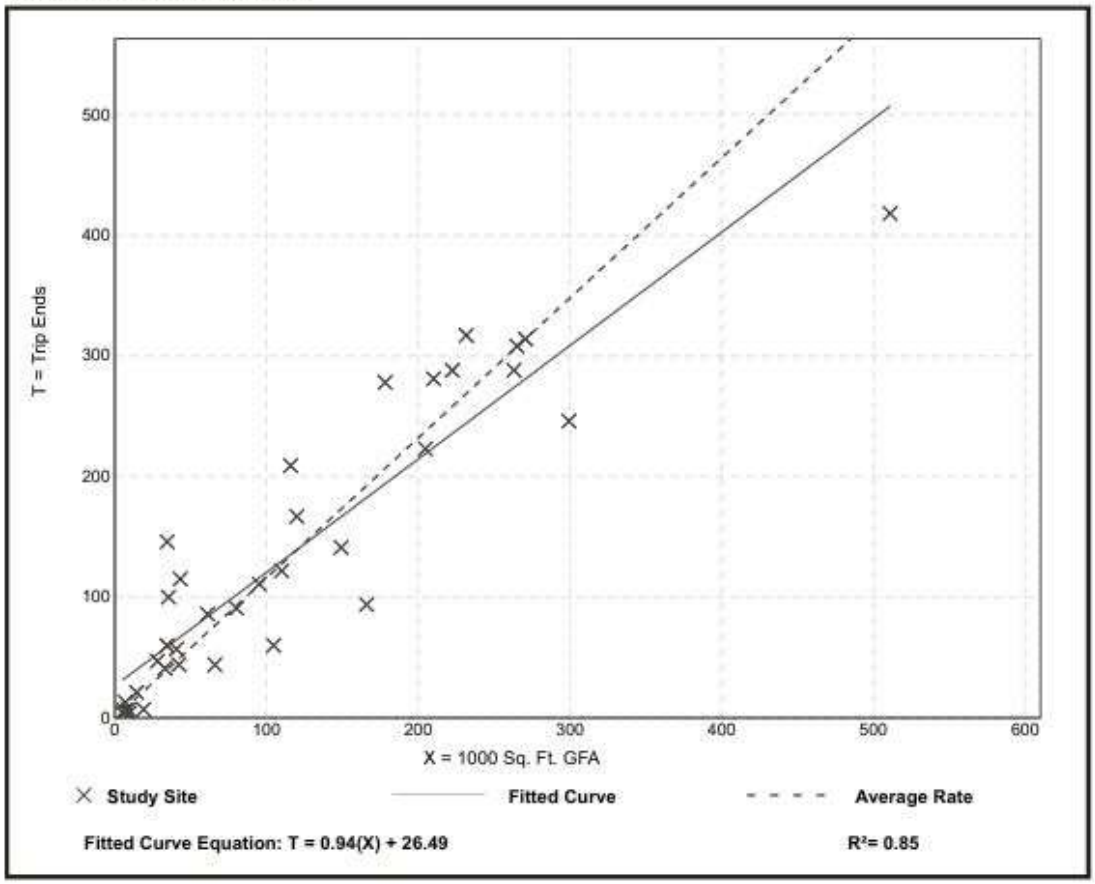
General Office Building
(710)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	35
1000 Sq. Ft. GFA:	117
Directional Distribution:	86% entering, 14% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.16	0.37 - 4.23	0.47

Data Plot and Equation



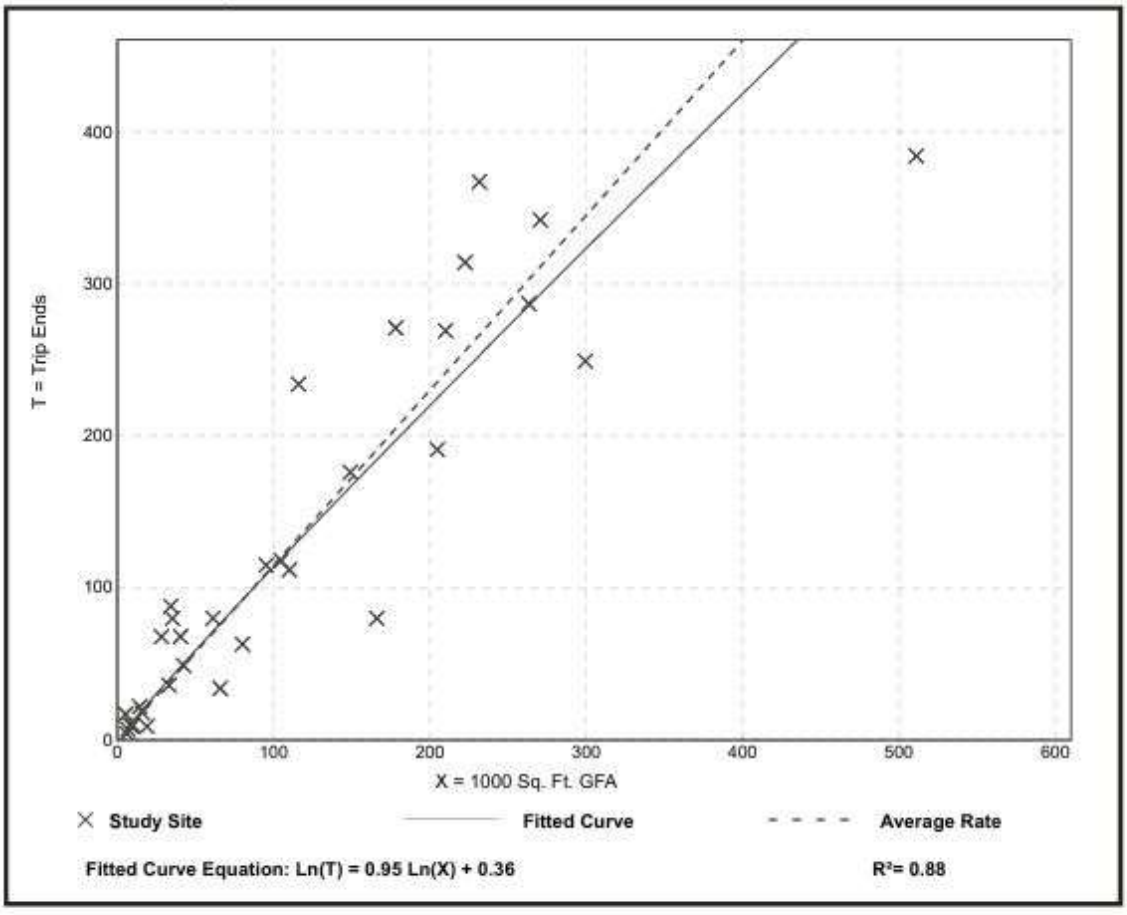
General Office Building
(710)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	32
1000 Sq. Ft. GFA:	114
Directional Distribution:	16% entering, 84% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.15	0.47 - 3.23	0.42

Data Plot and Equation



General Office Building
(710)

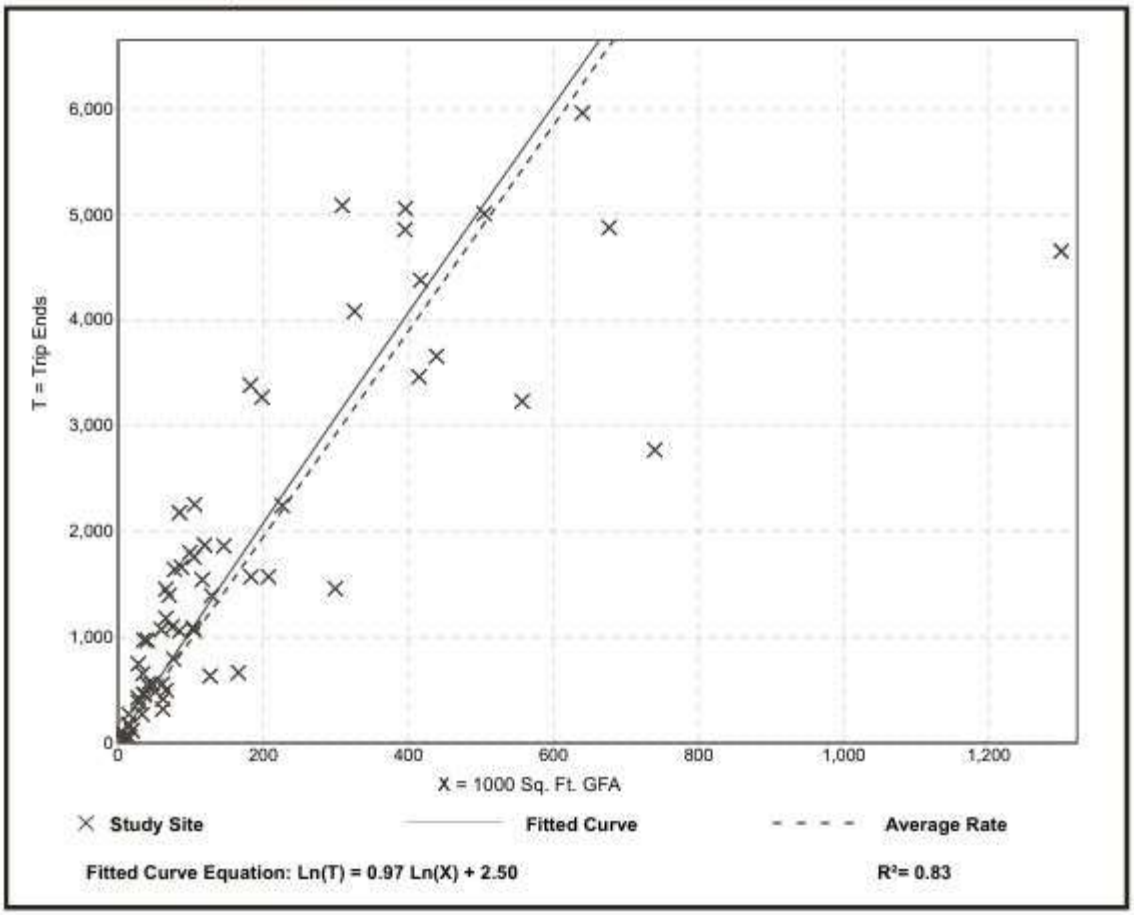
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 66
1000 Sq. Ft. GFA: 171
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
9.74	2.71 - 27.56	5.15

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.97 Ln(X) + 2.50

R^2= 0.83

Construction Equipment Rental Store
(811)

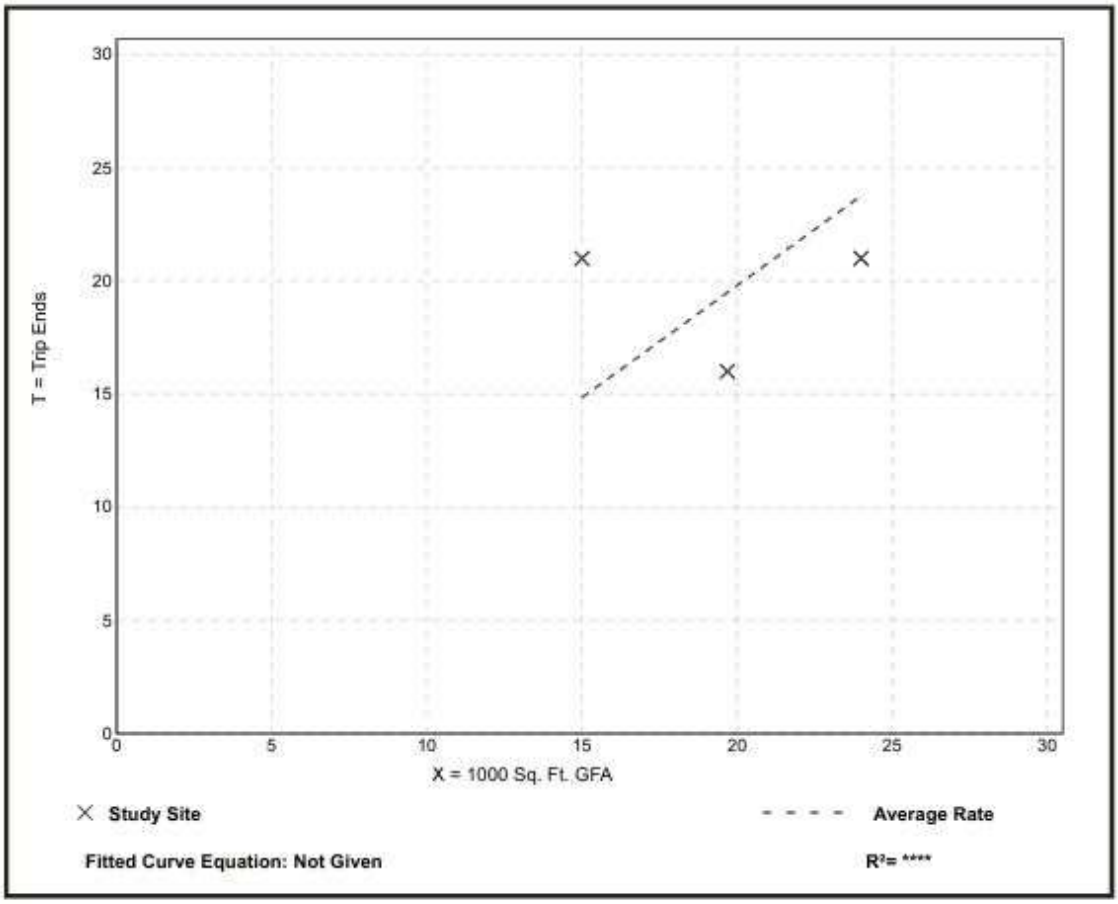
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 3
1000 Sq. Ft. GFA: 20
Directional Distribution: 28% entering, 72% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.99	0.81 - 1.40	1.30

