Advanced Planning Report

for

Vestavia Hills Traffic Operations APPLE Study (Phase 1)

RPC Project No. 1289.32

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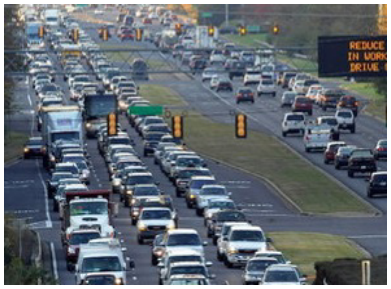
VESTAVIA HILLS



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ADMONITION

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Table of Contents

Appendices

List of Figures

List of Tables

1 Introduction

This study was initiated by the City of Vestavia Hills through the Advanced Planning, Programming, and Logical Engineering (APPLE) program developed by the Regional Planning Commission of Greater Birmingham (RPCGB). The City requested professional planning assistance in evaluating traffic operations at several intersections within the City. The study involves the following nine (9) intersections:

1. Rocky Ridge Road at Dolly Ridge Road
2. Sicard Hollow Road at Blue Lake Drive/Cahaba Heights Road
3. Rocky Ridge Road at US-280
4. US-31 at Shades Crest Road
5. US-31 at Columbiana Road/I-65 Northbound Ramps
6. Columbiana Road at Shades Crest Road/Vestaview Lane
7. US-31 at Vestavia Plaza/City Hall
8. US-31 at Pizitz Drive/Vestavia Forest Place
9. Dolly Ridge Road at Gresham Drive

1.1 Purpose and Need of the Study

This study was undertaken to assess traffic operational improvements at several intersections in and around the City, specifically stemming from user complaints and the redistricting of several schools within the district. This document summarizes the following topics:

- Existing transportation system operational conditions and deficiencies,
- The process used to identify potential alternatives for improvement,
- The resulting alternatives that were developed from that process, and
- An evaluation of potential positive and negative impacts to the area and adjacent properties that may be associated with each improvement.

The purpose of this study is to identify feasible improvements and their potential impacts. If the City chooses to move forward with an improvement project, a more detailed Environmental Planning Study would be required for federally funded projects; however, the City may also fund any improvements in order to achieve a quicker timeline.

Some of the intersections included in this study need improvements to accommodate adjusted traffic demands and pedestrian access as a result of the redistricting of schools within the City. For these intersections, this study is specifically geared towards identifying improvements that can be implemented with an accelerated timeline before the school redistricting takes effect for the 2019-2020 school year. Long term

improvements were identified at various locations to provide additional context for daily traffic operations at the intersections.

1.2 Study Approach

This study involves an evaluation of the existing conditions and constraints of several intersections selected by the City to be a part of the study. Existing traffic data was collected and a capacity analysis of the existing conditions was prepared. All information was compiled and evaluated to define the needs of each intersection and identify constraints and opportunities for improvement. Field reviews were performed that consisted of observing peak hour traffic patterns and investigating the impacts of various improvement options.

Recommendations were developed and evaluated relative to their ability to address the purpose and need for the project. Recommendations for each intersection are included within its respective subsection of this report.

1.3 Background Information

The most influential driver of the purpose and need for this project is the redistricting of several city schools. Table 1 outlines the changes in school facility enrollment and capacity as estimated by Vestavia Hills City School District.

Table 1: Vestavia Hills City School District Facility Enrollment Before and After Redistricting

School	Current Grades	Enrollment	Capacity	New Grades	New Enrollment	New Capacity
East	K - 3rd	770	779	K – 5th	774	836
West	K - 3rd	752	798	K – 5th	769	874
Central	4th - 5th	769	646	None	None	None
Gresham/ Dolly Ridge	None	None	None	K – 5th	735	836
Cahaba Heights	K - 5th	429	437	K – 5th	491	570
Liberty Park Elementary	K - 5th	589	779	K – 5th	613	779
Liberty Park Middle	6th - 8th	482	798	6th – 8th	479	798
Pizitz	6th - 8th	1149	1026	9th	510*	1026**
Berry	None	None	None	6th – 8th	1199	1300

Source: Vestavia Hills City Schools Annual Reports 2013-2018 (www.vestavia.k12.al.us)
*Estimated based on 2017-2018 Vestavia Hills High School total enrollment
**Assumed previous Pizitz campus capacity would remain the same as 2017-2018

2 Traffic Analysis and Recommendations

Stakeholder input resulted in the following intersections and any specified focus areas associated with each location. Each subsection contains an operations analysis of the existing conditions for the year 2019 and recommendations for mitigating operational deficiencies. Traffic counts are included in Appendix A, and capacity analysis reports from Trafficware's Synchro 10 software are included in Appendix B.

In the *Highway Capacity Manual* (2016), published by the Transportation Research Board, traffic capacities are expressed as levels of service (LOS) ranging from "A" to "F". A detailed description of each level of service designation is included in Appendix C. Generally, LOS "C" is considered desirable, while LOS "D" is considered acceptable during peak hours of traffic flow.

2.1 Rocky Ridge Road at Dolly Ridge Road

Rocky Ridge Road is classified as a two-lane minor arterial with a speed limit of 35 MPH, and Dolly Ridge Road is classified as a two-lane major collector. The intersection is signalized and operates currently as a two-phase cycle running free at all times. Figure 1 displays aerial imagery of the intersection. Traffic counts were collected by Jefferson County on Tuesday, January 15, 2019, from 6:00 AM to 8:00 AM, 2:00 PM to 3:00 PM, and 4:30 PM to 6:00 PM. Analysis completed by Jefferson County and Sain Associates included a Synchro capacity analysis, trip generation estimates for added school traffic, and crash data analysis. According to the City, plans are in place to install sidewalks in the vicinity of the intersection. These plans were considered when making recommendations.

Figure 1: Aerial Imagery of the Rocky Ridge Road at Dolly Ridge Road Intersection

Analysis

Rocky Ridge Road is a heavily utilized roadway for commuters accessing US-280 and schools. Dolly Ridge Road connects Rocky Ridge Road on the western end to Cahaba River Road on the eastern end. Both Rocky Ridge Road approaches have left turn lanes. The trip generating land parcels that feed the eastbound approach to this intersection are fully built-out. The west leg of Dolly Ridge Road provides access to a CVS, a veterinarian office, an assisted-living facility, and a moderately-sized residential neighborhood. With its close proximity to Vestavia Hills High School and the new Dolly Ridge Elementary, the intersection is expected to be noticeably affected by the redistricting of schools. Table 2 displays the current level of service for each lane group. The numbers shown in parentheses indicate each lane group's delay per vehicle in seconds.

Table 2: Existing Lane Group LOS at Rocky Ridge Road and Dolly Ridge Road (2019)

Approach	AM LOS		School PM LOS		PM LOS	
	Left	Through/ Right	Left	Through/ Right	Left	Through/ Right
Rocky Ridge Road – Northbound	A (5.7)	C (22.2)	A (5.6)	A (7.0)	A (7.3)	A (9.4)
Rocky Ridge Road – Southbound	D (41.5)	A (7.9)	A (6.8)	B (10.2)	A (9.1)	B (15.5)
Dolly Ridge Road – Eastbound	B (19.9)		B (14.5)		B (18.3)	
Dolly Ridge Road – Westbound	D (35.7)		B (19.3)		C (25.6)	

Table 3 shows the estimated additional trips induced by the opening of Dolly Ridge Elementary. Trip generation was completed based on turning movement counts from an existing Vestavia Hills elementary school and distributed by a shortest-path analysis using GIS software. Since Vestavia Hills does not employ a typical bus system, the *ITE Trip Generation Manual* trip rates for elementary schools (LUC 520) is not appropriate for this scenario. Further details of the trip generation methodology used in this study can be found in Section 2.9 and Appendix D. Table 4 contains the peak hour capacity analysis with the estimated added volume from the trip generation.

Table 3: Net Added Volume from Trip Generation

Approach	Net Added AM Trips			Net Added School PM Trips		
	Left	Through	Right	Left	Through	Right
Rocky Ridge Road – Northbound	0	0	302	0	0	82
Rocky Ridge Road – Southbound	154	0	0	137	0	0
Dolly Ridge Road – Eastbound	0	5	0	0	16	0
Dolly Ridge Road – Westbound	119	2	196	139	19	146

Table 4: Lane Group LOS with Trip Generation Volumes Added (2019)

Approach	AM LOS		School PM LOS		PM** LOS	
	Left	Through/ Right	Left	Through/ Right	Left	Through/ Right
Rocky Ridge Road – Northbound	A (6.2)	**F (122.7)**	A (7.6)	B (11.2)	A (7.3)	A (9.4)
Rocky Ridge Road – Southbound	**F (>300)***	A (8.6)	D (38.8)	B (16.9)	A (9.1)	B (15.5)
Dolly Ridge Road – Eastbound	C (21.2)		B (17.4)		B (18.3)	
Dolly Ridge Road – Westbound	**F (>300)***		**F (89.5)**		C (25.6)	

*Computed delay in seconds exceeds a meaningful value

**School trip generation estimates do not affect PM LOS, only AM and School PM LOS.

The crash data analysis included ten (10) crashes from 2016 through 2018. 40% of crashes involved angle collisions, and an additional 40% of the crashes were sideswipe crashes. There were two safety issues observed at this intersection that could be contributing to angle or sideswipe crashes. First, the diagonal span-wire arrangement leads to poor signal head visibility for drivers as they enter the intersection. This is especially true for drivers attempting to make a permissive left turn from either Rocky Ridge Road approach. Second, the access point density in the segment just north of the intersection on Rocky Ridge Road is unnecessarily high. The potential for drivers to use the access points as cut-throughs during peak hours is high, which presents a safety issue for gas station customers walking to and from the gas pumps. One access is striped as a right-in, right-out configuration, which is generally less effective at preventing incorrect movements than raised channelizing islands. Figure 2 shows a view of the intersection, its span-wire arrangement, and the right-in, right-out access point to the gas station.

Figure 2: View from the northeast corner of the Rocky Ridge Road at Dolly Ridge Road intersection

Recommendations

Considering the added volumes and the existing operational performance of the intersection, the following short-term and long-term recommendations should be implemented.

Short Term Recommendations:

1. Add a left turn phase for the Rocky Ridge Road northbound and southbound approaches. A flashing yellow arrow (FYA) signal head arrangement is recommended for both protected-permissive left turn conditions. Base signal timings with the added phase are included in Appendix E. The timings should be monitored after school begins, and any necessary adjustments should be made.
2. In conjunction with adding left turn phases, the existing span-wire arrangement should be converted to a box arrangement. Long term recommendations below should be considered in the placement of any new signal poles.
3. Include pedestrian timings, signal heads, and crosswalks in accordance with the plans for sidewalks in the area.
4. Install a raised channelizing island at the right-in, right-out gas station driveway along Rocky Ridge Road just north of the intersection.

Long Term Recommendations:

5. Install right turn lanes on the Rocky Ridge Road northbound and Dolly Ridge Road westbound approaches. Both turn lanes should be as long as feasible to ensure effectiveness in improving traffic operations at the intersection.

Table 5 shows the capacity analysis results when accounting for short term recommendations (no turn lane additions) and added volumes from trip generation. Table 6 shows the capacity analysis results when accounting for both short term and long term recommendations and added volumes from trip generation. Inclusion of pedestrian phases will impact levels of service for other movements.

Table 5: Lane Group LOS with Short Term Recommendations Implemented (2019)

Approach	AM LOS		School PM LOS		PM LOS	
	Left	Through/ Right	Left	Through/ Right	Left	Through/ Right
Rocky Ridge Road – Northbound	A (9.7)	**F (258.9)**	B (10.5)	D (43.5)	A (3.6)	B (16.3)
Rocky Ridge Road – Southbound	**F (211.9)**	B (15.1)	D (29.6)	C (25.9)	A (4.6)	B (15.1)
Dolly Ridge Road – Eastbound	C (30.0)		B (16.6)		B (19.8)	
Dolly Ridge Road – Westbound	**F (297.8)**		D (52.3)		C (33.7)	

Table 6: Lane Group LOS with Short Term and Long Term Recommendations Implemented (2019)

Approach	AM LOS			School PM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Rocky Ridge Road – Northbound	A (5.3)	D (37.8)	A (4.3)	A (5.3)	C (20.8)	A (4.2)	A (4.3)	B (13.8)	A (3.2)
Rocky Ridge Road – Southbound	**F (81.0)**	A (9.5)		A (8.4)	B (16.6)		A (4.8)	B (13.4)	
Dolly Ridge Road – Eastbound	C (26.5)			B (16.0)			B (18.9)		
Dolly Ridge Road – Westbound	**E (71.3)**		C (26.6)	D (39.0)		A (5.6)	C (27.8)		A (7.2)

2.2 Sicard Hollow Road at Blue Lake Drive/Cahaba Heights Road

Blue Lake Road and Sicard Hollow Road are both classified as two-lane major collectors with speed limits of 35 MPH. The intersection is unsignalized and has four legs. The intersection serves as a hub for access between three areas: Cahaba Heights, the Colonnade and Patchwork Farms, and Liberty Park. 24-hour turning movement counts were collected at this intersection on February 6, 2019. Analysis completed for this intersection includes a capacity analysis, a signal warrant, sight distance measurements, Curve Analysis Reporting Services (CARS) runs, and crash data analysis. No measurable impact to operations is expected due to school redistricting. The Cahaba Pump Station on the northeast quadrant of the intersection is a historic property, and several utility poles and markers exist in close proximity to the intersection. Figure 3 displays the view from the western leg of the intersection.

