[External] Carolina Springs Avenue Traffic Tech Memo

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Sent: June 12, 2019 11:20:27 AM EDT

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Sean,

Thanks again for accommodating us this morning. The discussion was helpful to moving this project forward.

As discussed, I am forwarding the Draft Traffic Analysis Technical Memorandum that Lochner prepared for the project. Please feel free to forward to the appropriate NCDOT staff for review of options presented at the Lake Wheeler Road / Carolina Pines Avenue intersection. Of course anything that can be done to expedite the process would be appreciated.

If you should have any questions, please let me know.

Thanks again!

Brian Dehler

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May 2019

Carolina Pines Avenue

From Lake Wheeler Road to S. Saunders Street

Traffic Analysis Technical Memorandum

Prepared for:

City Of Raleigh

NORTH CAROLINA

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NORTH CAROLINA PROFESSIONAL SEAL 016067 ENGINEER BRIAN D. DEHLER

5/13/19

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Contents

Introduction 1
Project Location and Limits 1
Purpose of Traffic Capacity Analysis 1
Roadway Characteristics 2
Traffic Capacity Method of Analysis 3
Measures of Effectiveness (MOE) 3
Level of Service 3
Highway Capacity Analysis Results 4
2019 Existing 4
2045 No-Build Scenario 4
2045 Build Scenario 5
Signal Warrant Analysis 8
Warrant 1: Eight-Hour Vehicular Volume 9
Warrant 2: Four Hour Vehicular Volume 9
Warrant 3: Peak Hour 9
Warrant 7: Crash Experience 9
Conclusion 9
Safety Analysis 10
Crash Data 10
Summary of Crash Data 10
Severity 10
Comparison to Statewide Rates 12
Conclusions and Recommendations 13

List of Figures

Figure 1: Project Area 2
Figure 2: Typical Section 7
Figure 3-Alternative Roundabout Designs at Lake Wheeler Road 7

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

List of Tables

Table 1: Analysis Type per Location 3
Table 2: Level of Service Criteria for Intersections 4
Table 3: Synchro Results 6
Table 4: Sidra Results 6
Table 5: Queuing Results 6
Table 6: Warrant Results Summary 10
Table 7: Crash Summary 10
Table 8: Crash Severity 11
Table 9: Crash Rates 12

Appendices

Appendix A: Traffic Counts and Growth Rates
Appendix B: 2019 Existing Analysis Reports
Appendix C: 2045 No-Build Analysis Reports
Appendix D: 2045 Build Analysis Reports
Appendix E: Signal Warrants
Appendix F: Crash Reports

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Introduction

The purpose of this project is to improve mobility and connectivity for pedestrian, bicycle, and vehicular traffic while improving safety throughout this important corridor. Carolina Pines Avenue is an existing 2-lane roadway from Lake Wheeler Road to S. Saunders Street. The proposed roadway improvements will include a 2-lane undivided curb and gutter roadway with amenities for bicycles and pedestrians. Traffic calming measures consisting of horizontal deflections will be implemented to help control travel speeds in the corridor. Deficiencies and safety related concerns stemming from the implementation of the proposed project will be evaluated in this Technical Memorandum.

Project Location and Limits

The project study area is located in Wake County and within the corporate limits of the City of Raleigh. The project extends along Carolina Pines Avenue from Lake Wheeler Road to S. Saunders Street (see Figure 1).

Purpose of Traffic Capacity Analysis

The purpose of this traffic analysis, is to document existing and projected intersection operations and identify any potential deficiencies and safety related concerns stemming from the implementation of the proposed project. This traffic capacity analysis was prepared using Synchro Professional Version 9.1 and Sidra to evaluate traffic operations at study area intersections and roundabouts, respectively. The analysis complies with NCDOT Congestion Management Capacity Analysis Guidelines and City of Raleigh Street Design Manual (July 1, 2018). This traffic capacity analysis uses AM and PM peak hour traffic volumes for three scenarios:

1. Existing (2019)
2. Future No Build (2045)
3. Future Build (2045)

Quality Counts, LLC conducted the turning movement counts on February 26th, 2019 for select project intersections:

1. Lake Wheeler Road at Carolina Pines Avenue
2. Carolina Pines Avenue at Henslowe Drive
3. Carolina Pines Avenue at Suffolk Boulevard
4. Carolina Pines Avenue at Granite Street

The traffic growth rate used in this analysis was determined in a meeting between Lochner and the City of Raleigh. The turning movement counts and the growth rate are included in Appendix A. The results of the analysis will be used to support the build alternative development process and preliminary design for the project.

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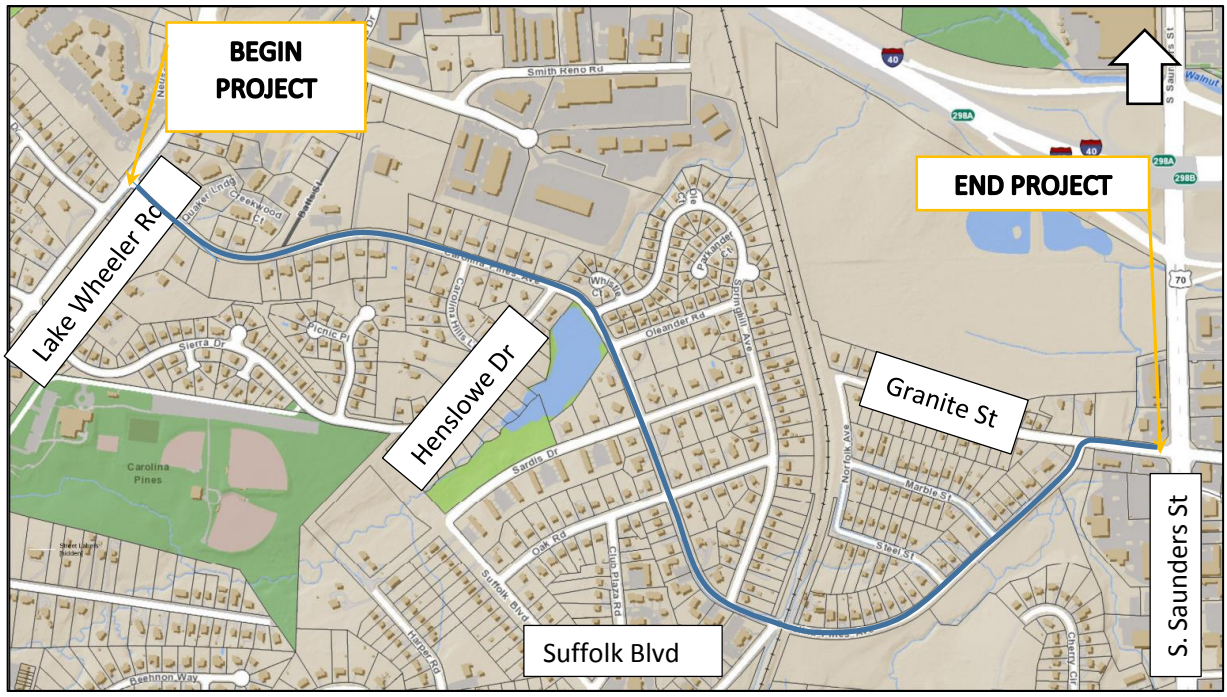

Figure 1: Project Area

Roadway Characteristics

Carolina Pines Ave

Carolina Pines Avenue is an east-west two-way secondary route facility in the study area. It is classified as a Major collector, on NCDOT's Functional Classification system and has a statutory speed limit of 35 miles per hour (mph). The Average Annual Daily Traffic (AADT) of Carolina Pines Avenue is 3,300 vehicles per day (vpd), and land uses mainly residential.

Lake Wheeler Road

Lake Wheeler Road is a two-lane, north-south roadway that operates as minor arterial and has an AADT south of Carolina Pines Avenue of 13,000 vpd and north of Carolina Pines Ave with AADT of 22,000 vpd. Lake Wheeler Road is the western terminus of the project and has a posted speed limit of 35 mph. Land uses range from residential and agricultural to commercial/industrial.

Henslowe Drive, Suffolk Boulevard, and Granite Street

These roads are two-lane roadways and are classified as Local Roads according to NCDOT's Functional Classification system. They all terminate at Carolina Pines Avenue forming "T-type" or 3-legged intersections.

Suffolk Boulevard and Granite Street serve single-family and multi-family residential units. Granite Street has no other outlets for traffic besides Carolina Pines Avenue, while Suffolk Boulevard connects to Fairway Drive which intersects Tryon Road. Henslowe Drive turns into Sierra Drive and provides an outlet at a signalized intersection with Lake Wheeler Road.

The posted speed limit is 25 miles per hour (mph) for all local roads within the project area.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Traffic Capacity Method of Analysis

This project was analyzed using Synchro Professional Version 9.1 for both signalized and un-signalized intersections. The traffic capacity analysis was conducted by utilizing NCDOT's Congestion Management's Capacity Analysis Guidelines and the City of Raleigh Street Design Manual. Synchro software was used to analyze the AM and PM peak hour traffic volumes under three scenarios, one for the existing condition (2019 Base Year), one for future (2045 No build) and one for future (2045 Build) design year conditions. The level of service provided per intersection under these scenarios is considered to be the measure of effectiveness for traffic operations. Table 1 identifies the analysis type and scenario for each location. The Synchro reports are provided in Appendices B-D.

Table 1: Analysis Type per Location

Intersection Location (Route)	Analysis Type	Scenario
Lake Wheeler Road / Carolina Pines Avenue	Un-Signalized	2019 Existing 2045 No-Build
Lake Wheeler Road / Carolina Pines Avenue	Signalized	2045 Build
Carolina Pines Avenue / Henslowe Drive	Un-Signalized	All
Carolina Pines Avenue / Suffolk Boulevard	Un-Signalized	All
Carolina Pines Avenue / Granite Street	Un-Signalized	All

Measures of Effectiveness (MOE)

Level of Service

Level of service (LOS) is a qualitative stratification of performance measure describing operational conditions of a traffic stream along a roadway or at an intersection of two roadways. Six levels of service are defined from A to F, with LOS A representing little to no delay and LOS F representing heavy congestion and large delays. The Transportation Research Board's Highway Capacity Manual (2010) presents procedures and guidelines for the determination of level of service for various traffic operational conditions. Table 2 lists the LOS criteria applied to un-signalized and signalized intersections.

Jun 12, 2019 11_20_27 AM
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Table 2: Level of Service Criteria for Intersections

Level of Service (v/c < 1.0)	Level of Service (v/c >1.0)	Un-signalized Intersections* Control Delay (seconds/vehicle)	Signalized Intersections** Control Delay (seconds/vehicle)
A	F	0-10	0-10
B	F	>10-15	>10-20
C	F	>15-25	>20-35
D	F	>25-35	>35-55
E	F	>35-50	>55-80
F	F	>50	>80

* The LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major street approaches or for the intersection as a whole (Highway Capacity Manual 2010 – Exhibit 19-1).

**For approach-based and intersection assessments, LOS is defined solely by control delay (Highway Capacity Manual 2010 – Exhibit 18-4).

Highway Capacity Analysis Results

2019 Existing

The 2019 Existing scenario was analyzed. This analysis includes four un-signalized intersections. The existing road network and lane configurations are utilized in the analysis with no changes or improvements. Table 3 summarizes the level of service and delay (in seconds) that result from the traffic analysis. Noteworthy results from the 2019 Existing traffic analysis include:

1. The un-signalized intersection of Carolina Pines Avenue at Lake Wheeler Road operates at an unacceptable LOS F for the WB approach during both AM and PM peak hours. All other approaches operate at an acceptable level-of-service with LOS of B.
2. Turning movements from the minor roads onto Carolina Pines Avenue operate at an acceptable LOS B or better.

The Synchro traffic analysis output for the 2019 Existing condition are provided in Appendix B.

2045 No-Build Scenario

The 2045 No-Build scenario was analyzed. This analysis includes the same intersections, the same road network, and the same lane configurations as the 2019 Existing analysis. The annual traffic growth rate was established at 1% (see Appendix A) and was applied to the 2019 turning movement counts to determine the 2045 traffic volumes to be used in the analysis. The growth factor accounts for general background traffic growth in the corridor. Table 3 summarizes the level of service and delays that result from the 2045 No-Build traffic analysis.

It is clear from Table 3, that the growth in traffic volumes will have a negative impact in terms of delay, particularly at the Lake Wheeler Road/Carolina Pines Avenue intersection during the PM peak hour. A summary of the results include:

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

1. The Un-signalized intersection of Carolina Pines Avenue at Lake Wheeler Road operates at an unacceptable LOS F for the WB approach in both the AM and PM peak hours.
2. Turning movements from the minor roads to Carolina Pines Avenue operate at acceptable LOS B or better during the AM and PM peak hours.

The Synchro traffic analysis reports for this scenario can be found in Appendix C.

2045 Build Scenario

This scenario includes the proposed improvements to widen Carolina Pines Avenue, from Lake Wheeler Road to S. Saunders Street, to a two-lane undivided facility with bike lanes and sidewalks in both directions (see Figure 2). For the purposes of this traffic analysis, a new traffic signal at Lake Wheeler Road is included based on a warrant analysis (see section on Traffic Signal Analysis later in the Technical Memorandum) under the 2019 Existing conditions. Also, this analysis includes an evaluation to install roundabouts at the intersection of Lake Wheeler Road, as an alternative to a traffic signal, and Granite Street. Two alternatives were evaluated for the intersection of Lake Wheeler Road. The first alternative was a single lane for all approaches entering and exiting the roundabout (see Figure 3). The second alternative was a single entering lane for the northbound (NB) and westbound (WB) approaches, and separating the left from the through movement for the southbound (SB) approach. This way only the SB left-turn lane (which is a 150' lane) will be circulating into the roundabout, while the SB through movement will be in a "bypass" lane. To support the second scenario a short exit lane will be provided to the south leg of the roundabout (see Figure 3).

For the 2045 Build scenario, Table 3 summarizes the level of service and delays that result from the Synchro analysis of signalized/un-signalized intersections. Table 4 summarizes the level of service for roundabouts that result from Sidra traffic analysis.

1. The signalized intersection of Carolina Pines Avenue at Lake Wheeler Road will operate at an overall acceptable LOS C or better during the AM and PM peak hours with the proposed improvements, with all approaches operating at LOS D or better.
2. The SB left-turn lane operates at an acceptable LOS D or better (at the intersection of Lake Wheeler Road and Carolina Pines Avenue). However, after running the simulation using the Simtraffic tool, the queuing length for this lane still exceeds the current storage lane (see Table 5) which is limited due to the NB left-turn lane into Village Green Apartments.
3. Turning movements from/to the minor streets continue to operate at acceptable LOS B or better during the AM and PM peak hours.
4. The Roundabout alternative at the Lake Wheeler Road intersection will operate at LOS F for Alternative 1 and LOS A for Alternative 2 (see Table 4).

All of the Synchro/Sidra traffic analysis reports for this scenario can be found in Appendix D.

Jun 12, 2019 11_20_27 AM
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Table 3: Synchro Results

		Traffic Signal(Synchro)								
		LOS Results (Delay)								
			2019 Existing		2045 No-Build		2045 Build (Un-Signalized)		2045 Build -Signal	
Intersection	Node #	Approach	AM	PM	AM	PM	AM	PM	AM	PM
Lake Wheeler Road @ Carolina Pines Avenue	3	WB	F(173.4)	F(91.5)	F(191)	F(843.4)			B(18.4)	B(15.1)
		NB							B(18.6)	A(9.6)
		SB/SBL(Un-Signalized)	B(10.9)	A(9.5)	A(10)	B(11)			B(11.3)	D(45.5)
		overall							B(16.2)	C(32.9)
Carolina Pines Avenue @ Suffolk Boulevard	8	NE	B(10.1)	B(10.8)	B(11)	B(12.1)	B(11)	B(11.8)		
		WBL	A(7.4)	A(7.9)	A(7.4)	A(8.1)	A(7.4)	A(8.1)		
Carolina Pines Avenue @ Granite Steet	11	NBL	A(0)	A(7.3)	A(7.3)	A(7.3)	A(7.3)	A(7.3)		
		EB	A(8.4)	A(8.5)	A(8.5)	A(8.6)	A(8.5)	A(8.6)		
		WBL	A(7.9)	A(8.1)	A(8.2)	A(8.4)	A(8.2)	A(8.4)		
Carolina Pines Avenue @ Henslowe Drive.	17	NE	A(9.1)	A(9.7)	A(9.4)	B(10.2)	A(9.4)	B(10.2)		
		WBL	A(7.4)	A(7.7)	A(7.4)	A(7.9)	A(7.4)	A(7.9)		

Table 4: Sidra Results

			Roundabout(Sidra)			
			LOS Results(Delay)			
Intersection	Node #		2045 Build -Alternative 1		2045 Build -Alternative 2	
		Approach	AM	PM	AM	PM
Lake Wheeler Road @ Carolina Pines Avenue	3	WB	C	A	C(18.4)	A(8.2)
		NB	B	B	B(11.9)	C(15.2)
		SB/SBL	A	F	A(0.2)	A(0.9)
		overall	B	F	A(9.3)	A(5.5)
Carolina Pines Avenue @ Granite Street	11	NB	A	A	N/A	
		EB	A	A		
		WB	A	A		
		overall	A	A		

Table 5: Queuing Results

	Approach	Storage(')	Queuing(')					
Node #			2019-Existing		2045 No Build		2045 Build	
			AM	PM	AM	PM	AM	PM
3	SBL	150	48	76	47	97	86	217
	WB	2162	832	143	889	1573	242	132

Jun 12, 2019 11_20_27 AM
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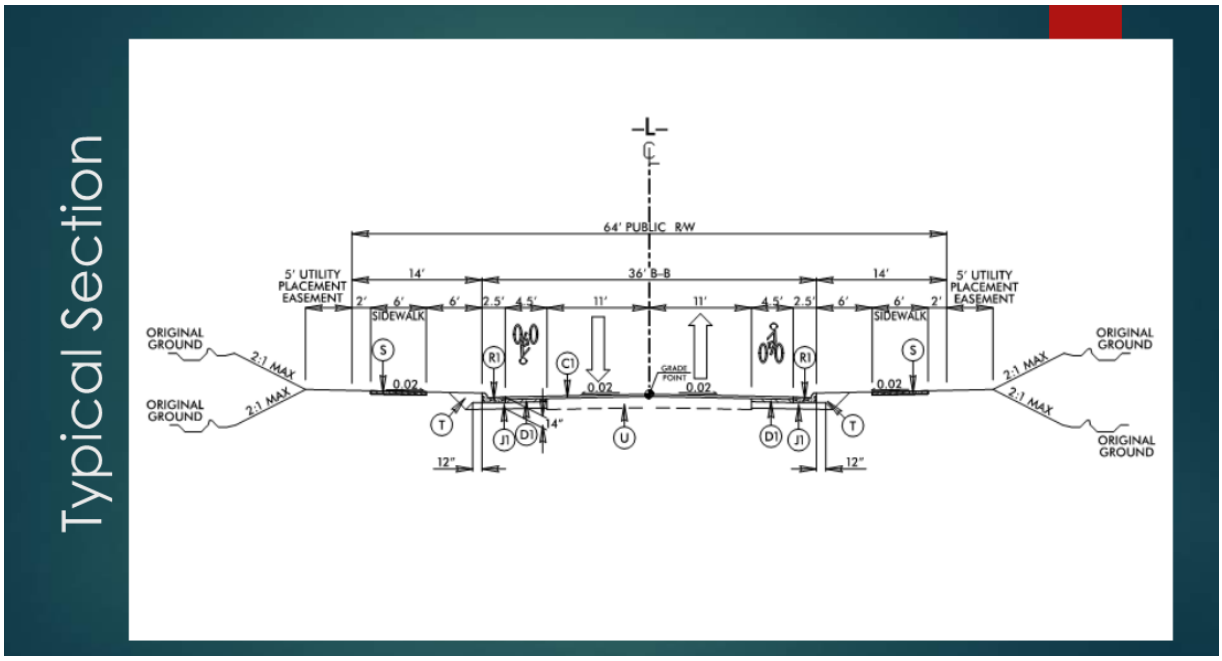

Figure 2: Typical Section

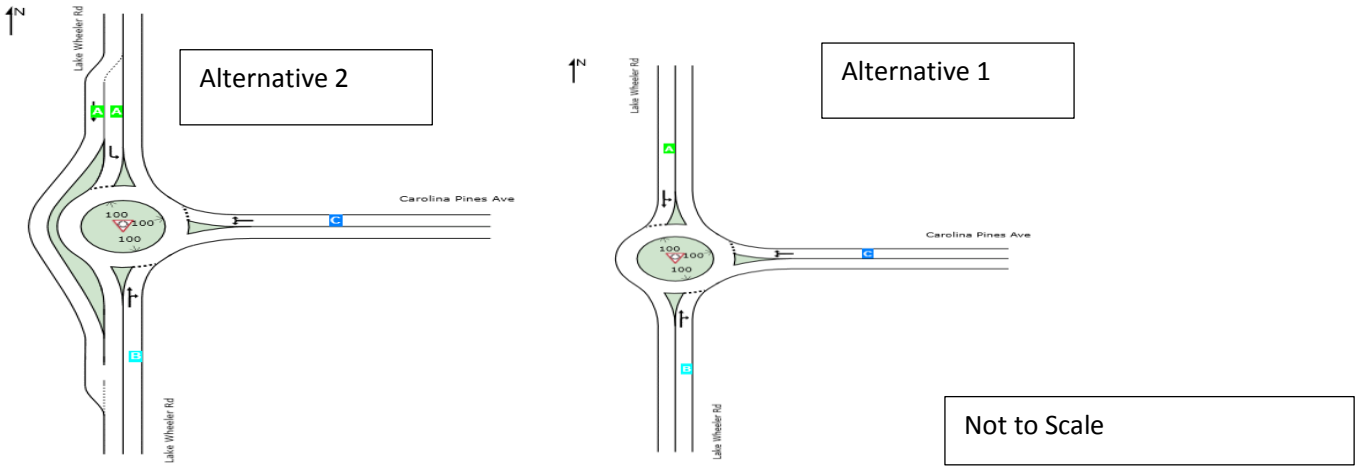

Figure 3-Alternative Roundabout Designs at Lake Wheeler Road

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Signal Warrant Analysis

The City of Raleigh requested a signal warrant analysis for the intersection of Carolina Pines Avenue and Lake Wheeler Road to evaluate the potential need for installation of a traffic signal. This analysis includes assessment of traffic signal warrants detailed in the 2009 Manual on Uniform Traffic Control Devices (MUTCD), namely:

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

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

Several of the warrants can be eliminated from consideration based on the following:

- **Warrant 4, Pedestrian Volume** – There were no pedestrians counted at this location during the 16-hour period, therefore this warrant can be eliminated.
- **Warrant 5, School Crossing** – There is no nearby schools nor do school children cross Lake Wheeler Road or Carolina Pines Avenue at this location, therefore Warrant 5 can be eliminated.
- **Warrant 6, Coordinated Signal System** – This section of Lake Wheeler Road is not controlled by a coordinated traffic signal system and a traffic control signal is not necessary to maintain the proper platooning of vehicles in the traffic stream, therefore Warrant 6 can be eliminated.
- **Warrant 8, Roadway Network** - The intersection location selected for analysis is not considered an intersection of two or more major routes as defined in the MUTCD, therefore Warrant 8 can be eliminated from the analysis.
- **Warrant 9, Intersection near a Grade Crossing** – There is no at-grade highway/rail crossing within 140 feet of the intersection location. For this reason, Warrant 9 can be eliminated.

The Eight Hour Vehicular Volume Warrant (Warrant 1), the Four-Hour Warrant (Warrant 2), the Peak-Hour Warrant (Warrant 3), and the Crash Experience Warrant (Warrant 7) are the applicable warrants for the given data at this intersection. The individual traffic signal warrants are discussed in more detail below.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Warrant 1: Eight-Hour Vehicular Volume

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

Condition B, is intended for application where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

If Condition A is satisfied (100% or 70%), then the criteria for Warrant 1 is satisfied and Condition B and the combination of Conditions A and B do not require analysis to consider the warrant "satisfied." Similarly, if Condition B is satisfied (100% or 70%), then the criteria for Warrant 1 is satisfied and the combination of Conditions A and B do not require analysis. In case neither condition A or B are satisfied in their 100% or 70% conditions, then the combination of Condition A and B is analyzed for 80% or 56% to meet the warrant.

After conducting the analysis for warrant 1, Condition B (100%) was satisfied therefore Warrant 1 is satisfied. See Appendix D for detailed tables and charts.

Warrant 2: Four Hour Vehicular Volume

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

Due to a volume on the minor street that is higher than the minimum threshold of 80 vph, the intersection of Lake Wheeler Road and Carolina Pines Avenue satisfies Warrant 2 criteria. See Appendix D for detailed tables and charts.

Warrant 3: Peak Hour

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of one hour of an average day, the minor-street traffic suffers delay when entering or crossing the major street. The MUTCD states that this warrant is intended for application where a land use attracts or discharges a large number of vehicles over a short time.

Warrant 3 is satisfied under category B using 2019 traffic volumes. The plotted point (Figure 4C-3 in Appendix D) representing the total approach volume on Lake Wheeler Road (major – both directions) and the corresponding volume on Carolina Pines Avenue (minor – one direction only) for a 1-hour period. It stands to reason that Warrant 3 would also be met in the design year 2045.

Warrant 7: Crash Experience

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

Three crashes were reported during the previous 12 months, therefore Condition B is not satisfied. See Appendix D for detailed tables and charts.

Conclusion

Based on the evaluation of applicable warrants above, three of the four warrants are satisfied given the data as outlined (see Table 6). The City of Raleigh should consider the installation of a traffic control signal at this location.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Table 6: Warrant Results Summary

Warrant	Description	2019 Existing
Warrant 1	8-hr Vehicular Volume	Yes
Warrant 2	4-hr Vehicular Volume	Yes
Warrant 3	Peak Hour Volume	Yes
Warrant 4	Pedestrian Volume	Not Applicable
Warrant 5	School Crossing	Not Applicable
Warrant 6	Coordinated Signal System	Not Applicable
Warrant 7	Crash Experience	No
Warrant 8	Road Network	Not Applicable
Warrant 9	Intersection Near a Grade Crossing	Not Applicable

"Yes" the warrant is satisfied and "No" the warrant is not satisfied.

Safety Analysis

Crash Data

Crash data was provided to Lochner by the NCDOT Safety Planning Group in April 2019 (see Appendix F). The data covers a 5-year period from April 2014 through March 2019. Crash data is obtained through the North Carolina Crash Database, which is maintained by the Division of Motor Vehicles. Some reported crashes may have data deficiencies that are inherent in collecting data for, and maintaining, large databases. Also, many crashes are unreported for a variety of reasons. Any crashes identified are reported crashes in the vicinity of the project location that correlate to specific analysis parameters within a given time period.

Summary of Crash Data

Over the 5-year period from 2014 to 2019, 50 crashes were reported in the project study area. Table 7 provides a breakdown of crashes that occurred in the project study area. The dominant accident type is "Ran Off Road," which accounted for 38% of the accidents reported in the project study area, followed by accident types "Rear End" (12%) and "Left Turn" (14%). These types of crashes are common on narrow, 2-lane local roadways.

Severity

In this section, the crashes reported are examined for the number of injuries, the extent of injuries sustained, including fatalities, or if the crash resulted in no injuries but caused property damage only.

No fatalities were reported during the recent 5-year analysis period. Also, over 90% of the crashes involved injury types B and C. Table 8 summarizes the findings.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Table 7: Crash Summary

Accident Type	Carolina Pines Ave	% of Total
Angle	4	8%
Collision – Animal	3	6%
Backing Up	1	2%
Fixed Object	1	2%
Head On	3	6%
Left Turn, Different Road	3	6%
Left Turn, Same Road	4	8%
Ran off Road - Left	4	8%
Ran off Road - Right	14	28%
Ran off Road - Straight	1	2%
Rear End, Slow or Stop	5	10%
Rear End, Turn	1	2%
Sideswipe, Opposite Direction	2	4%
Sideswipe, Same Direction	3	6%
Other	1	2%
TOTALS	50	100%

Table 8: Crash Severity

Description	Totals	% of Total
Total Non-Fatal Injuries	15	100%
Class A*	1	7%
Class B*	6	40%
Class C*	8	53%
Fatalities	0	0%

* Definitions:

Class A injury type (disabling) - Injury obviously serious enough to prevent the person injured from performing his normal activities for at least one day beyond the day of the collision. Massive loss of blood, broken bone, unconsciousness of more than momentary duration are examples.

Class B injury type (evident) - Obvious injury, other than killed or disabling, which is evident at the scene. Bruises, swelling, limping, soreness, are examples and would not necessarily prevent the person from carrying on his normal activities.

Class C injury type (possible) - No visible injury, but person complains of pain, or has been momentarily unconscious.

Jun 12, 2019 11_20_27 AM
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Comparison to Statewide Rates

Crashes on the study area roadways can be compared to statewide average rates for similar roadway facilities. The statewide rates used in this analysis were provided in the NCDOT 2015-2017 edition of NC Crash Rates. Crash rates are compared on the basis of crashes per 100 million vehicle miles traveled (HMVM) to account for differences in average daily traffic (ADT) volumes on roadways across the state. Rates are computed for Accident Rate, Injury Rate, Fatality Rate, Wet Crash Rate, and Night Crash Rate. There is an additional category called the Severity Index. This formula based index takes into account variables for fatalities, Class A, B, or C injuries, Property Damage Only crashes, and the total number of crashes. Table 9 identifies these crash rates, along with the Severity Index, for the Carolina Pines Avenue project area. Red text indicates that the rate/index exceeds the statewide average rate for that category.