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ****

Attachment 5
Signal Timing

ID: 964
Name: Rultledge & Springhill
Configuration: Permanent

Param	Phs 1	Phs 2	Phs 3	Phs 4	Phs 5	Phs 6	Phs 7	Phs 8	Phs 9	Phs 10	Phs 11
Walk	0	0	0	0	0	0	0	0	0	0	0
Ped Clearance	0	0	0	0	0	0	0	0	0	0	0
Min Green	6	10	6	6	6	10	6	6	0	0	0
Gap Ext	3	3	3	3	3	3	3	3	0	0	0
Max1	25	50	30	30	25	50	25	30	0	0	0
Max2	50	50	50	50	50	50	50	50	0	0	0
Yellow Clr	4	4	4	4	4	4	4	4	3.5	3.5	3.5
Red Clr	1.5	2	2	2	1.5	2	1.5	2	1.5	1.5	1.5
Red Revert	0	0	0	0	0	0	0	0	0	0	0
Added Initial	0	0	0	0	0	0	0	0	0	0	0
Max Initial	0	0	0	0	0	0	0	0	0	0	0
Time Before Reduce	0	0	0	0	0	0	0	0	0	0	0
Cars Before Reduce	0	0	0	0	0	0	0	0	0	0	0
Time To Reduce	0	0	0	0	0	0	0	0	0	0	0
Reduce By	0	0	0	0	0	0	0	0	0	0	0
Min Gap	0	0	0	0	0	0	0	0	0	0	0
Dynamic Max Limit	0	0	0	0	0	0	0	0	0	0	0
Dynamic Max Step	0	0	0	0	0	0	0	0	0	0	0
Startup	RED	GREEN	RED	RED	RED	GREEN	RED	RED	RED	RED	RED
Enable	Off	On	Off	On	Off	Off	Off	Off	Off	Off	Off
Auto Flash Entry	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Auto Flash Exit	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Non-Actuated 1	Off	On	Off	Off	Off	On	Off	Off	Off	Off	Off
Non-Actuated 2	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Lock Call	Off	Off	Off	Off	Off	Off	Off	Off	On	On	On
Min Recall	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Max Recall	Off	On	Off	Off	Off	Off	Off	Off	Off	Off	Off
Ped Recall	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Soft Recall	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Dual Entry	Off	On	Off	On	Off	On	Off	On	Off	Off	Off
Sim Gap Enable	On	On	On	On	On	On	On	On	On	On	On
Guar Passage	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Rest In Walk	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Cond Service	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Add Init Calc	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Concurrent Ps	1	1	1	1	2	2	2	2	0	0	0
Concur 1	5	5	7	7	1	1	3	3	0	0	0
Concur 2	6	6	8	8	2	2	4	4	0	0	0
Concur 3	0	0	0	0	0	0	0	0	0	0	0
Concur 4	0	0	0	0	0	0	0	0	0	0	0
Concur 5	0	0	0	0	0	0	0	0	0	0	0
Concur 6	0	0	0	0	0	0	0	0	0	0	0
Concur 7	0	0	0	0	0	0	0	0	0	0	0
Concur 8	0	0	0	0	0	0	0	0	0	0	0

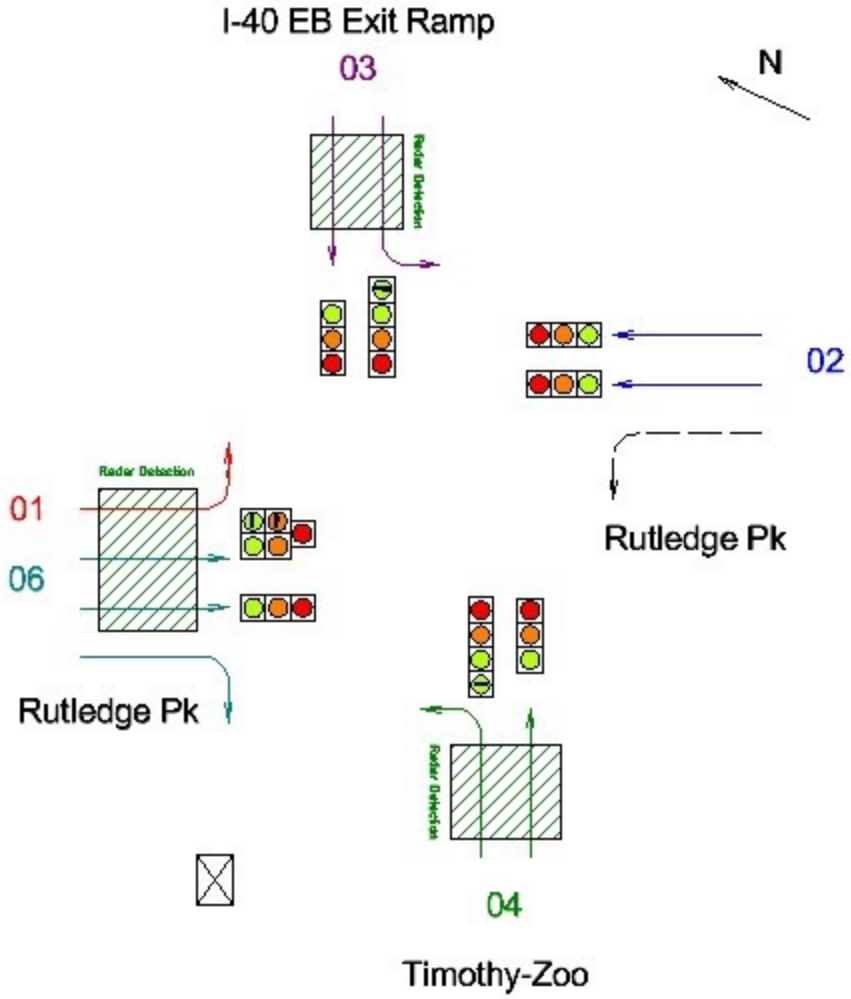
Phs 12	Phs 13	Phs 14	Phs 15	Phs 16
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
3.5	3.5	3.5	3.5	3.5
1.5	1.5	1.5	1.5	1.5
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
RED	RED	RED	RED	RED
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
On	On	On	On	On
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
On	On	On	On	On
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

ID: 964
Name: Rultledge & Springhill
Configuration: Permanent

Pattern	Cycle Time	Offset Time	Split Number	Seq Number
Pattern 1	140	0	1	1
Pattern 2	160	0	2	1
Pattern 3	140	0	3	1
Pattern 4	160	0	4	1
Pattern 5	0	0	0	1
Pattern 6	0	0	0	1
Pattern 7	0	0	0	1
Pattern 8	0	0	0	1
Pattern 9	0	0	0	1
Pattern 10	0	0	0	1
Pattern 11	0	0	0	1
Pattern 12	0	0	0	1
Pattern 13	0	0	0	1
Pattern 14	0	0	0	1
Pattern 15	0	0	0	1
Pattern 16	0	0	0	1
Pattern 17	0	0	0	1
Pattern 18	0	0	0	1
Pattern 19	0	0	0	1
Pattern 20	0	0	0	1
Pattern 21	0	0	0	1
Pattern 22	0	0	0	1
Pattern 23	0	0	0	1
Pattern 24	0	0	0	1
Pattern 25	0	0	0	1
Pattern 26	0	0	0	1
Pattern 27	0	0	0	1
Pattern 28	0	0	0	1
Pattern 29	0	0	0	1
Pattern 30	0	0	0	1
Pattern 31	0	0	0	1
Pattern 32	0	0	0	1
Pattern 33	0	0	0	1
Pattern 34	0	0	0	1
Pattern 35	0	0	0	1
Pattern 36	0	0	0	1
Pattern 37	0	0	0	1
Pattern 38	0	0	0	1
Pattern 39	0	0	0	1
Pattern 40	0	0	0	1
Pattern 41	0	0	0	1
Pattern 42	0	0	0	1
Pattern 43	0	0	0	1
Pattern 44	0	0	0	1
Pattern 45	0	0	0	1
Pattern 46	0	0	0	1
Pattern 47	0	0	0	1
Pattern 48	0	0	0	1

Rutledge Pk & Timothy / Zoo

On Stop & Go 08/13/98 @ 11:40 AM
Updated to new intersection 1/29/18 @ 10:00AM



ID: 968
Name: Rutledge & Zoo
Configuration: Permanent

Param	Phs 1	Phs 2	Phs 3	Phs 4	Phs 5	Phs 6	Phs 7	Phs 8	Phs 9	Phs 10
Walk	0	0	0	0	0	0	0	0	0	0
Ped Clearance	0	0	0	0	0	0	0	0	0	0
Min Green	6	15	6	6	6	15	6	6	0	0
Gap Ext	2	2	2	2	3	2	3	3	0	0
Max1	25	45	30	30	25	45	25	30	0	0
Max2	30	50	35	35	50	50	50	50	0	0
Yellow Clr	4	4	4	4	4	4	4	4	3.5	3.5
Red Clr	0.1	1.5	1.5	1.5	1.5	1.5	1.5	2	1.5	1.5
Red Revert	0	0	0	0	0	0	0	0	0	0
Added Initial	0	0	0	0	0	0	0	0	0	0
Max Initial	0	0	0	0	0	0	0	0	0	0
Time Before Reduce	0	0	0	0	0	0	0	0	0	0
Cars Before Reduce	0	0	0	0	0	0	0	0	0	0
Time To Reduce	0	0	0	0	0	0	0	0	0	0
Reduce By	0	0	0	0	0	0	0	0	0	0
Min Gap	0	0	0	0	0	0	0	0	0	0
Dynamic Max Limit	0	0	0	0	0	0	0	0	0	0
Dynamic Max Step	0	0	0	0	0	0	0	0	0	0
Startup	RED	GREEN	RED	RED	RED	GREEN	RED	RED	RED	RED
Enable	On	On	On	On	Off	On	Off	Off	Off	Off
Auto Flash Entry	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Auto Flash Exit	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Non-Actuated 1	Off	On	Off	Off	Off	On	Off	Off	Off	Off
Non-Actuated 2	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Lock Call	Off	Off	Off	Off	Off	Off	Off	Off	On	On
Min Recall	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Max Recall	Off	On	Off	Off	Off	On	Off	Off	Off	Off
Ped Recall	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Soft Recall	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Dual Entry	Off	On	Off	On	Off	On	Off	On	Off	Off
Sim Gap Enable	On	On	On	On	On	On	On	On	On	On
Guar Passage	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Rest In Walk	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Cond Service	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Add Init Calc	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Concurrent Ps	1	1	1	1	2	2	2	2	0	0
Concur 1	5	5	7	7	1	1	3	3	0	0
Concur 2	6	6	8	8	2	2	4	4	0	0
Concur 3	0	0	0	0	0	0	0	0	0	0
Concur 4	0	0	0	0	0	0	0	0	0	0
Concur 5	0	0	0	0	0	0	0	0	0	0
Concur 6	0	0	0	0	0	0	0	0	0	0
Concur 7	0	0	0	0	0	0	0	0	0	0
Concur 8	0	0	0	0	0	0	0	0	0	0

Phs 11	Phs 12	Phs 13	Phs 14	Phs 15	Phs 16
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
3.5	3.5	3.5	3.5	3.5	3.5
1.5	1.5	1.5	1.5	1.5	1.5
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
RED	RED	RED	RED	RED	RED
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
On	On	On	On	On	On
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
On	On	On	On	On	On
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

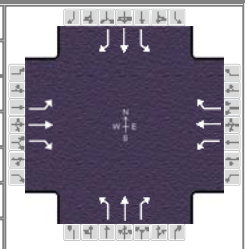
ID: 968
Name: Rutledge & Zoo
Configuration: Permanent

Pattern	Cycle Time	Offset Time	Split Number	Seq Number
Pattern 1	140	40	1	1
Pattern 2	160	40	2	1
Pattern 3	140	100	3	1
Pattern 4	160	120	4	1
Pattern 5	0	0	0	1
Pattern 6	0	0	0	1
Pattern 7	0	0	0	1
Pattern 8	0	0	0	1
Pattern 9	0	0	0	1
Pattern 10	0	0	0	1
Pattern 11	0	0	0	1
Pattern 12	0	0	0	1
Pattern 13	0	0	0	1
Pattern 14	0	0	0	1
Pattern 15	0	0	0	1
Pattern 16	0	0	0	1
Pattern 17	0	0	0	1
Pattern 18	0	0	0	1
Pattern 19	0	0	0	1
Pattern 20	0	0	0	1
Pattern 21	0	0	0	1
Pattern 22	0	0	0	1
Pattern 23	0	0	0	1
Pattern 24	0	0	0	1
Pattern 25	0	0	0	1
Pattern 26	0	0	0	1
Pattern 27	0	0	0	1
Pattern 28	0	0	0	1
Pattern 29	0	0	0	1
Pattern 30	0	0	0	1
Pattern 31	0	0	0	1
Pattern 32	0	0	0	1
Pattern 33	0	0	0	1
Pattern 34	0	0	0	1
Pattern 35	0	0	0	1
Pattern 36	0	0	0	1
Pattern 37	0	0	0	1
Pattern 38	0	0	0	1
Pattern 39	0	0	0	1
Pattern 40	0	0	0	1
Pattern 41	0	0	0	1
Pattern 42	0	0	0	1
Pattern 43	0	0	0	1
Pattern 44	0	0	0	1
Pattern 45	0	0	0	1
Pattern 46	0	0	0	1
Pattern 47	0	0	0	1
Pattern 48	0	0	0	1

Attachment 6
Intersection Worksheets – Existing AM/PM Peaks

HCS7 Signalized Intersection Results Summary

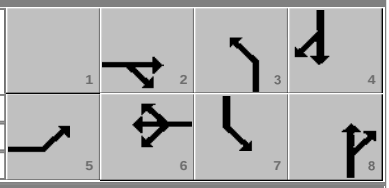
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 21, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Existing AM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2020	Analysis Period	1> 7:00
Intersection	Rutledge Pike at I-40E I…	File Name	Existing AM Peak_Zoo.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	63	42	8	83	112	401	7	257	100	175	320	125

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	56.8	1.3	7.8	20.5	0.0	
Yellow	4.0	4.0	4.0	4.0	4.0	0.0	
Red	1.5	1.5	1.5	1.5	1.5	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	2.0	3.0		5.3	2.0	3.0	2.0	3.0
Phase Duration, s	11.5	73.8		62.3	6.8	26.0	20.2	39.4
Change Period, ($Y+R_c$), s	5.5	5.5		5.5	5.5	5.5	5.5	5.5
Max Allow Headway (*MAH*), s	3.0	0.0		0.0	3.0	3.0	3.0	3.0
Queue Clearance Time (g_s), s	6.5				2.5	19.3	14.5	20.5
Green Extension Time (g_e), s	0.1	0.0		0.0	0.0	1.2	0.2	1.3
Phase Call Probability	0.90				0.22	1.00	1.00	1.00
Max Out Probability	0.00				0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	68	46	9	90	122	0	8	279	0	190	348	136
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1360	1870	1585	1781	1870	1585	1781	1870	1585
Queue Service Time (g_s), s	4.5	0.7	0.2	3.2	3.2	0.0	0.5	17.3	0.0	12.5	18.5	7.2
Cycle Queue Clearance Time (g_c), s	4.5	0.7	0.2	3.2	3.2	0.0	0.5	17.3	0.0	12.5	18.5	7.2
Green Ratio (*g/C*)	0.05	0.57	0.57	0.47	0.47	0.47	0.01	0.17	0.17	0.12	0.28	0.28
Capacity (*c*), veh/h	88	1064	902	704	886	751	20	320	271	218	528	447
Volume-to-Capacity Ratio (*X*)	0.775	0.043	0.010	0.128	0.137	0.000	0.381	0.873	0.000	0.872	0.659	0.304
Back of Queue (*Q*), ft/ln (95 th percentile)	95.8	13.8	2.6	45.6	60.7	0	11.3	311	0	239.5	304.5	119.5
Back of Queue (*Q*), veh/ln (95 th percentile)	3.8	0.5	0.1	1.8	2.4	0.0	0.4	12.2	0.0	9.4	12.0	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.64	0.00	0.00	0.35	0.46	0.00	0.04	0.00	0.00	1.37	0.00	0.00
Uniform Delay (d_1), s/veh	55.4	6.3	6.3	12.2	12.2	0.0	58.7	45.1	0.0	49.3	32.6	29.1
Incremental Delay (d_2), s/veh	5.3	0.1	0.0	0.4	0.3	0.0	4.4	4.4	0.0	6.2	0.5	0.1
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	60.7	6.4	6.3	12.6	12.5	0.0	63.1	49.4	0.0	55.5	33.2	29.3
Level of Service (LOS)	E	A	A	B	B		E	D		E	C	C
Approach Delay, s/veh / LOS	36.7	D		12.6	B		49.8	D		38.7	D	
Intersection Delay, s/veh / LOS	36.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.5	C	2.4	B	3.0	C	2.4	B
Bicycle LOS Score / LOS	0.7	A	0.8	A	1.0	A	1.6	B