Figure 3: Intersection of Sicard Hollow Road and Blue Lake Drive/Cahaba Heights Road

Analysis

While the eight-hour volume warrant was not satisfied, the four-hour volume warrant was satisfied. The signal warrant analysis can be found in Appendix F. Intersections that do not meet the eight-hour volume warrant are typically not considered signal candidates by ALDOT. Though this is not an ALDOT-owned or maintained roadway, there are also stopping sight distance concerns associated with the installation of a signal at this location that increase the likelihood of more severe crashes. Additionally, the installation of a signal generally increases the number of rear end crashes at an intersection. There is no discernible growth trend in nearby historical traffic count data, but Sicard Hollow Road approach volumes would have to grow by at least 5% annually for the eight-hour warrant to be satisfied in five years.

Much of the queuing observed at this intersection was a result of several vehicles platooning behind a slower driver along Sicard Hollow Road. This type of arrival occurred several times during peak hour observations, but the queue processed fairly quickly each time. Considering the safety implications as well as the delay tradeoffs associated with signalization, it is not recommended that a signal be installed at this time. However, this intersection is an excellent candidate for a roundabout based on the need for acceptable levels of service, traffic calming measures, and the mitigation of insufficient intersection sight distance from Sicard Hollow Road. Table 7 shows the existing levels of service for each lane group at the intersection. Table 8 shows levels of service after signalization and the addition of a southbound left turn lane. The numbers shown in parentheses indicate the lane group delay per vehicle in seconds. Table 9 contains the levels of service for a roundabout at the intersection.

Table 7: Existing Lane Group LOS at Sicard Hollow Road and Blue Lake Drive/Cahaba Heights Road (2019)

Approach (Existing Conditions)	AM LOS	PM LOS
	Left/Through/Right	Left/Through/Right
Blue Lake Drive – Northbound	A (0)	A (0)
Cahaba Heights Road – Southbound	A (2.8)	A (3.9)
Driveway – Eastbound	N/A	N/A
Sicard Hollow Road – Westbound	**F (>300)***	**F (265.6)**

*Computed delay in seconds exceeds a meaningful value

Table 8: Lane Group LOS with Signalization (2019)

Approach (Signalized)	AM LOS		PM LOS	
	Left	Through/ Right	Left	Through/ Right
Blue Lake Drive – Northbound	D (53.7)		B (18.6)	
Cahaba Heights Road – Southbound	B (16.9)	B (10.7)	A (8.9)	A (4.5)
Driveway – Eastbound	N/A		N/A	
Sicard Hollow Road – Westbound	**F (117.8)**		C (31.6)	

Table 9: Proposed Roundabout LOS at Sicard Hollow Road and Blue Lake Drive/Cahaba Heights Road

Type of Roundabout	Blue Lake Drive – NB		Cahaba Heights Road – SB		Driveway – EB		Sicard Hollow Road – WB		Roundabout LOS	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1-Lane by 1-Lane	B	B	A	A	B	B	**E**	A	**C**	**B**
1-Lane by 2-Lanes	A	B	A	A	A	A	B	A	**A**	**A**
2-Lanes by 1-Lane	A	A	A	A	A	A	C	A	**B**	**A**
2-Lanes by 2-Lanes	A	A	A	A	A	A	B	A	**A**	**A**

Sight distance measurements are documented in Table 10 below. Figures 4 and 5 show the view from the stop line at the Sicard Hollow Road approach.

Table 10: Intersection Sight Distance Summary-Sicard Hollow Road & Blue Lake Drive/Cahaba Heights Road

Approach – View Direction	Measured Intersection Sight Distance (ft)	Required Intersection Sight Distance* (ft)
Sicard Hollow Road – looking northbound	350	390
Sicard Hollow Road – looking southbound	305	390

*According to *A Policy on Geometric Design of Highways and Streets* (AASHTO 2011) for a 35 MPH facility.

There is limited curve warning signage along Blue Lake Drive and Cahaba Heights Road to encourage lower speeds and caution near the intersection of Sicard Hollow Road. Existing signage is in poor condition. To determine what advisory speeds should be in place for the curves near the intersection, CARS analysis was run on this stretch of roadway. All recommended curve advisory speeds were at or above the speed limit except for the Blue Lake Drive curve immediately south of the Sicard Hollow Road intersection. CARS analysis documentation can be found in Appendix G, and the appropriate signage is noted in the short term recommendations.

Crash data queries returned just two (2) crashes at the intersection itself. Three (3) additional crashes were analyzed, but their actual locations were north of the intersection of Sicard Hollow Road and Blue Lake Drive. Speed was a factor in at least 60% of the crashes, but no other conclusive trends can be established with this sample size.

Figure 4: View from Sicard Hollow Road Looking Northbound along Cahaba Heights Road

Figure 5: View from Sicard Hollow Road Looking Southbound along Blue Lake Drive

Recommendations

Considering existing safety and operational performance of the intersection, the following short-term and long-term recommendations should be implemented.

Short Term Recommendations:

1. A Winding Road (W1-5) sign should be installed 100 feet prior to the group of curves along Blue Lake Drive northbound and southbound between Lakeside Drive and the I-459 overpass.
2. Install a combination horizontal alignment/intersection (W1-10e) sign with a Speed Advisory Plaque (W13-1P) at the beginning of the first curve in each direction along Blue Lake Drive/Cahaba Heights Road (northbound and southbound) before the Sicard Hollow Road intersection. In the northbound direction along Blue Lake Drive, the Speed Advisory Plaque (W13-1P) should be 25 MPH. In the southbound direction along Cahaba Heights Road, the Speed

Advisory Plaque (W13-1P) should be 20 MPH. Ideally, solar-powered flashing beacons should be installed on these sign arrangements to improve visibility to drivers.

3. Install two (2) double-sided Chevron (W1-8) signs along the Blue Lake Drive curve immediately south of the intersection.
4. Trim vegetation on the southwestern quadrant of the intersection to improve intersection sight distance for Sicard Hollow Road drivers looking southbound.
5. Install gate-posted Stop Ahead (W3-1) signs approximately 100 feet from the stop line of the Sicard Hollow Road westbound approach.
6. Install lighting at the intersection to improve intersection visibility during nighttime conditions.

Long Term Recommendations:

7. Install a one-lane by one-lane roundabout at the intersection to calm traffic speeds, mitigate sight distance deficiencies, lessen the likelihood of high severity crashes, and improve average delays at the intersection for Sicard Hollow Road approaches. If a roundabout is installed, reevaluate the warning signage in the area prior to installation. Figure 6 shows a concept of the proposed roundabout.

Short term recommendations would not necessarily change the capacity analysis results from existing conditions, but in practice it would ease the execution of movements from the Sicard Hollow Road approach and improve visibility at the intersection and approaching the intersection. The installation of a roundabout is estimated to bring about the levels of service found in Table 9, based on the ALDOT Capacity Analysis for Planning of Roundabouts tool. This analysis tool uses methodology from the *Highway Capacity Manual* (6th Edition). After evaluating the different types of roundabouts and potential design constraints at this location, a one-lane by one-lane roundabout is the recommended configuration. The LOS E at Sicard Hollow Road westbound is a significant improvement over the LOS F registered by the existing intersection (Table 7) and a signalized intersection (Table 8).

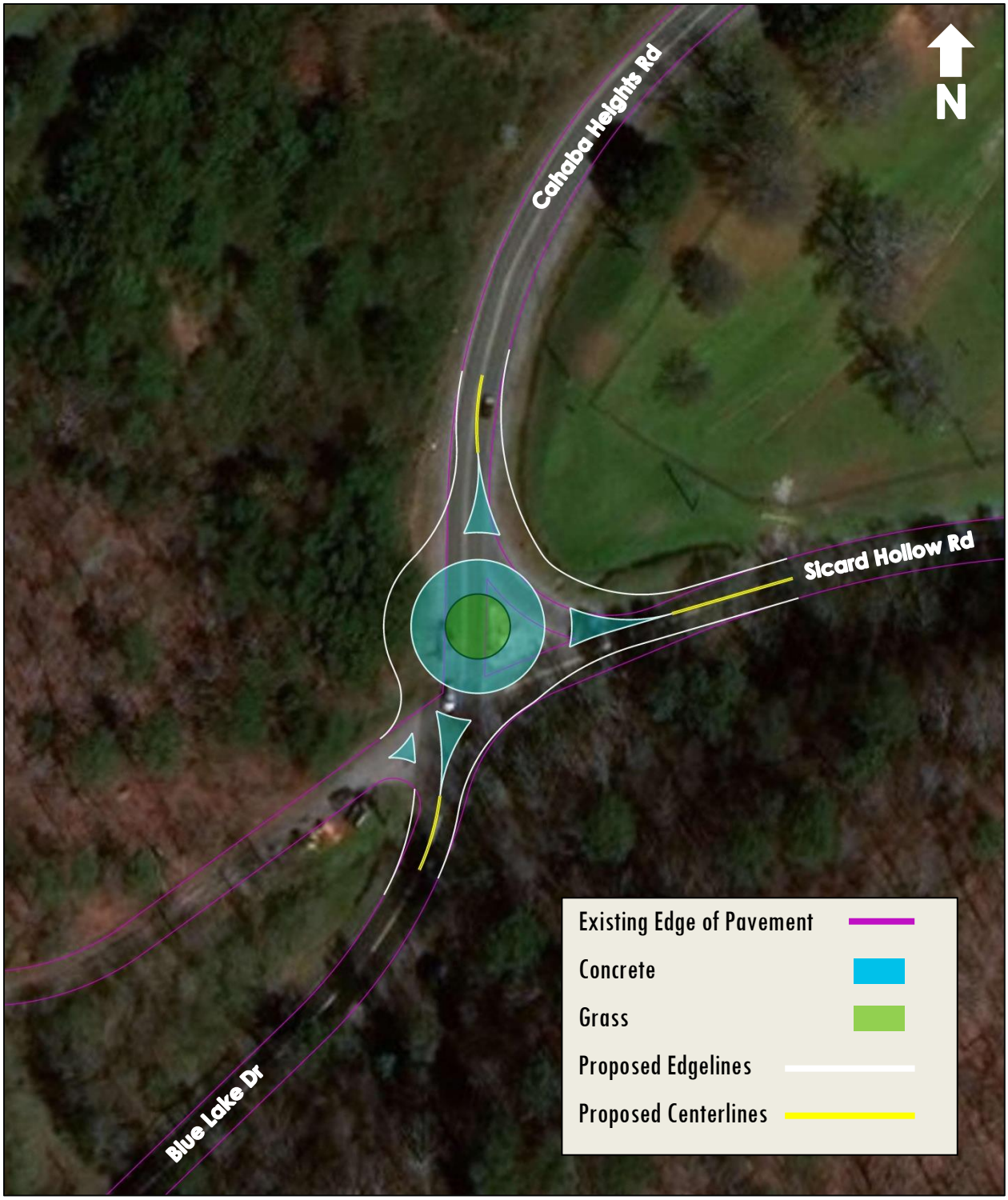


Figure 6: Sicard Hollow Road at Blue Lake Drive Roundabout Concept

2.3 Rocky Ridge Road at Shades Crest Road and US-280

This junction serves to connect many Vestavia Hills neighborhoods to the US-280 corridor. Rocky Ridge Road and Shades Crest Road are both classified as two-lane minor arterials. US-280 is classified as a six-lane principal arterial with a speed limit of 55 MPH. The two signalized intersections are separated by approximately 300 feet. 24-hour turning movement counts were collected on February 6, 2019 at the intersection of Rocky Ridge Road and Shades Crest Road. Peak hour volumes from the US-280 at Rocky Ridge Road intersection were obtained through Skipper Consulting from November 2018.