As shown in Table 9, the total crash rate along Carolina Pines Avenue is significantly higher than the statewide average for similar facilities, the injury rate is lower, the fatality rate is zero, and the Severity Index is slightly lower than the statewide average**.**

Table 9: Crash Rates

Highway Segment	Segment Length (Miles)	ADT* 2019	Accident Rate (HMVM)	Injury Rate (HMVM)	Fatality Rate (HMVM)	Wet Crash Rate	Night Crash Rate	Severity Index
Carolina Pines Avenue	1.28	4700	**465.05**	**83.71**	**0**	**102.31**	**176.72**	3.7
Statewide Rate (Secondary Road – Urban)			**315.24**	**93.99**	**1.05**	**50.12**	**73.43**	**3.96**

*****ADT provided in NCDOT Crash Analysis.

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Conclusions and Recommendations

While conducting this analysis to evaluate traffic operations at specific locations in the Carolina Pines Avenue project area, the analysis shows that all intersecting roads operate with an acceptable approach LOS B or better for all scenarios, except at the Lake Wheeler Road location. This intersection has a LOS of F in the AM and PM peak hours for the WB approach in both 2019 Existing and 2045 No-Build scenarios. A Traffic Signal Warrant analysis was conducted and 3 out of 4 applicable traffic signal warrants were satisfied. A Traffic Signal will improve traffic operations at the intersection to LOS C or better (for Design Year 2045). However, a traffic signal will create a queuing problem for the SB approach caused by the SB through movement blocking access to the SB left-turn lane which cannot be lengthened due to constraints with a NB left-turn lane to Village Green Apartments. A Roundabout alternative was also evaluated for this location. Two roundabout alternatives were developed. The first alternative was a single lane for all approaches entering and exiting the roundabout (See Figure 3) And the second alternative was a single entering lane for the northbound (NB) and westbound (WB) approaches, and separating the left-turn from the through movement for the southbound (SB) approach. The second alternative will be more efficient and operate with an overall LOS A during both peak hours (for the Design Year 2045). A Roundabout (Alternative 2) at Lake Wheeler Road and Carolina Pines Avenue will also relieve the vehicular queuing for the SB approach by preventing the SB through movement from blocking the SB left turning traffic to access the intersection (SB through movement will have a dedicated lane circulating the roundabout and a short receiving lane).

Jun 12, 2019 11_20_27 AM
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APPENDIX A

Traffic Counts and Growth Rates

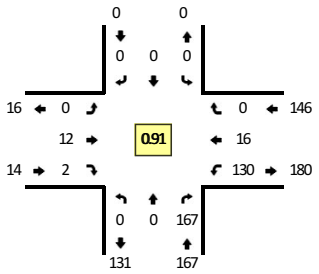
Type of peak hour being reported: Intersection Peak

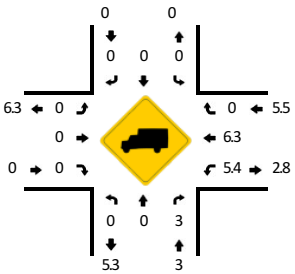
Method for determining peak hour: Total Entering Volume

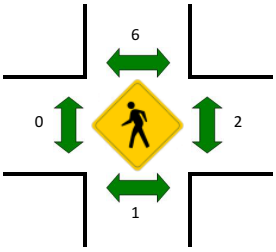
LOCATION: Carolina Pines Ave -- Granite St
CITY/STATE: Raleigh, NC

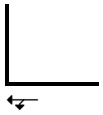
QC JOB #: 14785202
DATE: Tue, Feb 26 2019

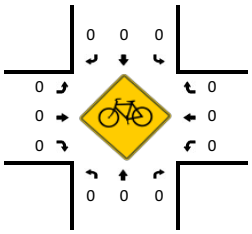
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

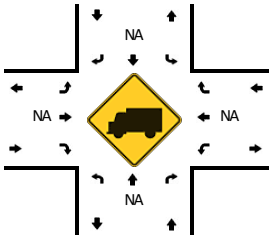


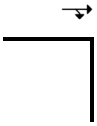


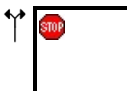


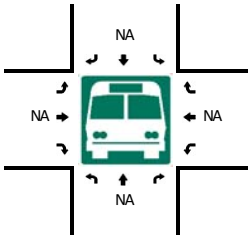












15-Min Count Period Beginning At	Carolina Pines Ave (Northbound)				Carolina Pines Ave (Southbound)				Granite St (Eastbound)				Granite St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	28	0	0	0	0	0	0	3	1	0	33	1	0	0	66	
7:15 AM	0	0	39	0	0	0	0	0	0	1	0	0	35	3	0	0	78	
7:30 AM	0	0	33	0	0	0	0	0	0	3	2	0	33	4	0	0	75	
7:45 AM	0	0	54	0	0	0	0	0	0	5	0	0	30	1	0	0	90	309
8:00 AM	0	0	41	0	0	0	0	0	0	3	0	0	31	8	0	1	84	327
8:15 AM	0	0	50	0	0	0	0	0	0	5	3	1	15	3	0	0	77	326
8:30 AM	0	0	33	0	0	0	0	0	0	5	0	0	23	5	0	0	66	317
8:45 AM	0	0	33	0	0	0	0	0	0	2	0	0	25	1	0	0	61	288

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	216	0	0	0	0	0	0	20	0	0	120	4	0	0	360
Heavy Trucks	0	0	4		0	0	0		0	0	0		4	0	0		8
Pedestrians		0				4				0				4			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 3/5/2019 11:33 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

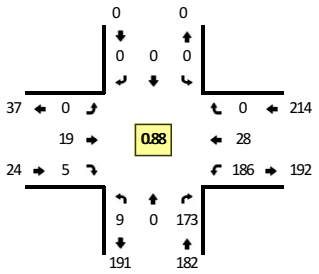
Type of peak hour being reported: Intersection Peak

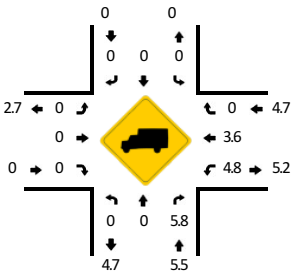
Method for determining peak hour: Total Entering Volume

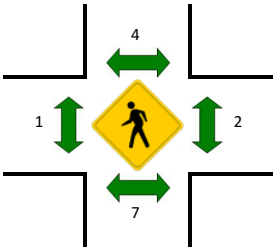
LOCATION: Carolina Pines Ave -- Granite St
CITY/STATE: Raleigh, NC

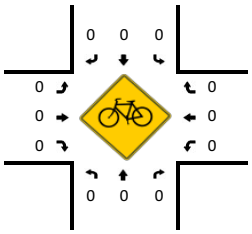
QC JOB #: 14785203
DATE: Tue, Feb 26 2019

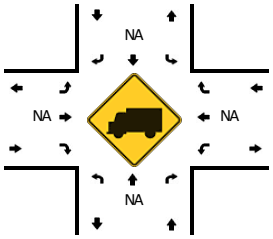
Peak-Hour: 4:15 PM -- 5:15 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

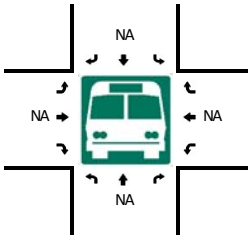












15-Min Count Period Beginning At	Carolina Pines Ave (Northbound)				Carolina Pines Ave (Southbound)				Granite St (Eastbound)				Granite St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	1	0	39	0	0	0	0	0	0	3	0	0	49	5	0	0	97	
4:15 PM	5	0	35	0	0	0	0	0	0	3	0	0	47	9	0	0	99	
4:30 PM	0	0	49	0	0	0	0	0	0	6	3	0	55	7	0	0	120	
4:45 PM	2	0	46	0	0	0	0	0	0	6	2	0	38	6	0	0	100	416
5:00 PM	2	0	43	0	0	0	0	0	0	4	0	0	46	6	0	0	101	420
5:15 PM	1	0	35	0	0	0	0	0	0	4	2	0	50	4	0	0	96	417
5:30 PM	1	0	47	0	0	0	0	0	0	0	1	0	54	6	0	0	109	406
5:45 PM	1	0	53	0	0	0	0	0	0	4	1	0	48	7	0	0	114	420

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	196	0	0	0	0	0	0	24	12	0	220	28	0	0	480
Heavy Trucks	0	0	16		0	0	0		0	0	0		16	4	0		36
Pedestrians		8				8				0				8			24
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 3/5/2019 11:33 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

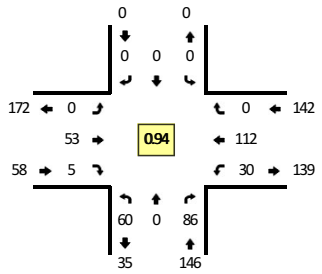
Type of peak hour being reported: Intersection Peak

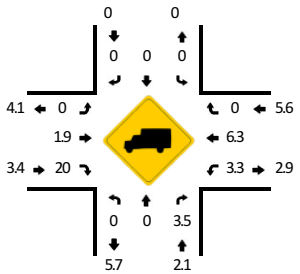
Method for determining peak hour: Total Entering Volume

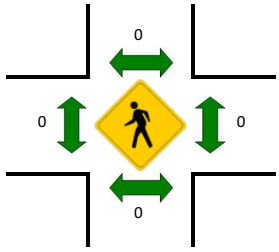
LOCATION: Suffolk Blvd -- Carolina Pines Ave
CITY/STATE: Raleigh, NC

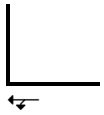
QC JOB #: 14785204
DATE: Tue, Feb 26 2019

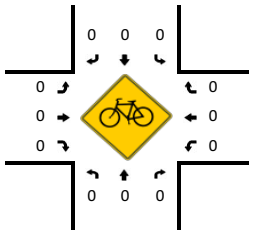
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

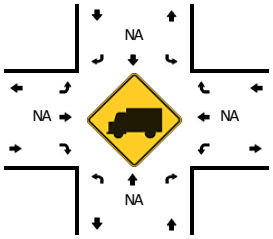


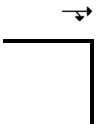


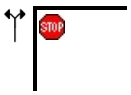


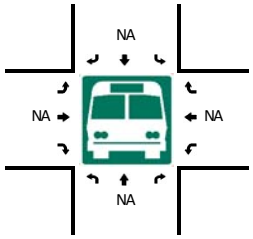












15-Min Count Period Beginning At	Suffolk Blvd (Northbound)				Suffolk Blvd (Southbound)				Carolina Pines Ave (Eastbound)				Carolina Pines Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	16	0	17	0	0	0	0	0	0	5	4	0	7	34	0	0	83	
7:15 AM	13	0	21	0	0	0	0	0	0	15	0	0	6	26	0	0	81	
7:30 AM	19	0	18	0	0	0	0	0	0	15	0	0	8	30	0	0	90	
7:45 AM	12	0	30	0	0	0	0	0	0	18	1	0	9	22	0	0	92	346
8:00 AM	10	0	27	0	0	0	0	0	0	14	1	0	7	24	0	0	83	346
8:15 AM	7	0	28	0	0	0	0	0	0	20	1	0	5	16	0	0	77	342
8:30 AM	8	0	15	0	0	0	0	0	0	16	2	0	5	22	0	0	68	320
8:45 AM	2	0	21	0	0	0	0	0	0	12	3	0	6	18	0	0	62	290

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	48	0	120	0	0	0	0	0	0	72	4	0	36	88	0	0	368
Heavy Trucks	0	0	4		0	0	0		0	0	0		4	0	0		8
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 3/5/2019 11:33 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

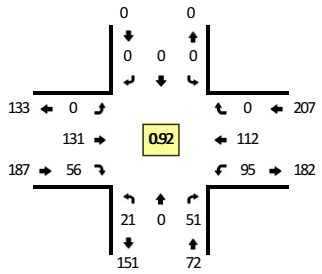
Type of peak hour being reported: Intersection Peak

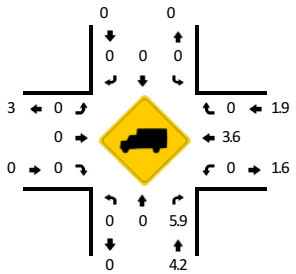
Method for determining peak hour: Total Entering Volume

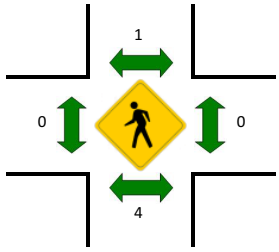
LOCATION: Suffolk Blvd -- Carolina Pines Ave
CITY/STATE: Raleigh, NC

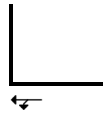
QC JOB #: 14785205
DATE: Tue, Feb 26 2019

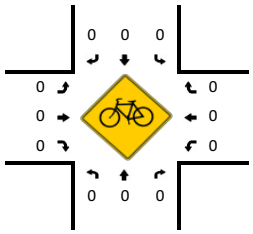
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

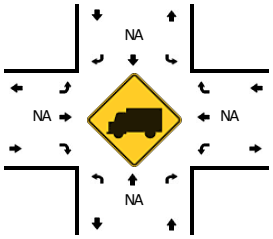


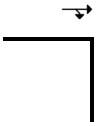


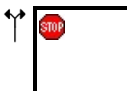


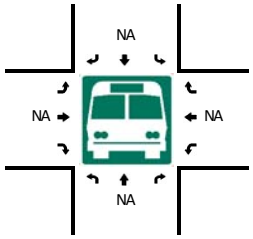












15-Min Count Period Beginning At	Suffolk Blvd (Northbound)				Suffolk Blvd (Southbound)				Carolina Pines Ave (Eastbound)				Carolina Pines Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	3	0	7	0	0	0	0	0	0	31	6	0	23	20	0	0	90	
4:15 PM	3	0	14	0	0	0	0	0	0	26	9	0	18	36	0	0	106	
4:30 PM	3	0	17	0	0	0	0	0	0	33	8	0	19	37	0	0	117	
4:45 PM	6	0	9	0	0	0	0	0	0	31	10	0	7	23	0	0	86	399
5:00 PM	6	0	9	0	0	0	0	0	0	39	13	0	19	40	0	0	126	435
5:15 PM	5	0	10	0	0	0	0	0	0	22	9	0	25	25	0	0	96	425
5:30 PM	5	0	14	0	0	0	0	0	0	34	20	0	26	25	0	0	124	432
5:45 PM	5	0	18	0	0	0	0	0	0	36	14	0	25	22	0	0	120	466

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	24	0	36	0	0	0	0	0	0	156	52	0	76	160	0	0	504
Heavy Trucks	0	0	4		0	0	0		0	0	0		0	12	0		16
Pedestrians		8				0				0				0			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 3/5/2019 11:33 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

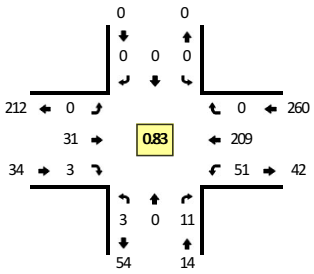
Type of peak hour being reported: Intersection Peak

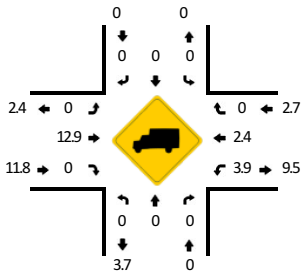
Method for determining peak hour: Total Entering Volume

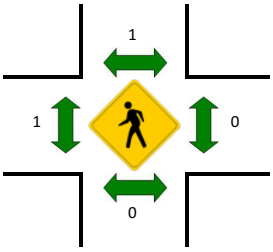
LOCATION: Henslowe Dr -- Carolina Pines Ave
CITY/STATE: Raleigh, NC

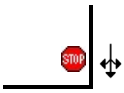
QC JOB #: 14785206
DATE: Tue, Feb 26 2019

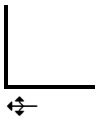
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

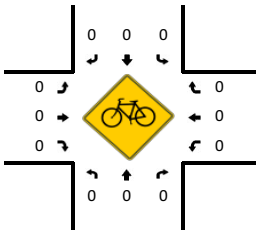


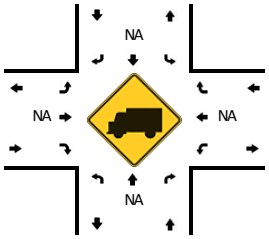


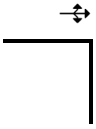


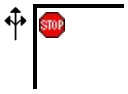


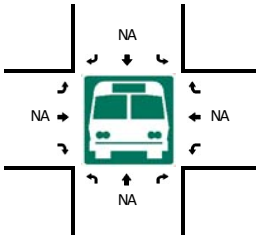












15-Min Count Period Beginning At	Henslowe Dr (Northbound)				Henslowe Dr (Southbound)				Carolina Pines Ave (Eastbound)				Carolina Pines Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	3	0	3	0	0	0	0	0	0	3	0	0	12	45	0	0	66	
7:15 AM	0	0	2	0	0	0	0	0	0	10	0	0	8	55	0	0	75	
7:30 AM	0	0	3	0	0	0	0	0	0	9	2	0	19	60	0	0	93	
7:45 AM	0	0	3	0	0	0	0	0	0	9	1	0	12	49	0	0	74	308
8:00 AM	0	0	1	0	0	0	0	0	0	16	0	0	7	39	0	0	63	305
8:15 AM	1	0	5	0	0	0	0	0	0	10	0	0	11	28	0	0	55	285
8:30 AM	0	0	3	0	0	0	0	0	0	10	1	0	11	23	0	0	48	240
8:45 AM	0	0	1	0	0	0	0	0	0	13	1	0	5	23	0	0	43	209

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	12	0	0	0	0	0	0	36	8	0	76	240	0	0	372
Heavy Trucks	0	0	0		0	0	0		0	0	0		4	4	0		8
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 3/5/2019 11:33 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

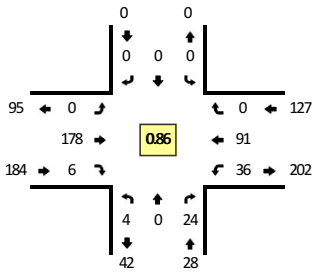
Type of peak hour being reported: Intersection Peak

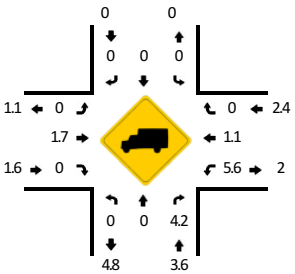
Method for determining peak hour: Total Entering Volume

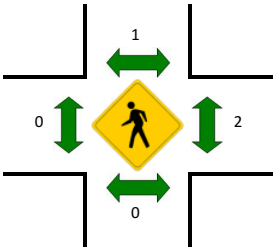
LOCATION: Henslowe Dr -- Carolina Pines Ave
CITY/STATE: Raleigh, NC

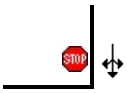
QC JOB #: 14785207
DATE: Tue, Feb 26 2019

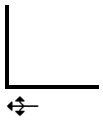
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

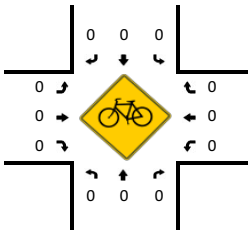


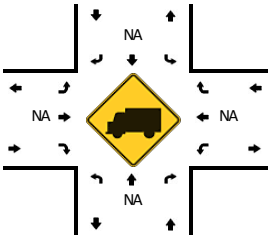


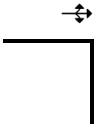


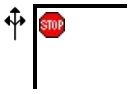


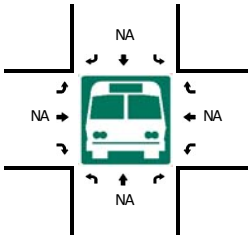












15-Min Count Period Beginning At	Henslowe Dr (Northbound)				Henslowe Dr (Southbound)				Carolina Pines Ave (Eastbound)				Carolina Pines Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	1	0	2	0	0	0	0	0	0	37	2	0	7	9	0	0	58	
4:15 PM	0	0	4	0	0	0	0	0	0	42	1	0	4	30	0	0	81	
4:30 PM	2	0	6	0	0	0	0	0	0	39	1	0	8	21	1	0	78	
4:45 PM	0	0	9	0	0	0	0	0	0	32	1	0	5	23	0	0	70	287
5:00 PM	1	0	9	0	0	0	0	0	0	52	0	0	16	21	0	0	99	328
5:15 PM	0	0	3	0	0	0	0	0	0	44	3	0	7	27	0	0	84	331
5:30 PM	3	0	3	0	0	0	0	0	0	50	2	0	8	20	0	0	86	339
5:45 PM	0	0	3	0	0	0	0	0	0	40	0	0	7	19	0	0	69	338

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	0	36	0	0	0	0	0	0	208	0	0	64	84	0	0	396
Heavy Trucks	0	0	0		0	0	0		0	4	0		4	0	0		8
Pedestrians		0				4				0				8			12
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 3/5/2019 11:33 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Growth Rate	# OF YEARS
0.01	26

Lake Wheeler Rd

	AM	0	379	28
2019	*PM*	*0*	*935*	*180*
	AM	**0**	**491**	**36**
2045	*PM*	**0**	**1211**	**233**

Carolina Pines Ave

0	595	24	AM	2019
0	474	44	PM	
0	**771**	**31**	AM	2045
0	**614**	**57**	PM	

Lake Wheeler Rd

2019		2045	
AM	PM	AM	PM
189	78	**245**	**101.03**
		0	**0**
44	32	**57**	**41.4482**

Growth Rat	# OF YEARS
0.01	26

Carolina Pines Ave

2019		2045	
AM	PM	AM	PM
31	178	**40**	**231**
3	5	**4**	**6**

2019		2045	
AM	PM	AM	PM
209	91	**271**	**118**
51	36	**66**	**47**

3	11	AM	
4	24	PM	2019
4	**14**	AM	
5	**31**	PM	2045

Henslowe Dr

Growth Rat	# OF YEARS
0.01	26

Carolina Pines Ave

2019		2045	
AM	PM	AM	PM
53	131	**69**	**170**
5	56	**6**	**73**

2019		2045	
AM	PM	AM	PM
112	112	**145**	**145**
30	95	**39**	**123**

60	86	AM	
21	51	PM	2019
78	**111**	AM	
27	**66**	PM	2045

Suffolk Blvd

Growth Rai	# OF YEARS
0.01	26

Carolina Pines Ave

2019		2045	
AM	PM	AM	PM
2	19	**3**	**25**
12	5	**16**	**6**

2019		2045	
AM	PM	AM	PM
16	28	**21**	**36**
129	186	**167**	**241**

0	167	AM	
9	173	PM	2019
0	**216**	AM	
12	**224**	PM	2045

Granite St

APPENDIX B

2019 Existing Analysis Reports

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lanes, Volumes, Timings
3: Lake Wheeler Rd & Carolina Pines Ave

04/23/2019

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	44	189	959	24	28	375
Future Volume (vph)	44	189	959	24	28	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	150	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.891		0.997			
Flt Protected	0.991				0.950	
Satd. Flow (prot)	1645	0	1857	0	1770	1863
Flt Permitted	0.991				0.950	
Satd. Flow (perm)	1645	0	1857	0	1770	1863
Link Speed (mph)	35		35			35
Link Distance (ft)	2259		1198			1271
Travel Time (s)	44.0		23.3			24.8
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	49	210	1066	27	31	417
Shared Lane Traffic (%)						
Lane Group Flow (vph)	259	0	1093	0	31	417
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 72.7%	ICU Level of Service C
Analysis Period (min) 15	

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	25.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	189	959	24	28	375
Future Vol, veh/h	44	189	959	24	28	375
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	49	210	1066	27	31	417

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1558	1079	0	0	1092	0
Stage 1	1079	-	-	-	-	-
Stage 2	479	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	124	265	-	-	639	-
Stage 1	326	-	-	-	-	-
Stage 2	623	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	118	265	-	-	639	-
Mov Cap-2 Maneuver	118	-	-	-	-	-
Stage 1	326	-	-	-	-	-
Stage 2	593	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	173.4	0	0.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	215	639	-
HCM Lane V/C Ratio	-	-	1.204	0.049	-
HCM Control Delay (s)	-	-	173.4	10.9	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	13	0.2	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	53	5	30	112	60	86
Future Volume (vph)	53	5	30	112	60	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.988				0.920	
Flt Protected				0.990	0.980	
Satd. Flow (prot)	1840	0	0	1844	1679	0
Flt Permitted				0.990	0.980	
Satd. Flow (perm)	1840	0	0	1844	1679	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	307			1969	556	
Travel Time (s)	6.0			38.4	10.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	59	6	33	124	67	96
Shared Lane Traffic (%)						
Lane Group Flow (vph)	65	0	0	157	163	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 29.5%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	4.9

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	53	5	30	112	60	86
Future Vol, veh/h	53	5	30	112	60	86
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	59	6	33	124	67	96

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	64	0	253	62
Stage 1	-	-	-	-	62	-
Stage 2	-	-	-	-	191	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1538	-	736	1003
Stage 1	-	-	-	-	961	-
Stage 2	-	-	-	-	841	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1538	-	719	1003
Mov Cap-2 Maneuver	-	-	-	-	719	-
Stage 1	-	-	-	-	961	-
Stage 2	-	-	-	-	822	-

Approach	EB	WB	NE
HCM Control Delay, s	0	1.6	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	863	-	-	1538	-
HCM Lane V/C Ratio	0.188	-	-	0.022	-
HCM Control Delay (s)	10.1	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.1	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2	12	129	16	0	167
Future Volume (vph)	2	12	129	16	0	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.883				0.865	
Flt Protected				0.957		
Satd. Flow (prot)	1645	0	0	1783	1611	0
Flt Permitted				0.957		
Satd. Flow (perm)	1645	0	0	1783	1611	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	1216			260	1969	
Travel Time (s)	23.7			5.1	38.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	13	143	18	0	186
Shared Lane Traffic (%)						
Lane Group Flow (vph)	15	0	0	161	186	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.7%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2	12	129	16	0	167
Future Vol, veh/h	2	12	129	16	0	167
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	13	143	18	0	186

Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	490	18	186	0	18	0
Stage 1	304	-	-	-	-	-
Stage 2	186	-	-	-	-	-
Critical Hdwy	6.52	6.22	4.12	-	4.12	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	4.018	3.318	2.218	-	2.218	-
Pot Cap-1 Maneuver	479	1061	1388	-	1599	-
Stage 1	663	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	1061	1388	-	1599	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	8.4	7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBR	EBLn1	WBL	WBT
Capacity (veh/h)	1599	-	1061	1388	-
HCM Lane V/C Ratio	-	-	0.015	0.103	-
HCM Control Delay (s)	0	-	8.4	7.9	0
HCM Lane LOS	A	-	A	A	A
HCM 95th %tile Q(veh)	0	-	0	0.3	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	31	3	51	209	3	11
Future Volume (vph)	31	3	51	209	3	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.989				0.892	
Flt Protected				0.990	0.990	
Satd. Flow (prot)	1842	0	0	1844	1645	0
Flt Permitted				0.990	0.990	
Satd. Flow (perm)	1842	0	0	1844	1645	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	2259			288	493	
Travel Time (s)	44.0			5.6	9.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	34	3	57	232	3	12
Shared Lane Traffic (%)						
Lane Group Flow (vph)	37	0	0	289	15	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.5%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	1.6

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	31	3	51	209	3	11
Future Vol, veh/h	31	3	51	209	3	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	3	57	232	3	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	38	0	382	36
Stage 1	-	-	-	-	36	-
Stage 2	-	-	-	-	346	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1572	-	620	1037
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	716	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1572	-	594	1037
Mov Cap-2 Maneuver	-	-	-	-	594	-
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	686	-

Approach	EB	WB	NE
HCM Control Delay, s	0	1.4	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	894	-	-	1572	-
HCM Lane V/C Ratio	0.017	-	-	0.036	-
HCM Control Delay (s)	9.1	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:45	6:45	6:45	6:45	6:45	6:45	6:45
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	1843	1926	1878	1856	1798	1849	1791
Vehs Exited	1835	1908	1877	1830	1803	1824	1776
Starting Vehs	39	55	38	48	48	35	34
Ending Vehs	47	73	39	74	43	60	49
Travel Distance (mi)	1030	1092	1055	1055	1020	1039	1017
Travel Time (hr)	40.1	72.8	47.5	60.7	45.3	48.9	39.8
Total Delay (hr)	5.6	36.3	12.2	25.4	11.2	14.0	5.7
Total Stops	401	472	403	462	398	430	413
Fuel Used (gal)	32.0	40.5	34.3	36.8	32.8	33.9	31.4

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:45	6:45	6:45	6:45
End Time	8:00	8:00	8:00	8:00
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	1862	1833	1812	1845
Vehs Exited	1838	1822	1821	1832
Starting Vehs	47	41	47	38
Ending Vehs	71	52	38	53
Travel Distance (mi)	1066	1049	1013	1044
Travel Time (hr)	58.5	52.7	47.9	51.4
Total Delay (hr)	22.6	17.4	13.9	16.4
Total Stops	444	456	413	429
Fuel Used (gal)	37.2	35.3	33.7	34.8

Interval #0 Information Seeding

Start Time	6:45
End Time	7:00
Total Time (min)	15

Volumes adjusted by Growth Factors.
No data recorded this interval.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	1843	1926	1878	1856	1798	1849	1791
Vehs Exited	1835	1908	1877	1830	1803	1824	1776
Starting Vehs	39	55	38	48	48	35	34
Ending Vehs	47	73	39	74	43	60	49
Travel Distance (mi)	1030	1092	1055	1055	1020	1039	1017
Travel Time (hr)	40.1	72.8	47.5	60.7	45.3	48.9	39.8
Total Delay (hr)	5.6	36.3	12.2	25.4	11.2	14.0	5.7
Total Stops	401	472	403	462	398	430	413
Fuel Used (gal)	32.0	40.5	34.3	36.8	32.8	33.9	31.4