HCS7 Two-Way Stop-Control Report

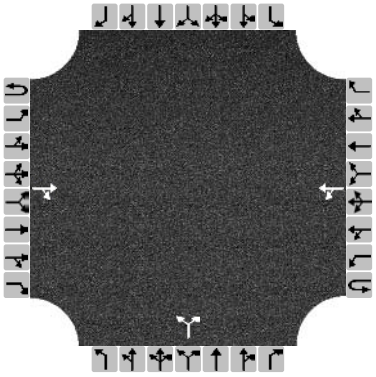
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2020
Analysis Year	2020
Time Analyzed	Existing AM Peak
Intersection Orientation	East-West
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	McCalla at Pelham
Jurisdiction	City of Knoxville
East/West Street	Pelham Road
North/South Street	McCalla Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			6	50		1	39			10		1				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						1					12					
Capacity, c (veh/h)						1541					932					
v/c Ratio						0.00					0.01					
95% Queue Length, Q_{95} (veh)						0.0					0.0					
Control Delay (s/veh)						7.3					8.9					
Level of Service, LOS						A					A					
Approach Delay (s/veh)						0.2				8.9						
Approach LOS										A						

HCS7 Two-Way Stop-Control Report

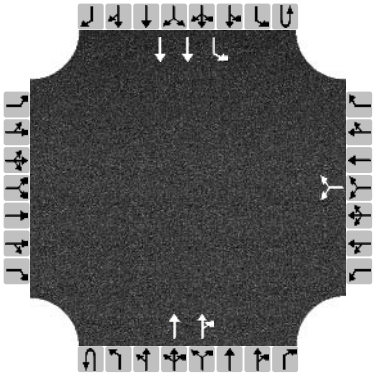
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2020
Analysis Year	2020
Time Analyzed	Existing AM Peak
Intersection Orientation	North-South
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	Rutledge Pike at McCalla
Jurisdiction	City of Knoxville
East/West Street	McCalla Avenue
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	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	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume, V (veh/h)						9		40			291	5		51	318	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								5						

Critical and Follow-up Headways

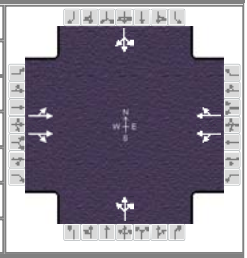
Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							53							55		
Capacity, c (veh/h)							808							1236		
v/c Ratio							0.07							0.04		
95% Queue Length, Q_{95} (veh)							0.2							0.1		
Control Delay (s/veh)							9.8							8.0		
Level of Service, LOS							A							A		
Approach Delay (s/veh)						9.8								1.1		
Approach LOS						A										

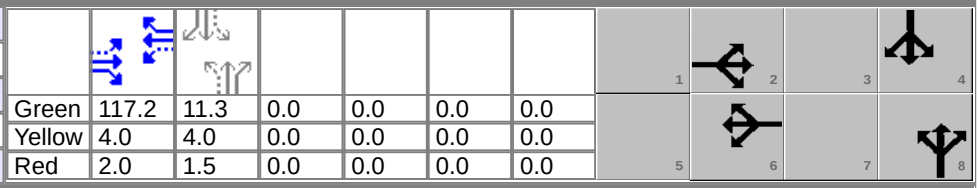
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 21, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Existing AM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2020	Analysis Period	1> 7:00
Intersection	Rutledge Pike at Spring…	File Name	Existing AM Peak_Spring Hill Road.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	37	734	21	10	2278	18	9	17	9	29	18	51

Signal Information			
Cycle, s	140.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	117.2	11.3	0.0	0.0	0.0	0.0						
Yellow	4.0	4.0	0.0	0.0	0.0	0.0						
Red	2.0	1.5	0.0	0.0	0.0	0.0						

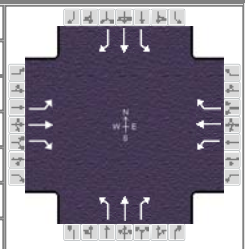
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		123.2		123.2		16.8		16.8
Change Period, ($Y+R_c$), s		6.0		6.0		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		3.1		3.1
Queue Clearance Time (g_s), s						4.8		11.1
Green Extension Time (g_e), s		0.0		0.0		0.2		0.2
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	265		595	1312		1194		38			107	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	696		1583	1742		1589		1718			1597	
Queue Service Time (g_s), s	0.0		0.0	0.0		0.0		0.0			6.4	
Cycle Queue Clearance Time (g_c), s	0.0		0.0	0.0		0.0		2.8			9.1	
Green Ratio (*g/C*)	0.84		0.84	0.84		0.84		0.08			0.08	
Capacity (*c*), veh/h	612		1325	1484		1331		171			162	
Volume-to-Capacity Ratio (*X*)	0.434		0.449	0.884		0.897		0.223			0.657	
Back of Queue (*Q*), ft/ln (95 th percentile)	17.1		18.3	149.1		162.4		57.8			171.4	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.7		0.7	6.0		6.5		2.3			6.7	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	0.0		0.0	0.0		0.0		60.5			63.3	
Incremental Delay (d_2), s/veh	2.2		1.1	8.0		9.8		0.2			1.7	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	2.2		1.1	8.0		9.8		60.7			65.0	
Level of Service (LOS)	A		A	A		A		E			E	
Approach Delay, s/veh / LOS	1.5	A		8.9	A		60.7	E		65.0	E	
Intersection Delay, s/veh / LOS	9.3						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.7	C	2.7	C
Bicycle LOS Score / LOS	1.2	A	2.6	C	0.6	A	0.7	A

HCS7 Signalized Intersection Results Summary

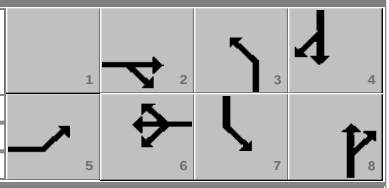
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 21, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Existing PM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2020	Analysis Period	1> 7:00
Intersection	Rutledge Pike at I-40E I…	File Name	Existing PM Peak_Zoo.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	65	42	13	110	52	1046	12	357	155	132	218	31

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.1	53.3	2.1	3.9	27.0	0.0
Yellow	4.0	4.0	4.0	4.0	4.0	0.0
Red	1.5	1.5	1.5	1.5	1.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	2.0	3.0		5.3	2.0	3.0	2.0	3.0
Phase Duration, s	11.6	70.4		58.8	7.6	32.5	17.0	41.9
Change Period, ($Y+R_c$), s	5.5	5.5		5.5	5.5	5.5	5.5	5.5
Max Allow Headway (*MAH*), s	3.0	0.0		0.0	3.0	2.9	3.0	2.9
Queue Clearance Time (g_s), s	6.7				2.9	26.1	11.4	12.9
Green Extension Time (g_e), s	0.1	0.0		0.0	0.0	1.0	0.2	1.1
Phase Call Probability	0.91				0.35	1.00	0.99	1.00
Max Out Probability	0.00				0.00	0.01	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	71	46	14	120	57	0	13	388	0	143	237	34
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1360	1870	1585	1781	1870	1585	1781	1870	1585
Queue Service Time (g_s), s	4.7	0.8	0.3	4.9	1.5	0.0	0.9	24.1	0.0	9.4	10.9	1.6
Cycle Queue Clearance Time (g_c), s	4.7	0.8	0.3	4.9	1.5	0.0	0.9	24.1	0.0	9.4	10.9	1.6
Green Ratio (*g/C*)	0.05	0.54	0.54	0.44	0.44	0.44	0.02	0.23	0.23	0.10	0.30	0.30
Capacity (*c*), veh/h	91	1012	858	664	831	704	31	422	357	171	568	481
Volume-to-Capacity Ratio (*X*)	0.777	0.045	0.016	0.180	0.068	0.000	0.415	0.921	0.000	0.839	0.417	0.070
Back of Queue (*Q*), ft/ln (95 th percentile)	98.6	16.1	5	69.1	30.6	0	18.7	434.9	0	191.2	202.1	26.5
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	0.6	0.2	2.7	1.2	0.0	0.7	17.1	0.0	7.5	8.0	1.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.66	0.00	0.00	0.52	0.23	0.00	0.06	0.00	0.00	1.09	0.00	0.00
Uniform Delay (d_1), s/veh	55.2	7.8	7.7	14.6	13.9	0.0	58.0	40.9	0.0	51.4	28.1	25.3
Incremental Delay (d_2), s/veh	5.2	0.1	0.0	0.6	0.2	0.0	3.2	13.7	0.0	4.2	0.2	0.0
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	60.5	7.9	7.7	15.2	14.1	0.0	61.2	54.6	0.0	55.6	28.3	25.3
Level of Service (LOS)	E	A	A	B	B		E	D		E	C	C
Approach Delay, s/veh / LOS	36.4	D		14.8	B		54.8	D		37.5	D	
Intersection Delay, s/veh / LOS	40.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.6	C	2.4	B	3.9	D	2.4	B
Bicycle LOS Score / LOS	0.7	A	0.8	A	1.1	A	1.2	A

HCS7 Two-Way Stop-Control Report

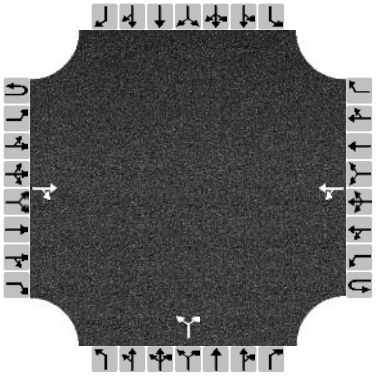
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2020
Analysis Year	2020
Time Analyzed	Existing PM Peak
Intersection Orientation	East-West
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	McCalla at Pelham
Jurisdiction	City of Knoxville
East/West Street	Pelham Road
North/South Street	McCalla Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			11	95		19	21			27		3				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						21					32					
Capacity, c (veh/h)						1473					866					
v/c Ratio						0.01					0.04					
95% Queue Length, Q_{95} (veh)						0.0					0.1					
Control Delay (s/veh)						7.5					9.3					
Level of Service, LOS						A					A					
Approach Delay (s/veh)						3.6				9.3						
Approach LOS										A						

HCS7 Two-Way Stop-Control Report

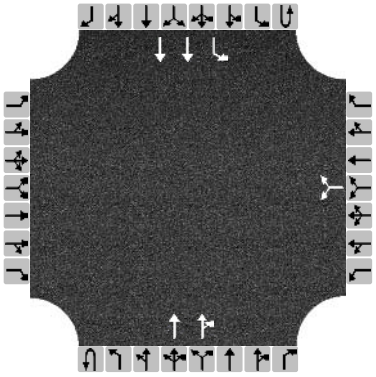
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2020
Analysis Year	2020
Time Analyzed	Existing PM Peak
Intersection Orientation	North-South
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	Rutledge Pike at McCalla
Jurisdiction	City of Knoxville
East/West Street	McCalla Avenue
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	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	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume, V (veh/h)						15		33			449	28		78	205	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								5						

Critical and Follow-up Headways

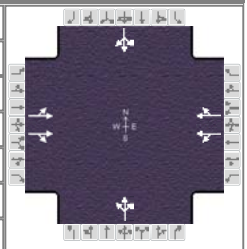
Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							52							85		
Capacity, c (veh/h)							667							1044		
v/c Ratio							0.08							0.08		
95% Queue Length, Q_{95} (veh)							0.3							0.3		
Control Delay (s/veh)							10.9							8.8		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						10.9								2.4		
Approach LOS						B										

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 21, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Existing PM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2020	Analysis Period	1> 7:00
Intersection	Rutledge Pike at Spring…	File Name	Existing PM Peak_Spring Hill Road.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	84	1682	43	19	832	6	9	9	18	18	9	41

Signal Information			
Cycle, s	160.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	139.2	9.3	0.0	0.0	0.0	0.0	5	6	7	8
Yellow	4.0	4.0	0.0	0.0	0.0	0.0				
Red	2.0	1.5	0.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		145.2		145.2		14.8		14.8
Change Period, ($Y+R_c$), s		6.0		6.0		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		3.1		3.1
Queue Clearance Time (g_s), s						5.5		9.2
Green Extension Time (g_e), s		0.0		0.0		0.2		0.1
Phase Call Probability						0.99		0.99
Max Out Probability						0.00		0.00

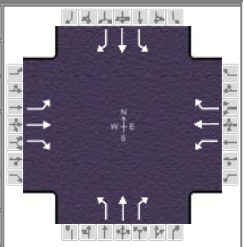
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	1030		936	445		486		39			74	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1503		1580	1455		1590		1680			1608	
Queue Service Time (g_s), s	0.0		0.0	0.0		0.0		0.0			3.7	
Cycle Queue Clearance Time (g_c), s	0.0		0.0	0.0		0.0		3.5			7.2	
Green Ratio (*g/C*)	0.87		0.87	0.87		0.87		0.06			0.06	
Capacity (*c*), veh/h	1332		1375	1290		1384		126			122	
Volume-to-Capacity Ratio (*X*)	0.773		0.681	0.345		0.351		0.312			0.607	
Back of Queue (*Q*), ft/ln (95 th percentile)	73.6		47.1	11.8		12.2		71			138.4	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.9		1.9	0.5		0.5		2.8			5.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	0.0		0.0	0.0		0.0		72.7			74.3	
Incremental Delay (d_2), s/veh	4.4		2.7	0.7		0.7		0.5			1.8	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	4.4		2.7	0.7		0.7		73.2			76.1	
Level of Service (LOS)	A		A	A		A		E			E	
Approach Delay, s/veh / LOS	3.6	A		0.7	A		73.2	E		76.1	E	
Intersection Delay, s/veh / LOS	5.4						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.8	C	2.8	C
Bicycle LOS Score / LOS	2.1	B	1.3	A	0.6	A	0.6	A

Attachment 7
Intersection Worksheets – Background AM/PM Peaks

HCS7 Signalized Intersection Results Summary

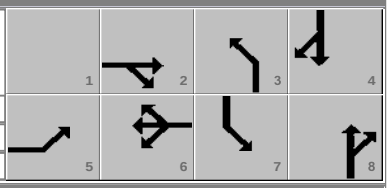
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 21, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Background AM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Rutledge Pike at I-40E I…	File Name	Background AM Peak_Zoo.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	68	45	9	89	120	431	8	276	108	188	344	134