Analysis performed at these intersections included a capacity analysis and crash data analysis. Figure 7 shows aerial imagery of the two intersections. Several utilities lie in close proximity to the roadway on the east side of Rocky Ridge Road, presenting challenges for any short-term widening of the Rocky Ridge Road northbound approach to US-280.

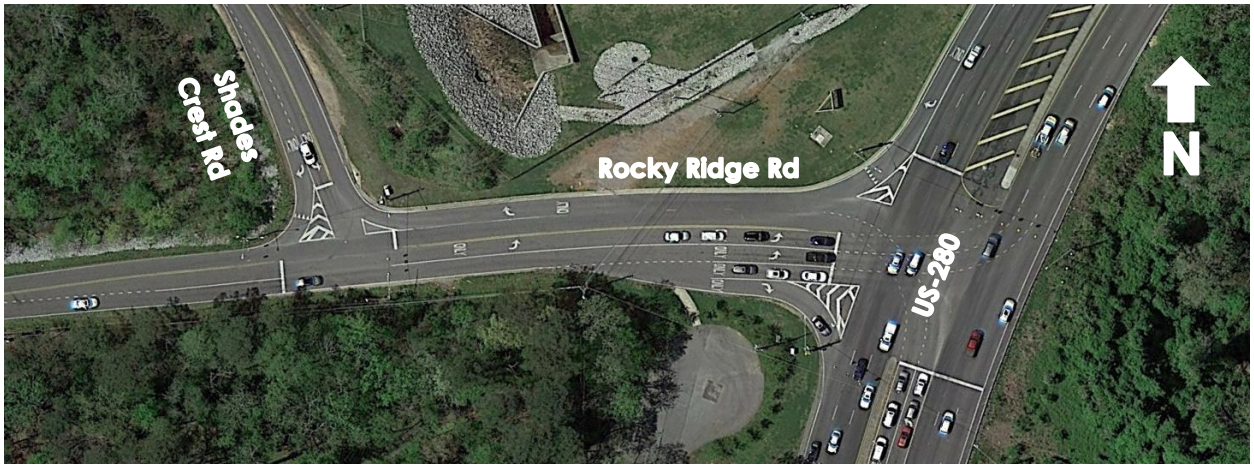


Figure 7: Aerial View of US-280 at Rocky Ridge Road and Shades Crest Road

Analysis

At the height of the AM peak hour, the queue for the Rocky Ridge Road northbound approach to US-280 extended over half of a mile back to Rocky Brook Drive. The Shades Crest Road eastbound phase was served twice per US-280 cycle, which led to drivers receiving a green light when there was no available space to occupy on Rocky Ridge Road northbound. The majority of Shades Crest Road eastbound drivers continue onto Rocky Ridge Road northbound to turn right onto US-280 eastbound.

In the southbound direction during the AM peak hour, Rocky Ridge Road never queued back to US-280. However, the offset between the two intersections caused issues in the PM peak with Rocky Ridge Road southbound queuing back onto US-280. As soon as the westbound left turn phase is serviced on US-280, the southbound phase for Rocky

Ridge Road at Shades Crest Road turned red. Unfortunately, establishing an offset to employ at the Rocky Ridge Road and Shades Crest Road signal is not practical due to cycle lengths on the US-280 adaptive signal system varying throughout the day.

Another issue associated with the short distance between these intersections is that some drivers are unaware that one lane on Rocky Ridge Road southbound continues on Rocky Ridge Road and the other feeds onto Shades Crest Road westbound. This leads to drivers stopping between the two intersections to change lanes and increases the risk of traffic queuing back onto US-280. Existing directional signage along US-280 westbound prior to the left turn lane that illustrates the upcoming scenario is small and outside of the natural eyeline of the average driver. Figure 8 shows the view of the eastbound left turn phase signal heads.

Figure 8: View of US-280 Westbound Left Turn Signal Heads

There is a short concrete path connecting Rocky Ridge Road with the adjacent cul-de-sac on the south side of Rocky Ridge Road. There is a Bike Route sign on Rocky Ridge Road northbound a few feet prior to the path, however it is unclear what purpose the path is currently serving. There are safety concerns regarding the lack of guidance associated with this path, and there are no nearby destinations or existing infrastructure to support bicycles or pedestrians. If vehicles are queued on Rocky Ridge Road northbound, a cyclist or pedestrian exiting the path has no view of oncoming traffic.

Table 11 shows existing levels of service at the US-280 and Rocky Ridge Road intersection for each lane group. The numbers shown in parentheses indicate the lane group delay per vehicle in seconds. Though modeled contiguously in Synchro, the capacity analysis results (see Appendix B) for Shades Crest Road at Rocky Ridge Road were not indicative of the conditions observed in the field due to queue spillback from the US-280 and Rocky Ridge Road intersection.

Table 11: Existing Lane Group LOS at US-280 and Rocky Ridge Road (2019)

Approach	AM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right
Rocky Ridge Road – Northbound	**F (111.1)**		**E (58.7)**	**F (104.0)**		**E (67.3)**
US-280 – Eastbound		C (34.8)	A (8.2)		**F (212.0)**	B (9.0)
US-280 – Westbound	**F (116.8)**	C (31.0)		**F (116.4)**	A (9.0)	

Despite the satisfactory levels of service registered in the capacity analysis at the intersection of Shades Crest Road and Rocky Ridge Road, queue spillback from the US-280 at Rocky Ridge Road signal prevents the intersection from achieving these levels of service in the field. In other words, the signal at Rocky Ridge Road and Shades Crest Road would operate well if it wasn't in such close proximity to US-280. As a result, our recommendations promote the strategy of maximizing the use of limited space between the intersections to improve the overall efficiency of the system. Currently, the Shades Crest Road phase is set to Max Recall, which takes valuable green time away from Rocky Ridge Road traffic in the PM peak hour and increases the chances of traffic queuing back to US-280 along Rocky Ridge Road southbound.

Thirty nine (39) crashes were reported at the intersection of US-280 and Rocky Ridge Road from 2016 through 2018. The vast majority of crashes from this dataset were low-severity, rear end collisions on the US-280 mainline. Approximately 90% of all crashes involved property damage only. Crash data queries returned zero (0) reported crashes at the intersection of Rocky Ridge Road at Shades Crest Road; however, City staff mentioned two recent crashes involving garbage trucks running straight through the intersection from the steep downgrade of Shades Crest Road's approach to Rocky Ridge Road. Advance warning signage on Shades Crest Road has since been installed to notify heavy vehicle drivers of the steep grade.

Recommendations

Considering existing safety and operational performance of the intersection, the following short-term and long-term recommendations should be implemented.

Short Term Recommendations:

1. Place signage on the south signal span wire facing US-280 westbound traffic that delineates the appropriate lane to occupy for each subsequent route once the left turn movement is made onto Rocky Ridge Road southbound. The inside left turn lane feeds Rocky Ridge Road southbound, while the outside left turn lane feeds Shades Crest Road.
2. At the intersection of Shades Crest Road and Rocky Ridge Road, turn off the Max Recall setting for the Shades Crest Road phase.
3. Extend the Rocky Ridge Road northbound right turn lane onto US-280 eastbound back to the Shades Crest Road intersection to give the right turn lane 275 feet of

storage length from the stop line at US-280 with an additional 100 feet of taper length. This would also require the extension of the outermost left turn lane by the same distance as the right turn lane.

4. Remove the path between Rocky Ridge Road and the adjacent cul-de-sac. There are no pedestrian or bicycle facilities nearby, and it is not within driver expectation to encounter either mode at this location.

Long Term Recommendations:

5. Upon turn lane extension, observe the signal performance at the Rocky Ridge Road and Shades Crest Road intersection and make adjustments to signal timings based on the altered traffic conditions.

Table 12 shows the levels of service for the lane groups at the intersection of US-280 and Rocky Ridge Road after taking into account the recommendations found above. Long cycle lengths on US-280 during peak hours lead to poor delay-related metrics, so the goal of the recommendations is to make the most of each phase. Queue spillback will remain an issue for the Rocky Ridge Road at Shades Crest Road intersection as long as it is a full access intersection, but allowing Shades Crest Road drivers to go directly to the right turn lane on Rocky Ridge Road northbound at US-280 will aid the efficiency of both intersections.

Table 12: Lane Group LOS at US-280 and Rocky Ridge Road with All Improvements (2019)

Approach	AM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right
Rocky Ridge Road – Northbound	**F (111.1)**		B (15.1)	**F (104.3)**		**E (65.8)**
US-280 – Eastbound		C (34.8)	A (8.2)		**F (211.2)**	B (16.8)
US-280 – Westbound	**F (116.8)**	C (31.0)		**F (116.4)**	A (8.9)	

Though there is no major difference in the levels of service registered by Synchro due to turn lane lengthening, our peak hour observations at the intersections indicate that increasing turn lane lengths per the recommendations will increase capacity at the intersection by maximizing the number of vehicles that can be stored between US-280 and Shades Crest Road. Several other methods for signal coordination between the two intersections were evaluated, but we do not believe that they guarantee enough of an operational benefit to traffic conditions. Converting the two intersections to run on one signal controller may result in unacceptable inefficiency at the Shades Crest Road and Rocky Ridge Road intersection at all hours of the day. Attempting to hardwire the controller or detection of the US-280 and Rocky Ridge Road signal to the Rocky Ridge Road and Shades Crest Road signal would most likely be effective during peak hours, but also presents a likelihood of unacceptable inefficiency during non-peak hours.

2.4 US-31 at Shades Crest Road

US-31 is classified as a four-lane principal arterial with a speed limit of 40 MPH, and Shades Crest Road is classified as a two-lane minor arterial. Shades Crest Road is one of the major east-west roads in the City of Vestavia Hills, and it intersects US-31 in close proximity to the Vestavia City Center, which is a popular commercial destination. 24-hour turning movement counts from May 2012 were grown using a conservative 0.5% annual growth rate to reach the 2019 existing conditions year. Figure 9 shows a view of the full intersection, and Figure 10 shows the view of the intersection from the Shades Crest Road eastbound approach to US-31. School redistricting will affect this intersection, but no schools are close enough to quantify volume differences with any degree of accuracy. Analysis performed at the intersection included capacity analysis and crash data analysis.

Analysis

Table 13 shows the levels of service for existing conditions. The numbers shown in parentheses indicate the lane group delay per vehicle in seconds. The most pressing issue at this intersection is the interaction between the Shades Crest Road approaches during the side street phase. There is not a sufficient lane configuration for a protected left turn phase on the side streets, and it is difficult to gauge the intentions of opposing drivers due to the skew of the approaches. Figure 11 shows aerial imagery of the intersection.

Figure 9: Looking north at the intersection of US-31 at Shades Crest Road

Figure 10: Looking Eastbound from the Shades Crest Road approach to US-31

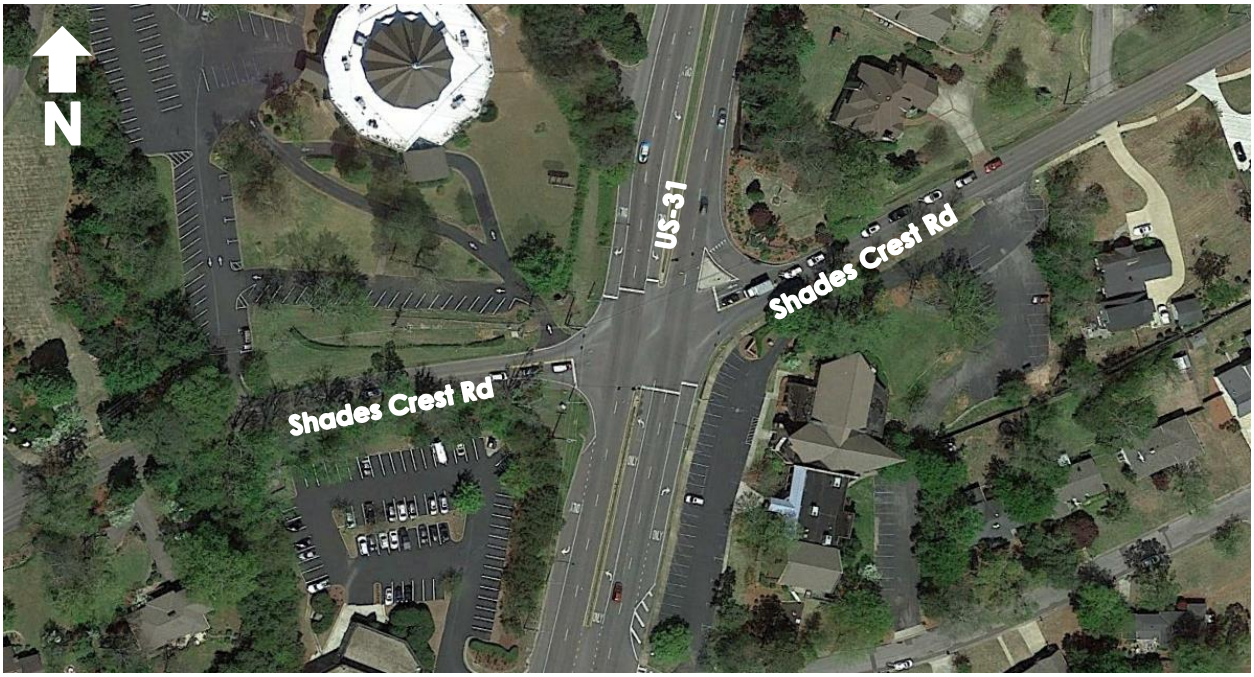


Figure 11: Aerial View of US-31 at Shades Crest Road

During the AM peak hour, the heaviest side street movements are the Shades Crest Road eastbound left turn and the Shades Crest Road westbound right turn. However, there is enough through volume on each Shades Crest Road approach to make it difficult to execute a permissive left turn, which hurts the efficiency of the side street phase. Similar issues are seen during the PM peak hour, but the Shades Crest Road movements are more balanced.