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	1862	1833	1812	1845
Vehs Exited	1838	1822	1821	1832
Starting Vehs	47	41	47	38
Ending Vehs	71	52	38	53
Travel Distance (mi)	1066	1049	1013	1044
Travel Time (hr)	58.5	52.7	47.9	51.4
Total Delay (hr)	22.6	17.4	13.9	16.4
Total Stops	444	456	413	429
Fuel Used (gal)	37.2	35.3	33.7	34.8

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 3: Lake Wheeler Rd & Carolina Pines Ave

Movement	WB	NB	SB
Directions Served	LR	TR	L
Maximum Queue (ft)	635	19	58
Average Queue (ft)	380	1	18
95th Queue (ft)	832	9	48
Link Distance (ft)	2162	1170	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Carolina Pines Ave

Movement	WB	NE
Directions Served	LT	LR
Maximum Queue (ft)	29	66
Average Queue (ft)	2	33
95th Queue (ft)	15	55
Link Distance (ft)	1899	518
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 11: Carolina Pines Ave & Granite St

Movement	EB
Directions Served	TR
Maximum Queue (ft)	33
Average Queue (ft)	10
95th Queue (ft)	34
Link Distance (ft)	1164
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 17: Henslowe Dr & Carolina Pines Ave

Movement	WB	NE
Directions Served	LT	LR
Maximum Queue (ft)	35	23
Average Queue (ft)	2	8
95th Queue (ft)	17	23
Link Distance (ft)	249	449
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Lanes, Volumes, Timings
3: Lake Wheeler Rd & Carolina Pines Ave

04/23/2019

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	32	78	474	44	180	935
Future Volume (vph)	32	78	474	44	180	935
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	150	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.905		0.989			
Flt Protected	0.986				0.950	
Satd. Flow (prot)	1662	0	1842	0	1770	1863
Flt Permitted	0.986				0.950	
Satd. Flow (perm)	1662	0	1842	0	1770	1863
Link Speed (mph)	35		35			35
Link Distance (ft)	2259		1198			1271
Travel Time (s)	44.0		23.3			24.8
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	36	87	527	49	200	1039
Shared Lane Traffic (%)						
Lane Group Flow (vph)	123	0	576	0	200	1039
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 62.5%		ICU Level of Service B	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	6.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	78	474	44	180	935
Future Vol, veh/h	32	78	474	44	180	935
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	87	527	49	200	1039

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1990	551	0	0	576	0
Stage 1	551	-	-	-	-	-
Stage 2	1439	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	67	534	-	-	997	-
Stage 1	577	-	-	-	-	-
Stage 2	218	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	54	534	-	-	997	-
Mov Cap-2 Maneuver	54	-	-	-	-	-
Stage 1	577	-	-	-	-	-
Stage 2	174	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	91.5	0	1.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	149	997	-
HCM Lane V/C Ratio	-	-	0.82	0.201	-
HCM Control Delay (s)	-	-	91.5	9.5	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	5.3	0.7	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	131	56	95	112	21	51
Future Volume (vph)	131	56	95	112	21	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.960				0.904	
Flt Protected				0.977	0.986	
Satd. Flow (prot)	1788	0	0	1820	1660	0
Flt Permitted				0.977	0.986	
Satd. Flow (perm)	1788	0	0	1820	1660	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	307			1969	556	
Travel Time (s)	6.0			38.4	10.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	146	62	106	124	23	57
Shared Lane Traffic (%)						
Lane Group Flow (vph)	208	0	0	230	80	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 35.8%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	3.3

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	131	56	95	112	21	51
Future Vol, veh/h	131	56	95	112	21	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	146	62	106	124	23	57

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	208	0	513	177
Stage 1	-	-	-	-	177	-
Stage 2	-	-	-	-	336	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1363	-	521	866
Stage 1	-	-	-	-	854	-
Stage 2	-	-	-	-	724	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1363	-	477	866
Mov Cap-2 Maneuver	-	-	-	-	477	-
Stage 1	-	-	-	-	854	-
Stage 2	-	-	-	-	663	-

Approach	EB	WB	NE
HCM Control Delay, s	0	3.6	10.8
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	700	-	-	1363	-
HCM Lane V/C Ratio	0.114	-	-	0.077	-
HCM Control Delay (s)	10.8	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.3	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	19	5	186	28	9	173
Future Volume (vph)	19	5	186	28	9	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.970				0.872	
Flt Protected				0.958	0.998	
Satd. Flow (prot)	1807	0	0	1785	1621	0
Flt Permitted				0.958	0.998	
Satd. Flow (perm)	1807	0	0	1785	1621	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	1216			547	1969	
Travel Time (s)	23.7			10.7	38.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	21	6	207	31	10	192
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	0	238	202	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 36.3%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	4.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	19	5	186	28	9	173
Future Vol, veh/h	19	5	186	28	9	173
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	6	207	31	10	192

Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	656	31	192	0	31	0
Stage 1	444	-	-	-	-	-
Stage 2	212	-	-	-	-	-
Critical Hdwy	6.52	6.22	4.12	-	4.12	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	4.018	3.318	2.218	-	2.218	-
Pot Cap-1 Maneuver	385	1043	1381	-	1582	-
Stage 1	575	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	1043	1381	-	1582	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	8.5	7	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBR	EBLn1	WBL	WBT
Capacity (veh/h)	1582	-	1043	1381	-
HCM Lane V/C Ratio	0.006	-	0.026	0.15	-
HCM Control Delay (s)	7.3	-	8.5	8.1	0
HCM Lane LOS	A	-	A	A	A
HCM 95th %tile Q(veh)	0	-	0.1	0.5	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	178	5	36	91	4	24
Future Volume (vph)	178	5	36	91	4	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.996				0.882	
Flt Protected				0.986	0.994	
Satd. Flow (prot)	1855	0	0	1837	1633	0
Flt Permitted				0.986	0.994	
Satd. Flow (perm)	1855	0	0	1837	1633	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	2259			288	493	
Travel Time (s)	44.0			5.6	9.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	198	6	40	101	4	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	204	0	0	141	31	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 29.8%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	1.6

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	178	5	36	91	4	24
Future Vol, veh/h	178	5	36	91	4	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	198	6	40	101	4	27

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	203	0	382	201
Stage 1	-	-	-	-	201	-
Stage 2	-	-	-	-	181	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1369	-	620	840
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	850	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1369	-	601	840
Mov Cap-2 Maneuver	-	-	-	-	601	-
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	824	-

Approach	EB	WB	NE
HCM Control Delay, s	0	2.2	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	795	-	-	1369	-
HCM Lane V/C Ratio	0.039	-	-	0.029	-
HCM Control Delay (s)	9.7	-	-	7.7	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	3:45	3:45	3:45	3:45	3:45	3:45	3:45
End Time	5:00	5:00	5:00	5:00	5:00	5:00	5:00
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	2004	2000	2068	1939	1974	1956	1969
Vehs Exited	2017	2002	2069	1919	2001	1951	1984
Starting Vehs	50	40	42	35	62	45	48
Ending Vehs	37	38	41	55	35	50	33
Travel Distance (mi)	1249	1251	1267	1181	1245	1181	1226
Travel Time (hr)	46.2	46.5	47.5	43.2	46.6	43.4	44.9
Total Delay (hr)	4.5	4.8	5.4	3.9	5.0	3.9	4.0
Total Stops	369	339	359	344	360	346	346
Fuel Used (gal)	38.3	38.3	39.3	36.1	38.5	35.8	37.5

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	3:45	3:45	3:45	3:45
End Time	5:00	5:00	5:00	5:00
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	2021	1968	2024	1992
Vehs Exited	2021	1960	2022	1994
Starting Vehs	45	51	34	43
Ending Vehs	45	59	36	42
Travel Distance (mi)	1239	1231	1266	1234
Travel Time (hr)	46.3	45.6	47.1	45.7
Total Delay (hr)	5.2	4.5	5.0	4.6
Total Stops	355	369	344	353
Fuel Used (gal)	37.9	37.6	39.0	37.9

Interval #0 Information Seeding

Start Time	3:45
End Time	4:00
Total Time (min)	15

Volumes adjusted by Growth Factors.
No data recorded this interval.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Interval #1 Information Recording

Start Time	4:00
End Time	5:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	2004	2000	2068	1939	1974	1956	1969
Vehs Exited	2017	2002	2069	1919	2001	1951	1984
Starting Vehs	50	40	42	35	62	45	48
Ending Vehs	37	38	41	55	35	50	33
Travel Distance (mi)	1249	1251	1267	1181	1245	1181	1226
Travel Time (hr)	46.2	46.5	47.5	43.2	46.6	43.4	44.9
Total Delay (hr)	4.5	4.8	5.4	3.9	5.0	3.9	4.0
Total Stops	369	339	359	344	360	346	346
Fuel Used (gal)	38.3	38.3	39.3	36.1	38.5	35.8	37.5

Interval #1 Information Recording

Start Time	4:00
End Time	5:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	2021	1968	2024	1992
Vehs Exited	2021	1960	2022	1994
Starting Vehs	45	51	34	43
Ending Vehs	45	59	36	42
Travel Distance (mi)	1239	1231	1266	1234
Travel Time (hr)	46.3	45.6	47.1	45.7
Total Delay (hr)	5.2	4.5	5.0	4.6
Total Stops	355	369	344	353
Fuel Used (gal)	37.9	37.6	39.0	37.9

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 3: Lake Wheeler Rd & Carolina Pines Ave

Movement	WB	NB	SB
Directions Served	LR	TR	L
Maximum Queue (ft)	198	14	93
Average Queue (ft)	64	1	42
95th Queue (ft)	143	10	76
Link Distance (ft)	2162	1170	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Suffolk Blvd & Carolina Pines Ave

Movement	EB	WB	NE
Directions Served	TR	LT	LR
Maximum Queue (ft)	6	72	55
Average Queue (ft)	0	17	24
95th Queue (ft)	4	54	43
Link Distance (ft)	238	1902	518
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Carolina Pines Ave & Granite St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	44	17	17
Average Queue (ft)	17	1	1
95th Queue (ft)	43	11	8
Link Distance (ft)	1166	531	1902
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 17: Henslowe Dr & Carolina Pines Ave

Movement	WB	NE
Directions Served	LT	LR
Maximum Queue (ft)	49	27
Average Queue (ft)	6	12
95th Queue (ft)	30	28
Link Distance (ft)	249	449
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

APPENDIX C

2045 No-Build Analysis Reports

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lanes, Volumes, Timings
3: Lake Wheeler Rd & Carolina Pines Ave

04/23/2019

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	57	245	771	31	36	491
Future Volume (vph)	57	245	771	31	36	491
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	150	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.890		0.995			
Flt Protected	0.991				0.950	
Satd. Flow (prot)	1643	0	1853	0	1770	1863
Flt Permitted	0.991				0.950	
Satd. Flow (perm)	1643	0	1853	0	1770	1863
Link Speed (mph)	35		35			35
Link Distance (ft)	2259		1198			1271
Travel Time (s)	44.0		23.3			24.8
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	63	272	857	34	40	546
Shared Lane Traffic (%)						
Lane Group Flow (vph)	335	0	891	0	40	546
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 67.4%	ICU Level of Service C
Analysis Period (min) 15	

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	35.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	57	245	771	31	36	491
Future Vol, veh/h	57	245	771	31	36	491
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	63	272	857	34	40	546

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1500	874	0	0	891	0
Stage 1	874	-	-	-	-	-
Stage 2	626	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	134	349	-	-	761	-
Stage 1	408	-	-	-	-	-
Stage 2	533	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	127	349	-	-	761	-
Mov Cap-2 Maneuver	127	-	-	-	-	-
Stage 1	408	-	-	-	-	-
Stage 2	505	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	191	0	0.7
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	262	761	-
HCM Lane V/C Ratio	-	-	1.281	0.053	-
HCM Control Delay (s)	-	-	191	10	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	16.7	0.2	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	69	6	39	145	78	111
Future Volume (vph)	69	6	39	145	78	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.989				0.921	
Flt Protected				0.990	0.980	
Satd. Flow (prot)	1842	0	0	1844	1681	0
Flt Permitted				0.990	0.980	
Satd. Flow (perm)	1842	0	0	1844	1681	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	307			1969	556	
Travel Time (s)	6.0			38.4	10.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	77	7	43	161	87	123
Shared Lane Traffic (%)						
Lane Group Flow (vph)	84	0	0	204	210	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.3%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	5.3

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	69	6	39	145	78	111
Future Vol, veh/h	69	6	39	145	78	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	77	7	43	161	87	123

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	83	0	328	80
Stage 1	-	-	-	-	80	-
Stage 2	-	-	-	-	248	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1514	-	666	980
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	793	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1514	-	645	980
Mov Cap-2 Maneuver	-	-	-	-	645	-
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	768	-

Approach	EB	WB	NE
HCM Control Delay, s	0	1.6	11
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	807	-	-	1514	-
HCM Lane V/C Ratio	0.26	-	-	0.029	-
HCM Control Delay (s)	11	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	1	-	-	0.1	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	3	16	167	21	4	216
Future Volume (vph)	3	16	167	21	4	216
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.884				0.867	
Flt Protected				0.957	0.999	
Satd. Flow (prot)	1647	0	0	1783	1613	0
Flt Permitted				0.957	0.999	
Satd. Flow (perm)	1647	0	0	1783	1613	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	1216			702	1969	
Travel Time (s)	23.7			13.7	38.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	18	186	23	4	240
Shared Lane Traffic (%)						
Lane Group Flow (vph)	21	0	0	209	244	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.3%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	3	16	167	21	4	216
Future Vol, veh/h	3	16	167	21	4	216
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	18	186	23	4	240

Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	643	23	240	0	23	0
Stage 1	394	-	-	-	-	-
Stage 2	249	-	-	-	-	-
Critical Hdwy	6.52	6.22	4.12	-	4.12	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	4.018	3.318	2.218	-	2.218	-
Pot Cap-1 Maneuver	392	1054	1327	-	1592	-
Stage 1	605	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	1054	1327	-	1592	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	8.5	7.2	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBR	EBLn1	WBL	WBT
Capacity (veh/h)	1592	-	1054	1327	-
HCM Lane V/C Ratio	0.003	-	0.02	0.14	-
HCM Control Delay (s)	7.3	-	8.5	8.2	0
HCM Lane LOS	A	-	A	A	A
HCM 95th %tile Q(veh)	0	-	0.1	0.5	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	40	4	66	271	4	14
Future Volume (vph)	40	4	66	271	4	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.989				0.892	
Flt Protected				0.990	0.990	
Satd. Flow (prot)	1842	0	0	1844	1645	0
Flt Permitted				0.990	0.990	
Satd. Flow (perm)	1842	0	0	1844	1645	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	2259			288	493	
Travel Time (s)	44.0			5.6	9.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	44	4	73	301	4	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	48	0	0	374	20	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.6%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	40	4	66	271	4	14
Future Vol, veh/h	40	4	66	271	4	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	44	4	73	301	4	16

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	49	0	495	47
Stage 1	-	-	-	-	47	-
Stage 2	-	-	-	-	448	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1558	-	534	1022
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	644	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1558	-	504	1022
Mov Cap-2 Maneuver	-	-	-	-	504	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	608	-

Approach	EB	WB	NE
HCM Control Delay, s	0	1.5	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	832	-	-	1558	-
HCM Lane V/C Ratio	0.024	-	-	0.047	-
HCM Control Delay (s)	9.4	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:45	6:45	6:45	6:45	6:45	6:45	6:45
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	1895	1995	1970	1902	1878	1924	1933
Vehs Exited	1882	1994	1947	1887	1884	1912	1906
Starting Vehs	42	50	60	50	56	59	46
Ending Vehs	55	51	83	65	50	71	73
Travel Distance (mi)	1136	1208	1216	1158	1150	1179	1165
Travel Time (hr)	47.3	51.2	70.5	48.4	49.2	69.8	65.5
Total Delay (hr)	8.8	10.4	29.8	9.4	10.1	29.9	26.2
Total Stops	534	561	551	550	527	542	577
Fuel Used (gal)	36.0	38.5	43.3	37.0	37.0	42.0	40.5

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:45	6:45	6:45	6:45
End Time	8:00	8:00	8:00	8:00
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	1948	1914	1856	1920
Vehs Exited	1944	1907	1847	1912
Starting Vehs	56	67	40	47
Ending Vehs	60	74	49	59
Travel Distance (mi)	1173	1176	1126	1169
Travel Time (hr)	51.1	68.3	48.2	56.9
Total Delay (hr)	11.4	28.5	10.1	17.5
Total Stops	563	561	519	549
Fuel Used (gal)	37.9	41.8	36.2	39.0

Interval #0 Information Seeding

Start Time	6:45
End Time	7:00
Total Time (min)	15

Volumes adjusted by Growth Factors.

No data recorded this interval.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	1895	1995	1970	1902	1878	1924	1933
Vehs Exited	1882	1994	1947	1887	1884	1912	1906
Starting Vehs	42	50	60	50	56	59	46
Ending Vehs	55	51	83	65	50	71	73
Travel Distance (mi)	1136	1208	1216	1158	1150	1179	1165
Travel Time (hr)	47.3	51.2	70.5	48.4	49.2	69.8	65.5
Total Delay (hr)	8.8	10.4	29.8	9.4	10.1	29.9	26.2
Total Stops	534	561	551	550	527	542	577
Fuel Used (gal)	36.0	38.5	43.3	37.0	37.0	42.0	40.5

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	1948	1914	1856	1920
Vehs Exited	1944	1907	1847	1912
Starting Vehs	56	67	40	47
Ending Vehs	60	74	49	59
Travel Distance (mi)	1173	1176	1126	1169
Travel Time (hr)	51.1	68.3	48.2	56.9
Total Delay (hr)	11.4	28.5	10.1	17.5
Total Stops	563	561	519	549
Fuel Used (gal)	37.9	41.8	36.2	39.0

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 3: Lake Wheeler Rd & Carolina Pines Ave

Movement	WB	NB	SB
Directions Served	LR	TR	L
Maximum Queue (ft)	722	9	53
Average Queue (ft)	424	0	19
95th Queue (ft)	889	5	47
Link Distance (ft)	2162	1170	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Carolina Pines Ave

Movement	WB	NE
Directions Served	LT	LR
Maximum Queue (ft)	31	78
Average Queue (ft)	3	37
95th Queue (ft)	18	63
Link Distance (ft)	1902	518
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 11: Carolina Pines Ave & Granite St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	42	6	10
Average Queue (ft)	15	0	0
95th Queue (ft)	41	4	7
Link Distance (ft)	1166	686	1902
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 17: Henslowe Dr & Carolina Pines Ave

Movement	WB	NE
Directions Served	LT	LR
Maximum Queue (ft)	47	23
Average Queue (ft)	4	8
95th Queue (ft)	24	23
Link Distance (ft)	249	449
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Lanes, Volumes, Timings
3: Lake Wheeler Rd & Carolina Pines Ave

04/23/2019

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	41	101	614	57	233	1211
Future Volume (vph)	41	101	614	57	233	1211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	150	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.904		0.989			
Flt Protected	0.986				0.950	
Satd. Flow (prot)	1660	0	1842	0	1770	1863
Flt Permitted	0.986				0.950	
Satd. Flow (perm)	1660	0	1842	0	1770	1863
Link Speed (mph)	35		35			35
Link Distance (ft)	2259		1198			1271
Travel Time (s)	44.0		23.3			24.8
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	46	112	682	63	259	1346
Shared Lane Traffic (%)						
Lane Group Flow (vph)	158	0	745	0	259	1346
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 78.9%	ICU Level of Service D
Analysis Period (min) 15	

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	54.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	41	101	614	57	233	1211
Future Vol, veh/h	41	101	614	57	233	1211
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	112	682	63	259	1346

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2577	714	0	0	746	0
Stage 1	714	-	-	-	-	-
Stage 2	1863	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 28	431	-	-	862	-
Stage 1	485	-	-	-	-	-
Stage 2	135	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 20	431	-	-	862	-
Mov Cap-2 Maneuver	~ 20	-	-	-	-	-
Stage 1	485	-	-	-	-	-
Stage 2	94	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s$	843.4	0	1.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	62	862	-
HCM Lane V/C Ratio	-	-	2.545	0.3	-
HCM Control Delay (s)	-	-	$ 843.4	11	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	15.7	1.3	-

Notes

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

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	170	73	123	145	27	66
Future Volume (vph)	170	73	123	145	27	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.959				0.904	
Flt Protected				0.978	0.986	
Satd. Flow (prot)	1786	0	0	1822	1660	0
Flt Permitted				0.978	0.986	
Satd. Flow (perm)	1786	0	0	1822	1660	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	307			1969	556	
Travel Time (s)	6.0			38.4	10.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	189	81	137	161	30	73
Shared Lane Traffic (%)						
Lane Group Flow (vph)	270	0	0	298	103	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.4%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	170	73	123	145	27	66
Future Vol, veh/h	170	73	123	145	27	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	189	81	137	161	30	73

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	270	0	663	229
Stage 1	-	-	-	-	229	-
Stage 2	-	-	-	-	434	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1293	-	426	810
Stage 1	-	-	-	-	809	-
Stage 2	-	-	-	-	653	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1293	-	377	810
Mov Cap-2 Maneuver	-	-	-	-	377	-
Stage 1	-	-	-	-	809	-
Stage 2	-	-	-	-	577	-

Approach	EB	WB	NE
HCM Control Delay, s	0	3.7	12.1
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	607	-	-	1293	-
HCM Lane V/C Ratio	0.17	-	-	0.106	-
HCM Control Delay (s)	12.1	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.4	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	25	6	241	36	12	224
Future Volume (vph)	25	6	241	36	12	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.973				0.872	
Flt Protected				0.958	0.998	
Satd. Flow (prot)	1812	0	0	1785	1621	0
Flt Permitted				0.958	0.998	
Satd. Flow (perm)	1812	0	0	1785	1621	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	1216			547	1969	
Travel Time (s)	23.7			10.7	38.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	7	268	40	13	249
Shared Lane Traffic (%)						
Lane Group Flow (vph)	35	0	0	308	262	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.1%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	4.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	25	6	241	36	12	224
Future Vol, veh/h	25	6	241	36	12	224
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	7	268	40	13	249

Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	852	40	249	0	40	0
Stage 1	576	-	-	-	-	-
Stage 2	276	-	-	-	-	-
Critical Hdwy	6.52	6.22	4.12	-	4.12	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	4.018	3.318	2.218	-	2.218	-
Pot Cap-1 Maneuver	297	1031	1317	-	1570	-
Stage 1	502	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	1031	1317	-	1570	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	8.6	7.3	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBR	EBLn1	WBL	WBT
Capacity (veh/h)	1570	-	1031	1317	-
HCM Lane V/C Ratio	0.008	-	0.033	0.203	-
HCM Control Delay (s)	7.3	-	8.6	8.4	0
HCM Lane LOS	A	-	A	A	A
HCM 95th %tile Q(veh)	0	-	0.1	0.8	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	231	6	47	118	5	31
Future Volume (vph)	231	6	47	118	5	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.996				0.885	
Flt Protected				0.986	0.993	
Satd. Flow (prot)	1855	0	0	1837	1637	0
Flt Permitted				0.986	0.993	
Satd. Flow (perm)	1855	0	0	1837	1637	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	2259			288	493	
Travel Time (s)	44.0			5.6	9.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	257	7	52	131	6	34
Shared Lane Traffic (%)						
Lane Group Flow (vph)	264	0	0	183	40	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.7%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	231	6	47	118	5	31
Future Vol, veh/h	231	6	47	118	5	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	257	7	52	131	6	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	263	0	496	260
Stage 1	-	-	-	-	260	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1301	-	533	779
Stage 1	-	-	-	-	783	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1301	-	510	779
Mov Cap-2 Maneuver	-	-	-	-	510	-
Stage 1	-	-	-	-	783	-
Stage 2	-	-	-	-	768	-

Approach	EB	WB	NE
HCM Control Delay, s	0	2.2	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	726	-	-	1301	-
HCM Lane V/C Ratio	0.055	-	-	0.04	-
HCM Control Delay (s)	10.2	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	3:45	3:45	3:45	3:45	3:45	3:45	3:45
End Time	5:00	5:00	5:00	5:00	5:00	5:00	5:00
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	2525	2479	2629	2449	2637	2525	2552
Vehs Exited	2502	2457	2602	2416	2607	2510	2515
Starting Vehs	60	67	55	56	79	55	82
Ending Vehs	83	89	82	89	109	70	119
Travel Distance (mi)	1558	1524	1616	1522	1609	1554	1554
Travel Time (hr)	84.3	79.9	88.4	69.2	92.2	64.5	121.9
Total Delay (hr)	37.2	33.7	39.4	23.2	43.6	17.4	75.1
Total Stops	460	520	514	506	544	495	490
Fuel Used (gal)	56.9	55.1	58.9	52.3	59.8	52.3	65.0

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	3:45	3:45	3:45	3:45
End Time	5:00	5:00	5:00	5:00
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	2577	2636	2587	2560
Vehs Exited	2539	2606	2531	2530
Starting Vehs	89	65	52	66
Ending Vehs	127	95	108	93
Travel Distance (mi)	1583	1643	1583	1574
Travel Time (hr)	120.3	85.6	80.9	88.7
Total Delay (hr)	72.5	35.7	33.0	41.1
Total Stops	486	542	497	507
Fuel Used (gal)	65.1	59.5	56.7	58.2

Interval #0 Information Seeding

Start Time	3:45
End Time	4:00
Total Time (min)	15

Volumes adjusted by Growth Factors.
No data recorded this interval.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Interval #1 Information Recording

Start Time	4:00
End Time	5:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	2525	2479	2629	2449	2637	2525	2552
Vehs Exited	2502	2457	2602	2416	2607	2510	2515
Starting Vehs	60	67	55	56	79	55	82
Ending Vehs	83	89	82	89	109	70	119
Travel Distance (mi)	1558	1524	1616	1522	1609	1554	1554
Travel Time (hr)	84.3	79.9	88.4	69.2	92.2	64.5	121.9
Total Delay (hr)	37.2	33.7	39.4	23.2	43.6	17.4	75.1
Total Stops	460	520	514	506	544	495	490
Fuel Used (gal)	56.9	55.1	58.9	52.3	59.8	52.3	65.0

Interval #1 Information Recording

Start Time	4:00
End Time	5:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	2577	2636	2587	2560
Vehs Exited	2539	2606	2531	2530
Starting Vehs	89	65	52	66
Ending Vehs	127	95	108	93
Travel Distance (mi)	1583	1643	1583	1574
Travel Time (hr)	120.3	85.6	80.9	88.7
Total Delay (hr)	72.5	35.7	33.0	41.1
Total Stops	486	542	497	507
Fuel Used (gal)	65.1	59.5	56.7	58.2

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 3: Lake Wheeler Rd & Carolina Pines Ave

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	1289	23	119	32
Average Queue (ft)	811	2	57	1
95th Queue (ft)	1573	14	97	31
Link Distance (ft)	2162	1170		1232
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			150	
Storage Blk Time (%)			0	
Queuing Penalty (veh)			1	

Intersection: 8: Suffolk Blvd & Carolina Pines Ave

Movement	EB	WB	NE
Directions Served	TR	LT	LR
Maximum Queue (ft)	8	78	65
Average Queue (ft)	0	25	27
95th Queue (ft)	5	61	48
Link Distance (ft)	238	1902	518
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Carolina Pines Ave & Granite St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	59	14	33
Average Queue (ft)	22	1	2
95th Queue (ft)	51	7	17
Link Distance (ft)	1166	531	1902
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 17: Henslowe Dr & Carolina Pines Ave

Movement	WB	NE
Directions Served	LT	LR
Maximum Queue (ft)	56	36
Average Queue (ft)	10	13
95th Queue (ft)	39	29
Link Distance (ft)	249	449
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1

APPENDIX D

2045 Build Analysis Reports

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Traffic Signal Warrants

Signal Warrant Analysis

Warrants number 1, 2, 3, and 7 were applicable for this intersection.

Warrant 1, Eight-Hour Vehicular Volume.

If Condition A is satisfied (100% or 70%), then the criteria for Warrant 1 is satisfied and Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied (100% or 70%), then the criteria for Warrant 1 is satisfied and the combination of Conditions A and B is not needed. In case neither condition A or B were satisfied in their 100% or 70% conditions then the combination of condition A and B is needed for 80% or 56% to meet the warrant.

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

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

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

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

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

Notes;

1. Major street speed limit near Lake Wheeler Rd/Carolina Pines intersection is 35 mph , therefore warrant# 1 conditions A and B for 100% volume and 80% volume will be reviewed if necessary.
2. Number of lanes for major and minor streets is 1 (the first row is applicable).
3. After conducting the analysis - this intersection meets condition B(100%) of the standards

For more details see attached calculation sheet for Warrant #1.