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.4	54.1	1.5	8.6	21.8	0.0	
Yellow	4.0	4.0	4.0	4.0	4.0	0.0	
Red	1.5	1.5	1.5	1.5	1.5	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	2.0	3.0		5.3	2.0	3.0	2.0	3.0
Phase Duration, s	11.9	71.5		59.6	7.0	27.3	21.1	41.5
Change Period, ($Y+R_c$), s	5.5	5.5		5.5	5.5	5.5	5.5	5.5
Max Allow Headway (*MAH*), s	3.0	0.0		0.0	3.0	3.0	3.0	3.0
Queue Clearance Time (g_s), s	6.9				2.6	20.5	15.4	21.6
Green Extension Time (g_e), s	0.1	0.0		0.0	0.0	1.3	0.2	1.4
Phase Call Probability	0.91				0.25	1.00	1.00	1.00
Max Out Probability	0.00				0.00	0.01	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	74	49	10	97	130	0	9	300	0	204	374	146
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1356	1870	1585	1781	1870	1585	1781	1870	1585
Queue Service Time (g_s), s	4.9	0.9	0.2	3.8	3.7	0.0	0.6	18.5	0.0	13.4	19.6	7.5
Cycle Queue Clearance Time (g_c), s	4.9	0.9	0.2	3.8	3.7	0.0	0.6	18.5	0.0	13.4	19.6	7.5
Green Ratio (*g/C*)	0.05	0.55	0.55	0.45	0.45	0.45	0.01	0.18	0.18	0.13	0.30	0.30
Capacity (*c*), veh/h	95	1029	872	672	843	715	22	341	289	232	561	475
Volume-to-Capacity Ratio (*X*)	0.778	0.048	0.011	0.144	0.155	0.000	0.388	0.881	0.000	0.880	0.667	0.307
Back of Queue (*Q*), ft/ln (95 th percentile)	102.8	16.5	3.3	53.7	71.3	0	12.8	338.4	0	259.4	316.4	123.2
Back of Queue (*Q*), veh/ln (95 th percentile)	4.0	0.6	0.1	2.1	2.8	0.0	0.5	13.3	0.0	10.2	12.5	4.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.69	0.00	0.00	0.41	0.54	0.00	0.04	0.00	0.00	1.48	0.00	0.00
Uniform Delay (d_1), s/veh	55.0	7.3	7.2	13.9	13.9	0.0	58.5	44.2	0.0	48.7	31.1	27.5
Incremental Delay (d_2), s/veh	5.1	0.1	0.0	0.5	0.4	0.0	4.0	7.6	0.0	9.4	0.6	0.1
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	60.1	7.4	7.2	14.3	14.3	0.0	62.6	51.8	0.0	58.1	31.7	27.6
Level of Service (LOS)	E	A	A	B	B		E	D		E	C	C
Approach Delay, s/veh / LOS	36.8	D		14.3	B		52.1	D		38.3	D	
Intersection Delay, s/veh / LOS	37.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.6	C	2.4	B	3.1	C	2.4	B
Bicycle LOS Score / LOS	0.7	A	0.9	A	1.0	A	1.7	B

HCS7 Two-Way Stop-Control Report

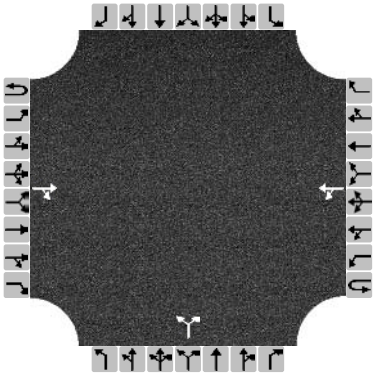
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2020
Analysis Year	2025
Time Analyzed	Background AM Peak
Intersection Orientation	East-West
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	McCalla at Pelham
Jurisdiction	City of Knoxville
East/West Street	Pelham Road
North/South Street	McCalla Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			6	54		1	42			11		1				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						1					13					
Capacity, c (veh/h)						1535					925					
v/c Ratio						0.00					0.01					
95% Queue Length, Q_{95} (veh)						0.0					0.0					
Control Delay (s/veh)						7.3					8.9					
Level of Service, LOS						A					A					
Approach Delay (s/veh)						0.2				8.9						
Approach LOS										A						

HCS7 Two-Way Stop-Control Report

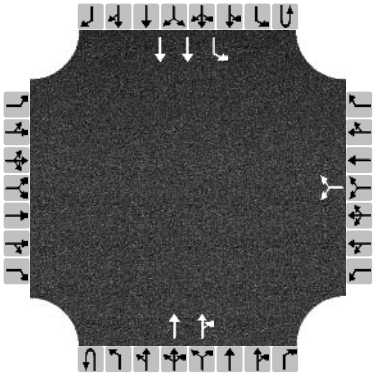
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2020
Analysis Year	2025
Time Analyzed	Background AM Peak
Intersection Orientation	North-South
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	Rutledge Pike at McCalla
Jurisdiction	City of Knoxville
East/West Street	McCalla Avenue
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	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	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume, V (veh/h)						10		43			313	5		55	343	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								5						

Critical and Follow-up Headways

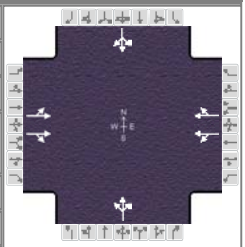
Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							58							60		
Capacity, c (veh/h)							790							1211		
v/c Ratio							0.07							0.05		
95% Queue Length, Q_{95} (veh)							0.2							0.2		
Control Delay (s/veh)							9.9							8.1		
Level of Service, LOS							A							A		
Approach Delay (s/veh)						9.9								1.1		
Approach LOS						A										

HCS7 Signalized Intersection Results Summary

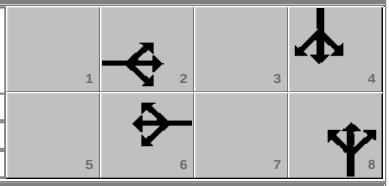
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 21, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Background AM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Rutledge Pike at Spring…	File Name	Background AM Peak_Spring Hill Road.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	791	23	11	2454	19	10	18	10	32	19	55

Signal Information			
Cycle, s	140.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	116.4	12.1	0.0	0.0	0.0	0.0	
Yellow	4.0	4.0	0.0	0.0	0.0	0.0	
Red	2.0	1.5	0.0	0.0	0.0	0.0	



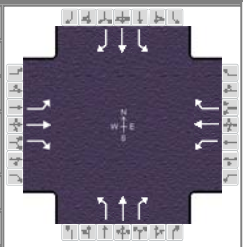
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		122.4		122.4		17.6		17.6
Change Period, ($Y+R_c$), s		6.0		6.0		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		3.1		3.1
Queue Clearance Time (g_s), s						5.0		11.9
Green Extension Time (g_e), s		0.0		0.0		0.2		0.2
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	241		687	1414		1286		41			115	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	549		1584	1740		1590		1712			1594	
Queue Service Time (g_s), s	0.0		0.0	0.0		0.0		0.0			6.9	
Cycle Queue Clearance Time (g_c), s	0.0		0.0	0.0		0.0		3.0			9.9	
Green Ratio (*g/C*)	0.83		0.83	0.83		0.83		0.09			0.09	
Capacity (*c*), veh/h	487		1317	1473		1322		180			171	
Volume-to-Capacity Ratio (*X*)	0.496		0.522	0.960		0.973		0.229			0.673	
Back of Queue (*Q*), ft/ln (95 th percentile)	21.8		24.4	264.1		284.1		62.4			185.2	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.9		1.0	10.6		11.4		2.5			7.3	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	0.0		0.0	0.0		0.0		59.8			62.9	
Incremental Delay (d_2), s/veh	3.6		1.5	15.7		19.1		0.2			1.7	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	3.6		1.5	15.7		19.1		60.1			64.6	
Level of Service (LOS)	A		A	B		B		E			E	
Approach Delay, s/veh / LOS	2.0		A	17.3		B	60.1		E	64.6		E
Intersection Delay, s/veh / LOS	15.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.7	C	2.7	C
Bicycle LOS Score / LOS	1.3	A	2.7	C	0.6	A	0.7	A

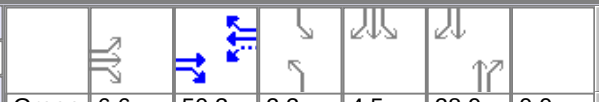
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 21, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Background PM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Rutledge Pike at I-40E I…	File Name	Background PM Peak_Zoo.xus		
Project Description	398.007 Rock Pointe Crossing				

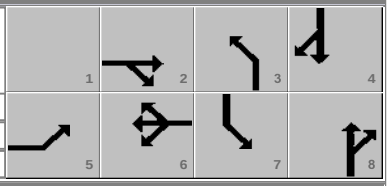


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70	45	14	118	56	1124	13	384	167	142	234	33

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	6.6	50.3	2.3	4.5	28.9	0.0
Yellow	4.0	4.0	4.0	4.0	4.0	0.0
Red	1.5	1.5	1.5	1.5	1.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	2.0	3.0		5.3	2.0	3.0	2.0	3.0
Phase Duration, s	12.1	67.9		55.8	7.8	34.4	17.8	44.4
Change Period, ($Y+R_c$), s	5.5	5.5		5.5	5.5	5.5	5.5	5.5
Max Allow Headway (*MAH*), s	3.0	0.0		0.0	3.0	2.9	3.0	2.9
Queue Clearance Time (g_s), s	7.0				2.9	27.9	12.2	13.3
Green Extension Time (g_e), s	0.1	0.0		0.0	0.0	1.0	0.2	1.2
Phase Call Probability	0.92				0.38	1.00	0.99	1.00
Max Out Probability	0.00				0.00	0.05	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	76	49	15	128	61	0	14	417	0	154	254	36
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1356	1870	1585	1781	1870	1585	1781	1870	1585
Queue Service Time (g_s), s	5.0	1.0	0.4	5.7	1.8	0.0	0.9	25.9	0.0	10.2	11.3	1.6
Cycle Queue Clearance Time (g_c), s	5.0	1.0	0.4	5.7	1.8	0.0	0.9	25.9	0.0	10.2	11.3	1.6
Green Ratio (*g/C*)	0.05	0.52	0.52	0.42	0.42	0.42	0.02	0.24	0.24	0.10	0.32	0.32
Capacity (*c*), veh/h	97	972	824	628	784	664	33	450	381	182	606	514
Volume-to-Capacity Ratio (*X*)	0.781	0.050	0.018	0.204	0.078	0.000	0.422	0.928	0.000	0.848	0.420	0.070
Back of Queue (*Q*), ft/ln (95 th percentile)	105.7	19.3	6	81.7	36.1	0	20.2	472.2	0	202	206.4	26.8
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	0.8	0.2	3.2	1.4	0.0	0.8	18.6	0.0	8.0	8.1	1.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.70	0.00	0.00	0.62	0.27	0.00	0.07	0.00	0.00	1.15	0.00	0.00
Uniform Delay (d_1), s/veh	54.9	9.0	8.9	16.6	15.8	0.0	57.9	39.7	0.0	50.9	26.3	23.5
Incremental Delay (d_2), s/veh	5.0	0.1	0.0	0.7	0.2	0.0	3.1	16.9	0.0	4.2	0.2	0.0
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	59.9	9.1	8.9	17.4	16.0	0.0	61.0	56.7	0.0	55.1	26.4	23.5
Level of Service (LOS)	E	A	A	B	B		E	E		E	C	C
Approach Delay, s/veh / LOS	36.7	D		16.9	B		56.8	E		36.1	D	
Intersection Delay, s/veh / LOS	40.6						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.7	C	2.4	B	4.1	D	2.4	B
Bicycle LOS Score / LOS	0.7	A	0.8	A	1.2	A	1.2	A

HCS7 Two-Way Stop-Control Report

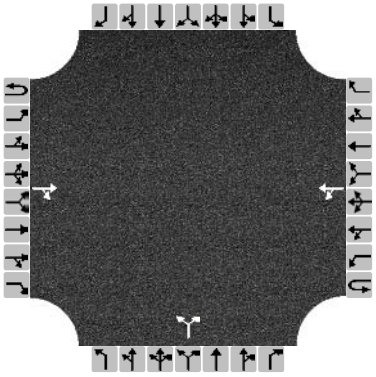
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2020
Analysis Year	2025
Time Analyzed	Background PM Peak
Intersection Orientation	East-West
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	McCalla at Pelham
Jurisdiction	City of Knoxville
East/West Street	Pelham Road
North/South Street	McCalla Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			11	103		20	23			29		3				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						22					35					
Capacity, c (veh/h)						1462					854					
v/c Ratio						0.02					0.04					
95% Queue Length, Q_{95} (veh)						0.0					0.1					
Control Delay (s/veh)						7.5					9.4					
Level of Service, LOS						A					A					
Approach Delay (s/veh)						3.6				9.4						
Approach LOS										A						

HCS7 Two-Way Stop-Control Report

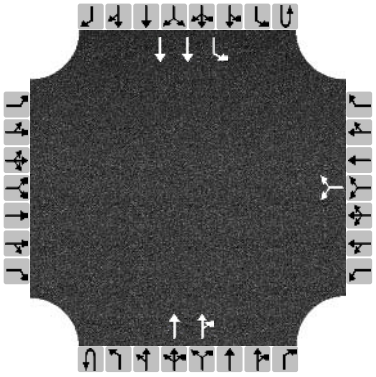
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2020
Analysis Year	2025
Time Analyzed	Background PM Peak
Intersection Orientation	North-South
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	Rutledge Pike at McCalla
Jurisdiction	City of Knoxville
East/West Street	McCalla Avenue
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	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	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume, V (veh/h)						16		36			484	30		84	221	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								5						

Critical and Follow-up Headways

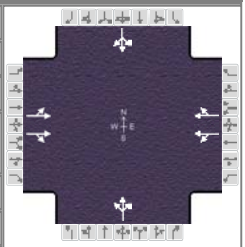
Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							56							91		
Capacity, c (veh/h)							644							1008		
v/c Ratio							0.09							0.09		
95% Queue Length, Q_{95} (veh)							0.3							0.3		
Control Delay (s/veh)							11.1							8.9		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						11.1								2.5		
Approach LOS						B										

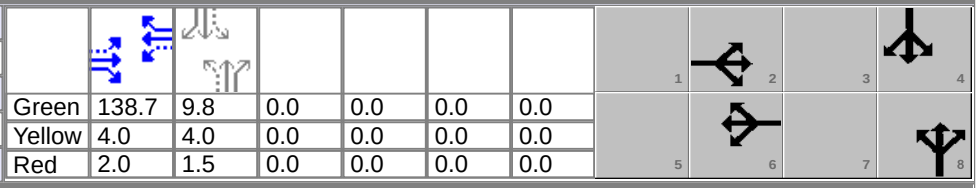
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 21, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Background PM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Rutledge Pike at Spring…	File Name	Background PM Peak_Spring Hill Road.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	91	1812	46	21	897	6	10	10	19	19	10	44