Table 13: Existing Lane Group LOS at US-31 and Shades Crest Road (2019)

Approach	AM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right
US-31 – Northbound	B (10.7)	D (48.6)	B (11.7)	C (27.3)	B (18.6)	A (4.7)
US-31 – Southbound	D (42.4)	B (18.8)	A (3.5)	C (21.8)	C (32.4)	A (5.9)
Shades Crest Road – Eastbound	**F (>300)***			**F (198.2)**		
Shades Crest Road – Westbound	**E (72.1)**	**E (65.3)**		**F (165.5)**	**E (64.9)**	

*Computed delay in seconds exceeds a meaningful value

Crash data analysis from 2016 through 2018 reveals a high percentage of low-severity crashes. Over half of reported crashes at the intersection were rear end collisions, nearly 20% were angle crashes, and approximately 13% were sideswipe crashes. This data supports the notion that it is difficult to ascertain the intentions of opposing drivers on the Shades Crest Road approaches. The other potential safety concern observed during field observation was the lack of functional sight distance from the US-31 northbound left turn lane. Due to the vertical crest along US-31 just north of the intersection, it is difficult to achieve adequate sight distance to execute a permissive left turn on the US-31 northbound approach, especially when a vehicle is waiting to make the opposing left turn from the US-31 southbound left turn lane.

Recommendations

Considering existing safety and operational performance of the intersection, the following short-term and long-term recommendations should be implemented.

Short Term Recommendations:

1. Convert the US-31 northbound left turn phase to protected-only.

Long Term Recommendations:

2. Widen both Shades Crest Road approaches to US-31. Each approach should have a left turn lane and a shared through/right lane. The left turn lanes should have at least 225 feet of storage length to separate the approach's movements early enough for the opposing side street drivers to discern each other's intentions prior to their actual decision point.
3. In conjunction with the widening of the Shades Crest Road approaches to US-31, install flashing yellow arrow (FYA) signal operation on the Shades Crest Road approaches to employ protected-permissive left turn phases. Remove pedestrian push-buttons and pedestrian timings, unless pedestrian facilities are constructed on the west side of the intersection. At that time, perform a signal timing study to determine the appropriate modified timings for the flashing yellow arrow operation.

For the analysis, a parameter was set to utilize the existing amount of the cycle length dedicated to the Shades Crest Road phase during the AM and PM peak hours in order

to fit the recently-retimed US-31 signal system throughout Vestavia Hills. Levels of service along US-31 at the intersection indicate that there is flexibility within the cycle to allocate more time to Shades Crest Road; however, a marginal benefit to the side street may not be an economical use of time when considering how that might affect the US-31 mainline. Given that US-31 within Vestavia Hills was retimed as recently as 2017 with several timing plans in place throughout each day of the week, the practical solution was to accommodate the existing signal coordination on US-31.

Table 14 shows the levels of service for the movements at each intersection after taking into account the recommendations found above. The benefits of the improvements found above come in the form of increased safety and a more functional configuration from the driver's perspective. The high cycle length on US-31 worsens the northbound left turning movement to LOS F, but the sight distance issue is mitigated for a low-volume movement.

Table 14: Lane Group LOS at US-31 and Shades Crest Road with All Improvements (2019)

Approach	AM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right
US-31 – Northbound	**F (107.6)**	D (48.6)	A (9.0)	**F (103.5)**	B (17.4)	A (4.6)
US-31 – Southbound	D (44.7)	C (20.2)	A (2.0)	C (20.9)	D (33.7)	A (6.4)
Shades Crest Road – Eastbound	**F (>300)***	F (80.1)		**F (88.4)**	**F (109.6)**	
Shades Crest Road – Westbound	**E (70.5)**	**F (272.8)**		**F (213.9)**	**E (97.4)**	

*Computed delay in seconds exceeds a meaningful value

2.5 US-31 at Columbiana Road/I-65 Northbound Ramps

US-31 is classified as a four-lane principal arterial with a speed limit of 40 MPH, and Columbiana Road is classified as a four-lane minor arterial with a speed limit of 40 MPH. Both routes utilize auxiliary turn lanes. The fourth leg (westbound) of the intersection is the I-65 northbound on and off ramps. This signalized intersection is running free with split-phased side streets. 24-hour turning movement counts from May 2012 were grown using a conservative 0.5% annual growth rate to reach the 2019 existing conditions year. Analysis completed at the intersection included a capacity analysis and crash data analysis. It should be noted that extensive capacity issues exist at this intersection and will be documented in any LOS tables, but the focus of the analysis was to provide the City with practical, economical short-term recommendations. Figure 12 shows the view of the US-31 southbound signal heads at the intersection along with the Columbiana Road eastbound right turn approach.

This intersection was included in two past studies performed by Sain Associates. The Statewide Wrong Way Interchange Assessment (2015) identified safety improvements with the focus of preventing wrong way movements at this interchange, which has a

higher potential for wrong way movements due to its partial cloverleaf configuration. The East Central Region Birmingham Area Horizontal Curve Study (2017) evaluated safety improvements for the segment of US-31 (SR-3) between approximate mile points 265.9 and 266.3. US-31's intersection with Columbiana Road and the I-65 Northbound Ramps occurs at approximate mile point 266.3. Documentation of recommendations from both studies can be found in Appendix H.

Analysis

Table 15 shows the existing conditions levels of service for each lane group at the intersection. The numbers shown in parentheses indicate the lane group delay per vehicle in seconds.

Table 15: Existing Lane Group LOS at US-31 and Columbiana Road/I-65 Northbound Ramps (2019)

Approach	AM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right
US-31 – Northbound	C (32.0)	C (31.2)	B (17.5)	D (49.7)	C (27.7)	A (9.8)
US-31 – Southbound	C (20.3)	D (41.2)	A (4.6)	B (17.4)	**F (86.2)**	A (2.2)
Columbiana Road – Eastbound	**F (92.9)**	**F (84.9)**	B (11.2)	**F (97.8)**	**F (87.9)**	**E (55.9)**
I-65 Northbound Ramps – Westbound	**E (56.9)**	**F (135.9)**	**F (208.6)**	**E (68.8)**	**F (134.6)**	**F (>300)***

*Computed delay in seconds exceeds a meaningful value

The Columbiana Road right turn movement onto US-31 southbound is a dual-right turn lane. The outside right turn lane feeds into a US-31 southbound right turn lane onto the I-65 southbound on ramp. The inside right turn lane feeds into a US-31 southbound through lane. The dual-right turn lanes are currently regulated by the signal. However, observations revealed that familiar drivers tend to treat this as a yield condition when the signal heads are red. Unfamiliar drivers appear to be unsure of what to do when navigating this movement, which frustrates familiar drivers. In addition to that, the inside right turn lane vehicles impair the sight distance of the outside right turn lane drivers and prevents them from safely turning right on red. Some drivers ignore all signage, striping, and signals, and continue through the outside right turn lane without observing US-31 southbound traffic. In summary, the current layout for this dual-right turn lane is not clear enough and functional enough for familiar and unfamiliar drivers.

Figure 12: View of Columbiana Road Right Turn Condition onto US-31 Southbound

Out of 95 reported crashes at this intersection from 2016 through 2018, approximately 79% of all reported crashes involved rear end collisions and approximately 94% of all reported crashes involved property damage only. These numbers are typical of a high-volume, high-capacity signalized intersection such as this. The skewed approach of Columbiana Road presents a higher potential for angle, sideswipe, and head-on collisions, so a focus on lane continuity, signage, and striping was adopted for the recommended safety and operational improvements. The data revealed that these three collision types comprised approximately 21% of all reported crashes in the dataset. At the I-65 northbound off ramp, the horizontal and vertical alignment of the approach causes limited sight distance and a higher potential for rear end collisions on this approach, but the cost of modifying the off ramp would be extremely high given the topography.

Recommendations

Considering existing safety and operational performance of the intersection, the following short-term and long-term recommendations should be implemented.

Short Term Recommendations:

1. Restripe the dual-right turn lane from Columbiana Road to US-31 southbound as shown on Figure 13. Convert the inside lane of Columbiana Road southbound to an option lane, enabling drivers to queue in that lane for either the movement to I-65 northbound or the movement to US-31 southbound. Provide pavement markings in advance to communicate to drivers the appropriate lanes to occupy.

2. Perform access management at the gas station on the northern corner of the intersection. It currently has five (5) driveways, several of which are unnecessarily wide.
3. Convert one (1) access on Columbiana Road to a right-in, right-out configuration.

Long Term Recommendations:

- None

Synchro is not able to adequately process the recommendations listed above in a manner that provides accurate changes to the existing conditions levels of service. However, it is estimated that restriping the right turn lane from Columbiana Road to US-31 southbound may slightly worsen the level of service for that movement, but substantially reduce the issues caused by driver confusion on the movement. Converting the inside lane of Columbiana Road to an option lane should function as an overflow lane for the right turning vehicles onto US-31 southbound. When there isn't a queue in the outside right turn lane, drivers will use the outside right turn lane to the yield condition at US-31. When a queue develops in the outside right turn lane, drivers can opt for the inside right turn lane, which is signalized in accordance with the Columbiana Road signal phase and overlaps with the US-31 northbound left turn phase. The volume distribution between the Columbiana Road left, through, and right turn lanes is so disproportionate towards the right turning movement that any left or through volume caught up in a queue for the right turn lanes would still translate to a more effective overall experience for the most amount of drivers.