Caliculation Sheet For Warrant#1_2019

From	To	Hourly/Minor	Total Major	A(100%)	B(100%)	A(70%)	B(70%)	A(80%)	B(80%)	A AND B(80%)	A(56%)	B(56%)	A AND B(56%)	Total Approach	Rank
6:00 AM	7:00 AM	109	648	NO	NO	YES	YES	NO	YES	NO	YES	YES	YES	757	50
6:15 AM	7:15 AM	144	811	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	955	40
6:30 AM	7:30 AM	173	1026	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	1199	24
6:45 AM	7:45 AM	206	1207	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	1413	16
7:00 AM	8:00 AM	231	1331	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	1562	9
7:15 AM	8:15 AM	233	1390	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	1623	6
7:30 AM	8:30 AM	209	1350	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	1559	10
7:45 AM	8:45 AM	172	1259	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	1431	14
8:00 AM	9:00 AM	145	1162	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	1307	20
8:15 AM	9:15 AM	117	1124	NO	YES	YES	YES	NO	YES	NO	YES	YES	YES	1241	22
8:30 AM	9:30 AM	96	1060	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1156	26
8:45 AM	9:45 AM	100	984	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1084	30
9:00 AM	10:00 AM	91	985	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1076	32
9:15 AM	10:15 AM	86	901	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	987	36
9:30 AM	10:30 AM	88	853	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	941	41
9:45 AM	10:45 AM	75	825	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	900	45
10:00 AM	11:00 AM	61	750	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	811	49
10:15 AM	11:15 AM	56	774	NO	NO	NO	YES	NO	NO	NO	NO	YES	NO	830	47
10:30 AM	11:30 AM	53	775	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	828	48
10:45 AM	11:45 AM	50	806	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	856	46
11:00 AM	12:00 PM	66	840	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	906	44
11:15 AM	12:15 PM	77	839	NO	YES	NO	YES	NO	YES	NO	NO	YES	NO	916	43
11:30 AM	12:30 PM	82	877	NO	YES	NO	YES	NO	YES	NO	NO	YES	NO	959	39
11:45 AM	12:45 PM	80	853	NO	YES	NO	YES	NO	YES	NO	NO	YES	NO	933	42
12:00 PM	1:00 PM	71	891	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	962	38
12:15 PM	1:15 PM	59	921	NO	NO	NO	YES	NO	NO	NO	NO	YES	NO	980	37
12:30 PM	1:30 PM	62	932	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	994	35
12:45 PM	1:45 PM	66	1016	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	1082	31
1:00 PM	2:00 PM	69	994	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	1063	33
1:15 PM	2:15 PM	85	1004	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1089	29
1:30 PM	2:30 PM	86	1006	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1092	28
1:45 PM	2:45 PM	82	1021	NO	YES	NO	YES	NO	YES	NO	NO	YES	NO	1103	27
2:00 PM	3:00 PM	87	1080	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1167	25
2:15 PM	3:15 PM	85	1141	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1226	23
2:30 PM	3:30 PM	74	1209	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	1283	21
2:45 PM	3:45 PM	75	1250	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	1325	19
3:00 PM	4:00 PM	74	1257	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	1331	18
3:15 PM	4:15 PM	64	1306	NO	NO	NO	YES	NO	YES	NO	NO	YES	NO	1370	17
3:30 PM	4:30 PM	88	1376	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1464	13
3:45 PM	4:45 PM	96	1425	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1521	11
4:00 PM	5:00 PM	101	1477	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1578	8
4:15 PM	5:15 PM	115	1525	NO	YES	YES	YES	NO	YES	NO	YES	YES	YES	1640	5
4:30 PM	5:30 PM	111	1569	NO	YES	YES	YES	NO	YES	NO	YES	YES	YES	1680	4
4:45 PM	5:45 PM	110	1633	NO	YES	YES	YES	NO	YES	NO	YES	YES	YES	1743	1
5:00 PM	6:00 PM	108	1626	NO	YES	YES	YES	NO	YES	NO	YES	YES	YES	1734	2
5:15 PM	6:15 PM	111	1581	NO	YES	YES	YES	NO	YES	NO	YES	YES	YES	1692	3
5:30 PM	6:30 PM	100	1511	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1611	7
5:45 PM	6:45 PM	89	1378	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1467	12
6:00 PM	7:00 PM	90	1330	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	1420	15
6:15 PM	7:15 PM	58	967	NO	NO	NO	YES	NO	NO	NO	NO	YES	NO	1025	34
6:30 PM	7:30 PM	38	607	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	645	51
6:45 PM	7:45 PM	24	297	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	321	52

Warrant 2, Four-Hour Vehicular Volume

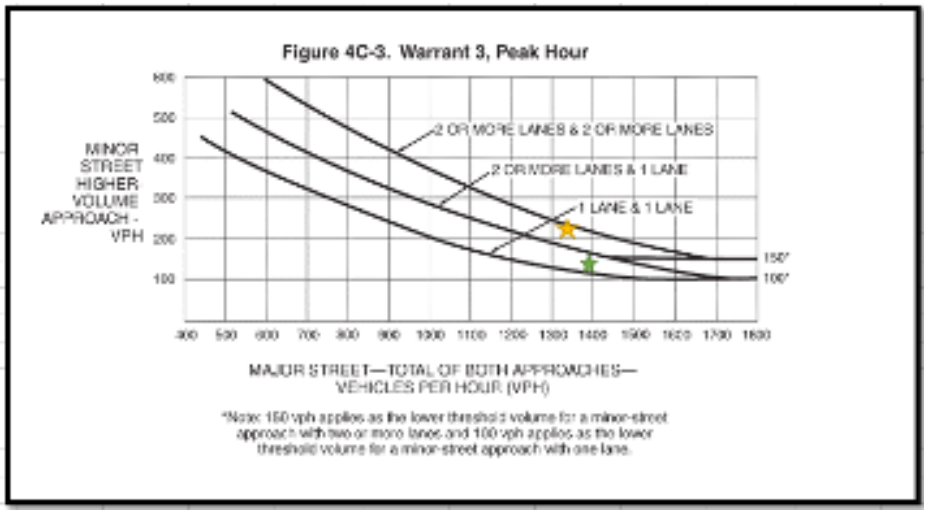
From the 13 hours count, the relevant (highest volume) 4 hours were analyzed to evaluate warrant number 2. The following factors were considered:

1. Major street speed limit on Lake Wheeler Rd is 35 mph.
2. Major street and minor street volumes representing the peak four hours from the 13-hour counts are 1390 and 233, 1425 and 96, 1633 and 110, and 1378 and 89 vehicles per hour (vph), respectively.
3. The minor street threshold for this warrant is 80 vph. Due to a volume on the minor street higher than the minimum threshold, this intersection meets warrant number 2 criteria (See Figure 4C-1 below).

Warrant 3, Peak Hour.

The 13-hour counts were analyzed to evaluate warrant number 3 (peak hour). The following factors were considered:

1. Major street speed limit on Lake Wheeler Rd is 35 mph
2. Major street volume in both direction for the AM and PM peak hours is 1386 vph and 1633vph respectively.
3. Minor street volume is 233 vehicles for the AM peak hour and 110 during the PM peak.
4. The minor street threshold for this warrant is 100 vph. Due to a volume on the minor street higher than the minimum threshold, this intersection meets warrant number 3 criteria (See Figure 4C-3 below).



Warrant 7, Crash Experience

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

- **A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and**
- **B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and**
- **C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.**

Three crashes were reported during the previous 12 months. Therefore condition B wasn't satisfied

Synchro Results

2045 Build AM

Lanes, Volumes, Timings
3: Lake Wheeler Rd & Carolina Pines Ave

04/23/2019

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	57	245	771	31	36	491
Future Volume (vph)	57	245	771	31	36	491
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	150	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.890		0.995			
Flt Protected	0.991				0.950	
Satd. Flow (prot)	1643	0	1853	0	1770	1863
Flt Permitted	0.991				0.168	
Satd. Flow (perm)	1643	0	1853	0	313	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	183		4			
Link Speed (mph)	30		35			35
Link Distance (ft)	2259		1198			1271
Travel Time (s)	51.3		23.3			24.8
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	63	272	857	34	40	546
Shared Lane Traffic (%)						
Lane Group Flow (vph)	335	0	891	0	40	546
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type	Prot		NA		Perm	NA
Protected Phases	2		4			8
Permitted Phases					8	
Minimum Split (s)	25.0		25.0		25.0	25.0
Total Split (s)	32.0		68.0		68.0	68.0
Total Split (%)	32.0%		68.0%		68.0%	68.0%
Maximum Green (s)	25.0		61.0		61.0	61.0
Yellow Time (s)	5.0		5.0		5.0	5.0
All-Red Time (s)	2.0		2.0		2.0	2.0
Lost Time Adjust (s)	-2.0		-2.0		-2.0	-2.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	27.0		63.0		63.0	63.0
Actuated g/C Ratio	0.27		0.63		0.63	0.63
v/c Ratio	0.58		0.76		0.20	0.47

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Control Delay	18.4		18.6		11.0	11.3
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	18.4		18.6		11.0	11.3
LOS	B		B		B	B
Approach Delay	18.4		18.6			11.3
Approach LOS	B		B			B

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 32 (32%), Referenced to phase 4:NBT and 8:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 16.2	Intersection LOS: B
Intersection Capacity Utilization 69.1%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Lake Wheeler Rd & Carolina Pines Ave

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	69	6	39	145	78	111
Future Volume (vph)	69	6	39	145	78	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.989				0.921	
Flt Protected				0.990	0.980	
Satd. Flow (prot)	1842	0	0	1844	1681	0
Flt Permitted				0.990	0.980	
Satd. Flow (perm)	1842	0	0	1844	1681	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	307			1989	556	
Travel Time (s)	7.0			45.2	12.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	77	7	43	161	87	123
Shared Lane Traffic (%)						
Lane Group Flow (vph)	84	0	0	204	210	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.3%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	5.3

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	69	6	39	145	78	111
Future Vol, veh/h	69	6	39	145	78	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	77	7	43	161	87	123

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	83	0	328	80
Stage 1	-	-	-	-	80	-
Stage 2	-	-	-	-	248	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1514	-	666	980
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	793	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1514	-	645	980
Mov Cap-2 Maneuver	-	-	-	-	645	-
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	768	-

Approach	EB	WB	NE
HCM Control Delay, s	0	1.6	11
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	807	-	-	1514	-
HCM Lane V/C Ratio	0.26	-	-	0.029	-
HCM Control Delay (s)	11	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	1	-	-	0.1	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	3	16	167	21	4	216
Future Volume (vph)	3	16	167	21	4	216
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.884				0.867	
Flt Protected				0.957	0.999	
Satd. Flow (prot)	1647	0	0	1783	1613	0
Flt Permitted				0.957	0.999	
Satd. Flow (perm)	1647	0	0	1783	1613	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1216			570	1989	
Travel Time (s)	27.6			13.0	45.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	18	186	23	4	240
Shared Lane Traffic (%)						
Lane Group Flow (vph)	21	0	0	209	244	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.3%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	3	16	167	21	4	216
Future Vol, veh/h	3	16	167	21	4	216
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	18	186	23	4	240

Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	643	23	240	0	23	0
Stage 1	394	-	-	-	-	-
Stage 2	249	-	-	-	-	-
Critical Hdwy	6.52	6.22	4.12	-	4.12	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	4.018	3.318	2.218	-	2.218	-
Pot Cap-1 Maneuver	392	1054	1327	-	1592	-
Stage 1	605	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	1054	1327	-	1592	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	8.5	7.2	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBR	EBLn1	WBL	WBT
Capacity (veh/h)	1592	-	1054	1327	-
HCM Lane V/C Ratio	0.003	-	0.02	0.14	-
HCM Control Delay (s)	7.3	-	8.5	8.2	0
HCM Lane LOS	A	-	A	A	A
HCM 95th %tile Q(veh)	0	-	0.1	0.5	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	40	4	66	271	4	14
Future Volume (vph)	40	4	66	271	4	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.989				0.892	
Flt Protected				0.990	0.990	
Satd. Flow (prot)	1842	0	0	1844	1645	0
Flt Permitted				0.990	0.990	
Satd. Flow (perm)	1842	0	0	1844	1645	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	2259			288	493	
Travel Time (s)	51.3			6.5	11.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	44	4	73	301	4	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	48	0	0	374	20	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.6%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	40	4	66	271	4	14
Future Vol, veh/h	40	4	66	271	4	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	44	4	73	301	4	16

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	49	0	495	47
Stage 1	-	-	-	-	47	-
Stage 2	-	-	-	-	448	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1558	-	534	1022
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	644	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1558	-	504	1022
Mov Cap-2 Maneuver	-	-	-	-	504	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	608	-

Approach	EB	WB	NE
HCM Control Delay, s	0	1.5	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	832	-	-	1558	-
HCM Lane V/C Ratio	0.024	-	-	0.047	-
HCM Control Delay (s)	9.4	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Synchro Results

2045 Build AM_Queuing

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:45	6:45	6:45	6:45	6:45	6:45	6:45
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	1895	1995	1970	1902	1879	1924	1933
Vehs Exited	1890	1985	1979	1898	1868	1948	1941
Starting Vehs	44	40	61	50	42	64	47
Ending Vehs	49	50	52	54	53	40	39
Travel Distance (mi)	1131	1198	1217	1154	1138	1181	1166
Travel Time (hr)	48.4	51.0	52.3	49.7	48.6	50.3	50.2
Total Delay (hr)	10.2	10.6	11.5	10.8	10.0	10.3	10.8
Total Stops	998	1079	1045	1030	968	1013	1064
Fuel Used (gal)	37.0	39.2	40.3	38.1	37.4	38.7	38.2

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:45	6:45	6:45	6:45
End Time	8:00	8:00	8:00	8:00
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	1948	1914	1856	1921
Vehs Exited	1959	1925	1847	1924
Starting Vehs	53	50	40	42
Ending Vehs	42	39	49	42
Travel Distance (mi)	1168	1175	1117	1165
Travel Time (hr)	51.0	50.5	47.5	50.0
Total Delay (hr)	11.4	10.7	9.8	10.6
Total Stops	1106	1029	980	1032
Fuel Used (gal)	38.7	38.9	36.7	38.3

Interval #0 Information Seeding

Start Time	6:45
End Time	7:00
Total Time (min)	15

Volumes adjusted by Growth Factors.
No data recorded this interval.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	1895	1995	1970	1902	1879	1924	1933
Vehs Exited	1890	1985	1979	1898	1868	1948	1941
Starting Vehs	44	40	61	50	42	64	47
Ending Vehs	49	50	52	54	53	40	39
Travel Distance (mi)	1131	1198	1217	1154	1138	1181	1166
Travel Time (hr)	48.4	51.0	52.3	49.7	48.6	50.3	50.2
Total Delay (hr)	10.2	10.6	11.5	10.8	10.0	10.3	10.8
Total Stops	998	1079	1045	1030	968	1013	1064
Fuel Used (gal)	37.0	39.2	40.3	38.1	37.4	38.7	38.2

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	1948	1914	1856	1921
Vehs Exited	1959	1925	1847	1924
Starting Vehs	53	50	40	42
Ending Vehs	42	39	49	42
Travel Distance (mi)	1168	1175	1117	1165
Travel Time (hr)	51.0	50.5	47.5	50.0
Total Delay (hr)	11.4	10.7	9.8	10.6
Total Stops	1106	1029	980	1032
Fuel Used (gal)	38.7	38.9	36.7	38.3

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 3: Lake Wheeler Rd & Carolina Pines Ave

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	275	394	138	249
Average Queue (ft)	141	236	33	126
95th Queue (ft)	242	367	86	222
Link Distance (ft)	2162	1170		1232
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			150	
Storage Blk Time (%)				4
Queuing Penalty (veh)				1

Intersection: 8: Carolina Pines Ave

Movement	WB	NE
Directions Served	LT	LR
Maximum Queue (ft)	39	77
Average Queue (ft)	3	38
95th Queue (ft)	21	64
Link Distance (ft)	1930	518
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 11: Carolina Pines Ave & Granite St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	47	3	13
Average Queue (ft)	15	0	1
95th Queue (ft)	41	3	7
Link Distance (ft)	1171	554	1930
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 17: Henslowe Dr & Carolina Pines Ave

Movement	WB	NE
Directions Served	LT	LR
Maximum Queue (ft)	46	23
Average Queue (ft)	4	8
95th Queue (ft)	24	23
Link Distance (ft)	249	449
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Synchro Results

2045 Build PM

Lanes, Volumes, Timings
3: Lake Wheeler Rd & Carolina Pines Ave

04/23/2019

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	41	101	614	57	233	1211
Future Volume (vph)	41	101	614	57	233	1211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	150	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.904		0.989			
Flt Protected	0.986				0.950	
Satd. Flow (prot)	1660	0	1842	0	1770	1863
Flt Permitted	0.986				0.294	
Satd. Flow (perm)	1660	0	1842	0	548	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	110		11			
Link Speed (mph)	25		35			35
Link Distance (ft)	2259		1198			1271
Travel Time (s)	61.6		23.3			24.8
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	46	112	682	63	259	1346
Shared Lane Traffic (%)						
Lane Group Flow (vph)	158	0	745	0	259	1346
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type	Prot		NA		Perm	NA
Protected Phases	2		4			8
Permitted Phases					8	
Minimum Split (s)	25.0		25.0		25.0	25.0
Total Split (s)	25.0		75.0		75.0	75.0
Total Split (%)	25.0%		75.0%		75.0%	75.0%
Maximum Green (s)	18.0		68.0		68.0	68.0
Yellow Time (s)	5.0		5.0		5.0	5.0
All-Red Time (s)	2.0		2.0		2.0	2.0
Lost Time Adjust (s)	-2.0		-2.0		-2.0	-2.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	20.0		70.0		70.0	70.0
Actuated g/C Ratio	0.20		0.70		0.70	0.70
v/c Ratio	0.38		0.58		0.68	1.03

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Control Delay	15.1		9.6		19.6	50.5
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	15.1		9.6		19.6	50.5
LOS	B		A		B	D
Approach Delay	15.1		9.6			45.5
Approach LOS	B		A			D

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 4:NBT and 8:SBTL, Start of Green	
Natural Cycle: 100	
Control Type: Pretimed	
Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 32.9	Intersection LOS: C
Intersection Capacity Utilization 80.6%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Lake Wheeler Rd & Carolina Pines Ave

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	170	73	123	145	21	51
Future Volume (vph)	170	73	123	145	21	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.959				0.904	
Flt Protected				0.978	0.986	
Satd. Flow (prot)	1786	0	0	1822	1660	0
Flt Permitted				0.978	0.986	
Satd. Flow (perm)	1786	0	0	1822	1660	0
Link Speed (mph)	25			25	30	
Link Distance (ft)	307			1969	556	
Travel Time (s)	8.4			53.7	12.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	189	81	137	161	23	57
Shared Lane Traffic (%)						
Lane Group Flow (vph)	270	0	0	298	80	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.1%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	3.2

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	170	73	123	145	21	51
Future Vol, veh/h	170	73	123	145	21	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	189	81	137	161	23	57

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	270	0	663	229
Stage 1	-	-	-	-	229	-
Stage 2	-	-	-	-	434	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1293	-	426	810
Stage 1	-	-	-	-	809	-
Stage 2	-	-	-	-	653	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1293	-	377	810
Mov Cap-2 Maneuver	-	-	-	-	377	-
Stage 1	-	-	-	-	809	-
Stage 2	-	-	-	-	577	-

Approach	EB	WB	NE
HCM Control Delay, s	0	3.7	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	607	-	-	1293	-
HCM Lane V/C Ratio	0.132	-	-	0.106	-
HCM Control Delay (s)	11.8	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.4	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	25	6	241	36	12	224
Future Volume (vph)	25	6	241	36	12	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.973				0.872	
Flt Protected				0.958	0.998	
Satd. Flow (prot)	1812	0	0	1785	1621	0
Flt Permitted				0.958	0.998	
Satd. Flow (perm)	1812	0	0	1785	1621	0
Link Speed (mph)	30			30	25	
Link Distance (ft)	1216			260	1969	
Travel Time (s)	27.6			5.9	53.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	7	268	40	13	249
Shared Lane Traffic (%)						
Lane Group Flow (vph)	35	0	0	308	262	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.1%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	4.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	25	6	241	36	12	224
Future Vol, veh/h	25	6	241	36	12	224
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	7	268	40	13	249

Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	852	40	249	0	40	0
Stage 1	576	-	-	-	-	-
Stage 2	276	-	-	-	-	-
Critical Hdwy	6.52	6.22	4.12	-	4.12	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	4.018	3.318	2.218	-	2.218	-
Pot Cap-1 Maneuver	297	1031	1317	-	1570	-
Stage 1	502	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	1031	1317	-	1570	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	8.6	7.3	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBR	EBLn1	WBL	WBT
Capacity (veh/h)	1570	-	1031	1317	-
HCM Lane V/C Ratio	0.008	-	0.033	0.203	-
HCM Control Delay (s)	7.3	-	8.6	8.4	0
HCM Lane LOS	A	-	A	A	A
HCM 95th %tile Q(veh)	0	-	0.1	0.8	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	231	6	47	118	5	31
Future Volume (vph)	231	6	47	118	5	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.996				0.885	
Flt Protected				0.986	0.993	
Satd. Flow (prot)	1855	0	0	1837	1637	0
Flt Permitted				0.986	0.993	
Satd. Flow (perm)	1855	0	0	1837	1637	0
Link Speed (mph)	25			30	30	
Link Distance (ft)	2259			288	493	
Travel Time (s)	61.6			6.5	11.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	257	7	52	131	6	34
Shared Lane Traffic (%)						
Lane Group Flow (vph)	264	0	0	183	40	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.7%		ICU Level of Service A	
Analysis Period (min) 15			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	231	6	47	118	5	31
Future Vol, veh/h	231	6	47	118	5	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	257	7	52	131	6	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	263	0	496	260
Stage 1	-	-	-	-	260	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1301	-	533	779
Stage 1	-	-	-	-	783	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1301	-	510	779
Mov Cap-2 Maneuver	-	-	-	-	510	-
Stage 1	-	-	-	-	783	-
Stage 2	-	-	-	-	768	-

Approach	EB	WB	NE
HCM Control Delay, s	0	2.2	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	726	-	-	1301	-
HCM Lane V/C Ratio	0.055	-	-	0.04	-
HCM Control Delay (s)	10.2	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Synchro Results

2045 Build PM_ Queuing

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	3:45	3:45	3:45	3:45	3:45	3:45	3:45
End Time	5:00	5:00	5:00	5:00	5:00	5:00	5:00
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	2408	2389	2442	2436	2404	2391	2379
Vehs Exited	2410	2399	2438	2431	2413	2396	2368
Starting Vehs	80	84	77	83	82	83	81
Ending Vehs	78	74	81	88	73	78	92
Travel Distance (mi)	1449	1442	1475	1500	1475	1451	1429
Travel Time (hr)	211.7	192.4	211.9	143.8	163.3	181.9	135.4
Total Delay (hr)	161.1	142.3	160.8	91.4	111.7	131.4	85.6
Total Stops	2721	2752	2809	2729	2688	2661	2562
Fuel Used (gal)	83.3	78.5	84.0	68.6	72.7	76.4	64.9

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	3:45	3:45	3:45	3:45
End Time	5:00	5:00	5:00	5:00
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	2461	2390	2392	2408
Vehs Exited	2453	2400	2392	2409
Starting Vehs	71	91	76	77
Ending Vehs	79	81	76	77
Travel Distance (mi)	1516	1448	1452	1464
Travel Time (hr)	164.5	142.9	176.1	172.4
Total Delay (hr)	111.3	92.5	125.5	121.4
Total Stops	2804	2782	2732	2722
Fuel Used (gal)	73.8	67.4	74.8	74.5

Interval #0 Information Seeding

Start Time	3:45
End Time	4:00
Total Time (min)	15

Volumes adjusted by Growth Factors.

No data recorded this interval.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Interval #1 Information Recording

Start Time	4:00
End Time	5:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	2408	2389	2442	2436	2404	2391	2379
Vehs Exited	2410	2399	2438	2431	2413	2396	2368
Starting Vehs	80	84	77	83	82	83	81
Ending Vehs	78	74	81	88	73	78	92
Travel Distance (mi)	1449	1442	1475	1500	1475	1451	1429
Travel Time (hr)	211.7	192.4	211.9	143.8	163.3	181.9	135.4
Total Delay (hr)	161.1	142.3	160.8	91.4	111.7	131.4	85.6
Total Stops	2721	2752	2809	2729	2688	2661	2562
Fuel Used (gal)	83.3	78.5	84.0	68.6	72.7	76.4	64.9

Interval #1 Information Recording

Start Time	4:00
End Time	5:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	2461	2390	2392	2408
Vehs Exited	2453	2400	2392	2409
Starting Vehs	71	91	76	77
Ending Vehs	79	81	76	77
Travel Distance (mi)	1516	1448	1452	1464
Travel Time (hr)	164.5	142.9	176.1	172.4
Total Delay (hr)	111.3	92.5	125.5	121.4
Total Stops	2804	2782	2732	2722
Fuel Used (gal)	73.8	67.4	74.8	74.5

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 3: Lake Wheeler Rd & Carolina Pines Ave

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	162	327	174	1285
Average Queue (ft)	70	156	131	1239
95th Queue (ft)	132	272	217	1393
Link Distance (ft)	2162	1170		1232
Upstream Blk Time (%)				40
Queuing Penalty (veh)				0
Storage Bay Dist (ft)			150	
Storage Blk Time (%)			7	27
Queuing Penalty (veh)			83	62

Intersection: 8: Suffolk Blvd & Carolina Pines Ave

Movement	EB	WB	NE
Directions Served	TR	LT	LR
Maximum Queue (ft)	4	88	55
Average Queue (ft)	0	28	25
95th Queue (ft)	3	74	44
Link Distance (ft)	238	1902	518
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Carolina Pines Ave & Granite St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	57	24	26
Average Queue (ft)	21	1	2
95th Queue (ft)	49	13	15
Link Distance (ft)	1166	244	1902
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Intersection: 17: Henslowe Dr & Carolina Pines Ave

Movement	WB	NE
Directions Served	LT	LR
Maximum Queue (ft)	61	46
Average Queue (ft)	10	15
95th Queue (ft)	41	35
Link Distance (ft)	249	449
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 144

Roundabout Results

2045 Build –Alternative 1_AM

INPUT REPORT

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_1]

Upgrade_2045
Site Category: -
Roundabout

Intersection - Site Data	
Site Name	Lake Wheeler Rd @ Carolina Pines Ave_1
Site ID	3
Site Category	-
Site Title	Upgrade_2045

Intersection - Site Properties	
Site (Intersection) Type	Roundabout
Setup Name	US HCM (Customary)
Base Setup	NA
Drive Rule	Right-hand side of the road
HCM Version	Yes
Units	US
First Created	----------
Date	4/2/2019 2:49:29 PM
Created By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916
Last Modified	----------
Date	4/3/2019 2:05:49 PM
Modified By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916

Intersection - Approach & Exit Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching %	Exit Distance ft	Approach Control	Area Type Factor
South	Lake Wheeler Rd	Two-way	1	1	1600.0	–	–	–	–
East	Carolina Pines Ave	Two-way	1	1	1600.0	–	–	–	–
North	Lake Wheeler Rd	Two-way	1	1	1600.0	–	–	–	–

Movement Definitions - Included Movement Classes

Name	ID	Model Designation	Type
Light Vehicles	LV	Light Vehicle	Standard
Heavy Vehicles	HV	Heavy Vehicle	Standard

Movement Definitions - Origin-Destination Movements

To Approach	Turn	OD Mov ID
From: South	Lake Wheeler Rd	
North	T1	8
East	R2	18

From: East	Carolina Pines Ave	
South	L2	1
North	R2	16
From: North	Lake Wheeler Rd	
East	L2	7
South	T1	4

Lane Geometry - Lane Configuration

Leg Item	Configuration	Type	Control	Slip/ Bypass Control	Length ft	Width ft	Grade %	Full Lane [ID	Colour]	Island [Front Width ft	Back Width ft	Fill Style	For Ped Staging]
South	Lake Wheeler Rd												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–
East	Carolina Pines Ave												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–
North	Lake Wheeler Rd												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–

Lanes are numbered from left to right in the direction of travel.