Signal Information			
Cycle, s	160.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	138.7	9.8	0.0	0.0	0.0	0.0	
Yellow	4.0	4.0	0.0	0.0	0.0	0.0	
Red	2.0	1.5	0.0	0.0	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		144.7		144.7		15.3		15.3
Change Period, ($Y+R_c$), s		6.0		6.0		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		3.1		3.1
Queue Clearance Time (g_s), s						5.8		9.7
Green Extension Time (g_e), s		0.0		0.0		0.2		0.2
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

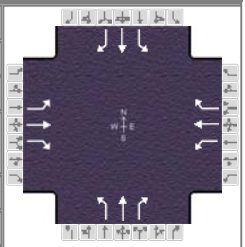
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	1110		1009	471		534		42			79	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1477		1580	1401		1591		1680			1610	
Queue Service Time (g_s), s	0.0		0.0	0.0		0.0		0.0			3.9	
Cycle Queue Clearance Time (g_c), s	0.0		0.0	0.0		0.0		3.8			7.7	
Green Ratio (*g/C*)	0.87		0.87	0.87		0.87		0.06			0.06	
Capacity (*c*), veh/h	1304		1369	1238		1379		131			127	
Volume-to-Capacity Ratio (*X*)	0.851		0.736	0.380		0.387		0.323			0.624	
Back of Queue (*Q*), ft/ln (95 th percentile)	116.2		61	13.8		14.2		76.7			148.5	
Back of Queue (*Q*), veh/ln (95 th percentile)	4.6		2.4	0.6		0.6		3.0			5.8	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	0.0		0.0	0.0		0.0		72.3			74.0	
Incremental Delay (d_2), s/veh	7.1		3.6	0.9		0.8		0.5			1.9	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	7.1		3.6	0.9		0.8		72.8			75.9	
Level of Service (LOS)	A		A	A		A		E			E	
Approach Delay, s/veh / LOS	5.4	A		0.9	A		72.8	E		75.9	E	
Intersection Delay, s/veh / LOS	6.6						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.8	C	2.8	C
Bicycle LOS Score / LOS	2.2	B	1.3	A	0.6	A	0.6	A

Attachment 8
Intersection Worksheets – Full Buildout AM/PM Peaks

HCS7 Signalized Intersection Results Summary

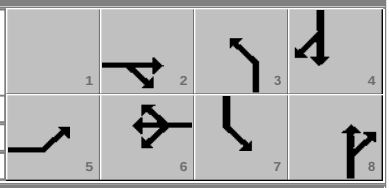
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jun 20, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Full Buildout AM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Rutledge Pike at I-40E I…	File Name	Full Buildout AM Peak_Zoo.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	68	45	9	99	120	431	8	292	116	188	366	134

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.4	53.0	1.5	8.6	23.0	0.0
Yellow	4.0	4.0	4.0	4.0	4.0	0.0
Red	1.5	1.5	1.5	1.5	1.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	2.0	3.0		5.3	2.0	3.0	2.0	3.0
Phase Duration, s	11.9	70.4		58.5	7.0	28.5	21.1	42.6
Change Period, ($Y+R_c$), s	5.5	5.5		5.5	5.5	5.5	5.5	5.5
Max Allow Headway (*MAH*), s	3.0	0.0		0.0	3.0	3.0	3.0	3.0
Queue Clearance Time (g_s), s	6.9				2.6	21.6	15.4	22.9
Green Extension Time (g_e), s	0.1	0.0		0.0	0.0	1.4	0.2	1.5
Phase Call Probability	0.91				0.25	1.00	1.00	1.00
Max Out Probability	0.00				0.00	0.02	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	74	49	10	108	130	0	9	317	9	204	398	146
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1356	1870	1585	1781	1870	1585	1781	1870	1585
Queue Service Time (g_s), s	4.9	0.9	0.2	4.4	3.8	0.0	0.6	19.6	0.5	13.4	20.9	7.4
Cycle Queue Clearance Time (g_c), s	4.9	0.9	0.2	4.4	3.8	0.0	0.6	19.6	0.5	13.4	20.9	7.4
Green Ratio (*g/C*)	0.05	0.54	0.54	0.44	0.44	0.44	0.01	0.19	0.19	0.13	0.31	0.31
Capacity (*c*), veh/h	95	1011	857	659	826	700	22	358	303	232	578	490
Volume-to-Capacity Ratio (*X*)	0.779	0.048	0.011	0.163	0.158	0.000	0.388	0.886	0.029	0.880	0.688	0.297
Back of Queue (*Q*), ft/ln (95 th percentile)	102.9	17.4	3.5	62.3	73.9	0	12.8	358.8	8.7	259.4	334.1	120.4
Back of Queue (*Q*), veh/ln (95 th percentile)	4.0	0.7	0.1	2.5	2.9	0.0	0.5	14.1	0.3	10.2	13.2	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.69	0.00	0.00	0.47	0.56	0.00	0.04	0.00	0.00	1.48	0.00	0.00
Uniform Delay (d_1), s/veh	55.0	7.8	7.7	14.7	14.6	0.0	58.5	43.4	36.3	48.7	30.5	26.5
Incremental Delay (d_2), s/veh	5.1	0.1	0.0	0.5	0.4	0.0	4.0	9.4	0.0	9.4	1.0	0.1
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	60.1	7.9	7.7	15.2	15.0	0.0	62.6	52.8	36.3	58.1	31.5	26.7
Level of Service (LOS)	E	A	A	B	B		E	D	D	E	C	C
Approach Delay, s/veh / LOS	37.0	D		15.1	B		52.6	D		37.8	D	
Intersection Delay, s/veh / LOS	37.4						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.6	C	2.4	B	3.1	C	2.4	B
Bicycle LOS Score / LOS	0.7	A	0.9	A	1.0	A	1.7	B

HCS7 Two-Way Stop-Control Report

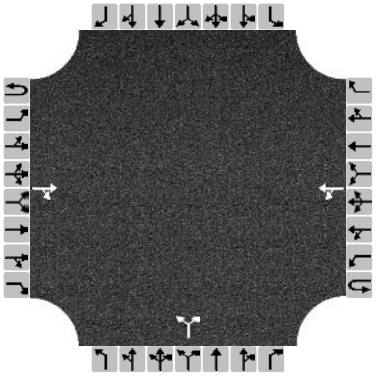
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	6/20/2020
Analysis Year	2025
Time Analyzed	Full Buildout AM Peak
Intersection Orientation	East-West
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	McCalla at Rock Pointe
Jurisdiction	City of Knoxville
East/West Street	Rock Pointe Drive
North/South Street	McCalla Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			100	54		1	123			11		4				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						1					16					
Capacity, c (veh/h)						1409					755					
v/c Ratio						0.00					0.02					
95% Queue Length, Q_{95} (veh)						0.0					0.1					
Control Delay (s/veh)						7.6					9.9					
Level of Service, LOS						A					A					
Approach Delay (s/veh)						0.1				9.9						
Approach LOS										A						

HCS7 Two-Way Stop-Control Report

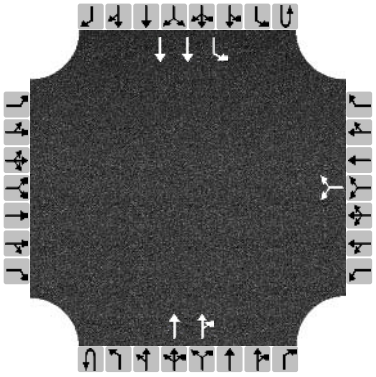
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	6/20/2020
Analysis Year	2025
Time Analyzed	Full Buildout AM Peak
Intersection Orientation	North-South
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	Rutledge Pike at Rock P
Jurisdiction	City of Knoxville
East/West Street	Rock Pointe Drive
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	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	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume, V (veh/h)						52		82			297	30		124	306	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								5						

Critical and Follow-up Headways

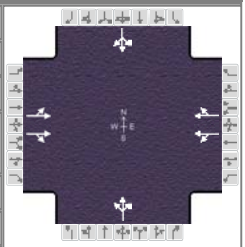
Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							146							135		
Capacity, c (veh/h)							681							1200		
v/c Ratio							0.21							0.11		
95% Queue Length, Q_{95} (veh)							0.8							0.4		
Control Delay (s/veh)							11.7							8.4		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						11.7								2.4		
Approach LOS						B										

HCS7 Signalized Intersection Results Summary

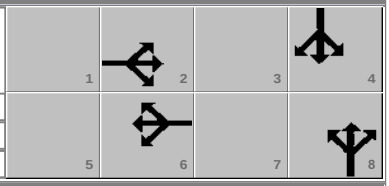
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jun 20, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Full Buildout AM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Rutledge Pike at Spring…	File Name	Full Buildout AM Peak_Spring Hill Road.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	787	52	42	2445	19	26	18	24	32	22	55

Signal Information			
Cycle, s	140.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	116.3	12.2	0.0	0.0	0.0	0.0	
Yellow	4.0	4.0	0.0	0.0	0.0	0.0	
Red	2.0	1.5	0.0	0.0	0.0	0.0	



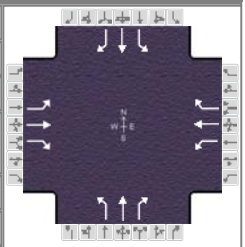
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		122.3		122.3		17.7		17.7
Change Period, ($Y+R_c$), s		6.0		6.0		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		3.1		3.1
Queue Clearance Time (g_s), s						8.1		11.9
Green Extension Time (g_e), s		0.0		0.0		0.3		0.3
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	263		693	1427		1297		74			118	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	590		1571	1670		1590		1557			1627	
Queue Service Time (g_s), s	0.0		0.0	87.6		0.0		0.0			3.8	
Cycle Queue Clearance Time (g_c), s	0.0		0.0	116.3		0.0		6.1			9.9	
Green Ratio (*g/C*)	0.83		0.83	0.83		0.83		0.09			0.09	
Capacity (*c*), veh/h	520		1305	1414		1321		171			175	
Volume-to-Capacity Ratio (*X*)	0.505		0.531	1.009		0.982		0.432			0.677	
Back of Queue (*Q*), ft/ln (95 th percentile)	22.6		25.3	393.2		305.3		114.5			190.2	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.9		1.0	15.7		12.2		4.5			7.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	0.0		0.0	1.1		0.0		61.0			62.8	
Incremental Delay (d_2), s/veh	3.5		1.5	26.1		20.9		0.6			1.7	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	3.5		1.5	27.2		20.9		61.7			64.5	
Level of Service (LOS)	A		A	F		C		E			E	
Approach Delay, s/veh / LOS	2.1		A	24.2		C	61.7		E	64.5		E
Intersection Delay, s/veh / LOS	20.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.7	C	2.7	C
Bicycle LOS Score / LOS	1.3	A	2.7	C	0.6	A	0.7	A

HCS7 Signalized Intersection Results Summary

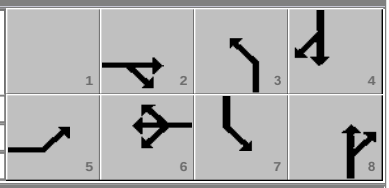
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jun 20, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Full Buildout PM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Rutledge Pike at I-40E I…	File Name	Full Buildout PM Peak_Zoo.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70	45	14	127	56	1124	13	406	177	142	254	33

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.6	48.8	2.3	4.5	30.4	0.0
Yellow	4.0	4.0	4.0	4.0	4.0	0.0
Red	1.5	1.5	1.5	1.5	1.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	2.0	3.0		5.3	2.0	3.0	2.0	3.0
Phase Duration, s	12.1	66.4		54.3	7.8	35.9	17.8	45.9
Change Period, ($Y+R_c$), s	5.5	5.5		5.5	5.5	5.5	5.5	5.5
Max Allow Headway (*MAH*), s	3.0	0.0		0.0	3.0	2.9	3.0	2.9
Queue Clearance Time (g_s), s	7.0				2.9	29.4	12.2	14.2
Green Extension Time (g_e), s	0.1	0.0		0.0	0.0	1.0	0.2	1.3
Phase Call Probability	0.92				0.38	1.00	0.99	1.00
Max Out Probability	0.00				0.00	0.12	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	76	49	15	138	61	0	14	441	11	154	276	36
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1356	1870	1585	1781	1870	1585	1781	1870	1585
Queue Service Time (g_s), s	5.0	1.1	0.4	6.5	1.9	0.0	0.9	27.4	0.6	10.2	12.2	1.5
Cycle Queue Clearance Time (g_c), s	5.0	1.1	0.4	6.5	1.9	0.0	0.9	27.4	0.6	10.2	12.2	1.5
Green Ratio (*g/C*)	0.05	0.51	0.51	0.41	0.41	0.41	0.02	0.25	0.25	0.10	0.34	0.34
Capacity (*c*), veh/h	97	949	804	612	761	645	33	473	401	182	629	533
Volume-to-Capacity Ratio (*X*)	0.781	0.052	0.019	0.226	0.080	0.000	0.422	0.933	0.027	0.848	0.439	0.067
Back of Queue (*Q*), ft/ln (95 th percentile)	105.7	20.5	6.3	92.1	37.6	0	20.2	500.2	9.5	202	216	25.9
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	0.8	0.2	3.6	1.5	0.0	0.8	19.7	0.4	8.0	8.5	1.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.70	0.00	0.00	0.70	0.29	0.00	0.07	0.00	0.00	1.15	0.00	0.00
Uniform Delay (d_1), s/veh	54.9	9.7	9.6	17.8	16.7	0.0	57.9	38.8	29.9	50.9	25.3	22.4
Incremental Delay (d_2), s/veh	5.0	0.1	0.0	0.9	0.2	0.0	3.1	18.8	0.0	4.2	0.2	0.0
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	60.0	9.8	9.7	18.6	16.9	0.0	61.0	57.6	29.9	55.1	25.5	22.4
Level of Service (LOS)	E	A	A	B	B		E	E	C	E	C	C
Approach Delay, s/veh / LOS	37.0	D		18.1	B		57.0	E		35.0	D	
Intersection Delay, s/veh / LOS	40.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.7	C	2.4	B	4.0	D	2.4	B
Bicycle LOS Score / LOS	0.7	A	0.8	A	1.3	A	1.3	A