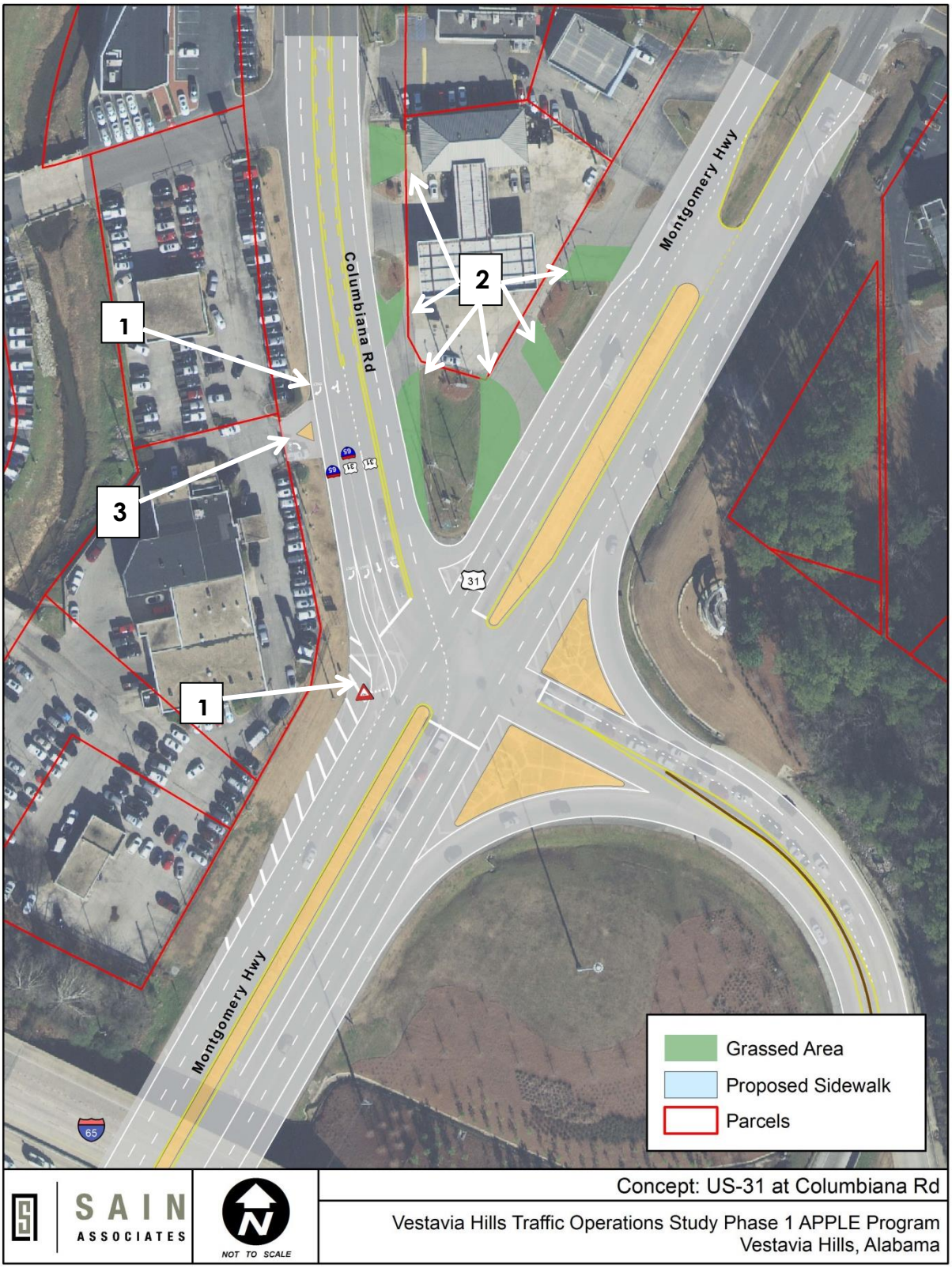


Figure 13: US-31 at Columbiana Road Concept

2.6 Columbiana Road at Shades Crest Road/Vestaview Lane

Columbiana Road is classified as a four-lane minor arterial with a speed limit of 45 MPH. Shades Crest Road and Vestaview Lane are both classified as two-lane major collectors. Columbiana Road and Shades Crest Road intersect twice, with Shades Crest Road running concurrently with Columbiana Road for approximately 450 feet. Figure 14 shows aerial imagery of the area. The southern, four-leg intersection of Columbiana Road and Shades Crest Road/Vestaview Lane is signalized and running free; the northern, three-leg intersection of Columbiana Road and Shades Crest Road is unsignalized. To fully capture the interaction between the two intersections, both were included in 24-hour turning movement counts collected on February 6, 2019. Shades Mountain Baptist Church is on the southeast corner of the southern intersection of Columbiana Road and Shades Crest Road/Vestaview Lane and has two satellite parking lots. One parking lot is on the southwest quadrant of the intersection, and the other parking lot is on the northeast quadrant of the intersection. School redistricting will place the new Pizitz Middle School along Columbiana Road approximately 1.25 miles south of these intersections. Theoretically, this will increase left turn volumes from Shades Crest Road westbound and Vestaview Lane westbound in the AM peak. Analysis performed at these intersections included a capacity analysis, crash data analysis, signal warrant, and pedestrian access evaluation.

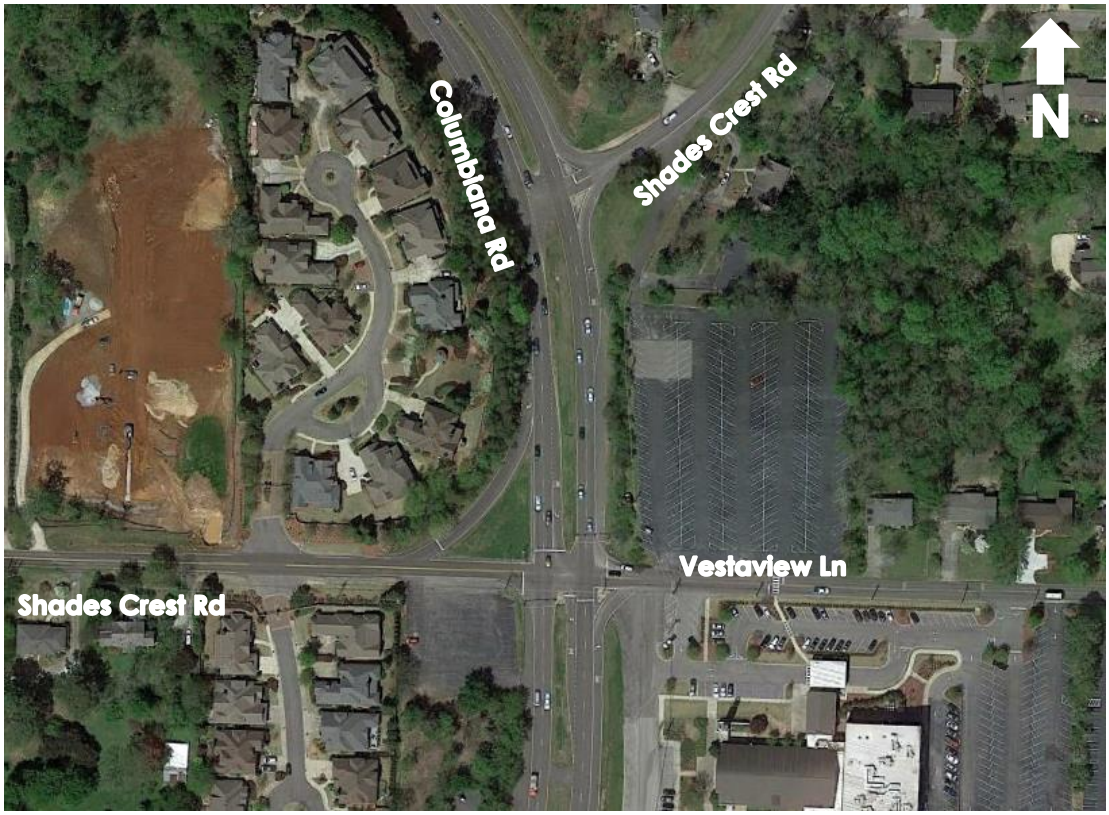


Figure 14: Aerial View of Columbiana Road at Shades Crest Road/Vestaview Lane

Analysis

Existing conditions levels of service for each lane group of these intersections are shown in Tables 16 and 17. The numbers shown in parentheses indicate the lane group delay per vehicle in seconds.

Table 16: Existing Lane Group LOS at Columbiana Road and Shades Crest Road/Vestaview Lane (2019)

Approach	AM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right
Columbiana Road – Northbound	**E (55.8)**	D (37.7)	A (0)	D (50.4)	C (25.7)	A (0)
Columbiana Road – Southbound	C (31.8)	B (15.4)	A (0)	B (16.9)	C (23.3)	A (0)
Shades Crest Road – Eastbound	**E (59.6)**			B (27.3)		
Vestaview Lane – Westbound	C (24.8)			C (39.7)		

Table 17: Existing Lane Group LOS at Columbiana Road and Shades Crest Road (2019)

Approach	AM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right
Columbiana Road – Northbound		A (0)	A(0)		A (0)	A (0)
Columbiana Road – Southbound	B (13.2)	A (0)		A (9.3)	A (0)	
Shades Crest Road – Westbound	**F (123.5)**			**F (>300)***		

*Computed delay in seconds exceeds a meaningful value

A signal warrant analysis was performed at the northern intersection of Columbiana Road and Shades Crest Road, and the eight-hour volume warrant was satisfied. Despite the satisfaction of the warrant, it is important to recognize the tradeoffs associated with signalizing an intersection in close proximity to an existing signalized intersection. Should the City opt for signalization of the intersection, it is imperative that the two signals be synchronized. This can be done in several ways, including but not limited to time-based coordination via GPS-clock devices, wireless communications equipment, and wired communication by installing a physical cable between the cabinets. The GPS-clock devices would be the most cost-effective measure, but regular maintenance will be required to ensure that the clocks remain consistent with one another. Over time, the GPS-clocks tend to drift out of sync.

Benefits of signalizing the northern intersection of Columbiana Road and Shades Crest Road include the following:

- Decreases delays on Shades Crest Road westbound approach to Columbiana Road
- Eliminates sight distance concerns for the Shades Crest Road westbound approach to Columbiana Road.
- Provides better route connectivity for Shades Crest Road

Challenges associated with signalizing the northern intersection of Columbiana Road and Shades Crest Road include the following:

- High initial cost to construct a signal

- Regular maintenance associated with ensuring that the two signals remain in sync
- Potential to induce more volume to the Shades Crest Road westbound approach to Columbiana Road
- Cost to upgrade the existing signal to communicate with the new signal

Crash data analysis revealed mostly low-severity crashes with approximately 84% registering as property damage only crashes. The most prevalent types of collisions among reported crashes at these intersections are angle crashes and rear end crashes. Though sight distance from the Shades Crest Road westbound approach is technically adequate, it is still challenging to complete the two-stage left turn from Shades Crest Road onto Columbiana Road southbound. The intersection sight distance requirements found in *A Policy on Geometric Design of Highways and Streets* (2011) are closely met for both directions (looking northbound and southbound) from the Shades Crest Road westbound approach, but it is difficult to ascertain which lane that Columbiana Road southbound vehicles occupy while simultaneously being aware of any vehicles traveling northbound on Columbiana Road. At 45 MPH, 500 feet of intersection sight distance is required. Looking northbound from the Shades Crest Road westbound approach to Columbiana Road, approximately 525 feet of sight distance is available. Looking southbound, approximately 625 feet of sight distance is available.

Another focus of the study of this particular intersection is pedestrian access. Currently, there are pedestrian signal heads on the two southern signal poles with push-button activation as well as a pedestrian phase for the side streets. There is no crosswalk or nearby sidewalk in the vicinity of the intersection. There is a mid-block pedestrian crossing on Vestaview Lane approximately 210 feet from the stop line used to travel between the church and the north satellite lot.

Recommendations

Considering existing safety and operational performance of the intersection, the following short-term and long-term recommendations should be implemented.

Short Term Recommendations:

1. Install a crosswalk on the southern side of the Columbiana Road intersection with Shades Crest Road and Vestaview Lane. Install additional sidewalk to connect to the church sidewalk. Install a pedestrian refuge island between Columbiana Road and the frontage road. Figure 15 displays a concept showing each of these improvements.
2. If the City opts for signalization of the northern intersection of Columbiana Road and Shades Crest Road, design and install the signal. Conduct a study to

determine appropriate signal timings, splits, offsets, signage, and striping for the new signal arrangement.

3. Convert the Columbiana Road southbound right turn lane to a smart channel configuration as shown on Figure 15.
4. Install one (1) Stop (R1-1) sign on the frontage road approach to Vestaview Lane just east of Columbiana Road.

Long Term Recommendations:

- None

Tables 18 and 19 show the levels of service for each lane group at the intersections after taking into account the short term recommendations listed above. This table includes the signalization of the northern intersection and the optimization of any cycle lengths, splits, and offsets.

Slightly worsened levels of service on the side streets of the south intersection are a result of the additional green time required for Columbiana Road traffic to achieve good progression in both directions between the two signalized intersections.