Lane Geometry - Lane Disciplines

To Approach	Turn	Free Queue Distance ft	Movement Class(es)
From: South	App. Lane 1		
North	T1	0	LV, HV
East	R2	0	LV, HV
From: East	App. Lane 1		
South	L2	0	LV, HV
North	R2	0	LV, HV
From: North	App. Lane 1		
East	L2	0	LV, HV
South	T1	0	LV, HV

Lane Geometry - Lane Data

Approach Lane	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count
South	Lake Wheeler Rd						
App. Lane 1	–	–	–	0.0	No	–	–
East	Carolina Pines Ave						
App. Lane 1	–	–	–	0.0	No	–	–

North	Lake Wheeler Rd						
App. Lane 1	–	–	–	0.0	No	–	–

Lane Movements - Flow Proportions

Exit Lane	To Exit Leg South %	East %	North %
Light Vehicles (LV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
From: North	App. Lane 1		
Exit Lane 1	100	100	–
Heavy Vehicles (HV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
From: North	App. Lane 1		
Exit Lane 1	100	100	–

Lane Movements - Blockage Calibration

Exit Lane	To Exit Leg South	East	North
From: South	App. Lane 1		
Exit Lane 1	–	1.0	1.0
From: East	App. Lane 1		
Exit Lane 1	1.0	–	1.0
From: North	App. Lane 1		
Exit Lane 1	1.0	1.0	–

Roundabouts - Options

Roundabout Model Options	
Roundabout Capacity Model	US HCM 6
Roundabout LOS Method	Same as Sign Control
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 2010	–
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 6	No
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Roundabouts - Geometry

Location	Name	Circ. Lanes	Circ. Width	Island Diameter	Inscribed Diameter	Entry Radius	Entry Angle	Raindrop Design	Circ Trans Line	Downstream Circ

										Lanes
			ft	ft	ft	ft	°			
South	Lake Wheeler Rd	1	20.0	100.0	–	65.0	30.0	No	No	–
East	Carolina Pines Ave	1	20.0	100.0	–	65.0	30.0	No	No	–
North	Lake Wheeler Rd	1	20.0	100.0	–	65.0	30.0	No	No	–

HCM 6 Roundabout Capacity Model Parameters

Location	Name	Single L.Circ: Single L.Entry		Single L.Circ: Multi L.Entry		Multi L.Circ: Single L.Entry		Multi L.Circ: Dominant Lane		Multi L.Circ: Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	Lake Wheeler Rd	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
East	Carolina Pines Ave	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
North	Lake Wheeler Rd	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920

HCM 6 Roundabout Model Calibration

Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
South	Lake Wheeler Rd	1.00	None
East	Carolina Pines Ave	1.00	None
North	Lake Wheeler Rd	1.00	None

Pedestrians - Pedestrian Movements

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes

Main Crossing/ Slip/Bypass Lane Crossing	Volume	Peak Flow	Flow Scale	Growth Rate
	ped	%	%	%
No Ped Movements				

Pedestrians - Pedestrian Movement Data

Main Crossing/ Slip/ Bypass Lane Crossing	Mov. ID	Crossing Distance	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed	App. Trav. Distance	Downst. Distance	Queue Space	Cr. Setback Distance
		ft			ft/sec	ft	ft	ft	
No Ped Movements									

Volumes - Vehicle Volumes

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes
Volume Data Method: Total and %

Movement	To Exit Leg		
	South	East	North

Class	veh	veh	veh
From: South	Lake Wheeler Rd		
Total (veh)	–	31.0	771.0
LV (%)	–	97.000	97.000
HV (%)	–	3.000	3.000
From: East	Carolina Pines Ave		
Total (veh)	57.0	–	245.0
LV (%)	97.000	–	97.000
HV (%)	3.000	–	3.000
From: North	Lake Wheeler Rd		
Total (veh)	491.0	36.0	–
LV (%)	97.000	97.000	–
HV (%)	3.000	3.000	–

Volumes - Volume Factors

To Approach	Peak Flow Factor %	Flow Scale %	Growth Rate %/year
Light Vehicles (LV)			
From: South	Lake Wheeler Rd		
North	92.0	100.00	2.00
East	92.0	100.00	2.00
From: East	Carolina Pines Ave		
South	92.0	100.00	2.00
North	92.0	100.00	2.00
From: North	Lake Wheeler Rd		
East	92.0	100.00	2.00
South	92.0	100.00	2.00
Heavy Vehicles (HV)			
From: South	Lake Wheeler Rd		
North	92.0	100.00	2.00
East	92.0	100.00	2.00
From: East	Carolina Pines Ave		
South	92.0	100.00	2.00
North	92.0	100.00	2.00
From: North	Lake Wheeler Rd		
East	92.0	100.00	2.00
South	92.0	100.00	2.00

Gap Acceptance - Gap Acceptance Data

Opposed Movement	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)
South	Lake Wheeler Rd					
T1	–	–	2.50	0	0.00	Prg(Flow)
R2	–	–	2.50	0	0.00	Prg(Flow)
East	Carolina Pines Ave					
L2	–	–	2.50	0	0.00	Prg(Flow)
R2	–	–	2.50	0	0.00	Prg(Flow)
North	Lake Wheeler Rd					
L2	–	–	2.50	0	0.00	Prg(Flow)
T1	–	–	2.50	0	0.00	Prg(Flow)

Gap Acceptance - Settings

Gap Acceptance Capacity : –

Vehicle Movement Data - Path Data

Turn	Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft
Light Vehicles (LV)						
From: South	Lake Wheeler Rd					
T1	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: East	Carolina Pines Ave					
L2	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: North	Lake Wheeler Rd					
L2	40.0	40.0	–	–	–	–
T1	40.0	40.0	–	–	–	–
Heavy Vehicles (HV)						
From: South	Lake Wheeler Rd					
T1	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: East	Carolina Pines Ave					
L2	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: North	Lake Wheeler Rd					
L2	40.0	40.0	–	–	–	–
T1	40.0	40.0	–	–	–	–

Vehicle Movement Data - Calibration

Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	Turn Veh Effect [Factor	Radius] ft	Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.
Light Vehicles (LV)								
From: South	Lake Wheeler Rd							
T1	25.00	17.00	1.20	1	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: East	Carolina Pines Ave							
L2	25.00	17.00	1.20	1.05	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: North	Lake Wheeler Rd							
L2	25.00	17.00	1.20	1.05	–	1	1	–
T1	25.00	17.00	1.20	1	–	1	1	–
Heavy Vehicles (HV)								
From: South	Lake Wheeler Rd							
T1	45.00	36.00	1.20	1	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: East	Carolina Pines Ave							
L2	45.00	36.00	1.20	1.05	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: North	Lake Wheeler Rd							
L2	45.00	36.00	1.20	1.05	–	2	2	–
T1	45.00	36.00	1.20	1	–	2	2	–

Site Demand & Sensitivity

Analysis Method: None

Parameter Settings - Options	
General Options	
Site Level of Service Method	Delay & v/c (HCM 6)
Site Level of Service Target	LOS D
Pedestrian Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	Percentile: 95%
Hours per Year	480 h
Include Short Lanes in determining Approach Queue Storage Ratio	No

Parameter Settings - Model Parameters	
Passenger Car Equivalents	
Light Vehicles (LV)	1.00 pcu/veh
Heavy Vehicles (HV)	2.00 pcu/veh
Queue Blockage	
Minimum Probability of Blockage	0
Delay and Queue	
Exclude Geometric Delay	Yes
HCM Delay Formula	Yes
HCM Queue Formula	Yes
Platoon Dispersion Model	
fpf	0.80
fpmin	1.00
fpmax	1.25
Lpmin	200.0 ft
Lpmax	1000.0 ft
n	0.60
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Parameter Settings - Cost

Cost Options

Cost Unit	$

Vehicle Cost Parameters

Movement Class	Veh Cost Method	Veh Operating Cost			Veh Time Cost	
		Pump Price of Fuel	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost	Avg. Income	Time Value Factor
		$/Gal			$/h	
Light Vehicles (LV)	Operating Cost	2.300	0.700	3.00	27.00	0.400
Heavy Vehicles (HV)	Operating Cost	2.300	0.700	3.00	27.00	0.400

Parameter Settings - Vehicle Parameters

Movement Class	Mass lb	Max Power kW	CO2 to Fuel Rate
Light Vehicles (LV)	3500.0	120	2.35
Heavy Vehicles (HV)	33000.0	170	2.633

Parameter Settings - Fuel Consumption				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1200	16	0.004	0.1
Heavy Vehicles (HV)	2300	200	0.009	0.075

Parameter Settings - CO Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1620	-138	0.0743	0.294
Heavy Vehicles (HV)	25000	320	-0.06	0.04

Parameter Settings - HC Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	340	-9	0.0031	0.029
Heavy Vehicles (HV)	3000	1	-0.0016	0.0013

Parameter Settings - NOx Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	300	-14	0.0068	0.166
Heavy Vehicles (HV)	44000	2820	0.21	1.9

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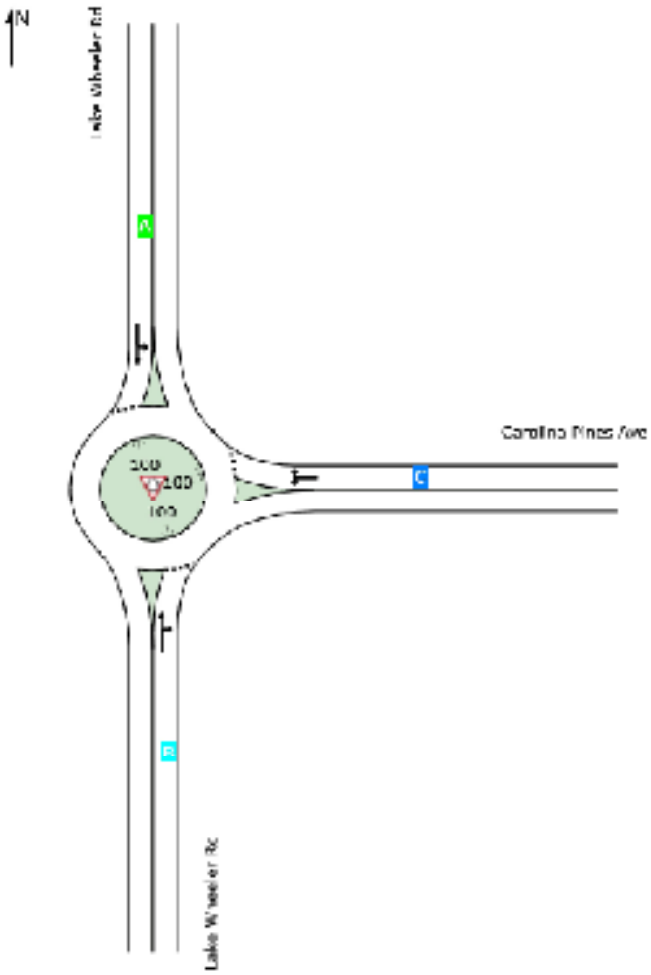
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_1]

Upgrade_2045
Site Category: -
Roundabout

	Approaches			Intersection
	South	East	North	
LOS	B	C	A	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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Roundabout Results

2045 Build –Alternative 1_PM

INPUT REPORT

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_1]

Upgrade_2045
Site Category: -
Roundabout

Intersection - Site Data	
Site Name	Lake Wheeler Rd @ Carolina Pines Ave_1
Site ID	3
Site Category	-
Site Title	Upgrade_2045

Intersection - Site Properties	
Site (Intersection) Type	Roundabout
Setup Name	US HCM (Customary)
Base Setup	NA
Drive Rule	Right-hand side of the road
HCM Version	Yes
Units	US
First Created	----------
Date	4/2/2019 2:49:29 PM
Created By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916
Last Modified	----------
Date	4/3/2019 1:57:25 PM
Modified By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916

Intersection - Approach & Exit Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching %	Exit Distance ft	Approach Control	Area Type Factor
South	Lake Wheeler Rd	Two-way	1	1	1600.0	–	–	–	–
East	Carolina Pines Ave	Two-way	1	1	1600.0	–	–	–	–
North	Lake Wheeler Rd	Two-way	1	1	1600.0	–	–	–	–

Movement Definitions - Included Movement Classes

Name	ID	Model Designation	Type
Light Vehicles	LV	Light Vehicle	Standard
Heavy Vehicles	HV	Heavy Vehicle	Standard

Movement Definitions - Origin-Destination Movements

To Approach	Turn	OD Mov ID
From: South	Lake Wheeler Rd	
North	T1	8
East	R2	18

From: East	Carolina Pines Ave	
South	L2	1
North	R2	16
From: North	Lake Wheeler Rd	
East	L2	7
South	T1	4

Lane Geometry - Lane Configuration

Leg Item	Configuration	Type	Control	Slip/ Bypass Control	Length ft	Width ft	Grade %	Full Lane [ID	Colour]	Island [Front Width ft	Back Width ft	Fill Style	For Ped Staging]
South	Lake Wheeler Rd												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–
East	Carolina Pines Ave												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–
North	Lake Wheeler Rd												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–

Lanes are numbered from left to right in the direction of travel.

Lane Geometry - Lane Disciplines

To Approach	Turn	Free Queue Distance ft	Movement Class(es)
From: South	App. Lane 1		
North	T1	0	LV, HV
East	R2	0	LV, HV
From: East	App. Lane 1		
South	L2	0	LV, HV
North	R2	0	LV, HV
From: North	App. Lane 1		
East	L2	0	LV, HV
South	T1	0	LV, HV

Lane Geometry - Lane Data

Approach Lane	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count
South	Lake Wheeler Rd						
App. Lane 1	–	–	–	0.0	No	–	–
East	Carolina Pines Ave						
App. Lane 1	–	–	–	0.0	No	–	–

North	Lake Wheeler Rd						
App. Lane 1	–	–	–	0.0	No	–	–

Lane Movements - Flow Proportions

Exit Lane	To Exit Leg South %	East %	North %
Light Vehicles (LV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
From: North	App. Lane 1		
Exit Lane 1	100	100	–
Heavy Vehicles (HV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
From: North	App. Lane 1		
Exit Lane 1	100	100	–

Lane Movements - Blockage Calibration

Exit Lane	To Exit Leg South	East	North
From: South	App. Lane 1		
Exit Lane 1	–	1.0	1.0
From: East	App. Lane 1		
Exit Lane 1	1.0	–	1.0
From: North	App. Lane 1		
Exit Lane 1	1.0	1.0	–

Roundabouts - Options

Roundabout Model Options	
Roundabout Capacity Model	US HCM 6
Roundabout LOS Method	Same as Sign Control
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 2010	–
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 6	No
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Roundabouts - Geometry

Location	Name	Circ. Lanes	Circ. Width	Island Diameter	Inscribed Diameter	Entry Radius	Entry Angle	Raindrop Design	Circ Trans Line	Downstream Circ

										Lanes
			ft	ft	ft	ft	°			
South	Lake Wheeler Rd	1	20.0	100.0	–	65.0	30.0	No	No	–
East	Carolina Pines Ave	1	20.0	100.0	–	65.0	30.0	No	No	–
North	Lake Wheeler Rd	1	20.0	100.0	–	65.0	30.0	No	No	–

HCM 6 Roundabout Capacity Model Parameters

Location	Name	Single L.Circ: Single L.Entry		Single L.Circ: Multi L.Entry		Multi L.Circ: Single L.Entry		Multi L.Circ: Dominant Lane		Multi L.Circ: Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	Lake Wheeler Rd	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
East	Carolina Pines Ave	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
North	Lake Wheeler Rd	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920

HCM 6 Roundabout Model Calibration

Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
South	Lake Wheeler Rd	1.00	None
East	Carolina Pines Ave	1.00	None
North	Lake Wheeler Rd	1.00	None

Pedestrians - Pedestrian Movements

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes

Main Crossing/ Slip/Bypass Lane Crossing	Volume	Peak Flow	Flow Scale	Growth Rate
	ped	%	%	%
No Ped Movements				

Pedestrians - Pedestrian Movement Data

Main Crossing/ Slip/ Bypass Lane Crossing	Mov. ID	Crossing Distance	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed	App. Trav. Distance	Downst. Distance	Queue Space	Cr. Setback Distance
		ft			ft/sec	ft	ft	ft	
No Ped Movements									

Volumes - Vehicle Volumes

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes
Volume Data Method: Total and %

Movement	To Exit Leg		
	South	East	North

Class	veh	veh	veh
From: South	Lake Wheeler Rd		
Total (veh)	–	57.0	614.0
LV (%)	–	97.000	97.000
HV (%)	–	3.000	3.000
From: East	Carolina Pines Ave		
Total (veh)	41.0	–	101.0
LV (%)	97.000	–	97.000
HV (%)	3.000	–	3.000
From: North	Lake Wheeler Rd		
Total (veh)	1211.0	233.0	–
LV (%)	97.000	97.000	–
HV (%)	3.000	3.000	–

Volumes - Volume Factors

To Approach	Peak Flow Factor %	Flow Scale %	Growth Rate %/year
Light Vehicles (LV)			
From: South	Lake Wheeler Rd		
North	92.0	100.00	2.00
East	92.0	100.00	2.00
From: East	Carolina Pines Ave		
South	92.0	100.00	2.00
North	92.0	100.00	2.00
From: North	Lake Wheeler Rd		
East	92.0	100.00	2.00
South	92.0	100.00	2.00
Heavy Vehicles (HV)			
From: South	Lake Wheeler Rd		
North	92.0	100.00	2.00
East	92.0	100.00	2.00
From: East	Carolina Pines Ave		
South	92.0	100.00	2.00
North	92.0	100.00	2.00
From: North	Lake Wheeler Rd		
East	92.0	100.00	2.00
South	92.0	100.00	2.00

Gap Acceptance - Gap Acceptance Data

Opposed Movement	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)
South	Lake Wheeler Rd					
T1	–	–	2.50	0	0.00	Prg(Flow)
R2	–	–	2.50	0	0.00	Prg(Flow)
East	Carolina Pines Ave					
L2	–	–	2.50	0	0.00	Prg(Flow)
R2	–	–	2.50	0	0.00	Prg(Flow)
North	Lake Wheeler Rd					
L2	–	–	2.50	0	0.00	Prg(Flow)
T1	–	–	2.50	0	0.00	Prg(Flow)

Gap Acceptance - Settings

Gap Acceptance Capacity : –

Vehicle Movement Data - Path Data

Turn	Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft
Light Vehicles (LV)						
From: South	Lake Wheeler Rd					
T1	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: East	Carolina Pines Ave					
L2	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: North	Lake Wheeler Rd					
L2	40.0	40.0	–	–	–	–
T1	40.0	40.0	–	–	–	–
Heavy Vehicles (HV)						
From: South	Lake Wheeler Rd					
T1	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: East	Carolina Pines Ave					
L2	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: North	Lake Wheeler Rd					
L2	40.0	40.0	–	–	–	–
T1	40.0	40.0	–	–	–	–

Vehicle Movement Data - Calibration

Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	Turn Veh Effect [Factor	Radius] ft	Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.
Light Vehicles (LV)								
From: South	Lake Wheeler Rd							
T1	25.00	17.00	1.20	1	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: East	Carolina Pines Ave							
L2	25.00	17.00	1.20	1.05	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: North	Lake Wheeler Rd							
L2	25.00	17.00	1.20	1.05	–	1	1	–
T1	25.00	17.00	1.20	1	–	1	1	–
Heavy Vehicles (HV)								
From: South	Lake Wheeler Rd							
T1	45.00	36.00	1.20	1	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: East	Carolina Pines Ave							
L2	45.00	36.00	1.20	1.05	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: North	Lake Wheeler Rd							
L2	45.00	36.00	1.20	1.05	–	2	2	–
T1	45.00	36.00	1.20	1	–	2	2	–

Site Demand & Sensitivity

Analysis Method: None

Parameter Settings - Options	
General Options	
Site Level of Service Method	Delay & v/c (HCM 6)
Site Level of Service Target	LOS D
Pedestrian Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	Percentile: 95%
Hours per Year	480 h
Include Short Lanes in determining Approach Queue Storage Ratio	No

Parameter Settings - Model Parameters	
Passenger Car Equivalents	
Light Vehicles (LV)	1.00 pcu/veh
Heavy Vehicles (HV)	2.00 pcu/veh
Queue Blockage	
Minimum Probability of Blockage	0
Delay and Queue	
Exclude Geometric Delay	Yes
HCM Delay Formula	Yes
HCM Queue Formula	Yes
Platoon Dispersion Model	
fpf	0.80
fpmin	1.00
fpmax	1.25
Lpmin	200.0 ft
Lpmax	1000.0 ft
n	0.60
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Parameter Settings - Cost

Cost Options

Cost Unit	$

Vehicle Cost Parameters

Movement Class	Veh Cost Method	Veh Operating Cost			Veh Time Cost	
		Pump Price of Fuel	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost	Avg. Income	Time Value Factor
		$/Gal			$/h	
Light Vehicles (LV)	Operating Cost	2.300	0.700	3.00	27.00	0.400
Heavy Vehicles (HV)	Operating Cost	2.300	0.700	3.00	27.00	0.400

Parameter Settings - Vehicle Parameters

Movement Class	Mass lb	Max Power kW	CO2 to Fuel Rate
Light Vehicles (LV)	3500.0	120	2.35
Heavy Vehicles (HV)	33000.0	170	2.633

Parameter Settings - Fuel Consumption				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1200	16	0.004	0.1
Heavy Vehicles (HV)	2300	200	0.009	0.075

Parameter Settings - CO Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1620	-138	0.0743	0.294
Heavy Vehicles (HV)	25000	320	-0.06	0.04

Parameter Settings - HC Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	340	-9	0.0031	0.029
Heavy Vehicles (HV)	3000	1	-0.0016	0.0013

Parameter Settings - NOx Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	300	-14	0.0068	0.166
Heavy Vehicles (HV)	44000	2820	0.21	1.9

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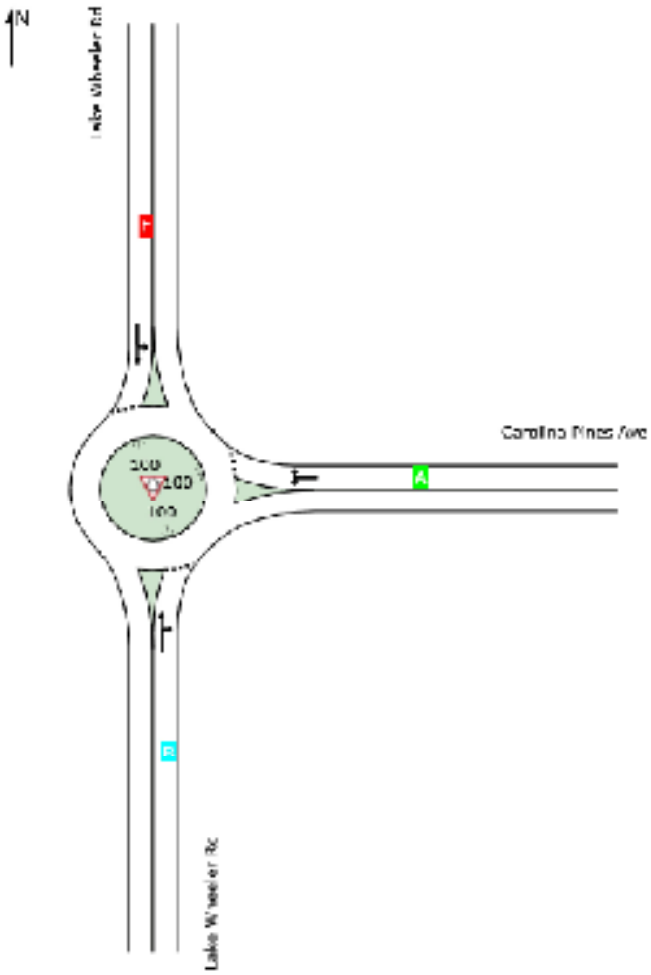
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_1]

Upgrade_2045
Site Category: -
Roundabout

	Approaches			Intersection
	South	East	North	
LOS	B	A	F	F



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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Project: I:\RAL\PRJ\000015027\R_CarolinaPines\Traffic\CongestionMgmt\Analysis\Sidra\Build\Lake Wheeler Rd_2045_PM.sip8

Roundabout Results

2045 Build –Alternative 2_AM

INPUT REPORT

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_2]

Upgrade_2045
Site Category: -
Roundabout

Intersection - Site Data	
Site Name	Lake Wheeler Rd @ Carolina Pines Ave_2
Site ID	3
Site Category	-
Site Title	Upgrade_2045

Intersection - Site Properties	
Site (Intersection) Type	Roundabout
Setup Name	US HCM (Customary)
Base Setup	NA
Drive Rule	Right-hand side of the road
HCM Version	Yes
Units	US
First Created	----------
Date	4/2/2019 2:49:29 PM
Created By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916
Last Modified	----------
Date	4/3/2019 2:05:49 PM
Modified By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916

Intersection - Approach & Exit Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching %	Exit Distance ft	Approach Control	Area Type Factor
South	Lake Wheeler Rd	Two-way	1	2	1600.0	–	–	–	–
East	Carolina Pines Ave	Two-way	1	1	1600.0	–	–	–	–
North	Lake Wheeler Rd	Two-way	2	1	1600.0	–	–	–	–

Movement Definitions - Included Movement Classes

Name	ID	Model Designation	Type
Light Vehicles	LV	Light Vehicle	Standard
Heavy Vehicles	HV	Heavy Vehicle	Standard

Movement Definitions - Origin-Destination Movements

To Approach	Turn	OD Mov ID
From: South	Lake Wheeler Rd	
North	T1	8
East	R2	18

From: East	Carolina Pines Ave	
South	L2	1
North	R2	16
From: North	Lake Wheeler Rd	
East	L2	7
South	T1	4

Lane Geometry - Lane Configuration

Leg Item	Configuration	Type	Control	Slip/ Bypass Control	Length ft	Width ft	Grade %	Full Lane [ID	Colour]	Island [Front Width ft	Back Width ft	Fill Style	For Ped Staging]
South	Lake Wheeler Rd												
Exit Lane 2	Short Lane	–	–	–	–	13	0	–	–	–	–	–	–
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Giveway/Yield	–	1600	13	0			–	–	–	–
East	Carolina Pines Ave												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Giveway/Yield	–	1600	13	0			–	–	–	–
North	Lake Wheeler Rd												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Short Lane	Normal	Giveway/Yield	–	–	13	0	–	–	–	–	–	–
App. Lane 2	Full-Length	Slip/ Bypass (Low Angle)	Continuous	Continuous	1600	13	0			–	–	–	–

Lanes are numbered from left to right in the direction of travel.

Lane Geometry - Lane Configuration - Short Lanes and Two-Segment Lanes

Leg Item	Configuration	Short Lane / Segment 1 [Length ft	Overflow/ Merge Lane Number	ID	Colour]	Segment 2 [Length ft	ID	Colour]
South	Lake Wheeler Rd							
Exit Lane 2	Short Lane	200	1			–	–	–
North	Lake Wheeler Rd							
App. Lane 1	Short Lane	150	2			–	–	–

Lane Geometry - Lane Disciplines

To Approach	Turn	Free Queue Distance ft	Movement Class(es)
From: South	App. Lane 1		
North	T1	0	LV, HV
East	R2	0	LV, HV
From: East	App. Lane 1		

South	L2	0	LV, HV
North	R2	0	LV, HV
From: North	App. Lane 1		
East	L2	–	LV, HV
From: North	App. Lane 2		
South	T1	–	LV, HV

Lane Geometry - Lane Data

Approach	Lane	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count
South	Lake Wheeler Rd							
App. Lane 1		–	–	–	0.0	No	–	–
East	Carolina Pines Ave							
App. Lane 1		–	–	–	0.0	No	–	–
North	Lake Wheeler Rd							
App. Lane 1		–	–	–	0.0	No	–	–
App. Lane 2		1900	–	–	0.0	No	–	Yes

Lane Movements - Flow Proportions

Exit Lane	To Exit Leg South %	East %	North %
Light Vehicles (LV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
Exit Lane 2	0	–	–
From: North	App. Lane 1		
Exit Lane 1	–	100	–
From: North	App. Lane 2		
Exit Lane 1	0	–	–
Exit Lane 2	100	–	–
Heavy Vehicles (HV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
Exit Lane 2	0	–	–
From: North	App. Lane 1		
Exit Lane 1	–	100	–
From: North	App. Lane 2		
Exit Lane 1	0	–	–
Exit Lane 2	100	–	–

Lane Movements - Blockage Calibration

Exit Lane	To Exit Leg South	East	North
From: South	App. Lane 1		
Exit Lane 1	–	1.0	1.0
From: East	App. Lane 1		

Exit Lane 1	1.0	–	1.0
Exit Lane 2	1.0	–	–
From: North	App. Lane 1		
Exit Lane 1	–	1.0	–
From: North	App. Lane 2		
Exit Lane 1	1.0	–	–
Exit Lane 2	1.0	–	–

Roundabouts - Options

Roundabout Model Options	
Roundabout Capacity Model	US HCM 6
Roundabout LOS Method	Same as Sign Control
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 2010	–
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 6	No
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Roundabouts - Geometry

Location	Name	Circ. Lanes	Circ. Width ft	Island Diameter ft	Inscribed Diameter ft	Entry Radius ft	Entry Angle °	Raindrop Design	Circ Trans Line	Downstream Circ Lanes
South	Lake Wheeler Rd	1	20.0	100.0	–	65.0	30.0	No	No	–
East	Carolina Pines Ave	1	20.0	100.0	–	65.0	30.0	No	No	–
North	Lake Wheeler Rd	1	20.0	100.0	–	65.0	30.0	No	No	–

HCM 6 Roundabout Capacity Model Parameters

Location	Name	Single L.Circ: Single L.Entry Para. A	Single L.Circ: Single L.Entry Para. B	Single L.Circ: Multi L.Entry Para. A	Single L.Circ: Multi L.Entry Para. B	Multi L.Circ: Single L.Entry Para. A	Multi L.Circ: Single L.Entry Para. B	Multi L.Circ: Dominant Lane Para. A	Multi L.Circ: Dominant Lane Para. B	Multi L.Circ: Subdominant Lane Para. A	Multi L.Circ: Subdominant Lane Para. B
South	Lake Wheeler Rd	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
East	Carolina Pines Ave	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
North	Lake Wheeler Rd	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920

HCM 6 Roundabout Model Calibration

Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
South	Lake Wheeler Rd	1.00	None
East	Carolina Pines Ave	1.00	None
North	Lake Wheeler Rd	1.00	None

Pedestrians - Pedestrian Movements

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes

Main Crossing/ Slip/Bypass Lane Crossing	Volume ped	Peak Flow %	Flow Scale %	Growth Rate %
No Ped Movements				

Pedestrians - Pedestrian Movement Data

Main Crossing/ Slip/ Bypass Lane Crossing	Mov. ID	Crossing Distance ft	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed ft/sec	App. Trav. Distance ft	Downst. Distance ft	Queue Space ft	Cr. Setback Distance
No Ped Movements									

Volumes - Vehicle Volumes

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes
Volume Data Method: Total and %

Movement Class	To Exit Leg South veh	East veh	North veh
From: South	Lake Wheeler Rd		
Total (veh)	–	31.0	771.0
LV (%)	–	97.000	97.000
HV (%)	–	3.000	3.000
From: East	Carolina Pines Ave		
Total (veh)	57.0	–	245.0
LV (%)	97.000	–	97.000
HV (%)	3.000	–	3.000
From: North	Lake Wheeler Rd		
Total (veh)	491.0	36.0	–
LV (%)	97.000	97.000	–
HV (%)	3.000	3.000	–

Volumes - Volume Factors

To Approach	Peak Flow Factor %	Flow Scale %	Growth Rate %/year
Light Vehicles (LV)			
From: South	Lake Wheeler Rd		
North	92.0	100.00	2.00
East	92.0	100.00	2.00
From: East	Carolina Pines Ave		
South	92.0	100.00	2.00
North	92.0	100.00	2.00
From: North	Lake Wheeler Rd		
East	92.0	100.00	2.00