HCS7 Two-Way Stop-Control Report

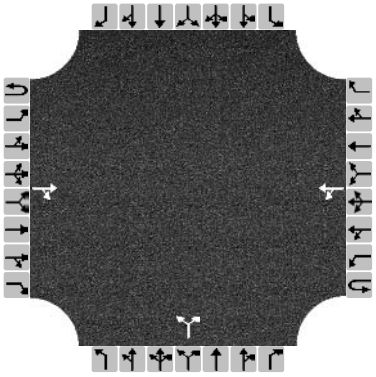
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	6/20/2020
Analysis Year	2025
Time Analyzed	Full Buildout PM Peak
Intersection Orientation	East-West
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	McCalla at Rock Pointe
Jurisdiction	City of Knoxville
East/West Street	Rock Pointe Drive
North/South Street	McCalla Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			107	103		22	121			29		4				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						24					36					
Capacity, c (veh/h)						1339					654					
v/c Ratio						0.02					0.06					
95% Queue Length, Q_{95} (veh)						0.1					0.2					
Control Delay (s/veh)						7.7					10.8					
Level of Service, LOS						A					B					
Approach Delay (s/veh)						1.3				10.8						
Approach LOS										B						

HCS7 Two-Way Stop-Control Report

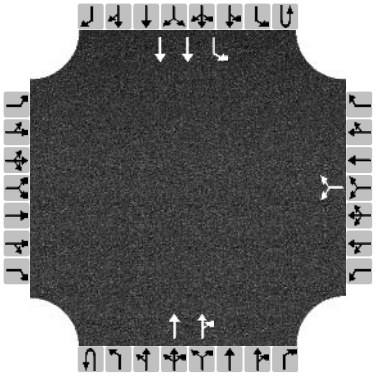
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	6/20/2020
Analysis Year	2025
Time Analyzed	Full Buildout PM Peak
Intersection Orientation	North-South
Project Description	398.007 Rock Pointe Crossing

Site Information

Intersection	Rutledge Pike at Rock P
Jurisdiction	City of Knoxville
East/West Street	Rock Pointe Dr
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	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	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume, V (veh/h)						65		85			466	56		154	180	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								5						

Critical and Follow-up Headways

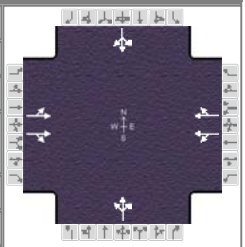
Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							163							167		
Capacity, c (veh/h)							582							1000		
v/c Ratio							0.28							0.17		
95% Queue Length, Q_{95} (veh)							1.1							0.6		
Control Delay (s/veh)							13.6							9.3		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						13.6								4.3		
Approach LOS						B										

HCS7 Signalized Intersection Results Summary

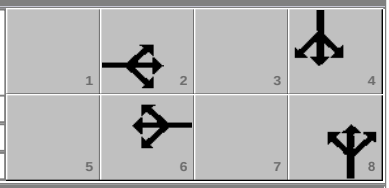
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jun 20, 2020	Area Type	Other
Jurisdiction	City of Knoxville	Time Period	Full Buildout PM Peak	PHF	0.92
Urban Street	Rutledge Pike	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Rutledge Pike at Spring…	File Name	Full Buildout PM Peak_Spring Hill Road.xus		
Project Description	398.007 Rock Pointe Crossing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	91	1807	64	40	887	6	40	13	47	19	11	44

Signal Information			
Cycle, s	160.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	135.3	13.2	0.0	0.0	0.0	0.0	
Yellow	4.0	4.0	0.0	0.0	0.0	0.0	
Red	2.0	1.5	0.0	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		141.3		141.3		18.7		18.7
Change Period, ($Y+R_c$), s		6.0		6.0		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		3.2		3.2
Queue Clearance Time (g_s), s						13.0		9.5
Green Extension Time (g_e), s		0.0		0.0		0.3		0.3
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	1117		1015	401		613		109			80	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1481		1575	1038		1591		1556			1630	
Queue Service Time (g_s), s	0.0		0.0	0.0		0.0		3.5			0.0	
Cycle Queue Clearance Time (g_c), s	0.0		0.0	0.0		0.0		11.0			7.5	
Green Ratio (*g/C*)	0.85		0.85	0.85		0.85		0.08			0.08	
Capacity (*c*), veh/h	1277		1332	903		1346		160			163	
Volume-to-Capacity Ratio (*X*)	0.875		0.762	0.444		0.455		0.680			0.494	
Back of Queue (*Q*), ft/ln (95 th percentile)	136.5		69.5	17.9		18.7		200.3			145.7	
Back of Queue (*Q*), veh/ln (95 th percentile)	5.5		2.8	0.7		0.7		7.9			5.7	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	0.0		0.0	0.0		0.0		72.3			70.7	
Incremental Delay (d_2), s/veh	8.6		4.2	1.6		1.1		1.9			0.9	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	8.6		4.2	1.6		1.1		74.2			71.6	
Level of Service (LOS)	A		A	A		A		E			E	
Approach Delay, s/veh / LOS	6.5	A		1.3	A		74.2	E		71.6	E	
Intersection Delay, s/veh / LOS	8.7						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.8	C	2.8	C
Bicycle LOS Score / LOS	2.2	B	1.3	A	0.7	A	0.6	A

Attachment 9
Turn Lane Warrant Analysis

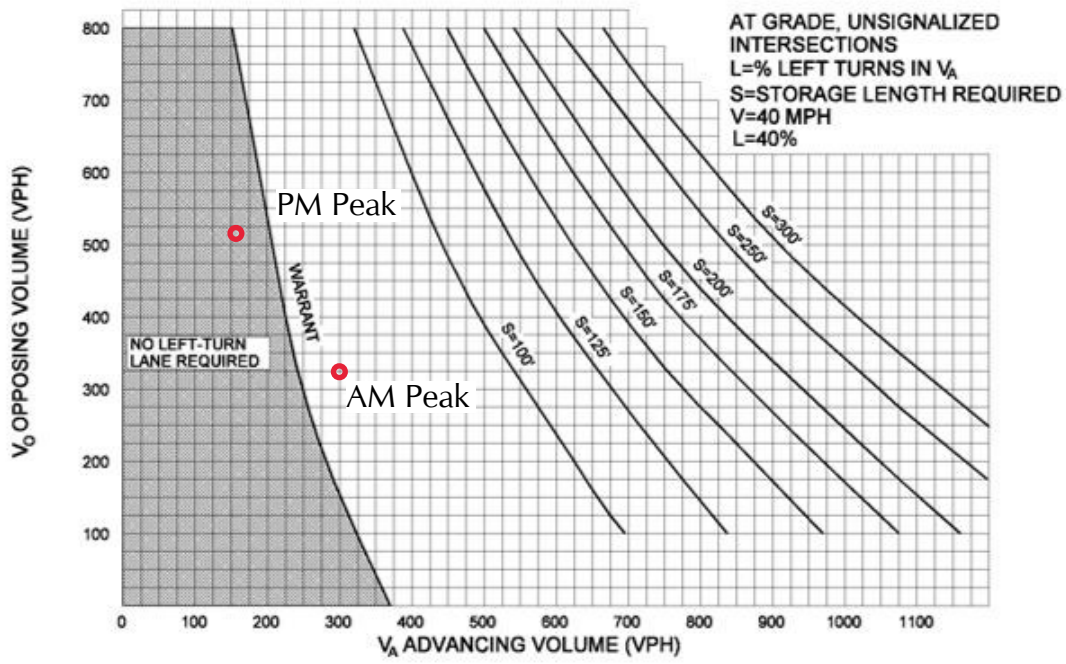


Figure 6
Warrant for 40% Left-Turn Storage Lanes at 40 mph

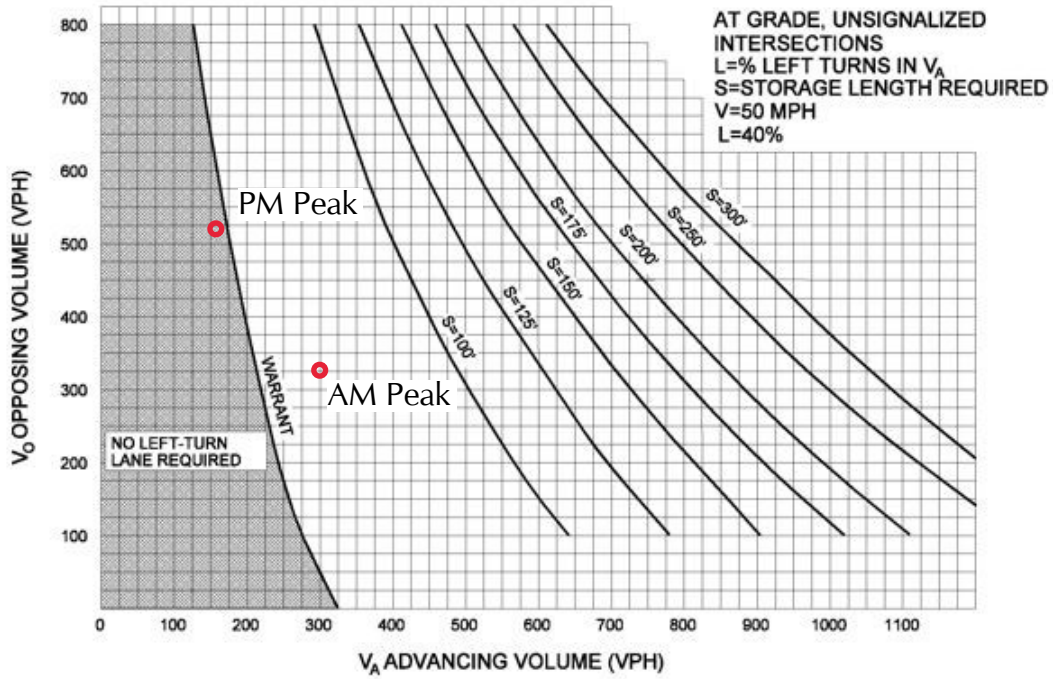
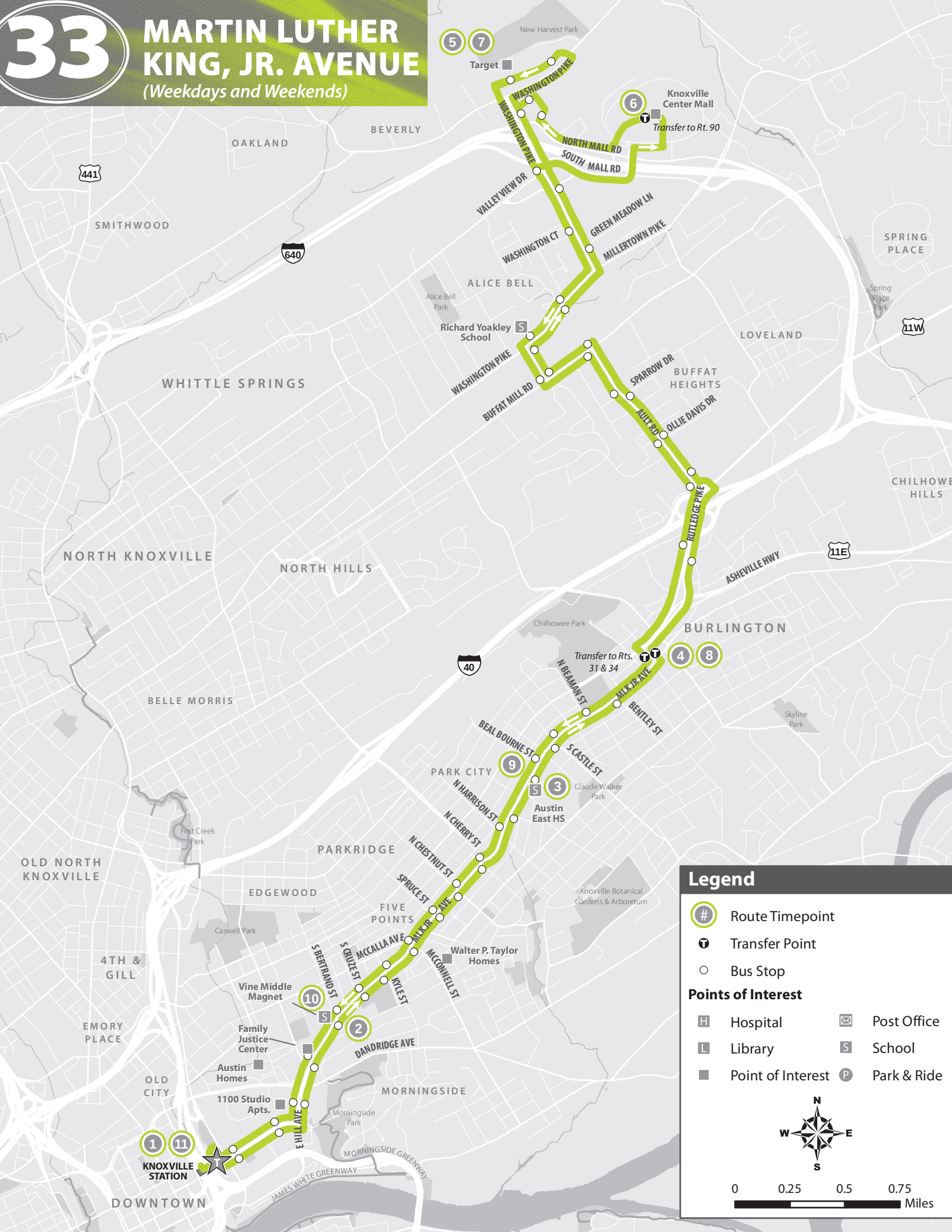


Figure 12
Warrant for 40% Left-Turn Storage Lanes at 50 mph

Attachment 10
Transit & Bicycle Networks

33 MARTIN LUTHER KING, JR. AVENUE

(Weekdays and Weekends)



Legend

- Route Timepoint
- Transfer Point
- Bus Stop

Points of Interest

- Hospital
- Library
- Point of Interest
- Post Office
- School
- Park & Ride

N W E S

0 0.25 0.5 0.75 Miles

33

MARTIN LUTHER KING, JR. AVENUE

(Weekdays and Weekends)

SERVES:

- Austin East High School
- Knoxville Center Mall
- Knoxville Station/Downtown
- Target
- Vine Middle Magnet School
- Walter P. Taylor Homes

kat KNOXVILLE AREA TRANSIT

Information Updated: January 6, 2020

Going away from Downtown							*Going toward Downtown*					
Transfer to:			*Rts. 31 & 34*		*Rt. 90*				*Rts. 31 & 34*			
Knoxville Station—Platform N (1)	MLK at Bertrand (2)	Austin East High (3)	Kirkwood St Superstop (4)	Target (5)	Knoxville Center Mall *(Arrives)* (6)	*Bus Goes On To Serve*	Knoxville Center Mall *(Leaves)* (6)	Target (7)	Kirkwood St Superstop (8)	MLK at Beal Bourne St. (9)	MLK at Bertrand (10)	Knoxville Station (11)
WEEKDAY SCHEDULE												
A.M.	—	—	—	—	—	—	—	—	—	6:24	6:27	6:34	6:40
	—	—	—	—	—	—	—	7:00	7:07	7:24	7:27	7:34	7:40
	6:45	6:48	6:57	7:03	7:16	7:25	*Rt. 23*	8:00	8:07	8:24	8:27	8:34	8:40
	7:45	7:48	7:57	8:03	8:16	8:25	*Rt. 23*	9:00	9:07	9:24	9:27	9:34	9:40
	8:45	8:48	8:57	9:03	9:16	9:25	*Rt. 23*	10:00	10:07	10:24	10:27	10:34	10:40
	9:45	9:48	9:57	10:03	10:16	10:25	*Rt. 23*	11:00	11:07	11:24	11:27	11:34	11:40
	10:45	10:48	10:57	11:03	11:16	11:25	*Rt. 23*	**12:00**	**12:07**	**12:24**	**12:27**	**12:34**	**12:40**
	11:45	11:48	11:57	**12:03**	**12:16**	**12:25**	*Rt. 23*	**1:00**	**1:07**	**1:24**	**1:27**	**1:34**	**1:40**
P.M.	**12:45**	**12:48**	**12:57**	**1:03**	**1:16**	**1:25**	*Rt. 23*	**2:00**	**2:07**	**2:24**	**2:27**	**2:34**	**2:40**
	1:45	**1:48**	**1:57**	**2:03**	**2:16**	**2:25**	*Rt. 23*	**3:00**	**3:07**	**3:24**	**3:27**	**3:34**	**3:40**
	2:45	**2:48**	**2:57**	**3:03**	**3:16**	**3:25**	*Rt. 23*	**4:00**	**4:07**	**4:24**	**4:27**	**4:34**	**4:40**
	3:45	**3:48**	**3:57**	**4:03**	**4:16**	**4:25**	*Rt. 23*	**5:00**	**5:07**	**5:24**	**5:27**	**5:34**	**5:40**
	4:45	**4:48**	**4:57**	**5:03**	**5:16**	**5:25**	*Rt. 23*	**6:00**	**6:07**	**6:24**	**6:27**	**6:34**	**6:40**
	5:45	**5:48**	**5:57**	**6:03**	**6:16**	**6:25**	*Rt. 23*	**7:00**	**7:07**	**7:24**	**7:27**	**7:34**	**7:40**
	6:45	**6:48**	**6:57**	**7:03**	**7:16**	**7:25**	*Rt. 23*	**8:00**	**8:07**	**8:24**	**8:27**	**8:34**	**8:40**
	7:45	**7:48**	**7:57**	**8:03**	**8:16**	**8:25**	*Rt. 23*	**9:00**	**9:07**	**9:24**	**9:27**	**9:34**	**9:40**
	8:45	**8:48**	**8:57**	**9:03**	**9:16**	**9:25**	*Rt. 23*	**10:00**	**10:07**	**10:24**	**10:27**	**10:34**	**10:40**
	9:45	**9:48**	**9:57**	**10:03**	**10:16**	**10:25**	*Rt. 23*	—	—	—	—	—	—
	10:45	**10:48**	**10:57**	**11:00**	*To Garage*								
	11:15	**11:18**	**11:27**	**11:30**	*To Garage*								
SATURDAY SCHEDULE												
A.M.	—	—	—	—	—	—	—	—	—	7:24	7:27	7:34	7:40
	—	—	—	—	—	—	—	8:00	8:07	8:24	8:27	8:34	8:40
	7:45	7:48	7:57	8:03	8:16	8:25	*Rt. 23*	9:00	9:07	9:24	9:27	9:34	9:40
	8:45	8:48	8:57	9:03	9:16	9:25	*Rt. 23*	10:00	10:07	10:24	10:27	10:34	10:40
	9:45	9:48	9:57	10:03	10:16	10:25	*Rt. 23*	11:00	11:07	11:24	11:27	11:34	11:40
	10:45	10:48	10:57	11:03	11:16	11:25	*Rt. 23*	**12:00**	**12:07**	**12:24**	**12:27**	**12:34**	**12:40**
	11:45	11:48	11:57	**12:03**	**12:16**	**12:25**	*Rt. 23*	**1:00**	**1:07**	**1:24**	**1:27**	**1:34**	**1:40**
P.M.	**12:45**	**12:48**	**12:57**	**1:03**	**1:16**	**1:25**	*Rt. 23*	**2:00**	**2:07**	**2:24**	**2:27**	**2:34**	**2:40**
	1:45	**1:48**	**1:57**	**2:03**	**2:16**	**2:25**	*Rt. 23*	**3:00**	**3:07**	**3:24**	**3:27**	**3:34**	**3:40**
	2:45	**2:48**	**2:57**	**3:03**	**3:16**	**3:25**	*Rt. 23*	**4:00**	**4:07**	**4:24**	**4:27**	**4:34**	**4:40**
	3:45	**3:48**	**3:57**	**4:03**	**4:16**	**4:25**	*Rt. 23*	**5:00**	**5:07**	**5:24**	**5:27**	**5:34**	**5:40**
	4:45	**4:48**	**4:57**	**5:03**	**5:16**	**5:25**	*Rt. 23*	**6:00**	**6:07**	**6:24**	**6:27**	**6:34**	**6:40**
	5:45	**5:48**	**5:57**	**6:03**	**6:16**	**6:25**	*Rt. 23*	**7:00**	**7:07**	**7:24**	**7:27**	**7:34**	**7:40**
	6:45	**6:48**	**6:57**	**7:03**	**7:16**	**7:25**	*Rt. 23*	**8:00**	**8:07**	**8:24**	**8:27**	**8:34**	**8:40**
	7:45	**7:48**	**7:57**	**8:03**	**8:16**	**8:25**	*Rt. 23*	**9:00**	**9:07**	**9:24**	**9:27**	**9:34**	**9:40**
	8:45	**8:48**	**8:57**	**9:03**	**9:16**	**9:25**	*Rt. 23*	**10:00**	**10:07**	**10:24**	**10:27**	**10:34**	**10:40**
	9:45	**9:48**	**9:57**	**10:03**	**10:16**	**10:25**	*Rt. 23*	—	—	—	—	—	—
	10:45	**10:48**	**10:57**	**11:03**	*To Garage*								
	11:15	**11:18**	**11:27**	**11:33**	*To Garage*								

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MARTIN LUTHER KING, JR. AVENUE

(Weekdays and Weekends)

SERVES:

- Austin East High School
- Knoxville Center Mall
- Knoxville Station/Downtown
- Target
- Vine Middle Magnet School
- Walter P. Taylor Homes

kat KNOXVILLE AREA TRANSIT

Information Updated: January 6, 2020

	Going away from Downtown							Going toward Downtown					
	Transfer to:			Rts. 31 & 34		Rt. 90				Rts. 31 & 34			
	Knoxville Station—Platform N (1)	MLK at Bertrand (2)	Austin East High (3)	Kirkwood St Superstop (4)	Target (5)	Knoxville Center Mall *(Arrives)* (6)	*Bus Goes On To Serve*	Knoxville Center Mall *(Leaves)* (6)	Target (7)	Kirkwood St Superstop (8)	MLK at Beal Bourne St. (9)	MLK at Bertrand (10)	Knoxville Station (11)
SUNDAY SCHEDULE													
A.M.	—	—	—	—	—	—	—	8:00	8:07	8:24	8:27	8:34	8:40
	—	—	—	—	—	—	—	9:00	9:07	9:24	9:27	9:34	9:40
	8:45	8:48	8:57	9:03	9:16	9:25	*Rt. 23*	10:00	10:07	10:24	10:27	10:34	10:40
	9:45	9:48	9:57	10:03	10:16	10:25	*Rt. 23*	11:00	11:07	11:24	11:27	11:34	11:40
	10:45	10:48	10:57	11:03	11:16	11:25	*Rt. 23*	**12:00**	**12:07**	**12:24**	**12:27**	**12:34**	**12:40**
	11:45	11:48	11:57	**12:03**	**12:16**	**12:25**	*Rt. 23*	**1:00**	**1:07**	**1:24**	**1:27**	**1:34**	**1:40**
P.M.	**12:45**	**12:48**	**12:57**	**1:03**	**1:16**	**1:25**	*Rt. 23*	**2:00**	**2:07**	**2:24**	**2:27**	**2:34**	**2:40**
	1:45	**1:48**	**1:57**	**2:03**	**2:16**	**2:25**	*Rt. 23*	**3:00**	**3:07**	**3:24**	**3:27**	**3:34**	**3:40**
	2:45	**2:48**	**2:57**	**3:03**	**3:16**	**3:25**	*Rt. 23*	**4:00**	**4:07**	**4:24**	**4:27**	**4:34**	**4:40**
	3:45	**3:48**	**3:57**	**4:03**	**4:16**	**4:25**	*Rt. 23*	**5:00**	**5:07**	**5:24**	**5:27**	**5:34**	**5:40**
	4:45	**4:48**	**4:57**	**5:03**	**5:16**	**5:25**	*Rt. 23*	**6:00**	**6:07**	**6:24**	**6:27**	**6:34**	**6:40**
	5:45	**5:48**	**5:57**	**6:03**	**6:16**	**6:25**	*Rt. 23*	**7:00**	**7:07**	**7:24**	**7:27**	**7:34**	**7:40**
	6:45	**6:48**	**6:57**	**7:03**	**7:16**	**7:25**	*Rt. 23*	**8:00**	**8:07**	**8:24**	**8:27**	**8:34**	**8:40**
	7:45	**7:48**	**7:57**	**8:03**	**8:16**	**8:25**	—	—	—	—	—	—	—

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E FIFTH AVE
E MAGNOLIA AVE
Chilhowee Park
PROSSER RD
WASHINGTON PIKE
AULT RD
BUFFAT MILL RD
Spring Hill Elem
SPRING HILL RD
RUTLEDGE PIKE
Spring Place Park
LILAC AVE
FERN ST
BEAMAN LAKE RD
Skyline Park
SKYLINE DR
HOLSTON DR
ASHEVILLE HWY

Attachment 11
Signal Warrant Analysis

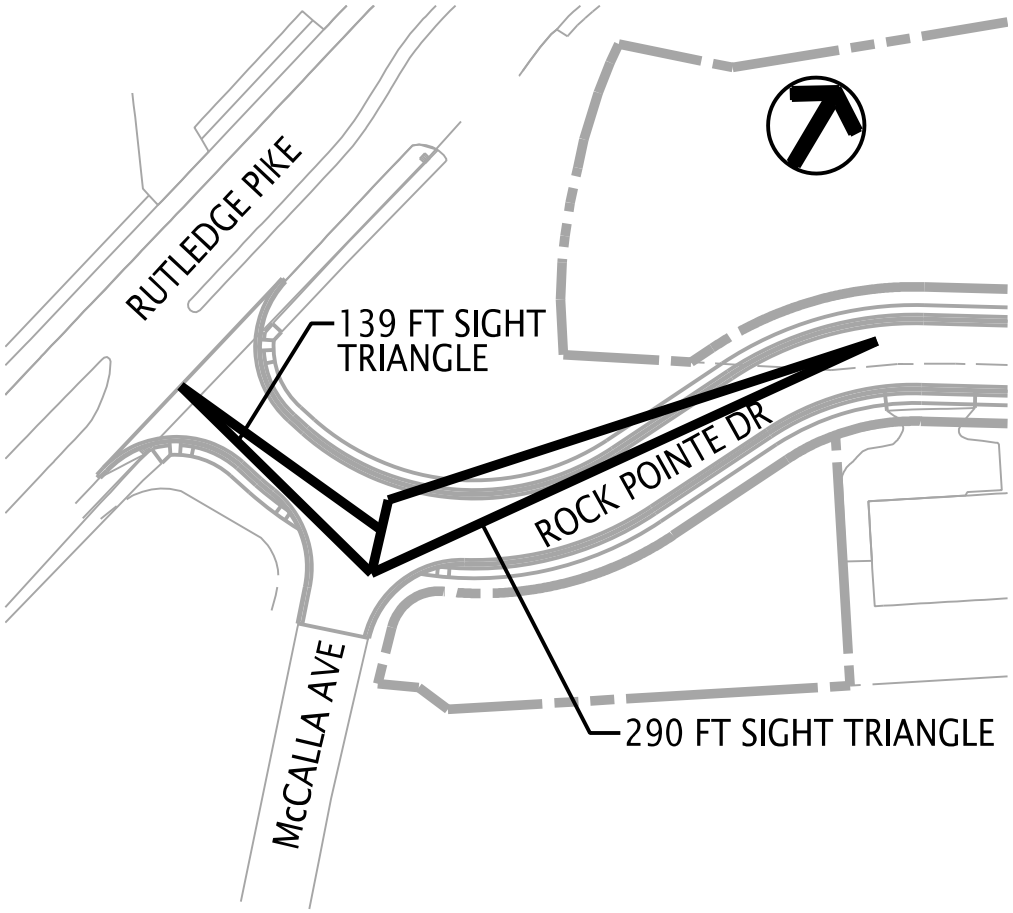
Project: Rock Pointe Crossing
Intersection: Rutledge Pike (SR 1) at Rock Pointe Drive
Date Conducted: 6/17/2020

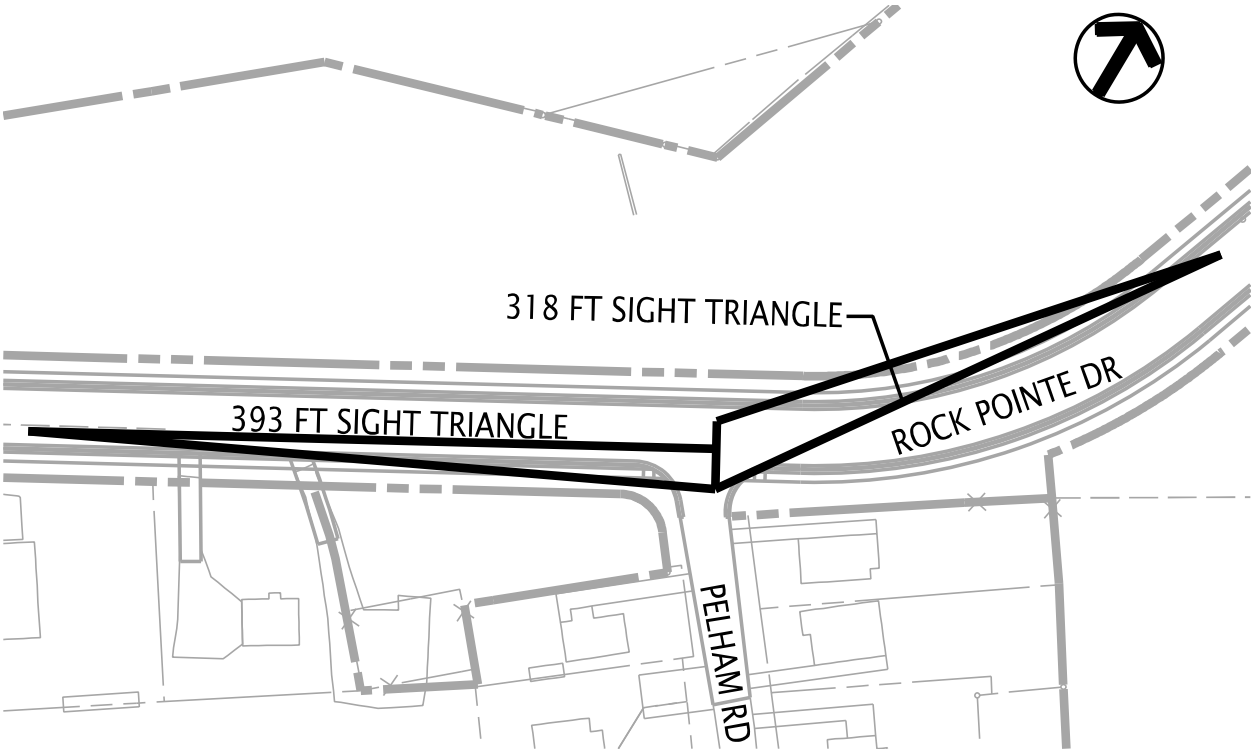
	Existing Conditions		**Warrant 1**			**Warrant 2**	**Warrant 3**
	Major Street	Minor Street	Condition A	Condition B	Condition A/B		
Start	veh/hr	veh/hr					
7:00 a.m.	726	49	NO	NO	NO	NO	NO
8:00 a.m.	587	49	NO	NO	NO	NO	NO
11:00 a.m.	631	0	-	-	-	-	-
12:00 p.m.	683	0	-	-	-	-	-
2:00 p.m.	-	0	-	-	-	-	-
3:00 p.m.	812	0	-	-	-	-	-
4:00 p.m.	860	48	NO	NO	NO	NO	NO
5:00 p.m.	820	48	NO	NO	NO	NO	NO