Table 18: Lane Group LOS at Columbiana Road and Shades Crest Road/Vestaview Lane with All Improvements (2019)

Approach (Signalized)	AM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right
Columbiana Road – Northbound	E (55.1)	C (28.5)	A (4.7)	D (47.5)	C (23.5)	A (5.2)
Columbiana Road – Southbound	C (31.5)	B (10.5)	A (0.5)	B (10.5)	B (14.0)	A (1.5)
Shades Crest Road – Eastbound	**F (97.1)**			C (27.3)		
Vestaview Lane – Westbound	C (27.7)			D (44.6)		

Table 19: Lane Group LOS at Columbiana Road and Shades Crest Road with All Improvements (2019)

Approach (Signalized)	AM LOS			PM LOS		
	Left	Thru	Right	Left	Thru	Right
Columbiana Road – Northbound		A (4.2)	A (0.7)		B (10.9)	A (0.9)
Columbiana Road – Southbound	A (5.0)	A (3.0)		B (11.7)	B (14.8)	
Shades Crest Road – Westbound	D (37.1)			C (35.0)		

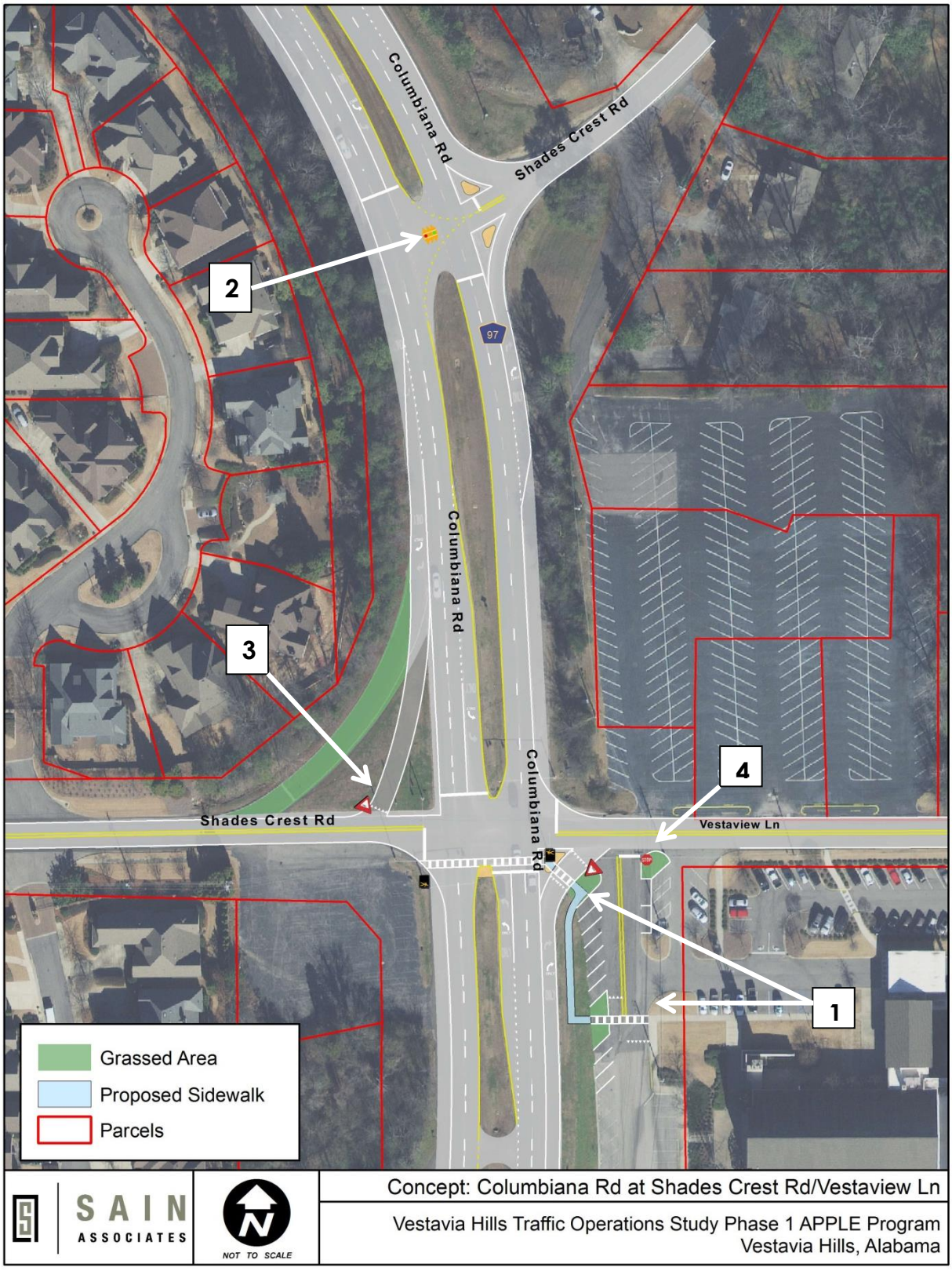


Figure 15: Columbiana Road at Shades Crest Road/Vestaview Lane Concept

2.7 US-31 at Vestavia Plaza/City Hall

US-31 is classified as a four-lane principal arterial with a speed limit of 40 MPH, and both accesses to US-31 are classified as local roads. This intersection is signalized and coordinated with a number of other signals along US-31 through Vestavia Hills. The primary focus of analysis on this particular intersection is to increase pedestrian access in the area. Nearby pedestrian trip generators and destinations include residential neighborhoods on both sides of US-31, shopping centers on the both sides of US-31, the Vestavia Hills City Hall on the west side of US-31, and the new community center schedule to open in 2020. Existing sidepaths are located along the west side of US-31 from Massey Road to Vestavia Court and the east side of US-31 from Pizitz Drive to Vesthaven Way. Vesthaven Way is approximately 400 feet south of this intersection. There is also existing sidewalk within the shopping centers on both sides of US-31 at this location. Figure 16 shows the view of the intersection from the west side of US-31 at Vestavia Plaza.

Figure 16: US-31 at Vestavia Plaza/City Hall

Analysis

Table 20 shows the current timings in place at the intersection. The phases most critical to pedestrian access would be the side street phases, which are Phases 4 and 8. During several time-of-day plans currently in service, the side street phase has a maximum split of 20 or 25 seconds. If pedestrian timings were implemented, these would need to be increased due to the intersection width of approximately 105 feet from back-of-curb to back-of-curb on the southern leg of the intersection. The minimum amount of time needed would be 4 seconds of 'Walk' time with an additional 28.5 seconds of 'Flashing – Don't Walk' time according to the *ALDOT Traffic Signal Design Guide and Timing Manual* (2015). For phases 2 and 6, the US-31 mainline cycle lengths allow plenty of

time for pedestrian pedestrians to safely cross the side streets via crosswalk. The first column in Table 20 denotes each timing plan in place along the US-31 corridor throughout Vestavia. Each plan is identified within the controller by a combination of numbers, which represent the dial identifier, split identifier, and offset identifier, respectively. The time of day that each plan is active is included in parentheses beside the Dial/Split/Offset identifiers.

Table 20: Existing Signal Timing Plans and Splits at US-31 and Vestavia Plaza

Dial / Split / Offset	Cycle	1	2	3	4	5	6	7	8	Offset
0/0/4 (Free)	-	-	-	-	-	-	-	-	-	-
1/1/1 (Off-peak)	110	20	70	0	20	20	70	0	20	11
2/1/1 (Mid-day)	160	20	115	0	25	20	115	0	25	88
2/3/1 (School Peak)	140	20	100	0	20	20	100	0	20	13
3/1/1 (AM Peak)	200	20	160	0	20	20	160	0	20	112
4/1/1 (PM Peak)	200	20	145	0	35	20	145	0	35	85

Recommendations

Considering existing safety and operational performance of the intersection, the following short-term and long-term recommendations should be implemented.

Short Term Recommendations:

1. Install a high-visibility crosswalk on the southern leg of the US-31 intersection at Vestavia Plaza and City Hall. Restripe the stop line and lane lines of US-31 northbound accordingly. Install pedestrian signal heads with countdown display. Figure 17 displays a concept showing each of these improvements.
2. Install additional sidewalk to connect to the existing sidewalks on both sides of US-31.

Long Term Recommendations:

- None

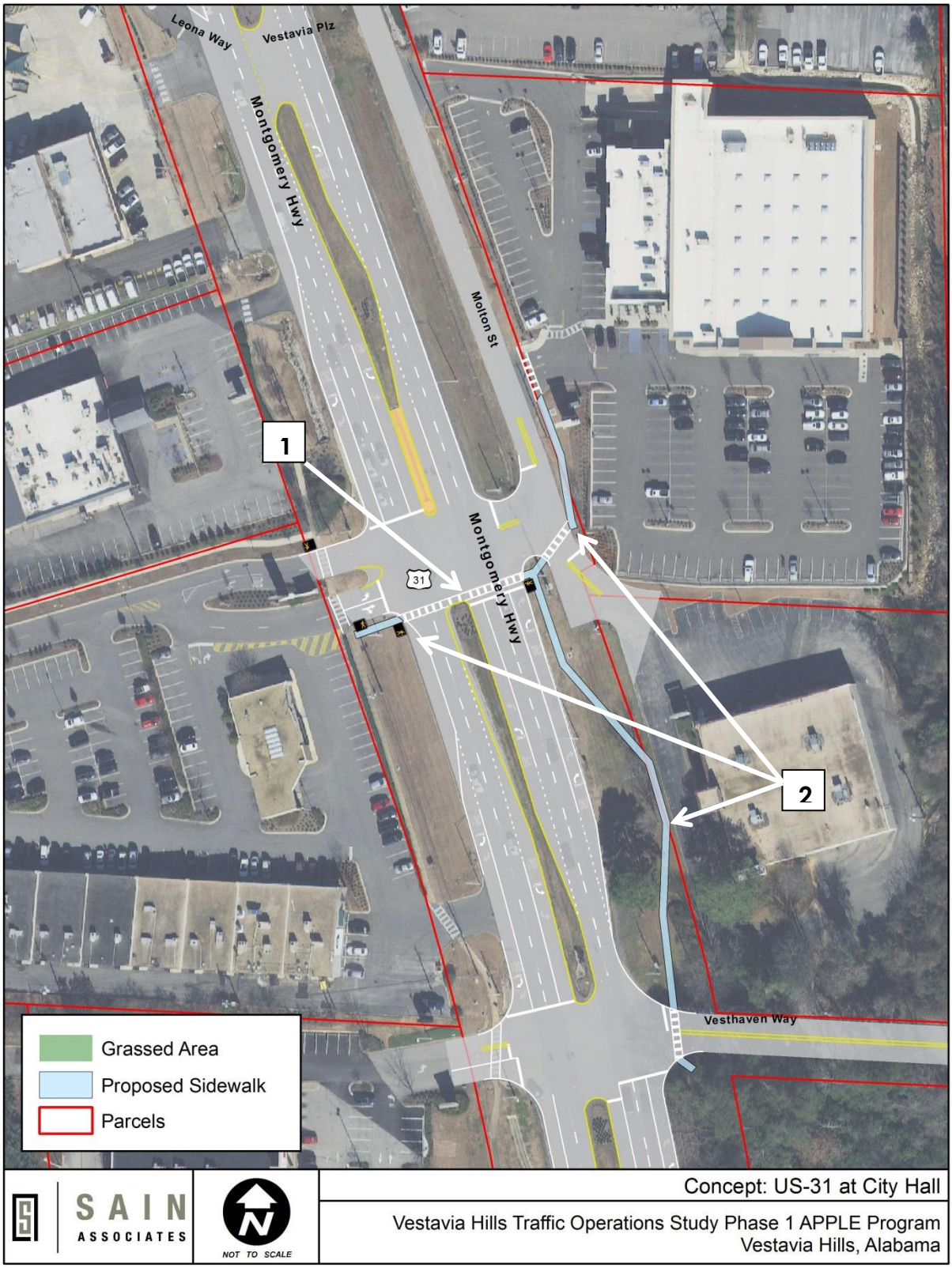


Figure 17: US-31 at Vestavia Plaza/City Hall Concept

2.8 US-31 at Pizitz Drive/Vestavia Forest Place

US-31 is classified as a four-lane principal arterial with a speed limit of 40 MPH, and both Pizitz Drive and Vestavia Forest Place are classified as local roads. This intersection is signalized and coordinated with a number of other signals along US-31 through Vestavia Hills. The primary focus of analysis on this particular intersection is to increase pedestrian access in the area. Nearby pedestrian trip generators and destinations include residential neighborhoods, high-density residential apartments, commercial establishments, and the existing Pizitz Middle School, which will house the 9th grade beginning in the 2020-2021 school year. It should be noted that the enrollment at Pizitz with 9th grade only is estimated to be less than half of the current middle school enrollment at the same facility (see Table 1). Existing sidepaths are located along the west side of US-31 from Massey Road to Vestavia Court and the east side of US-31 from Pizitz Drive to Vesthaven Way. Figure 18 shows the view of the intersection from the east side of US-31.

Figure 18: US-31 and Pizitz Drive/Vestavia Forest Place

Analysis

Table 21 shows the current timings in place at the intersection. The phases most critical to pedestrian access would be the side street phases, which are Phases 4 and 8. During one timing plan currently in service, the side street phase has a maximum split of 20 seconds. If pedestrian timings were implemented, the maximum split for that phase would need to be increased due to the intersection width of approximately 90 feet from the west edgeline to the east channelizing island on the northern leg of the intersection. The minimum amount of time needed would be 4 seconds of 'Walk' time with an additional 24 seconds of 'Flashing – Don't Walk' time according to the ALDOT Traffic Signal Design Guide and Timing Manual (2015). The first column in Table 21

denotes each timing plan in place along the US-31 corridor throughout Vestavia. Each plan is identified within the controller by a combination of numbers, which represent the dial identifier, split identifier, and offset identifier, respectively. The time of day that each plan is active is included in parentheses beside the Dial/Split/Offset identifiers.