South	92.0	100.00	2.00
Heavy Vehicles (HV)			
From: South	Lake Wheeler Rd		
North	92.0	100.00	2.00
East	92.0	100.00	2.00
From: East	Carolina Pines Ave		
South	92.0	100.00	2.00
North	92.0	100.00	2.00
From: North	Lake Wheeler Rd		
East	92.0	100.00	2.00
South	92.0	100.00	2.00

Gap Acceptance - Gap Acceptance Data

Opposed Movement		Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)
South	Lake Wheeler Rd						
T1		–	–	2.50	0	0.00	Prg(Flow)
R2		–	–	2.50	0	0.00	Prg(Flow)
East	Carolina Pines Ave						
L2		–	–	2.50	0	0.00	Prg(Flow)
R2		–	–	2.50	0	0.00	Prg(Flow)
North	Lake Wheeler Rd						
L2		–	–	2.50	0	0.00	Prg(Flow)
T1		–	–	2.50	0	0.00	Prg(Flow)

Gap Acceptance - Settings

Gap Acceptance Capacity : –

Vehicle Movement Data - Path Data

Turn		Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft
Light Vehicles (LV)							
From: South	Lake Wheeler Rd						
T1		40.0	40.0	–	–	–	–
R2		40.0	40.0	–	–	–	–
From: East	Carolina Pines Ave						
L2		40.0	40.0	–	–	–	–
R2		40.0	40.0	–	–	–	–
From: North	Lake Wheeler Rd						
L2		40.0	40.0	–	–	–	–
T1		40.0	40.0	–	–	–	–
Heavy Vehicles (HV)							
From: South	Lake Wheeler Rd						
T1		40.0	40.0	–	–	–	–
R2		40.0	40.0	–	–	–	–
From: East	Carolina Pines Ave						
L2		40.0	40.0	–	–	–	–
R2		40.0	40.0	–	–	–	–
From: North	Lake Wheeler Rd						
L2		40.0	40.0	–	–	–	–
T1		40.0	40.0	–	–	–	–

Vehicle Movement Data - Calibration

Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	Turn Veh Effect [Factor	Radius] ft	Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.
Light Vehicles (LV)								
From: South	Lake Wheeler Rd							
T1	25.00	17.00	1.20	1	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: East	Carolina Pines Ave							
L2	25.00	17.00	1.20	1.05	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: North	Lake Wheeler Rd							
L2	25.00	17.00	1.20	1.05	–	1	1	–
T1	25.00	17.00	1.20	1	–	1	1	–
Heavy Vehicles (HV)								
From: South	Lake Wheeler Rd							
T1	45.00	36.00	1.20	1	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: East	Carolina Pines Ave							
L2	45.00	36.00	1.20	1.05	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: North	Lake Wheeler Rd							
L2	45.00	36.00	1.20	1.05	–	2	2	–
T1	45.00	36.00	1.20	1	–	2	2	–

Site Demand & Sensitivity

Analysis Method: None

Parameter Settings - Options

General Options	
Site Level of Service Method	Delay & v/c (HCM 6)
Site Level of Service Target	LOS D
Pedestrian Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	Percentile: 95%
Hours per Year	480 h
Include Short Lanes in determining Approach Queue Storage Ratio	No

Parameter Settings - Model Parameters

Passenger Car Equivalents	
Light Vehicles (LV)	1.00 pcu/veh
Heavy Vehicles (HV)	2.00 pcu/veh
Queue Blockage	
Minimum Probability of Blockage	0
Delay and Queue	
Exclude Geometric Delay	Yes
HCM Delay Formula	Yes
HCM Queue Formula	Yes
Platoon Dispersion Model	
fpf	0.80
fpmin	1.00
fpmax	1.25
Lpmin	200.0 ft
Lpmax	1000.0 ft

n	0.60
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Parameter Settings - Cost

Cost Options	
Cost Unit	$

Vehicle Cost Parameters

Movement Class	Veh Cost Method	Veh Operating Cost			Veh Time Cost	
		Pump Price of Fuel	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost	Avg. Income	Time Value Factor
		$/Gal			$/h	
Light Vehicles (LV)	Operating Cost	2.300	0.700	3.00	27.00	0.400
Heavy Vehicles (HV)	Operating Cost	2.300	0.700	3.00	27.00	0.400

Parameter Settings - Vehicle Parameters

Movement Class	Mass lb	Max Power kW	CO2 to Fuel Rate
Light Vehicles (LV)	3500.0	120	2.35
Heavy Vehicles (HV)	33000.0	170	2.633

Parameter Settings - Fuel Consumption

Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1200	16	0.004	0.1
Heavy Vehicles (HV)	2300	200	0.009	0.075

Parameter Settings - CO Emission

Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1620	-138	0.0743	0.294
Heavy Vehicles (HV)	25000	320	-0.06	0.04

Parameter Settings - HC Emission

Movement Class	fi	A	B	Beta
Light Vehicles (LV)	340	-9	0.0031	0.029
Heavy Vehicles (HV)	3000	1	-0.0016	0.0013

Parameter Settings - NOx Emission

Movement Class	fi	A	B	Beta
Light Vehicles (LV)	300	-14	0.0068	0.166
Heavy Vehicles (HV)	44000	2820	0.21	1.9

MOVEMENT SUMMARY

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_2]

Upgrade_2045
Site Category: -
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Lake Wheeler Rd												
8	T1	838	3.0	0.678	11.9	LOS B	7.5	190.9	0.35	0.14	0.35	31.9
18	R2	34	3.0	0.678	11.9	LOS B	7.5	190.9	0.35	0.14	0.35	31.0
Approach		872	3.0	0.678	11.9	LOS B	7.5	190.9	0.35	0.14	0.35	31.8
East: Carolina Pines Ave												
1	L2	62	3.0	0.591	18.4	LOS C	3.9	100.8	0.81	0.99	1.38	28.7
16	R2	266	3.0	0.591	18.4	LOS C	3.9	100.8	0.81	0.99	1.38	28.0
Approach		328	3.0	0.591	18.4	LOS C	3.9	100.8	0.81	0.99	1.38	28.1
North: Lake Wheeler Rd												
7	L2	39	3.0	0.030	3.0	LOS A	0.1	2.9	0.16	0.05	0.16	33.4
4	T1	534	3.0	0.278	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	38.2
Approach		573	3.0	0.278	0.2	LOS A	0.1	2.9	0.01	0.00	0.01	37.8
All Vehicles		1773	3.0	0.678	9.3	LOS A	7.5	190.9	0.33	0.25	0.43	32.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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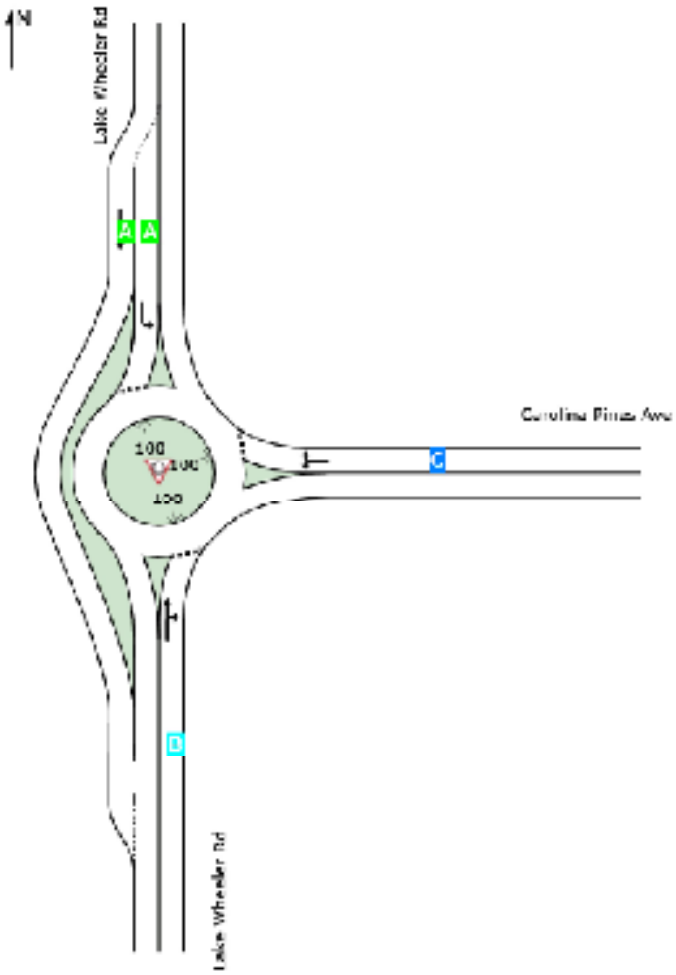
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_2]

Upgrade_2045
Site Category: -
Roundabout

	Approaches			Intersection
	South	East	North	
LOS	B	C	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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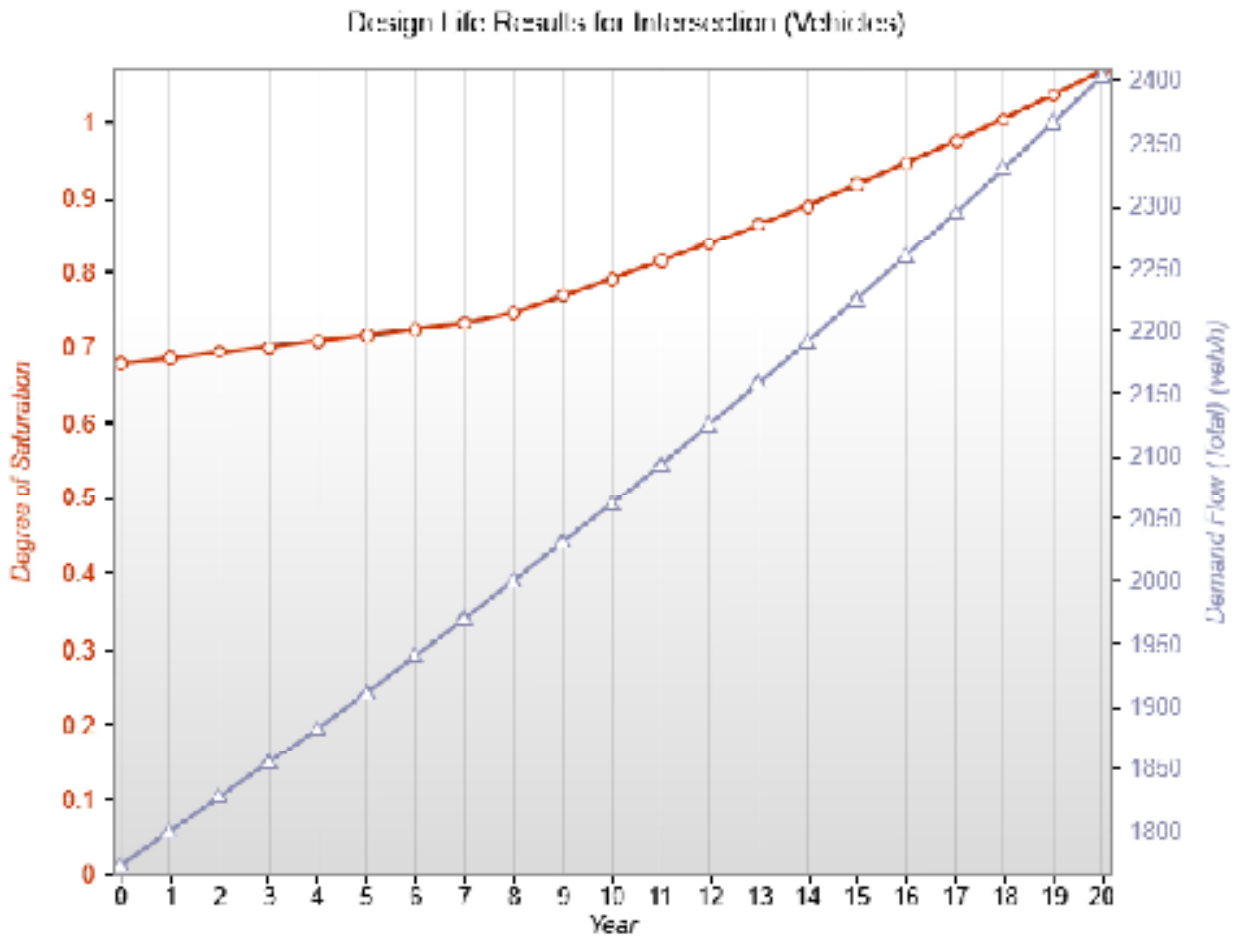
SITE GRAPHS - Demand (Design Life) Analysis

Highest degree of saturation in any lane and Total demand flow (vehicles/h)

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_2]

Upgrade_2045
Site Category: -
Roundabout
Design Life Analysis (Final Year): Results for 20 years



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Roundabout Results

2045 Build –Alternative 2_PM

INPUT REPORT

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_2]

Upgrade_2045
Site Category: -
Roundabout

Intersection - Site Data	
Site Name	Lake Wheeler Rd @ Carolina Pines Ave_2
Site ID	3
Site Category	-
Site Title	Upgrade_2045

Intersection - Site Properties	
Site (Intersection) Type	Roundabout
Setup Name	US HCM (Customary)
Base Setup	NA
Drive Rule	Right-hand side of the road
HCM Version	Yes
Units	US
First Created	----------
Date	4/2/2019 2:49:29 PM
Created By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916
Last Modified	----------
Date	4/3/2019 1:57:25 PM
Modified By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916

Intersection - Approach & Exit Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching %	Exit Distance ft	Approach Control	Area Type Factor
South	Lake Wheeler Rd	Two-way	1	2	1600.0	–	–	–	–
East	Carolina Pines Ave	Two-way	1	1	1600.0	–	–	–	–
North	Lake Wheeler Rd	Two-way	2	1	1600.0	–	–	–	–

Movement Definitions - Included Movement Classes

Name	ID	Model Designation	Type
Light Vehicles	LV	Light Vehicle	Standard
Heavy Vehicles	HV	Heavy Vehicle	Standard

Movement Definitions - Origin-Destination Movements

To Approach	Turn	OD Mov ID
From: South	Lake Wheeler Rd	
North	T1	8
East	R2	18

From: East	Carolina Pines Ave	
South	L2	1
North	R2	16
From: North	Lake Wheeler Rd	
East	L2	7
South	T1	4

Lane Geometry - Lane Configuration

Leg Item	Configuration	Type	Control	Slip/ Bypass Control	Length ft	Width ft	Grade %	Full Lane [ID	Colour]	Island [Front Width ft	Back Width ft	Fill Style	For Ped Staging]
South	Lake Wheeler Rd												
Exit Lane 2	Short Lane	–	–	–	–	13	0	–	–	–	–	–	–
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Giveway/Yield	–	1600	13	0			–	–	–	–
East	Carolina Pines Ave												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Giveway/Yield	–	1600	13	0			–	–	–	–
North	Lake Wheeler Rd												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Short Lane	Normal	Giveway/Yield	–	–	13	0	–	–	–	–	–	–
App. Lane 2	Full-Length	Slip/ Bypass (Low Angle)	Continuous	Continuous	1600	13	0			–	–	–	–

Lanes are numbered from left to right in the direction of travel.

Lane Geometry - Lane Configuration - Short Lanes and Two-Segment Lanes

Leg Item	Configuration	Short Lane / Segment 1 [Length ft	Overflow/ Merge Lane Number	ID	Colour]	Segment 2 [Length ft	ID	Colour]
South	Lake Wheeler Rd							
Exit Lane 2	Short Lane	200	1			–	–	–
North	Lake Wheeler Rd							
App. Lane 1	Short Lane	150	2			–	–	–

Lane Geometry - Lane Disciplines

To Approach	Turn	Free Queue Distance ft	Movement Class(es)
From: South	App. Lane 1		
North	T1	0	LV, HV
East	R2	0	LV, HV
From: East	App. Lane 1		

South	L2	0	LV, HV
North	R2	0	LV, HV
From: North	App. Lane 1		
East	L2	–	LV, HV
From: North	App. Lane 2		
South	T1	–	LV, HV

Lane Geometry - Lane Data

Approach	Lane	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count
South	Lake Wheeler Rd							
App. Lane 1		–	–	–	0.0	No	–	–
East	Carolina Pines Ave							
App. Lane 1		–	–	–	0.0	No	–	–
North	Lake Wheeler Rd							
App. Lane 1		–	–	–	0.0	No	–	–
App. Lane 2		1900	–	–	0.0	No	–	Yes

Lane Movements - Flow Proportions

Exit Lane	To Exit Leg South %	East %	North %
Light Vehicles (LV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
Exit Lane 2	0	–	–
From: North	App. Lane 1		
Exit Lane 1	–	100	–
From: North	App. Lane 2		
Exit Lane 1	0	–	–
Exit Lane 2	100	–	–
Heavy Vehicles (HV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
Exit Lane 2	0	–	–
From: North	App. Lane 1		
Exit Lane 1	–	100	–
From: North	App. Lane 2		
Exit Lane 1	0	–	–
Exit Lane 2	100	–	–

Lane Movements - Blockage Calibration

Exit Lane	To Exit Leg South	East	North
From: South	App. Lane 1		
Exit Lane 1	–	1.0	1.0
From: East	App. Lane 1		

Exit Lane 1	1.0	–	1.0
Exit Lane 2	1.0	–	–
From: North	App. Lane 1		
Exit Lane 1	–	1.0	–
From: North	App. Lane 2		
Exit Lane 1	1.0	–	–
Exit Lane 2	1.0	–	–

Roundabouts - Options

Roundabout Model Options	
Roundabout Capacity Model	US HCM 6
Roundabout LOS Method	Same as Sign Control
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 2010	–
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 6	No
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Roundabouts - Geometry

Location	Name	Circ. Lanes	Circ. Width ft	Island Diameter ft	Inscribed Diameter ft	Entry Radius ft	Entry Angle °	Raindrop Design	Circ Trans Line	Downstream Circ Lanes
South	Lake Wheeler Rd	1	20.0	100.0	–	65.0	30.0	No	No	–
East	Carolina Pines Ave	1	20.0	100.0	–	65.0	30.0	No	No	–
North	Lake Wheeler Rd	1	20.0	100.0	–	65.0	30.0	No	No	–

HCM 6 Roundabout Capacity Model Parameters

Location	Name	Single L.Circ: Single L.Entry Para. A	Single L.Circ: Single L.Entry Para. B	Single L.Circ: Multi L.Entry Para. A	Single L.Circ: Multi L.Entry Para. B	Multi L.Circ: Single L.Entry Para. A	Multi L.Circ: Single L.Entry Para. B	Multi L.Circ: Dominant Lane Para. A	Multi L.Circ: Dominant Lane Para. B	Multi L.Circ: Subdominant Lane Para. A	Multi L.Circ: Subdominant Lane Para. B
South	Lake Wheeler Rd	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
East	Carolina Pines Ave	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
North	Lake Wheeler Rd	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920

HCM 6 Roundabout Model Calibration

Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
South	Lake Wheeler Rd	1.00	None
East	Carolina Pines Ave	1.00	None
North	Lake Wheeler Rd	1.00	None

Pedestrians - Pedestrian Movements

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes

Main Crossing/ Slip/Bypass Lane Crossing	Volume ped	Peak Flow %	Flow Scale %	Growth Rate %
No Ped Movements				

Pedestrians - Pedestrian Movement Data

Main Crossing/ Slip/ Bypass Lane Crossing	Mov. ID	Crossing Distance ft	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed ft/sec	App. Trav. Distance ft	Downst. Distance ft	Queue Space ft	Cr. Setback Distance
No Ped Movements									

Volumes - Vehicle Volumes

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes
Volume Data Method: Total and %

Movement Class	To Exit Leg South veh	East veh	North veh
From: South	Lake Wheeler Rd		
Total (veh)	–	57.0	614.0
LV (%)	–	97.000	97.000
HV (%)	–	3.000	3.000
From: East	Carolina Pines Ave		
Total (veh)	41.0	–	101.0
LV (%)	97.000	–	97.000
HV (%)	3.000	–	3.000
From: North	Lake Wheeler Rd		
Total (veh)	1211.0	233.0	–
LV (%)	97.000	97.000	–
HV (%)	3.000	3.000	–

Volumes - Volume Factors

To Approach	Peak Flow Factor %	Flow Scale %	Growth Rate %/year
Light Vehicles (LV)			
From: South	Lake Wheeler Rd		
North	92.0	100.00	2.00
East	92.0	100.00	2.00
From: East	Carolina Pines Ave		
South	92.0	100.00	2.00
North	92.0	100.00	2.00
From: North	Lake Wheeler Rd		
East	92.0	100.00	2.00

South	92.0	100.00	2.00
Heavy Vehicles (HV)			
From: South	Lake Wheeler Rd		
North	92.0	100.00	2.00
East	92.0	100.00	2.00
From: East	Carolina Pines Ave		
South	92.0	100.00	2.00
North	92.0	100.00	2.00
From: North	Lake Wheeler Rd		
East	92.0	100.00	2.00
South	92.0	100.00	2.00

Gap Acceptance - Gap Acceptance Data

Opposed Movement		Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)
South	Lake Wheeler Rd						
T1		–	–	2.50	0	0.00	Prg(Flow)
R2		–	–	2.50	0	0.00	Prg(Flow)
East	Carolina Pines Ave						
L2		–	–	2.50	0	0.00	Prg(Flow)
R2		–	–	2.50	0	0.00	Prg(Flow)
North	Lake Wheeler Rd						
L2		–	–	2.50	0	0.00	Prg(Flow)
T1		–	–	2.50	0	0.00	Prg(Flow)

Gap Acceptance - Settings

Gap Acceptance Capacity : –

Vehicle Movement Data - Path Data

Turn		Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft
Light Vehicles (LV)							
From: South	Lake Wheeler Rd						
T1		40.0	40.0	–	–	–	–
R2		40.0	40.0	–	–	–	–
From: East	Carolina Pines Ave						
L2		40.0	40.0	–	–	–	–
R2		40.0	40.0	–	–	–	–
From: North	Lake Wheeler Rd						
L2		40.0	40.0	–	–	–	–
T1		40.0	40.0	–	–	–	–
Heavy Vehicles (HV)							
From: South	Lake Wheeler Rd						
T1		40.0	40.0	–	–	–	–
R2		40.0	40.0	–	–	–	–
From: East	Carolina Pines Ave						
L2		40.0	40.0	–	–	–	–
R2		40.0	40.0	–	–	–	–
From: North	Lake Wheeler Rd						
L2		40.0	40.0	–	–	–	–
T1		40.0	40.0	–	–	–	–

Vehicle Movement Data - Calibration

Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	Turn Veh Effect [Factor	Radius] ft	Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.
Light Vehicles (LV)								
From: South	Lake Wheeler Rd							
T1	25.00	17.00	1.20	1	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: East	Carolina Pines Ave							
L2	25.00	17.00	1.20	1.05	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: North	Lake Wheeler Rd							
L2	25.00	17.00	1.20	1.05	–	1	1	–
T1	25.00	17.00	1.20	1	–	1	1	–
Heavy Vehicles (HV)								
From: South	Lake Wheeler Rd							
T1	45.00	36.00	1.20	1	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: East	Carolina Pines Ave							
L2	45.00	36.00	1.20	1.05	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: North	Lake Wheeler Rd							
L2	45.00	36.00	1.20	1.05	–	2	2	–
T1	45.00	36.00	1.20	1	–	2	2	–

Site Demand & Sensitivity

Analysis Method: None

Parameter Settings - Options

General Options	
Site Level of Service Method	Delay & v/c (HCM 6)
Site Level of Service Target	LOS D
Pedestrian Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	Percentile: 95%
Hours per Year	480 h
Include Short Lanes in determining Approach Queue Storage Ratio	No

Parameter Settings - Model Parameters

Passenger Car Equivalents	
Light Vehicles (LV)	1.00 pcu/veh
Heavy Vehicles (HV)	2.00 pcu/veh
Queue Blockage	
Minimum Probability of Blockage	0
Delay and Queue	
Exclude Geometric Delay	Yes
HCM Delay Formula	Yes
HCM Queue Formula	Yes
Platoon Dispersion Model	
fpf	0.80
fpmin	1.00
fpmax	1.25
Lpmin	200.0 ft
Lpmax	1000.0 ft

n	0.60
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Parameter Settings - Cost

Cost Options	
Cost Unit	$

Vehicle Cost Parameters

Movement Class	Veh Cost Method	Veh Operating Cost			Veh Time Cost	
		Pump Price of Fuel	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost	Avg. Income	Time Value Factor
		$/Gal			$/h	
Light Vehicles (LV)	Operating Cost	2.300	0.700	3.00	27.00	0.400
Heavy Vehicles (HV)	Operating Cost	2.300	0.700	3.00	27.00	0.400

Parameter Settings - Vehicle Parameters

Movement Class	Mass lb	Max Power kW	CO2 to Fuel Rate
Light Vehicles (LV)	3500.0	120	2.35
Heavy Vehicles (HV)	33000.0	170	2.633

Parameter Settings - Fuel Consumption

Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1200	16	0.004	0.1
Heavy Vehicles (HV)	2300	200	0.009	0.075

Parameter Settings - CO Emission

Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1620	-138	0.0743	0.294
Heavy Vehicles (HV)	25000	320	-0.06	0.04

Parameter Settings - HC Emission

Movement Class	fi	A	B	Beta
Light Vehicles (LV)	340	-9	0.0031	0.029
Heavy Vehicles (HV)	3000	1	-0.0016	0.0013

Parameter Settings - NOx Emission

Movement Class	fi	A	B	Beta
Light Vehicles (LV)	300	-14	0.0068	0.166
Heavy Vehicles (HV)	44000	2820	0.21	1.9

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MOVEMENT SUMMARY

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_2]

Upgrade_2045
Site Category: -
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Lake Wheeler Rd												
8	T1	667	3.0	0.710	15.2	LOS C	11.6	296.5	0.78	0.87	1.26	30.4
18	R2	62	3.0	0.710	15.2	LOS C	11.6	296.5	0.78	0.87	1.26	29.7
Approach		729	3.0	0.710	15.2	LOS C	11.6	296.5	0.78	0.87	1.26	30.4
East: Carolina Pines Ave												
1	L2	45	3.0	0.232	8.2	LOS A	1.0	24.5	0.64	0.64	0.64	32.7
16	R2	110	3.0	0.232	8.2	LOS A	1.0	24.5	0.64	0.64	0.64	31.8
Approach		154	3.0	0.232	8.2	LOS A	1.0	24.5	0.64	0.64	0.64	32.1
North: Lake Wheeler Rd												
7	L2	253	3.0	0.192	4.3	LOS A	0.9	22.2	0.15	0.06	0.15	32.8
4	T1	1316	3.0	0.686	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	38.0
Approach		1570	3.0	0.686	0.9	LOS A	0.9	22.2	0.02	0.01	0.02	37.1
All Vehicles		2453	3.0	0.710	5.5	LOS A	11.6	296.5	0.29	0.31	0.43	34.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: C:\Users\hbariyeh\Desktop\Lake Wheeler Rd_2045_PM.sip8

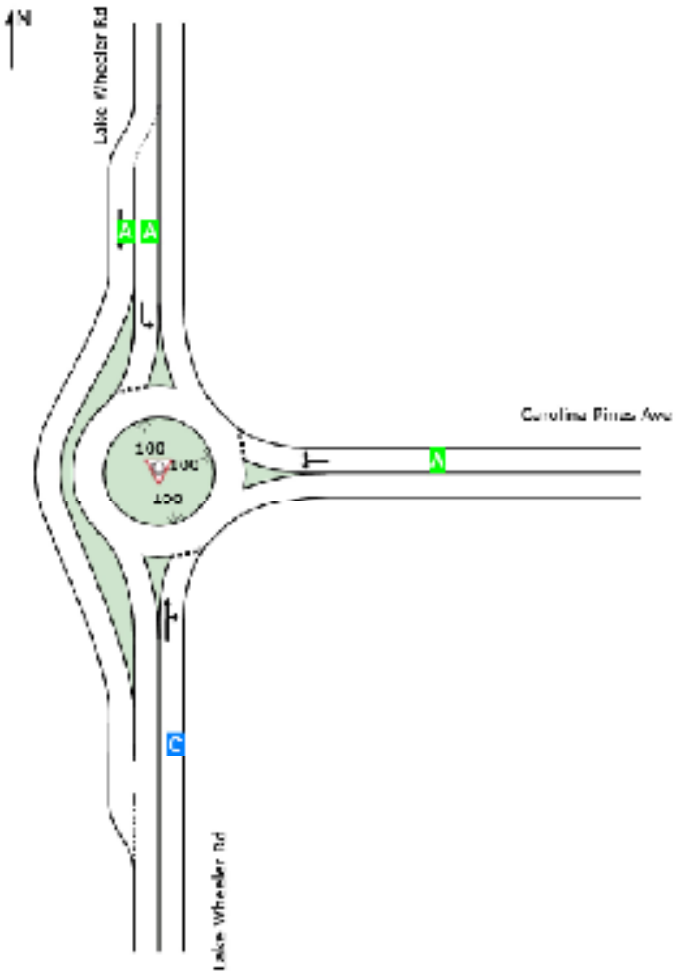
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_2]