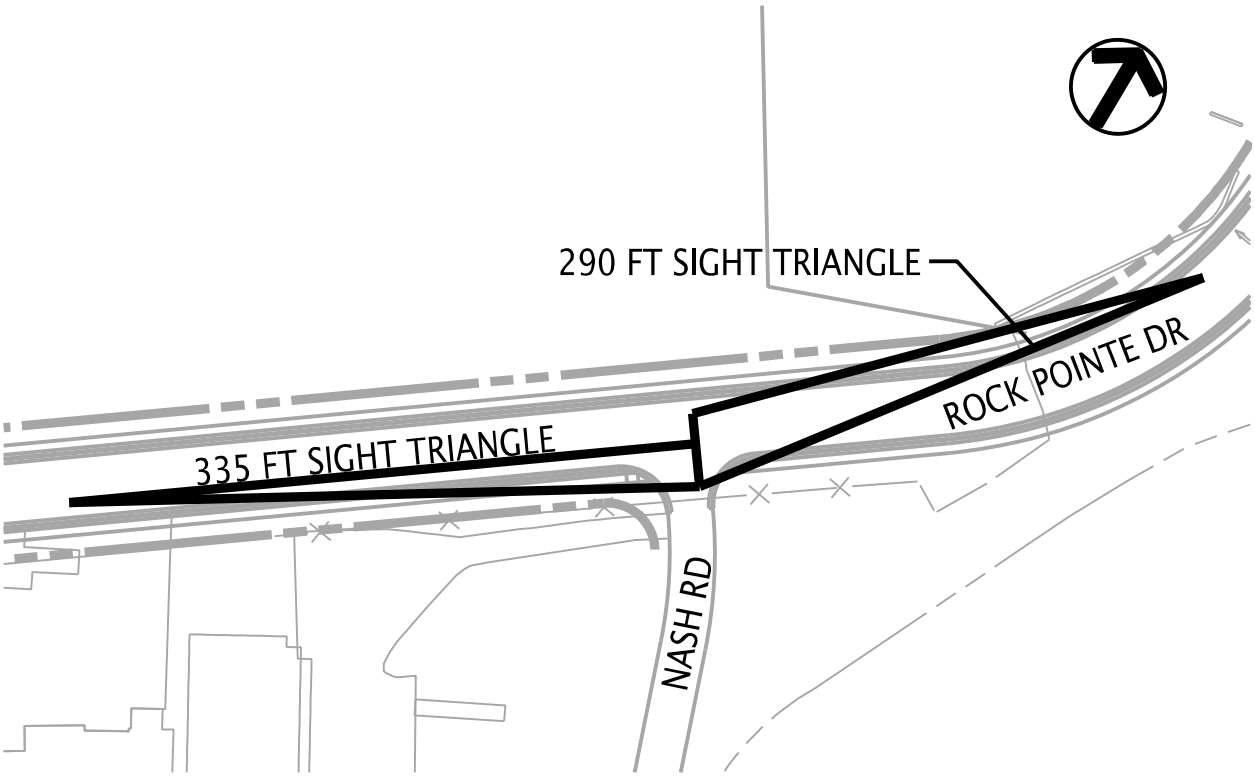
	Background Conditions		**Warrant 1**			**Warrant 2**	**Warrant 3**
	Major Street	Minor Street	Condition A	Condition B	Condition A/B		
Start	veh/hr	veh/hr					
7:00 a.m.	782	53	NO	NO	NO	NO	NO
8:00 a.m.	632	53	NO	NO	NO	NO	NO
11:00 a.m.	680	0	-	-	-	-	-
12:00 p.m.	736	0	-	-	-	-	-
2:00 p.m.	-	0	-	-	-	-	-
3:00 p.m.	875	0	-	-	-	-	-
4:00 p.m.	926	52	NO	NO	NO	NO	NO
5:00 p.m.	883	52	NO	NO	NO	NO	NO

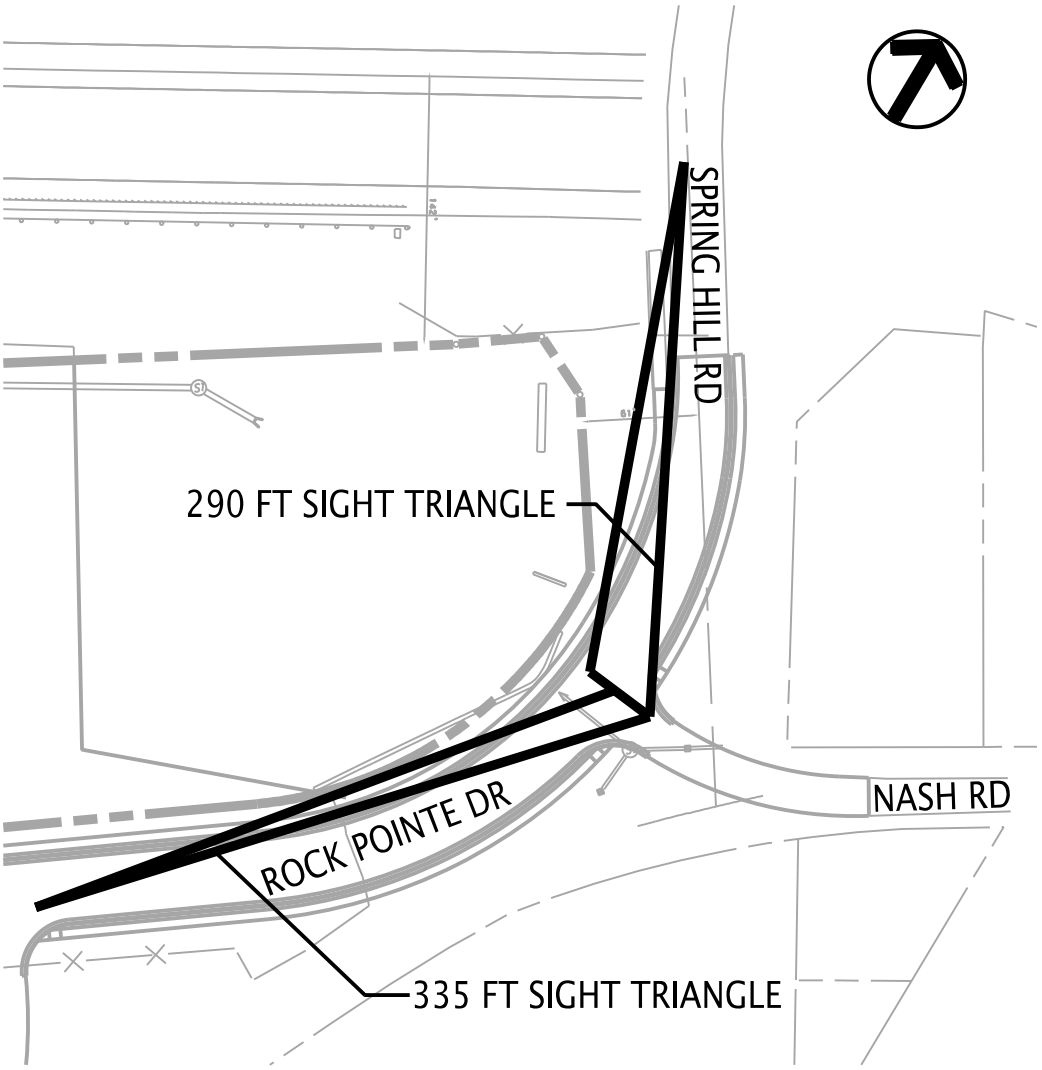
	Full Buildout		**Warrant 1**			**Warrant 2**	**Warrant 3**
	Major Street	Minor Street	Condition A	Condition B	Condition A/B		
Start	veh/hr	veh/hr					
7:00 a.m.	782	134	YES	YES	YES	YES	NO
8:00 a.m.	632	134	YES	YES	YES	YES	NO
11:00 a.m.	680	-	-	-	-	-	-
12:00 p.m.	736	-	-	-	-	-	-
2:00 p.m.	-	-	-	-	-	-	-
3:00 p.m.	875	-	-	-	-	-	-
4:00 p.m.	926	150	YES	YES	YES	YES	YES
5:00 p.m.	883	150	YES	YES	YES	YES	NO

Attachment 12
Sight Triangles


RUTLEDGE PIKE
139 FT SIGHT
TRIANGLE
ROCK POINTE DR
McCALLA AVE
290 FT SIGHT TRIANGLE


318 FT SIGHT TRIANGLE
393 FT SIGHT TRIANGLE
ROCK POINTE DR
PELHAM RD


290 FT SIGHT TRIANGLE
335 FT SIGHT TRIANGLE
ROCK POINTE DR
NASH RD


SPRING HILL RD
290 FT SIGHT TRIANGLE
NASH RD
ROCK POINTE DR
335 FT SIGHT TRIANGLE

Date: June 22, 2020

Project Name: Rock Pointe Crossing (5-SB-20-C)

To: Knoxville-Knox County Planning

Subject: TIS Review for Rock Pointe Crossing (5-SB-20-C)

Dear Knoxville-Knox County Planning staff,

The following comment response document is submitted to address comments dated June 16, 2020:

1. **Reviewer Comment:** On page 3 and 29, please discuss if this intersection is required to be signalized.

   Response: Added Section 7: Signal Warrant Analysis to Attachment 11.

2. **Reviewer Comment:** On page 4 and 31, the statement under the Rutledge Pike @ Spring Hill Road section, "The City of Knoxville should consider adding a separate westbound left turn lane in the future to improve the overall function of the intersection" should be removed from the document. This improvement would require City/TDOT to either add additional ROW pavement to form a dedicated left turn lane or make one of the thru lanes approaching the intersection to become a dedicated left turn lane.

   Response: Revised the statement and removed "The City of Knoxville."

   a. Between 2025 background and full buildout, the development increases the westbound left turns at Rutledge & Spring Hill from 11 to 49 (AM) and 21 to 45 (PM). In the AM peak, the LOS on the westbound approach goes from a B to a C and the westbound left turn movement goes from a B to an F. If this is considered a needed improvement, it needs to be completed by the developer, including the purchase of any extra ROW.

      Response: N/A

3. **Reviewer Comment:** On page 10 & 11, analysis assumed a 1.5% growth rate. Add statement relating to "Attachment 3: ADT Trends" to provide context of why 1.5% was used.

   Response: Added the following statement to pages 10 & 11. "The growth rate was determined by analyzing the nearby TDOT count station on Rutledge Pike (SR 1).

The ADT trend line growth charts for the TDOT count station are included in Attachment 3."

4. **Reviewer Comment:** On page 17, the average rate should be used for LUC 945 because the R^2 value is below 0.75. This would correct the total trips for the land use to 3,286. Please correct as appropriate throughout the study.

   Response: Updated the trip generation for LUC 945 in Table 4-1 Rock Pointe Crossing Trip Generation and throughout the study.

   a. In the same table, LUC 710 needs to use the fitted curve since the R^2 value is above 0.75. This would change the total trips for the land use to 399.

      Response: Updated the Daily Trips for LUC 710 in Table 4-1 Rock Pointe Crossing Trip Generation.

   b. In discussions with the City of Knoxville, they have mentioned that one of the parcels of this development plan now has a new business that does not fall within the listed land-uses from the TIA. This business is Sunbelt Rentals. Please address this in Table 4-1.

      Response: The 12,200 SF building materials and lumber store was updated to LUC 811 construction equipment rental store (i.e. Sunbelt Rentals) to reflect the new information regarding the business.

   c. In the second to last paragraph discussing the trip distribution, these percentages do not seem reasonable to staff considering the access closest to the interstate is the intersection of Rutledge Pike at Rock Pointe Drive. Staff recommends the higher distribution to be closer to the interstate, not furthest away. Please consider consulting with our staff once initial assumptions are made.

      Response: Revised the trip distribution of the Gasoline/Service Station with Convenience Market (LUC 945) to 80% of traffic entering/exiting at the intersection of Rutledge Pike (SR 1) at Rock Pointe Drive and 20% of traffic entering/existing at the intersection of Rutledge Pike (SR 1) at Spring Hill Road.

5. **Reviewer Comment:** On page 19, Figure 6, McCalla Avenue & Pelham Road bubble shows 15% entering and exiting. This should be 20% due to 15% turning southbound left off of Rutledge Pike and 5% turning northbound right off of Rutledge Pike.

   Response: Updated Figure 6 with revised trip distribution numbers.

6. **Reviewer Comment:** Please evaluate the new proposed realignment to determine if additional features (i.e. a TWLTL or other recommended turn lanes at driveways or intersections) above the minimum are required based upon the types of vehicles accessing the site and land uses being proposed for the area. The required minimum lane width in each direction of the new proposed realignment is 12ft. With this evaluation, also look at how the new proposed cross-section connects into the existing cross-section (to the north) of Spring Hill Rd.

   Response: The relatively low volume of traffic on Rock Pointe Drive is not expected to warrant any additional features and the required lane width and cross-section will need to be evaluated during the detailed design phase of the roadway project.

7. **Reviewer Comment:** The sight distance evaluations in Attachment 11 need to be discussed in the write-up portion of the study. Please ensure that the evaluation is based upon Section 3.04.J.5 of the Subdivision Regulations and AASHTO. Also, please indicate the speed limit of the redesign of the road is being designed to.

   Response: A design speed of 30 mph for Rock Pointe Drive was already stated at the beginning of the second paragraph in section 7.6 Sight Distance. Discussed the attached sight triangles and referenced that Section 3.04.J.5 of the subdivision regulations was used in determine the minimum required sight distance.

Sincerely,

Addie Kirkham, P.E.