Table 21: Existing Signal Timing Plans and Splits at US-31 and Pizitz Drive/Vestavia Forest Place

Dial / Split / Offset	Cycle	1	2	3	4	5	6	7	8	Offset
0/0/4 (Free)	-	-	-	-	-	-	-	-	-	-
1/1/1 (Off-peak)	110	20	70	0	20	20	70	0	20	13
2/1/1 (Mid-day)	160	20	110	0	30	20	110	0	30	11
2/3/1 (School Peak)	140	20	80	0	40	35	65	0	40	84
3/1/1 (AM Peak)	200	20	135	0	45	35	120	0	45	34
4/1/1 (PM Peak)	200	20	145	0	35	20	145	0	35	190

Additionally, the existing striping of the Pizitz Drive approach to US-31 is confusing given the skew of the approach. The current striping causes the US-31 southbound left turning vehicles to traverse the outbound left turn lane of Pizitz Drive. The skew also causes conflicts between drivers crossing US-31 from Pizitz Drive and Vestavia Forest Place. The striping of the Pizitz Drive approach does not offer adequate lane continuity, making it difficult to discern where other drivers will go from either approach. Figure 19 displays aerial imagery of the intersection.

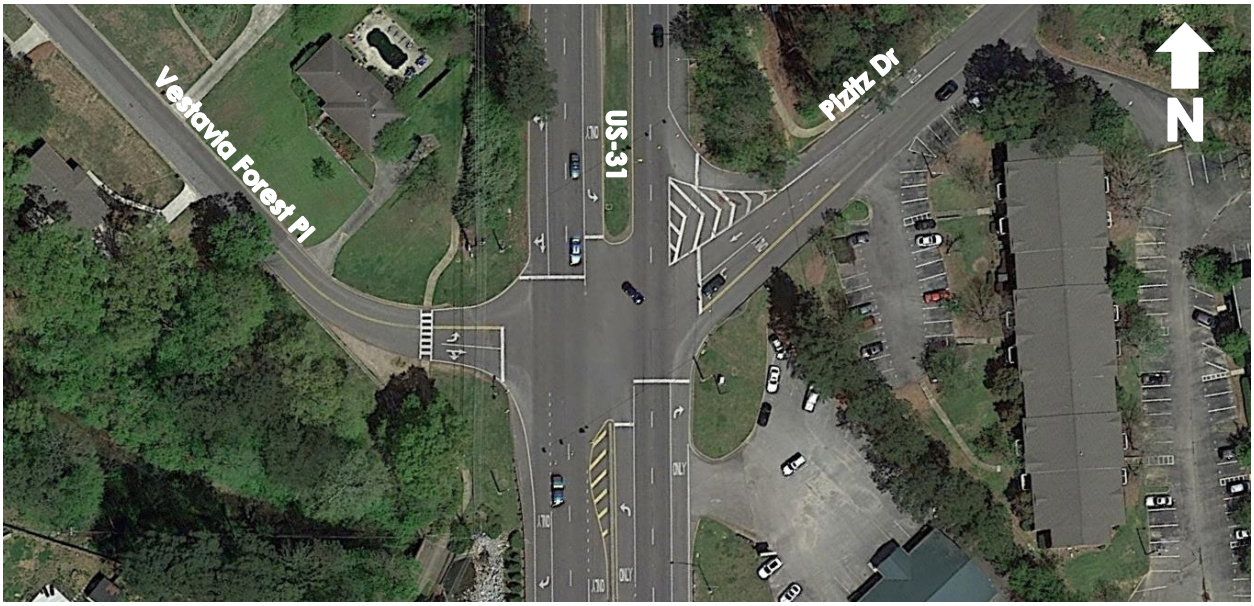


Figure 19: Aerial View of US-31 and Pizitz Drive/Vestavia Forest Place

Recommendations

Considering existing safety and operational performance of the intersection, the following short-term and long-term recommendations should be implemented.

Short Term Recommendations:

1. Install a crosswalk on the northern leg of the US-31 intersection at Pizitz Drive and Vestavia Forest Place. Restripe the stop line and lane lines of US-31 southbound accordingly. Additionally, install additional sidewalk to connect to the existing sidewalks on both sides of US-31. Install pedestrian signal heads with countdown display. Figure 20 displays a concept showing each of these improvements.
2. Restripe the Pizitz Drive approach as shown in Figure 20. Install a raised concrete island to channelize the right turn lane from Pizitz Drive to US-31 northbound and give pedestrians a refuge island.
3. Install a Yield Here to Pedestrians (R1-5) sign at the crosswalk located in the channelized right turn lane from Pizitz Drive westbound to US-31 northbound.

Long Term Recommendations:

- None

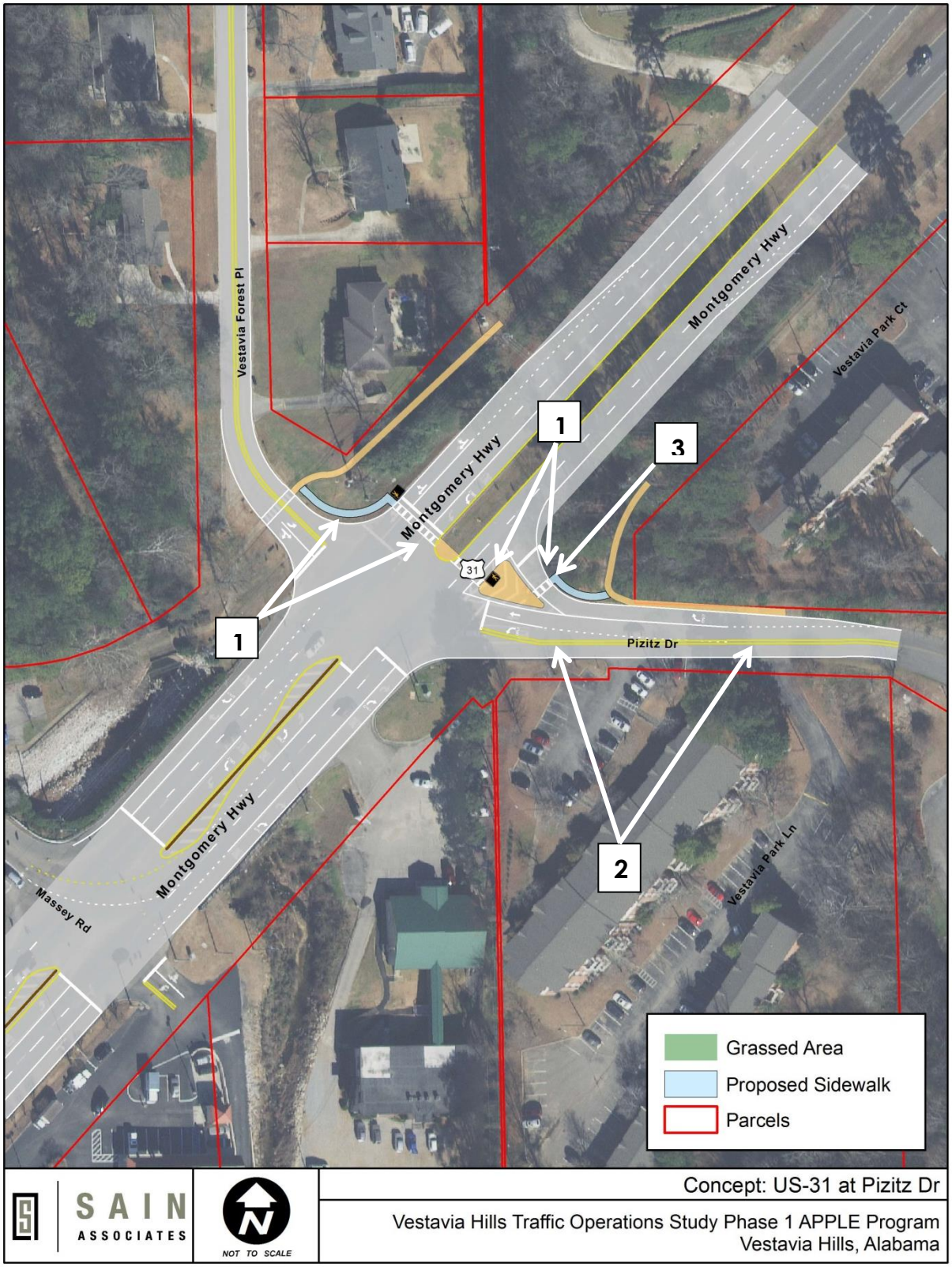


Figure 20: US-31 at Pizitz Drive/Vestavia Forest Place Concept

2.9 Dolly Ridge Road at Gresham Drive

Dolly Ridge Road is classified as a two-lane major collector with a speed limit of 35 MPH, while Gresham Drive is classified as a local road with a speed limit of 25 MPH. The intersection is currently signalized and running free at all times. Dolly Ridge Road is a low-volume roadway connecting Rocky Ridge Road and Cahaba River Road. Analysis performed at this intersection included a capacity analysis, crash data analysis, and trip generation for the estimated enrollment for the 2019-2020 school year.

The intersection of Dolly Ridge Road and Gresham Drive will be heavily affected by school redistricting. For the 2018-2019 school year, Jefferson County still occupies the school while Vestavia Hills renovates the school in preparation for its use in the 2019-2020 school year and beyond. Table 1 denotes that the estimated enrollment at the new elementary school will be 735 students. With a sizeable shift in trip mode choice from bus to personal vehicle that will be associated with changing the school from a Jefferson County school to Vestavia Hills city school, the demands on nearby signalized intersections and roadways will change significantly.

Trip generation was performed for the new Dolly Ridge Elementary School based on traffic volumes from Cahaba Heights Elementary School performed during the 2013-2014 school year. Cahaba Heights Elementary is also a Vestavia Hills city school and serves as a baseline for calculating potential trips per student enrolled at the new elementary school. Additional information regarding the methodology used in this trip generation can be found in Appendix D.

The intersection currently has a left turn lane along Dolly Ridge Road eastbound and a channelized right turn lane from Gresham Drive to Dolly Ridge Road westbound. Figure 21 shows aerial imagery of the intersection.

Figure 21: Aerial View of Dolly Ridge Road at Gresham Drive

The existing operational conditions for the AM and School PM peak hours were rendered mostly irrelevant due to the major changes brought about by school redistricting. Therefore, the existing volumes collected on February 6, 2019 were modified with trip generation volumes and analyzed after optimizing the signal timings to accommodate the new scenario. Largely unaffected by everyday school traffic, the afternoon commuter peak hour existing volumes were used in analysis for the PM peak hour. Table 22 displays the level of service for each lane group at the intersection after taking into account trip generation volumes. The numbers in parentheses indicate the average delay per vehicle in seconds.

Table 22: Existing Lane Group LOS with Trip Generation at Dolly Ridge Road and Gresham Drive (2019)

Approach	AM LOS		School PM LOS		PM* LOS	
	Left	Through/ Right	Left	Through/ Right	Left	Through/ Right
Gresham Drive – Southbound	D (46.4)	A (8.7)	C (21.3)	A (8.2)	B (13.3)	A (8.3)
Dolly Ridge Road – Eastbound	**F (170.3)**	A (6.0)	A (7.0)	A (5.8)	A (0)	A (2.6)
Dolly Ridge Road – Westbound		C (27.4)		C (22.1)		A (2.7)

*School trip generation estimates do not affect PM LOS, only AM and School PM LOS.

Table 23 shows the net added trips brought about by the trip generation. At its core, trip generation is a data-based approximation of future conditions for the surrounding area. The numbers shown below should be treated accordingly, especially for a scenario as unique as this one.

Table 23: Net Added Volume by Trip Generation

Approach	Net AM Trips			Net School PM Trips		
	Left	Thru	Right	Left	Thru	Right
Gresham Drive – Southbound	166	N/A	318	55	N/A	306
Dolly Ridge Road – Eastbound	576	0	N/A	237	0	N/A
Dolly Ridge Road – Westbound	N/A	0	16	N/A	0	115

Though the peak hour factors used in the capacity analysis account for the fact that most school-related traffic will attempt to access the school in a small window of time, the levels of service shown in Tables 22 and 24 do not entirely capture the nature of a school peak hour. The arrival rate in the carpool queue will be higher than the departure rate, and queues will increase quickly at that time. However, the levels of service from the capacity analysis do reflect the fact that traffic on Dolly Ridge Road is light enough that a protected-permissive left turn phase on Dolly Ridge Road should be able to handle much of the stress put on the intersection during these short peaks. For this reason, the school should develop a detailed circulation plan for pickup and dropoff to ensure that process is as safe and efficient as it can be. If carpool queues reach Dolly Ridge Road, it will not matter how efficiently the signal performs.