Upgrade_2045
Site Category: -
Roundabout

	Approaches			Intersection
	South	East	North	
LOS	C	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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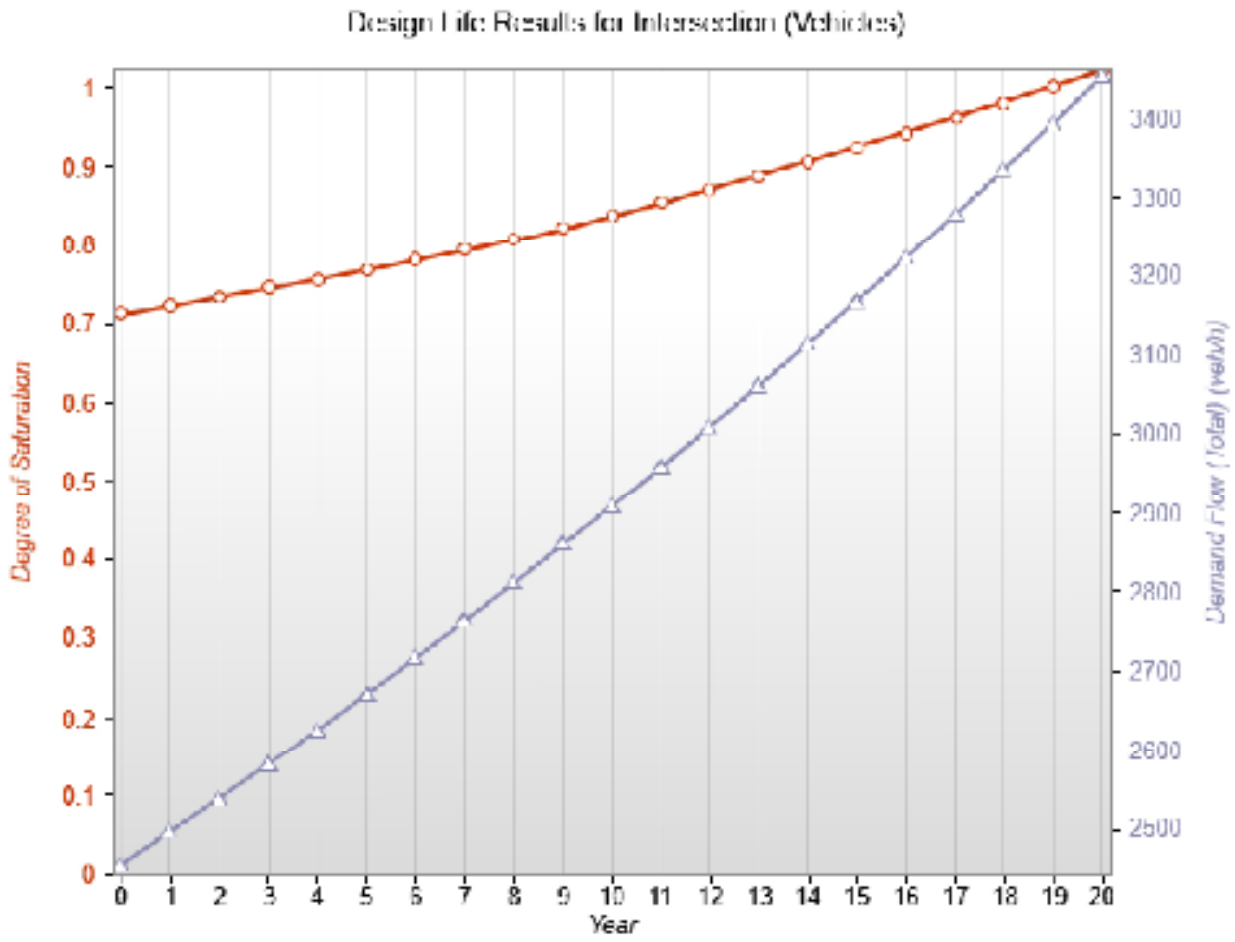
SITE GRAPHS - Demand (Design Life) Analysis

Highest degree of saturation in any lane and Total demand flow (vehicles/h)

Site: 3 [Lake Wheeler Rd @ Carolina Pines Ave_2]

Upgrade_2045
Site Category: -
Roundabout
Design Life Analysis (Final Year): Results for 20 years



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Roundabout Results

2045 Build –Granite St_AM

INPUT REPORT

Site: 11 [Carolina Pines Ave @ Granite St]

Upgrade_2045
Site Category: -
Roundabout

Intersection - Site Data	
Site Name	Carolina Pines Ave @ Granite St
Site ID	11
Site Category	-
Site Title	Upgrade_2045

Intersection - Site Properties	
Site (Intersection) Type	Roundabout
Setup Name	US HCM (Customary)
Base Setup	NA
Drive Rule	Right-hand side of the road
HCM Version	Yes
Units	US
First Created	----------
Date	4/2/2019 2:49:29 PM
Created By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916
Last Modified	----------
Date	4/3/2019 4:01:35 PM
Modified By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916

Intersection - Approach & Exit Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching %	Exit Distance ft	Approach Control	Area Type Factor
South	Carolina pines Ave	Two-way	1	1	1600.0	–	–	–	–
East	Granite St	Two-way	1	1	1600.0	–	–	–	–
West	Granite St	Two-way	1	1	1600.0	–	–	–	–

Movement Definitions - Included Movement Classes

Name	ID	Model Designation	Type
Light Vehicles	LV	Light Vehicle	Standard
Heavy Vehicles	HV	Heavy Vehicle	Standard

Movement Definitions - Origin-Destination Movements

To Approach	Turn	OD Mov ID
From: South	Carolina pines Ave	
West	L2	3
East	R2	18
From: East	Granite St	

South	L2	1
West	T1	6
From: West	Granite St	
East	T1	2
South	R2	12

Lane Geometry - Lane Configuration

Leg Item	Configuration	Type	Control	Slip/ Bypass Control	Length ft	Width ft	Grade %	Full Lane [ID	Colour]	[Front Width ft	Island Back Width ft	Fill Style	For Ped Staging]
South	Carolina pines Ave												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–
East	Granite St												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–
West	Granite St												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–

Lanes are numbered from left to right in the direction of travel.

Lane Geometry - Lane Disciplines

To Approach	Turn	Free Queue Distance ft	Movement Class(es)
From: South	App. Lane 1		
West	L2	0	LV, HV
East	R2	0	LV, HV
From: East	App. Lane 1		
South	L2	0	LV, HV
West	T1	0	LV, HV
From: West	App. Lane 1		
East	T1	0	LV, HV
South	R2	0	LV, HV

Lane Geometry - Lane Data

Approach Lane	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count
South	Carolina pines Ave						
App. Lane 1	–	–	–	0.0	No	–	–
East	Granite St						
App. Lane 1	–	–	–	0.0	No	–	–
West	Granite St						

App. Lane 1	–	–	–	0.0	No	–	–

Lane Movements - Flow Proportions

Exit Lane	To Exit Leg South %	East %	West %
Light Vehicles (LV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
From: West	App. Lane 1		
Exit Lane 1	100	100	–
Heavy Vehicles (HV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
From: West	App. Lane 1		
Exit Lane 1	100	100	–

Lane Movements - Blockage Calibration

Exit Lane	To Exit Leg South	East	West
From: South	App. Lane 1		
Exit Lane 1	–	1.0	1.0
From: East	App. Lane 1		
Exit Lane 1	1.0	–	1.0
From: West	App. Lane 1		
Exit Lane 1	1.0	1.0	–

Roundabouts - Options

Roundabout Model Options	
Roundabout Capacity Model	US HCM 6
Roundabout LOS Method	Same as Sign Control
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 2010	–
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 6	No
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Roundabouts - Geometry

Location	Name	Circ. Lanes	Circ. Width	Island Diameter	Inscribed Diameter	Entry Radius	Entry Angle	Raindrop Design	Circ Trans Line	Downstream Circ Lanes

			ft	ft	ft	ft	°			
South	Carolina pines Ave	1	20.0	100.0	–	65.0	30.0	No	No	–
East	Granite St	1	20.0	100.0	–	65.0	30.0	No	No	–
West	Granite St	1	20.0	100.0	–	65.0	30.0	No	No	–

HCM 6 Roundabout Capacity Model Parameters

Location	Name	Single L.Circ: Single L.Entry		Single L.Circ: Multi L.Entry		Multi L.Circ: Single L.Entry		Multi L.Circ: Dominant Lane		Multi L.Circ: Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	Carolina pines Ave	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
East	Granite St	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
West	Granite St	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920

HCM 6 Roundabout Model Calibration

Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
South	Carolina pines Ave	1.00	None
East	Granite St	1.00	None
West	Granite St	1.00	None

Pedestrians - Pedestrian Movements

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes

Main Crossing/ Slip/Bypass Lane Crossing	Volume	Peak Flow	Flow Scale	Growth Rate
	ped	%	%	%
No Ped Movements				

Pedestrians - Pedestrian Movement Data

Main Crossing/ Slip/ Bypass Lane Crossing	Mov. ID	Crossing Distance	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed	App. Trav. Distance	Downst. Distance	Queue Space	Cr. Setback Distance
		ft			ft/sec	ft	ft	ft	
No Ped Movements									

Volumes - Vehicle Volumes

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes
Volume Data Method: Total and %

Movement Class	To Exit Leg South veh	East veh	West veh
From: South	Carolina pines Ave		
Total (veh)	–	216.0	4.0

LV (%)	–	97.000	97.000
HV (%)	–	3.000	3.000
From: East	Granite St		
Total (veh)	167.0	–	21.0
LV (%)	97.000	–	97.000
HV (%)	3.000	–	3.000
From: West	Granite St		
Total (veh)	16.0	3.0	–
LV (%)	97.000	97.000	–
HV (%)	3.000	3.000	–

Volumes - Volume Factors

To Approach		Peak Flow Factor %	Flow Scale %	Growth Rate %/year
Light Vehicles (LV)				
From: South	Carolina pines Ave			
West		92.0	100.00	2.00
East		92.0	100.00	2.00
From: East	Granite St			
South		92.0	100.00	2.00
West		92.0	100.00	2.00
From: West	Granite St			
East		92.0	100.00	2.00
South		92.0	100.00	2.00
Heavy Vehicles (HV)				
From: South	Carolina pines Ave			
West		92.0	100.00	2.00
East		92.0	100.00	2.00
From: East	Granite St			
South		92.0	100.00	2.00
West		92.0	100.00	2.00
From: West	Granite St			
East		92.0	100.00	2.00
South		92.0	100.00	2.00

Gap Acceptance - Gap Acceptance Data

Opposed Movement		Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)
South	Carolina pines Ave						
L2		–	–	2.50	0	0.00	Prg(Flow)
R2		–	–	2.50	0	0.00	Prg(Flow)
East	Granite St						
L2		–	–	2.50	0	0.00	Prg(Flow)
T1		–	–	2.50	0	0.00	Prg(Flow)
West	Granite St						
T1		–	–	2.50	0	0.00	Prg(Flow)
R2		–	–	2.50	0	0.00	Prg(Flow)

Gap Acceptance - Settings

Gap Acceptance Capacity : –

Vehicle Movement Data - Path Data

Turn	Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft
Light Vehicles (LV)						
From: South	Carolina pines Ave					
L2	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: East	Granite St					
L2	40.0	40.0	–	–	–	–
T1	40.0	40.0	–	–	–	–
From: West	Granite St					
T1	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
Heavy Vehicles (HV)						
From: South	Carolina pines Ave					
L2	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: East	Granite St					
L2	40.0	40.0	–	–	–	–
T1	40.0	40.0	–	–	–	–
From: West	Granite St					
T1	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–

Vehicle Movement Data - Calibration

Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	Turn Veh Effect [Factor	Radius] ft	Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.
Light Vehicles (LV)								
From: South	Carolina pines Ave							
L2	25.00	17.00	1.20	1.05	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: East	Granite St							
L2	25.00	17.00	1.20	1.05	–	1	1	–
T1	25.00	17.00	1.20	1	–	1	1	–
From: West	Granite St							
T1	25.00	17.00	1.20	1	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
Heavy Vehicles (HV)								
From: South	Carolina pines Ave							
L2	45.00	36.00	1.20	1.05	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: East	Granite St							
L2	45.00	36.00	1.20	1.05	–	2	2	–
T1	45.00	36.00	1.20	1	–	2	2	–
From: West	Granite St							
T1	45.00	36.00	1.20	1	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–

Site Demand & Sensitivity

Analysis Method: None

Parameter Settings - Options	
General Options	
Site Level of Service Method	Delay & v/c (HCM 6)
Site Level of Service Target	LOS D
Pedestrian Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	Percentile: 95%
Hours per Year	480 h
Include Short Lanes in determining Approach Queue Storage Ratio	No

Parameter Settings - Model Parameters	
Passenger Car Equivalents	
Light Vehicles (LV)	1.00 pcu/veh
Heavy Vehicles (HV)	2.00 pcu/veh
Queue Blockage	
Minimum Probability of Blockage	0
Delay and Queue	
Exclude Geometric Delay	Yes
HCM Delay Formula	Yes
HCM Queue Formula	Yes
Platoon Dispersion Model	
fpf	0.80
fpmin	1.00
fpmax	1.25
Lpmin	200.0 ft
Lpmax	1000.0 ft
n	0.60
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Parameter Settings - Cost	
Cost Options	
Cost Unit	$

Vehicle Cost Parameters

Movement Class	Veh Cost Method	Veh Operating Cost			Veh Time Cost	
		Pump Price of Fuel	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost	Avg. Income	Time Value Factor
		$/Gal			$/h	
Light Vehicles (LV)	Operating Cost	2.300	0.700	3.00	27.00	0.400
Heavy Vehicles (HV)	Operating Cost	2.300	0.700	3.00	27.00	0.400

Parameter Settings - Vehicle Parameters

Movement Class	Mass lb	Max Power kW	CO2 to Fuel Rate
Light Vehicles (LV)	3500.0	120	2.35
Heavy Vehicles (HV)	33000.0	170	2.633

Parameter Settings - Fuel Consumption				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1200	16	0.004	0.1
Heavy Vehicles (HV)	2300	200	0.009	0.075

Parameter Settings - CO Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1620	-138	0.0743	0.294
Heavy Vehicles (HV)	25000	320	-0.06	0.04

Parameter Settings - HC Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	340	-9	0.0031	0.029
Heavy Vehicles (HV)	3000	1	-0.0016	0.0013

Parameter Settings - NOx Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	300	-14	0.0068	0.166
Heavy Vehicles (HV)	44000	2820	0.21	1.9

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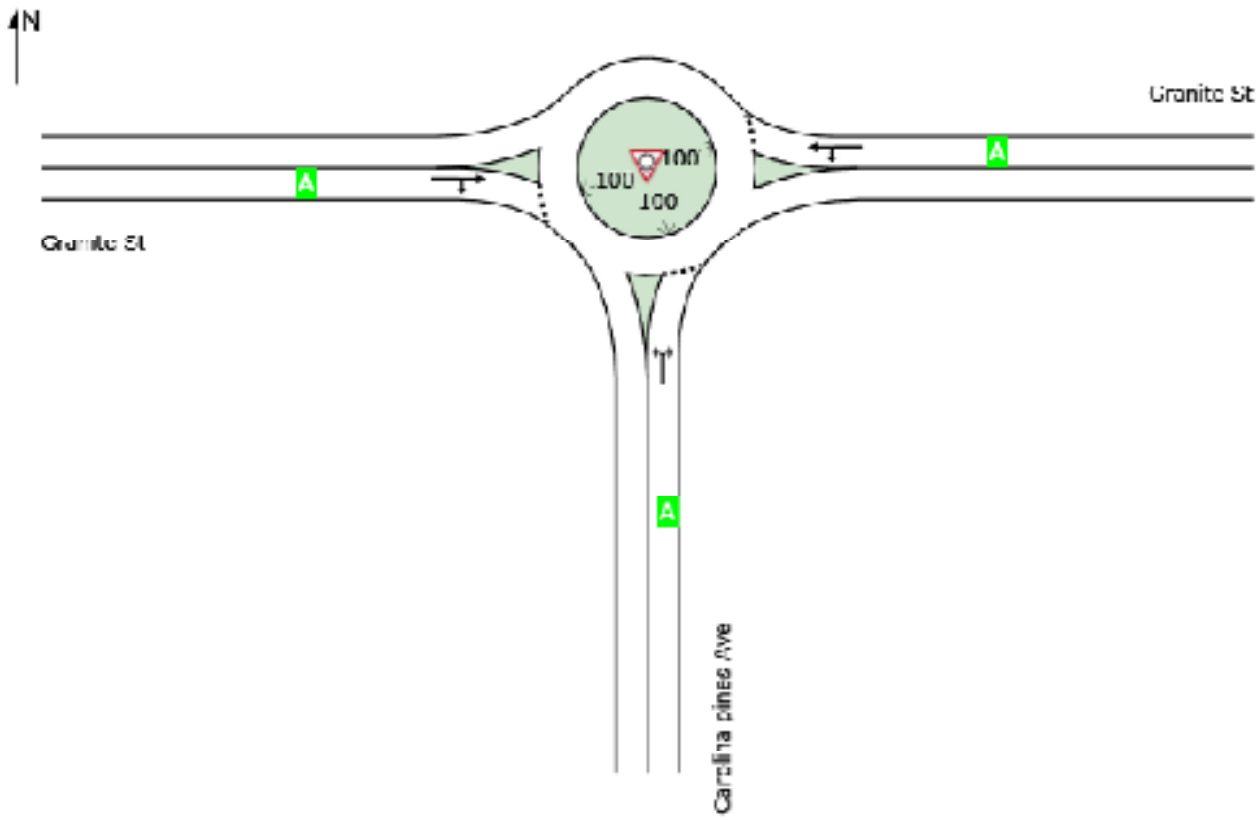
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 11 [Carolina Pines Ave @ Granite St]

Upgrade_2045
Site Category: -
Roundabout

	Approaches			Intersection
	South	East	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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Roundabout Results

2045 Build –Granite St_PM

INPUT REPORT

Site: 11 [Carolina Pines Ave @ Granite St]

Upgrade_2045
Site Category: -
Roundabout

Intersection - Site Data	
Site Name	Carolina Pines Ave @ Granite St
Site ID	11
Site Category	-
Site Title	Upgrade_2045

Intersection - Site Properties	
Site (Intersection) Type	Roundabout
Setup Name	US HCM (Customary)
Base Setup	NA
Drive Rule	Right-hand side of the road
HCM Version	Yes
Units	US
First Created	----------
Date	4/2/2019 2:49:29 PM
Created By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916
Last Modified	----------
Date	4/3/2019 4:11:08 PM
Modified By	HBARIYEH
Organisation	H. W. LOCHNER, INC.
Version	8.0.5.7916

Intersection - Approach & Exit Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching %	Exit Distance ft	Approach Control	Area Type Factor
South	Carolina pines Ave	Two-way	1	1	1600.0	–	–	–	–
East	Granite St	Two-way	1	1	1600.0	–	–	–	–
West	Granite St	Two-way	1	1	1600.0	–	–	–	–

Movement Definitions - Included Movement Classes

Name	ID	Model Designation	Type
Light Vehicles	LV	Light Vehicle	Standard
Heavy Vehicles	HV	Heavy Vehicle	Standard

Movement Definitions - Origin-Destination Movements

To Approach	Turn	OD Mov ID
From: South	Carolina pines Ave	
West	L2	3
East	R2	18
From: East	Granite St	

South	L2	1
West	T1	6
From: West	Granite St	
East	T1	2
South	R2	12

Lane Geometry - Lane Configuration

Leg Item	Configuration	Type	Control	Slip/ Bypass Control	Length ft	Width ft	Grade %	Full Lane [ID	Colour]	[Front Width ft	Island Back Width ft	Fill Style	For Ped Staging]
South	Carolina pines Ave												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–
East	Granite St												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–
West	Granite St												
Exit Lane 1	Full-Length	–	–	–	1600	13	0			–	–	–	–
Rou Splitter Island	–	–	–	–	–	–	–	–	–	-	0	Solid	Yes
App. Lane 1	Full-Length	Normal	Givewa y/Yield	–	1600	13	0			–	–	–	–

Lanes are numbered from left to right in the direction of travel.

Lane Geometry - Lane Disciplines

To Approach	Turn	Free Queue Distance ft	Movement Class(es)
From: South	App. Lane 1		
West	L2	0	LV, HV
East	R2	0	LV, HV
From: East	App. Lane 1		
South	L2	0	LV, HV
West	T1	0	LV, HV
From: West	App. Lane 1		
East	T1	0	LV, HV
South	R2	0	LV, HV

Lane Geometry - Lane Data

Approach Lane	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count
South	Carolina pines Ave						
App. Lane 1	–	–	–	0.0	No	–	–
East	Granite St						
App. Lane 1	–	–	–	0.0	No	–	–
West	Granite St						

App. Lane 1	–	–	–	0.0	No	–	–

Lane Movements - Flow Proportions

Exit Lane	To Exit Leg South %	East %	West %
Light Vehicles (LV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
From: West	App. Lane 1		
Exit Lane 1	100	100	–
Heavy Vehicles (HV)			
From: South	App. Lane 1		
Exit Lane 1	–	100	100
From: East	App. Lane 1		
Exit Lane 1	100	–	100
From: West	App. Lane 1		
Exit Lane 1	100	100	–

Lane Movements - Blockage Calibration

Exit Lane	To Exit Leg South	East	West
From: South	App. Lane 1		
Exit Lane 1	–	1.0	1.0
From: East	App. Lane 1		
Exit Lane 1	1.0	–	1.0
From: West	App. Lane 1		
Exit Lane 1	1.0	1.0	–

Roundabouts - Options

Roundabout Model Options	
Roundabout Capacity Model	US HCM 6
Roundabout LOS Method	Same as Sign Control
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 2010	–
Apply the SIDRA Model for Unbalanced Flow Conditions for HCM 6	No
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Roundabouts - Geometry

Location	Name	Circ. Lanes	Circ. Width	Island Diameter	Inscribed Diameter	Entry Radius	Entry Angle	Raindrop Design	Circ Trans Line	Downstream Circ Lanes

			ft	ft	ft	ft	°			
South	Carolina pines Ave	1	20.0	100.0	–	65.0	30.0	No	No	–
East	Granite St	1	20.0	100.0	–	65.0	30.0	No	No	–
West	Granite St	1	20.0	100.0	–	65.0	30.0	No	No	–

HCM 6 Roundabout Capacity Model Parameters

Location	Name	Single L.Circ: Single L.Entry		Single L.Circ: Multi L.Entry		Multi L.Circ: Single L.Entry		Multi L.Circ: Dominant Lane		Multi L.Circ: Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	Carolina pines Ave	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
East	Granite St	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920
West	Granite St	1380.0	0.001020	1420.0	0.000910	1420.0	0.000850	1420.0	0.000850	1350.0	0.000920

HCM 6 Roundabout Model Calibration

Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
South	Carolina pines Ave	1.00	None
East	Granite St	1.00	None
West	Granite St	1.00	None

Pedestrians - Pedestrian Movements

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes

Main Crossing/ Slip/Bypass Lane Crossing	Volume	Peak Flow	Flow Scale	Growth Rate
	ped	%	%	%
No Ped Movements				

Pedestrians - Pedestrian Movement Data

Main Crossing/ Slip/ Bypass Lane Crossing	Mov. ID	Crossing Distance	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed	App. Trav. Distance	Downst. Distance	Queue Space	Cr. Setback Distance
		ft			ft/sec	ft	ft	ft	
No Ped Movements									

Volumes - Vehicle Volumes

Unit Time for Volumes: 60 minutes
Peak Flow Period: 15 minutes
Volume Data Method: Total and %

Movement Class	To Exit Leg South veh	East veh	West veh
From: South	Carolina pines Ave		
Total (veh)	–	224.0	12.0

LV (%)	–	97.000	97.000
HV (%)	–	3.000	3.000
From: East	Granite St		
Total (veh)	241.0	–	36.0
LV (%)	97.000	–	97.000
HV (%)	3.000	–	3.000
From: West	Granite St		
Total (veh)	6.0	21.0	–
LV (%)	97.000	97.000	–
HV (%)	3.000	3.000	–

Volumes - Volume Factors

To Approach		Peak Flow Factor %	Flow Scale %	Growth Rate %/year
Light Vehicles (LV)				
From: South	Carolina pines Ave			
West		92.0	100.00	2.00
East		92.0	100.00	2.00
From: East	Granite St			
South		92.0	100.00	2.00
West		92.0	100.00	2.00
From: West	Granite St			
East		92.0	100.00	2.00
South		92.0	100.00	2.00
Heavy Vehicles (HV)				
From: South	Carolina pines Ave			
West		92.0	100.00	2.00
East		92.0	100.00	2.00
From: East	Granite St			
South		92.0	100.00	2.00
West		92.0	100.00	2.00
From: West	Granite St			
East		92.0	100.00	2.00
South		92.0	100.00	2.00

Gap Acceptance - Gap Acceptance Data

Opposed Movement		Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)
South	Carolina pines Ave						
L2		–	–	2.50	0	0.00	Prg(Flow)
R2		–	–	2.50	0	0.00	Prg(Flow)
East	Granite St						
L2		–	–	2.50	0	0.00	Prg(Flow)
T1		–	–	2.50	0	0.00	Prg(Flow)
West	Granite St						
T1		–	–	2.50	0	0.00	Prg(Flow)
R2		–	–	2.50	0	0.00	Prg(Flow)

Gap Acceptance - Settings

Gap Acceptance Capacity : –

Vehicle Movement Data - Path Data

Turn	Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft
Light Vehicles (LV)						
From: South	Carolina pines Ave					
L2	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: East	Granite St					
L2	40.0	40.0	–	–	–	–
T1	40.0	40.0	–	–	–	–
From: West	Granite St					
T1	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
Heavy Vehicles (HV)						
From: South	Carolina pines Ave					
L2	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–
From: East	Granite St					
L2	40.0	40.0	–	–	–	–
T1	40.0	40.0	–	–	–	–
From: West	Granite St					
T1	40.0	40.0	–	–	–	–
R2	40.0	40.0	–	–	–	–

Vehicle Movement Data - Calibration

Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	Turn Veh Effect [Factor	Radius] ft	Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.
Light Vehicles (LV)								
From: South	Carolina pines Ave							
L2	25.00	17.00	1.20	1.05	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
From: East	Granite St							
L2	25.00	17.00	1.20	1.05	–	1	1	–
T1	25.00	17.00	1.20	1	–	1	1	–
From: West	Granite St							
T1	25.00	17.00	1.20	1	–	1	1	–
R2	25.00	17.00	1.20	1.18	–	1	1	–
Heavy Vehicles (HV)								
From: South	Carolina pines Ave							
L2	45.00	36.00	1.20	1.05	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–
From: East	Granite St							
L2	45.00	36.00	1.20	1.05	–	2	2	–
T1	45.00	36.00	1.20	1	–	2	2	–
From: West	Granite St							
T1	45.00	36.00	1.20	1	–	2	2	–
R2	45.00	36.00	1.20	1.18	–	2	2	–

Site Demand & Sensitivity

Analysis Method: None

Parameter Settings - Options	
General Options	
Site Level of Service Method	Delay & v/c (HCM 6)
Site Level of Service Target	LOS D
Pedestrian Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	Percentile: 95%
Hours per Year	480 h
Include Short Lanes in determining Approach Queue Storage Ratio	No

Parameter Settings - Model Parameters	
Passenger Car Equivalents	
Light Vehicles (LV)	1.00 pcu/veh
Heavy Vehicles (HV)	2.00 pcu/veh
Queue Blockage	
Minimum Probability of Blockage	0
Delay and Queue	
Exclude Geometric Delay	Yes
HCM Delay Formula	Yes
HCM Queue Formula	Yes
Platoon Dispersion Model	
fpf	0.80
fpmin	1.00
fpmax	1.25
Lpmin	200.0 ft
Lpmax	1000.0 ft
n	0.60
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Parameter Settings - Cost	
Cost Options	
Cost Unit	$

Vehicle Cost Parameters

Movement Class	Veh Cost Method	Veh Operating Cost			Veh Time Cost	
		Pump Price of Fuel	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost	Avg. Income	Time Value Factor
		$/Gal			$/h	
Light Vehicles (LV)	Operating Cost	2.300	0.700	3.00	27.00	0.400
Heavy Vehicles (HV)	Operating Cost	2.300	0.700	3.00	27.00	0.400

Parameter Settings - Vehicle Parameters

Movement Class	Mass lb	Max Power kW	CO2 to Fuel Rate
Light Vehicles (LV)	3500.0	120	2.35
Heavy Vehicles (HV)	33000.0	170	2.633

Parameter Settings - Fuel Consumption				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1200	16	0.004	0.1
Heavy Vehicles (HV)	2300	200	0.009	0.075

Parameter Settings - CO Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	1620	-138	0.0743	0.294
Heavy Vehicles (HV)	25000	320	-0.06	0.04

Parameter Settings - HC Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	340	-9	0.0031	0.029
Heavy Vehicles (HV)	3000	1	-0.0016	0.0013

Parameter Settings - NOx Emission				
Movement Class	fi	A	B	Beta
Light Vehicles (LV)	300	-14	0.0068	0.166
Heavy Vehicles (HV)	44000	2820	0.21	1.9

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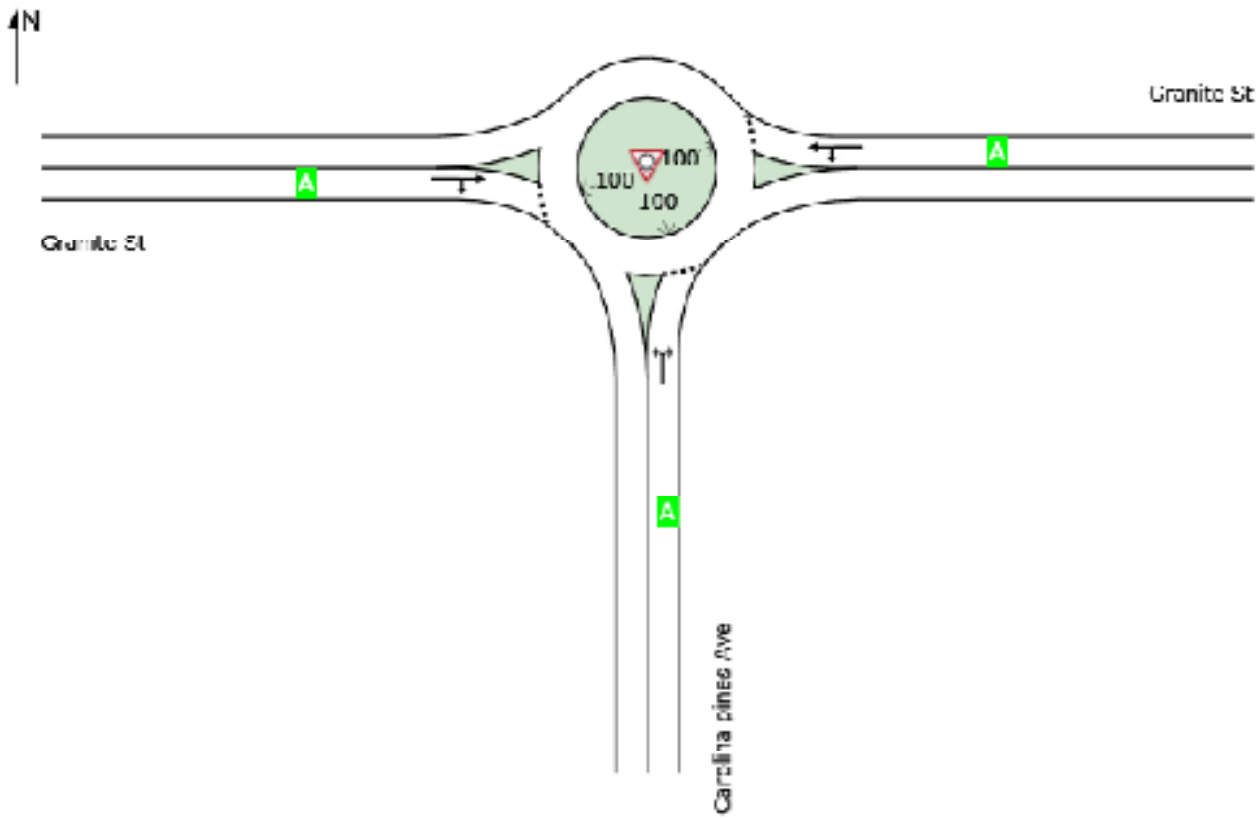
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 11 [Carolina Pines Ave @ Granite St]

Upgrade_2045
Site Category: -
Roundabout

	Approaches			Intersection
	South	East	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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Project: I:\RAL\PRJ\000015027\R_CarolinaPines\Traffic\CongestionMgmt\Analysis\Sidra\Build\Lake Wheeler Rd_2045_PM - Granite.sip8

APPENDIX E

Crash Reports

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Study Criteria Summary

County: WAKE **City:** All and Rural
Date: 3/1/2014 **to** 2/28/2019 **Study:** 41000056796
Location: Carolina Pines Ave from SR 1009 (Lake Wheeler Rd) to Granite St

Report Details

Acc No	Crash ID	Milepost	Date	Accident Type	Total Damage	Injuries F	Injuries A	Injuries B	Injuries C	Condition R	Condition L	Condition W	Road Ch	Road Ci	Trfc Ctl Dv	Trfc Ctl Op
1	**104136290**	0.000	08/26/2014 18:25	LEFT TURN, SAME ROADWAY	$ 6000	0	0	1	0	1	1	1	1	0	1	1
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 10 MPH	**Dir:** SW	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
Unit 2 : 20	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** NE	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
2	**104593346**	0.000	12/21/2015 17:10	LEFT TURN, DIFFERENT ROADWAYS	$ 16000	0	0	0	0	1	4	1	1	0	1	1
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 0 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
Unit 2 : 4	**Alchl/Drgs:** 0	**Speed:** 45 MPH	**Dir:** N	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
3	**105025343**	0.000	03/02/2017 06:37	LEFT TURN, SAME ROADWAY	$ 14000	0	0	0	1	1	2	2	1	0	3	1
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 45 MPH	**Dir:** SE	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
Unit 2 : 4	**Alchl/Drgs:** 0	**Speed:** 45 MPH	**Dir:** N	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
Unit 3 : 2	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 1	**Obj Strk:**											
4	**105081636**	0.000	05/02/2017 23:00	ANGLE	$ 2000	0	0	0	0	1	5	1	1	0	1	1
Unit 1 : 1	**Alchl/Drgs:** 7	**Speed:** 15 MPH	**Dir:** SE	**Veh Mnvr/Ped Actn:** 9	**Obj Strk:**											
Unit 2 : 1	**Alchl/Drgs:** 0	**Speed:** 30 MPH	**Dir:** SW	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
5	**105377350**	0.000	02/09/2018 22:39	HEAD ON	$ 4000	0	1	1	0	1	4	1	1	0	0	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 30 MPH	**Dir:** S	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
Unit 2 : 1	**Alchl/Drgs:** 0	**Speed:** 45 MPH	**Dir:** N	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
6	**105394458**	0.000	02/26/2018 10:53	ANGLE	$ 5000	0	0	0	0	1	1	1	1	0	0	
Unit 1 : 32	**Alchl/Drgs:** 7	**Speed:** 20 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
Unit 2 : 4	**Alchl/Drgs:** 0	**Speed:** 20 MPH	**Dir:** N	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
7	**104389132**	0.002	05/27/2015 19:49	LEFT TURN, DIFFERENT ROADWAYS	$ 3000	0	0	0	0	1	2	2	1	0	1	1
Unit 1 : 4	**Alchl/Drgs:** 0	**Speed:** 10 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
Unit 2 : 4	**Alchl/Drgs:** 0	**Speed:** 0 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 1	**Obj Strk:**											

All data presented in this report comes explicitly from the Traffic Engineering Accident Analysis System based upon va criteria provided by the report's creator. The onus is strictly upon the user of this report to exercise due diligence in in and further representing this data.

Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Acc No	Crash ID	Milepost	Date	Accident Type	Total Damage	Injuries F	Injuries A	Injuries B	Injuries C	Condition R	Condition L	Condition W	Road Ch	Road Ci	Trfc Ctl Dv	Trfc Ctl Op
8	**104609193**	0.002	01/08/2016 17:36	REAR END, SLOW OR STOP	$ 350	0	0	0	0	2	2	3	3	0	1	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 0 MPH	**Dir:** NW	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
Unit 2 : 1	**Alchl/Drgs:** 0	**Speed:** 0 MPH	**Dir:** NW	**Veh Mnvr/Ped Actn:** 1	**Obj Strk:**											
9	**104567547**	0.019	11/28/2015 16:11	ANIMAL	$ 800	0	0	0	0	1	1	1	1	0	0	
Unit 1 : 4	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:** 17											
10	**104152421**	0.030	09/12/2014 15:27	LEFT TURN, SAME ROADWAY	$ 4000	0	0	0	0	1	1	1	1	0	0	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** NE	**Veh Mnvr/Ped Actn:** 9	**Obj Strk:**											
Unit 2 : 5	**Alchl/Drgs:** 0	**Speed:** 20 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
11	**105092559**	0.070	05/08/2017 13:40	LEFT TURN, SAME ROADWAY	$ 6000	0	0	0	0	1	1	1	7	0	0	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 5 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
Unit 2 : 4	**Alchl/Drgs:** 0	**Speed:** 40 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
12	**104007677**	0.089	03/17/2014 21:20	SIDESWIPE, OPPOSITE DIRECTION	$ 5000	0	0	0	0	2	2	3	5	0	0	
Unit 1 : 1	**Alchl/Drgs:** 7	**Speed:** 40 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
Unit 2 : 1	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
13	**104315829**	0.123	03/09/2015 18:28	OTHER COLLISION WITH VEHICLE	$ 1200	0	0	0	0	1	1	2	5	0	0	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
Unit 2 : 1	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
14	**105215793**	0.123	09/10/2017 01:51	RAN OFF ROAD - LEFT	$ 1000	0	0	0	0	1	4	1	1	0	0	
Unit 1 : 4	**Alchl/Drgs:** 3	**Speed:** 35 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
15	**105206312**	0.130	08/31/2017 15:48	RAN OFF ROAD - LEFT	$ 3000	0	0	0	0	1	5	1	5	0	0	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 45 MPH	**Dir:** SW	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:** 59											
16	**104184323**	0.250	10/15/2014 20:30	RAN OFF ROAD - LEFT	$ 200	0	0	0	0	1	5	1	1	0	0	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** SW	**Veh Mnvr/Ped Actn:** 9	**Obj Strk:**											
17	**104959846**	0.413	12/24/2016 21:37	RAN OFF ROAD - RIGHT	$ 1300	0	0	0	0	1	4	1	1	0	0	
Unit 1 : 21	**Alchl/Drgs:** 1	**Speed:** 35 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:** 60											

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Acc No	Crash ID	Milepost	Date	Accident Type	Total Damage	Injuries F	A	B	C	Condition R	L	W	Road Ch	Ci	Trfc Ctl Dv	Op
18	**104499437**	0.434	09/27/2015 10:18	RAN OFF ROAD - RIGHT	$ 2000	0	0	0	0	2	1	2	5	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:** 35 MPH	**Dir:** NW	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**		58	
19	**104645551**	0.441	02/16/2016 00:58	RAN OFF ROAD - RIGHT	$ 2000	0	0	0	0	2	4	6	1	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:** 30 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**		56	
20	**105474822**	0.443	05/11/2018 04:15	RAN OFF ROAD - RIGHT	$ 2000	0	0	0	0	1	4	1	7	0	0	
Unit	**1 :** 20	**Alchl/Drgs:**	0	**Speed:** 35 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**		42	
21	**105497500**	0.443	05/29/2018 11:22	RAN OFF ROAD - RIGHT	$ 450	0	0	0	0	2	6	2	1	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	7	**Speed:** 45 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**		60	
22	**105712088**	0.443	12/15/2018 02:33	RAN OFF ROAD - RIGHT	$ 1750	0	0	0	0	2	5	2	1	0	0	
Unit	**1 :** 5	**Alchl/Drgs:**	1	**Speed:** 35 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**		60	
23	**104887873**	0.460	10/22/2016 16:54	SIDESWIPE, SAME DIRECTION	$ 8000	0	0	0	0	1	1	1	1	0	0	
Unit	**1 :** 4	**Alchl/Drgs:**	0	**Speed:** 25 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**			
Unit	**2 :** 1	**Alchl/Drgs:**	0	**Speed:** 25 MPH	**Dir:** SW	**Veh Mnvr/Ped Actn:**				8			**Obj Strk:**			
24	**104809617**	0.550	08/02/2016 16:45	SIDESWIPE, OPPOSITE DIRECTION	$ 2500	0	0	0	0	1	1	1	1	0	1	1
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:** 4 MPH	**Dir:** S	**Veh Mnvr/Ped Actn:**				8			**Obj Strk:**			
Unit	**2 :** 1	**Alchl/Drgs:**	0	**Speed:** 2 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:**				11			**Obj Strk:**			
25	**105201139**	0.630	08/26/2017 08:35	RAN OFF ROAD - RIGHT	$ 6250	0	0	0	0	1	1	1	1	0	0	
Unit	**1 :** 5	**Alchl/Drgs:**	7	**Speed:** 35 MPH	**Dir:** N	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**		58	
26	**104880244**	0.632	10/16/2016 08:04	RAN OFF ROAD - RIGHT	$ 20200	0	0	0	0	1	1	1	1	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	1	**Speed:** 45 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**		64	
27	**105343360**	0.634	01/06/2018 13:00	RAN OFF ROAD - RIGHT	$ 4100	0	0	0	0	10	8	1	3	0	0	
Unit	**1 :** 32	**Alchl/Drgs:**	7	**Speed:** 35 MPH	**Dir:** S	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**		64	
28	**104446951**	0.657	07/28/2015 17:15	RAN OFF ROAD - RIGHT	$ 1500	0	0	0	0	1	1	1	1	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:** 25 MPH	**Dir:** S	**Veh Mnvr/Ped Actn:**				4			**Obj Strk:**		61	

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

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29	**105122918**	0.670	06/05/2017 15:46	REAR END, SLOW OR STOP	$ 3000	0	0	0	2	1	1	1	1	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:**	20 MPH	**Dir:**	S		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**			
Unit	**2 :** 1	**Alchl/Drgs:**	0	**Speed:**	15 MPH	**Dir:**	S		**Veh Mnvr/Ped Actn:**		7		**Obj Strk:**			
30	**104200932**	0.710	11/01/2014 17:47	ANGLE	$ 6000	0	0	0	1	2	4	2	1	0	1	1
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:**	5 MPH	**Dir:**	N		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**			
Unit	**2 :** 1	**Alchl/Drgs:**	0	**Speed:**	35 MPH	**Dir:**	E		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**			
31	**104436777**	0.770	07/14/2015 08:50	RAN OFF ROAD - RIGHT	$ 900	0	0	0	0	1	1	1	5	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:**	35 MPH	**Dir:**	S		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**		64	
32	**104368598**	0.831	05/04/2015 16:29	REAR END, SLOW OR STOP	$ 5000	0	0	0	0	1	1	1	1	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:**	35 MPH	**Dir:**	NW		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**			
Unit	**2 :** 1	**Alchl/Drgs:**	0	**Speed:**	0 MPH	**Dir:**	NW		**Veh Mnvr/Ped Actn:**		1		**Obj Strk:**			
33	**105236324**	0.846	09/29/2017 01:14	HEAD ON	$ 25000	0	0	2	1	1	5	1	5	0	0	
Unit	**1 :** 5	**Alchl/Drgs:**	0	**Speed:**	50 MPH	**Dir:**	SE		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**			
Unit	**2 :** 1	**Alchl/Drgs:**	0	**Speed:**	10 MPH	**Dir:**	NW		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**			
34	**104937225**	0.849	12/07/2016 08:29	RAN OFF ROAD - RIGHT	$ 500	0	0	0	0	1	1	1	1	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:**	25 MPH	**Dir:**	E		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**		37	
35	**105285390**	0.890	11/09/2017 09:52	ANIMAL	$ 1000	0	0	0	0	2	1	3	1	0	0	
Unit	**1 :** 4	**Alchl/Drgs:**	0	**Speed:**	25 MPH	**Dir:**	NW		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**		17	
36	**105628167**	0.890	10/06/2018 04:30	REAR END, TURN	$ 2000	0	0	0	0	1	4	2	1	0	1	1
Unit	**1 :** 1	**Alchl/Drgs:**	7	**Speed:**	35 MPH	**Dir:**	W		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**			
Unit	**2 :** 4	**Alchl/Drgs:**	0	**Speed:**	10 MPH	**Dir:**	W		**Veh Mnvr/Ped Actn:**		8		**Obj Strk:**			
37	**104158920**	1.023	09/21/2014 23:09	RAN OFF ROAD - RIGHT	$ 9200	0	0	0	0	1	4	1	7	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	1	**Speed:**	35 MPH	**Dir:**	W		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**			
38	**104991284**	1.040	01/21/2017 11:15	BACKING UP	$ 2500	0	0	0	0	1	1	1	2	0	0	
Unit	**1 :** 2	**Alchl/Drgs:**	7	**Speed:**	15 MPH	**Dir:**	N		**Veh Mnvr/Ped Actn:**		10		**Obj Strk:**			
Unit	**2 :** 4	**Alchl/Drgs:**	0	**Speed:**	15 MPH	**Dir:**	N		**Veh Mnvr/Ped Actn:**		4		**Obj Strk:**			

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Acc No	Crash ID	Milepost	Date	Accident Type	Total Damage	Injuries F	Injuries A	Injuries B	Injuries C	Condition R	Condition L	Condition W	Road Ch	Road Ci	Trfc Ctl Dv	Trfc Ctl Op
39	**105236288**	1.080	10/01/2017 18:13	REAR END, SLOW OR STOP	$ 5000	0	0	0	0	1	1	1	5	0	0	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 10 MPH	**Dir:** NE	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
Unit 2 : 1	**Alchl/Drgs:** 0	**Speed:** 5 MPH	**Dir:** NE	**Veh Mnvr/Ped Actn:** 11	**Obj Strk:**											
40	**105665968**	1.080	11/07/2018 12:52	SIDESWIPE, SAME DIRECTION	$ 5500	0	0	0	0	1	1	1	1	0	0	
Unit 1 : 1	**Alchl/Drgs:** 7	**Speed:** 60 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:** 6	**Obj Strk:** 58											
Unit 2 : 4	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
41	**104599665**	1.082	12/29/2015 10:01	FIXED OBJECT	$ 30000	0	0	1	0	2	1	2	1	0	0	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** NE	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:** 34											
42	**105221960**	1.085	09/15/2017 19:15	RAN OFF ROAD - LEFT	$ 5550	0	0	1	2	1	1	1	1	0	0	
Unit 1 : 4	**Alchl/Drgs:** 1	**Speed:** 50 MPH	**Dir:** NE	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
43	**105095453**	1.099	05/10/2017 15:05	ANIMAL	$ 1500	0	0	0	0	1	1	1	3	0	0	
Unit 1 : 5	**Alchl/Drgs:** 0	**Speed:** 35 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:** 17											
44	**104735246**	1.141	05/18/2016 02:58	RAN OFF ROAD - RIGHT	$ 1000	0	0	0	0	2	5	2	1	0	0	
Unit 1 : 1	**Alchl/Drgs:** 7	**Speed:** 35 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:** 58											
45	**105059614**	1.278	04/05/2017 17:38	REAR END, SLOW OR STOP	$ 200	0	0	0	0	2	1	3	1	0	1	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 15 MPH	**Dir:** N	**Veh Mnvr/Ped Actn:** 11	**Obj Strk:**											
Unit 2 : 1	**Alchl/Drgs:** 0	**Speed:** 25 MPH	**Dir:** N	**Veh Mnvr/Ped Actn:** 11	**Obj Strk:**											
46	**104211428**	1.280	11/13/2014 22:08	SIDESWIPE, SAME DIRECTION	$ 4000	0	0	0	0	1	5	1	5	0	0	
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 20 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 6	**Obj Strk:**											
Unit 2 : 1	**Alchl/Drgs:** 0	**Speed:** 15 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
47	**104408785**	1.280	06/16/2015 07:40	LEFT TURN, DIFFERENT ROADWAYS	$ 13000	0	0	0	1	1	1	1	1	0	1	1
Unit 1 : 1	**Alchl/Drgs:** 0	**Speed:** 20 MPH	**Dir:** E	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:**											
Unit 2 : 2	**Alchl/Drgs:** 0	**Speed:** 20 MPH	**Dir:** W	**Veh Mnvr/Ped Actn:** 8	**Obj Strk:**											
48	**104622256**	1.280	01/23/2016 00:55	RAN OFF ROAD - STRAIGHT	$ 2000	0	0	0	0	6	5	6	1	1	0	
Unit 1 : 1	**Alchl/Drgs:** 7	**Speed:** 10 MPH	**Dir:** N	**Veh Mnvr/Ped Actn:** 4	**Obj Strk:** 33											

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

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49	**104771787**	1.280	06/23/2016 17:05	HEAD ON	$ 200	0	0	0	0	1	1	1	1	0	1	1
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:**	0 MPH	**Dir:**	E	**Veh Mnvr/Ped Actn:**	4	**Obj Strk:**						
Unit	**2 :** 1	**Alchl/Drgs:**	0	**Speed:**	10 MPH	**Dir:**	S	**Veh Mnvr/Ped Actn:**	4	**Obj Strk:**						
50	**105343930**	1.280	01/04/2018 00:34	ANGLE	$ 10100	0	0	0	0	4	4	2	1	0	0	
Unit	**1 :** 1	**Alchl/Drgs:**	0	**Speed:**	35 MPH	**Dir:**	NE	**Veh Mnvr/Ped Actn:**	4	**Obj Strk:**						
Unit	**2 :** 1	**Alchl/Drgs:**	0	**Speed:**	20 MPH	**Dir:**	W	**Veh Mnvr/Ped Actn:**	4	**Obj Strk:**						

Legend for Report Details:

Acc No - Accident Number
Injuries: F - Fatal, A - Class A, B - Class B, C - Class C
Condition: R - Road Surface, L - Ambient Light, W - Weather
Rd Ch - Road Character
Rd Ci - Roadway Contributing Circumstances
Trfc Ctl - Traffic Control: Dv - Device, Op - Operating
Alchl/Drgs - Alcohol Drugs Suspected
Veh Mnvr/Ped Actn - Vehicle Maneuver/Pedestrian Action
Obj Strk - Object Struck

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Summary Statistics

High Level Crash Summary

Crash Type	Number of Crashes	Percent of Total
Total Crashes	50	100.00
Fatal Crashes	0	0.00
Non-Fatal Injury Crashes	9	18.00
Total Injury Crashes	9	18.00
Property Damage Only Crashes	41	82.00
Night Crashes	19	38.00
Wet Crashes	11	22.00
Alcohol/Drugs Involvement Crashes	5	10.00

Crash Severity Summary

Crash Type	Number of Crashes	Percent of Total
Total Crashes	50	100.00
Fatal Crashes	0	0.00
Class A Crashes	1	2.00
Class B Crashes	4	8.00
Class C Crashes	4	8.00
Property Damage Only Crashes	41	82.00

Vehicle Exposure Statistics

Annual ADT = 4600

Total Length = 1.28 (Miles) **2.06 (Kilometers)**

Total Vehicle Exposure = 10.75 (MVMT) **17.3 (MVKMT)**

Crash Rate	Crashes Per 100 Million Vehicle Miles	Crashes Per 100 Million Vehicle Kilometers
Total Crash Rate	465.05	288.97
Fatal Crash Rate	0.00	0.00
Non Fatal Crash Rate	83.71	52.01
Night Crash Rate	176.72	109.81
Wet Crash Rate	102.31	63.57
EPDO Rate	1720.69	1069.19

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Miscellaneous Statistics

Severity Index =	3.70
EPDO Crash Index =	185.00
Estimated Property Damage Total = $	256750.00

Accident Type Summary

Accident Type	Number of Crashes	Percent of Total
ANGLE	4	8.00
ANIMAL	3	6.00
BACKING UP	1	2.00
FIXED OBJECT	1	2.00
HEAD ON	3	6.00
LEFT TURN, DIFFERENT ROADWAYS	3	6.00
LEFT TURN, SAME ROADWAY	4	8.00
OTHER COLLISION WITH VEHICLE	1	2.00
RAN OFF ROAD - LEFT	4	8.00
RAN OFF ROAD - RIGHT	14	28.00
RAN OFF ROAD - STRAIGHT	1	2.00
REAR END, SLOW OR STOP	5	10.00
REAR END, TURN	1	2.00
SIDESWIPE, OPPOSITE DIRECTION	2	4.00
SIDESWIPE, SAME DIRECTION	3	6.00

Injury Summary

Injury Type	Number of Injuries	Percent of Total
Fatal Injuries	0	0.00
Class A Injuries	1	6.67
Class B Injuries	6	40.00
Class C Injuries	8	53.33
Total Non-Fatal Injuries	15	100.00
Total Injuries	15	100.00

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Monthly Summary

Month	Number of Crashes	Percent of Total
Jan	5	10.00
Feb	3	6.00
Mar	3	6.00
Apr	1	2.00
May	8	16.00
Jun	3	6.00
Jul	2	4.00
Aug	4	8.00
Sep	6	12.00
Oct	5	10.00
Nov	5	10.00
Dec	5	10.00

Daily Summary

Day	Number of Crashes	Percent of Total
Mon	7	14.00
Tue	9	18.00
Wed	7	14.00
Thu	6	12.00
Fri	6	12.00
Sat	10	20.00
Sun	5	10.00

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Hourly Summary

Hour	Number of Crashes	Percent of Total
0000-0059	3	6.00
0100-0159	2	4.00
0200-0259	2	4.00
0300-0359	0	0.00
0400-0459	2	4.00
0500-0559	0	0.00
0600-0659	1	2.00
0700-0759	1	2.00
0800-0859	4	8.00
0900-0959	1	2.00
1000-1059	3	6.00
1100-1159	2	4.00
1200-1259	1	2.00
1300-1359	2	4.00
1400-1459	0	0.00
1500-1559	4	8.00
1600-1659	4	8.00
1700-1759	6	12.00
1800-1859	3	6.00
1900-1959	2	4.00
2000-2059	1	2.00
2100-2159	2	4.00
2200-2259	2	4.00
2300-2359	2	4.00

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Light and Road Conditions Summary

Condition	Dry	Wet	Other	Total
Day	22	4	0	26
Dark	12	5	2	19
Other	2	2	1	5
Total	36	11	3	50

Object Struck Summary

Object Type	Times Struck	Percent of Total
ANIMAL	3	15.00
CATCH BASIN OR CULVERT ON SHOULDER	1	5.00
DITCH	4	20.00
EMBANKMENT	1	5.00
FENCE OR FENCE POST	1	5.00
GUARDRAIL FACE ON SHOULDER	1	5.00
MAILBOX	3	15.00
OFFICIAL HIGHWAY SIGN NON-BREAKAWAY	1	5.00
OTHER FIXED OBJECT	3	15.00
TREE	1	5.00
UTILITY POLE	1	5.00

Vehicle Type Summary

Vehicle Type	Number Involved	Percent of Total
MOPED	1	1.28
MOTORCYCLE	2	2.56
PASSENGER CAR	51	65.38
PICKUP	3	3.85
SPORT UTILITY	14	17.95
UNKNOWN	2	2.56
VAN	5	6.41

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Yearly Totals Summary

Accident Totals

Year	Total Accidents	Fatal Accidents	Injury Accidents	Property Damage Only Accidents
2014	7	0	2	5
2015	10	0	2	8
2016	10	0	0	10
2017	14	0	4	10
2018	9	0	1	8
2019	0	0	0	0
Total	50	0	9	41

Injury Totals

Year	Fatal Injuries	Class A, B, or C Injuries
2014	0	2
2015	0	2
2016	0	0
2017	0	9
2018	0	2
2019	0	0
Total	0	15

Miscellaneous Totals

Year	Property Damage	EPDO Index
2014	$ 34400	21.80
2015	$ 73400	24.80
2016	$ 38050	10.00
2017	$ 76000	43.60
2018	$ 34900	84.80
2019	$ 0	0.00
Total	$ 256750	185.00

Type of Accident Totals

Year	Left Turn	Right Turn	Rear End	Run Off Road & Fixed Object	Angle	Side Swipe	Other
2014	2	0	0	2	1	2	0
2015	3	0	1	4	0	0	2

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Year	Left Turn	Right Turn	Rear End	Run Off Road & Fixed Object	Angle	Side Swipe	Other
2016	0	0	1	6	0	2	1
2017	2	0	3	4	1	0	4
2018	0	0	1	4	2	1	1
2019	0	0	0	0	0	0	0
Total	7	0	6	20	4	5	8

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Strip Diagram

Features	Milepost	Crash IDs
SR 1009 | LAKE WHEELER	0.00	104136290 | 104593346 | 105025343 | 105081636 | 105377350 | 105394458 | 104389132 | 104609193
	0.01	
	0.02	104567547
	0.03	104152421
	0.04	
	0.05	
	0.06	
QUAKER LANDING	0.07	105092559
	0.08	
	0.09	104007677
	0.10	
	0.11	
	0.12	104315829 | 105215793
	0.13	105206312
	0.14	
	0.15	
	0.16	
	0.17	
BATTS	0.18	
	0.19	
	0.20	
	0.21	
	0.22	
	0.23	
	0.24	
	0.25	104184323
	0.26	
	0.27	
	0.28	
	0.29	
	0.30	
	0.31	
	0.32	
	0.33	
	0.34	
	0.35	
	0.36	
CAROLINA HILL	0.37	
	0.38	
	0.39	
	0.40	

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Features	Milepost	Crash IDs
	0.41	104959846
	0.42	
	0.43	104499437
	0.44	104645551 | 105474822 | 105497500 | 105712088
	0.45	
HENSLOWE	0.46	104887873
	0.47	
	0.48	
	0.49	
	0.50	
SPRINGHILL	0.51	
	0.52	
	0.53	
	0.54	
OLEANDER	0.55	104809617
	0.56	
	0.57	
	0.58	
	0.59	
	0.60	
	0.61	
	0.62	
SARDIS	0.63	105201139 | 104880244 | 105343360
	0.64	
	0.65	
	0.66	104446951
	0.67	105122918
	0.68	
	0.69	
	0.70	
OAK	0.71	104200932
	0.72	
	0.73	
	0.74	
	0.75	
	0.76	
	0.77	104436777
	0.78	
	0.79	
	0.80	
	0.81	
	0.82	
	0.83	104368598
SPRINGHILL	0.84	

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Features	Milepost	Crash IDs
	0.85	105236324 | 104937225
	0.86	
	0.87	
	0.88	
SUFFOLK	0.89	105285390 | 105628167
	0.90	
	0.91	
Railroad Crossing:465791A	0.92	
	0.93	
	0.94	
	0.95	
	0.96	
	0.97	
	0.98	
	0.99	
	1.00	
	1.01	
	1.02	104158920
	1.03	
	1.04	104991284
	1.05	
	1.06	
	1.07	
STEELE	1.08	105236288 | 105665968 | 104599665
	1.09	105221960
	1.10	105095453
	1.11	
	1.12	
	1.13	
	1.14	104735246
MARBLE	1.15	
	1.16	
	1.17	
	1.18	
	1.19	
	1.20	
	1.21	
	1.22	
	1.23	
	1.24	
	1.25	
	1.26	
	1.27	
GRANITE	1.28	105059614 | 104211428 | 104408785 | 104622256 |

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs

Features	Milepost	Crash IDs
		104771787 | 105343930

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Jun 12, 2019 11_20_27 AM
EDT[External] Carolina Springs