The crash data analysis at this intersection included three (3) crashes from 2016 through 2018. The sample size is too small to derive any major conclusions, but speed or distracted driving was a factor in each of the reported crashes. The combination of the horizontal curves and the significant grade changes in the vicinity of this intersection cause sight distance issues, but this type of topography is typical of Dolly Ridge Road and well within driver expectation for drivers who are familiar with the road.

Recommendations

Considering existing safety and operational performance of the intersection, the following short-term and long-term recommendations should be implemented.

Short Term Recommendations:

1. Extend the left turn lane at the Dolly Ridge Road eastbound approach as far back as feasible. Due to existing pavement width and time constraints, this leg of the intersection could be restriped with lane widths of 10 feet to extend the left turn lane to allow a storage length of approximately 325 feet, a taper length of 100 feet, and a transition taper length of 205 feet (see Figure 22).
2. Widen Gresham Drive southbound to two lanes (one left turn lane, one right turn lane) to the school exit driveway or as far back as feasible.
3. Implement the base signal timings included in Appendix E. Periodically check that all detection continues to function. Monitor the intersection once school begins and make any necessary tweaks.

4. Upon any widening of Gresham Drive, resurface the roadway from Dolly Ridge Road to the northernmost school access point.
5. Develop a circulation plan for school pickup and dropoff to minimize impact to the signal performance of Dolly Ridge Road at Gresham Drive.
6. Install one (1) Signal Ahead Warning (W3-3) sign approximately 325 feet from the stop line along Dolly Ridge Road eastbound.
7. Install one (1) 20 MPH School Zone Speed Limit Assembly in each direction along Dolly Ridge Road approximately 1000 feet prior to the intersection with Gresham Drive. The assembly consists of one (1) 20 MPH Speed Limit (R2-1) sign, one (1) School (S4-3P) plaque, and one time of day plaque (S4-1P). See Figure 7B-1 in the *Manual on Uniform Traffic Control Devices* (2009) for other options on the assembly. Install one (1) End School Zone (S5-2) sign in each direction along Dolly Ridge Road approximately 1000 feet after the intersection with Gresham Drive.
8. Trim any vegetation blocking Dolly Ridge Road eastbound drivers' view of the signal heads at the intersection of Gresham Drive. Trim vegetation blocking the Gresham Drive southbound signal heads.

Long Term Recommendations:

- None

Table 24 shows the levels of service for the movements at the intersection after taking into account the recommendations. This table includes the optimization of any cycle lengths and splits. Synchro does not register a level of service improvement after lengthening existing turn lanes; however, it is clear that the existing turn lanes are insufficient for the volume expected at the intersection during school peak hours. Lengthening the Dolly Ridge Road eastbound left turn lane will lessen the impact on Dolly Ridge Road through traffic, while widening to two lanes on Gresham Drive southbound for any amount of length will allow school traffic to exit more efficiently.

Table 24: Lane Group LOS at Dolly Ridge Road and Gresham Drive with Improvements (2019)

Approach	AM LOS		School PM LOS		PM* LOS	
	Left	Through/ Right	Left	Through/ Right	Left	Through/ Right
Gresham Drive – Southbound	**F (88.6)**	B (10.8)	B (16.9)	A (6.1)	B (11.0)	A (6.7)
Dolly Ridge Road – Eastbound	**F (91.8)**	A (4.9)	A (9.3)	A (7.9)	A (0)	A (3.5)
Dolly Ridge Road – Westbound		D (43.9)		C (20.5)		A (3.6)

*School trip generation estimates do not affect PM LOS, only AM and School PM LOS.

Figure 22: Concept for Restriping Dolly Ridge Road just south of Gresham Drive

3 Cost Estimates

Planning level cost estimates were prepared for the improvement recommendations for each studied intersection. These detailed opinions of cost are included in Appendix I. Each estimate is based on the engineer's experiences and qualifications and represents the engineer's best judgment within the industry. The engineer does not guarantee that proposals, bids, or actual costs will not vary from the engineer's opinion of probable cost. Table 25 provides a summary of costs estimated in 2019 dollars for the improvement recommendations. For budgeting future year projects, the City will need to escalate the costs to future year dollars.

A contingency of 25% was included in each estimate. This contingency cost includes miscellaneous and/or unknown items that cannot be quantified at the time the study was conducted. The improvements identified at some of the intersections will require utility relocation and/or right-of-way acquisition; the 25% contingency does not cover utility or right-of-way costs which should be considered when programming any future projects.

Some of the improvement recommendations can be implemented solely with City funds. In instances where the proposed improvements are more extensive or costly, it is likely that federal or state funding would be required. For these cases, ALDOT indirect costs were included in the cost estimate and were estimated at 13.63% of the total project costs.

Table 25: Summary of Opinion of Probable Costs in Year 2019 Dollars

Intersection	Opinion of Cost (Yr. 2019)	
	Short Term	Long Term
Rocky Ridge Road @ Dolly Ridge Road	$100,000	$1.21M
Sicard Hollow Road @ Blue Lake Drive	$320,000	$2.02M
Rocky Ridge Road @ Shades Crest Road and US-280	$1M	
US-31 @ Shades Crest Road	$50,000	$1.13M
US-31 @ Columbiana Road/I-65 Northbound Ramps	$370,000	
Columbiana Road @ Shades Crest Road/Vestaview Lane	$770,000	
US-31 @ Vestavia Plaza/City Hall	$260,000	
US-31 @ Pizitz Drive	$230,000	
Dolly Ridge Road @ Gresham Drive	$750,000	

4 Funding Sources

The City has the option to fund the design and construction of their preferred improvements using only local funds. Choosing this route allows the project design and construction to have shorter timelines and the potential for reduced project costs since fewer plan reviews would be required and City guidelines will govern the project design. Improvements that only affect city or county roadways will be able to operate on a quicker timeline, but any improvements located on state routes must go through additional approvals, permitting, and use ALDOT standards.

Costs associated with the design and construction of the proposed alternatives could exceed the City's current available resources. This section discusses funding sources that are available to aid in design and construction. Federal programs are administered by the Alabama Department of Transportation. Table 26 details funding sources, the category of the source and type of project for which the funding can be used.

Table 26: Funding Options

Funding Source	Category	Match Type
Surface Transportation Plan (STP)	Federal	80% Federal / 20% City
Highway Safety Improvement Plan (HSIP)	Federal	90% Federal / 10% City
Transportation Alternatives Program (TAP)	Federal	80% Federal / 20% City
Congestion Mitigation and Air Quality Improvement Program (CMAQ)	Federal	80% Federal / 20% City

The Surface Transportation Program (STP), administered by ALDOT, requires an 80 Federal/20% Local match. The STP program provides flexible funding to states and localities for their use in preserving and improving the conditions and performance of a roadway. STP eligible activities applicable to the alternatives studied include: operational improvements for highways and intersections with high levels of congestion. The downside to STP funding is the time it adds to the overall project. Additional time is required in order to account for ALDOT and FHWA involvement including additional plan reviews and more stringent design and construction standards. For these reasons, a timeframe for completing a STP funded project is estimated at five to eight years. https://www.fhwa.dot.gov/specialfunding/stp/160307.cfm

The Highway Safety Improvement Program (HSIP) is a 90% Federal/10% Local match program and has been continued through the Fixing America's Surface Transportation Act (FAST Act). HSIP exists to provide funding to perform projects that seek to reduce the number of fatalities and serious injuries resulting from traffic crashes. HSIP funds are administered by ALDOT's Safety Operations Office. The application for HSIP funds

requests, among other general project details, that the project sponsor show how the proposed project will improve safety using Crash Reduction Factors (CRF). A benefit/cost ratio is also a requirement of the application. The application must be signed by a Professional Engineer. Like STP funding, HSIP funded projects require additional time in order to account for ALDOT and FHWA involvement including additional plan reviews and more stringent design and construction standards. For these reasons, a timeframe for completing a HSIP funded project is estimated at five to eight years.
https://safety.fhwa.dot.gov/hsip/

The Transportation Alternatives Program (TAP) is an 80% Federal/20% Local match program continued through the Fixing America's Surface Transportation (FAST) Act. TAP funding is available for projects defined as transportation alternatives. Example of transportation alternatives include the following scenarios: on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhance mobility, community improvement activities such as historic preservation and vegetation management, environmental mitigation related to stormwater and habitat connectivity, recreational trail projects, safe routes to school projects, and projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former divided highways.
https://www.fhwa.dot.gov/environment/transportation_alternatives/

The Congestion Mitigation and Air Quality Improvement Program (CMAQ) is a 80% Federal/20% Local match program and has been continued through the Fixing America's Surface Transportation Act (FAST Act). CMAQ funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for various pollutants. Any project must be included in the metropolitan planning organization's (MPO) current transportation plan and transportation improvement plan (TIP).
https://www.fhwa.dot.gov/fastact/factsheets/cmaqfs.cfm

5 Next Steps

The purpose of this study was to determine the feasibility of potential improvements to several intersections throughout the City of Vestavia Hills. The City may elect to pursue projects described in this study without federal funding. However, an Alabama Department of Transportation (ALDOT) permit for the improvements would have to be obtained for any work that would occur inside ALDOT right-of-way. If the City chooses to move forward with implementing any of the proposed improvements and would like to pursue Federal funding, the next step would be to request inclusion of a project in the Birmingham Regional Transportation Improvement Plan (TIP). Once funds are in

place for the project, an environmental document will need to be prepared. The environmental document must include technical studies and public involvement outreach necessary to comply with procedures of NEPA. Once the environmental study has been completed, design would be finalized followed by construction. If it is determined that additional right-of-way is required, acquisition would be conducted prior to construction.

Appendix A – Raw Traffic Counts

Vestavia Hills, AL
Classified Turn Movement Count

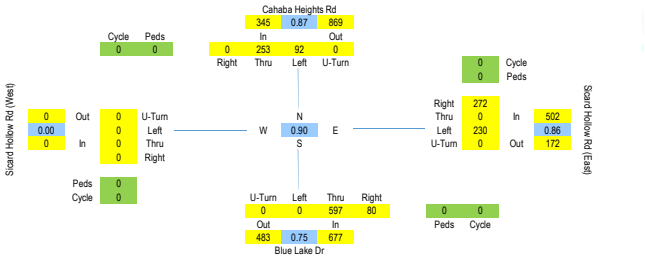
Site 1 of 5
Sicard Hollow Rd (West)
Sicard Hollow Rd (East)
Blue Lake Dr
Cahaba Heights Rd

Lat/Long
33.450874°, -86.717796°

Date
Wednesday 6 February 2019

Weather
Showers
Temp: 21°C

0000 - 2400 (Weekday 24h Session)



	Eastbound Sicard Hollow Rd (West)				Westbound Sicard Hollow Rd (East)				Northbound Blue Lake Dr				Southbound Cahaba Heights Rd					
TIME	U-Turn 1.1	Left 1.2	Thru 1.3	Right 1.4	U-Turn 1.5	Left 1.6	Thru 1.7	Right 1.8	U-Turn 1.9	Left 1.10	Thru 1.11	Right 1.12	U-Turn 1.13	Left 1.14	Thru 1.15	Right 1.16	Int Total	Rolling Hour
0000 - 0015	0	0	0	0	0	2	0	0	0	0	2	1	0	3	0	0	8	22
0015 - 0030	0	0	0	0	0	2	0	0	0	0	2	2	0	0	2	0	8	18
0030 - 0045	0	0	0	0	0	0	0	0	0	0	3	1	0	0	1	0	5	10
0045 - 0100	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	7
0100 - 0115	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	4	7
0115 - 0130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0130 - 0145	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2	6
0145 - 0200	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4
0200 - 0215	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	4
0215 - 0230	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
0230 - 0245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0245 - 0300	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	5
0300 - 0315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0315 - 0330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0330 - 0345	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	0	4	11
0345 - 0400	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	3	12
0400 - 0415	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0415 - 0430	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	0	4	43
0430 - 0445	0	0	0	0	0	0	0	2	0	0	0	0	0	0	3	0	5	63
0445 - 0500	0	0	0	0	0	9	0	0	0	0	0	0	0	0	5	0	14	86
0500 - 0515	0	0	0	0	0	8	0	1	0	0	2	0	0	1	8	0	20	109
0515 - 0530	0	0	0	0	0	5	0	4	0	0	4	2	0	0	9	0	24	148
0530 - 0545	0	0	0	0	0	8	0	7	0	0	5	2	0	1	5	0	28	208
0545 - 0600	0	0	0	0	0	4	0	8	0	0	5	6	0	2	12	0	37	302
0600 - 0615	0	0	0	0	0	8	0	16	0	0	14	10	0	1	10	0	59	423
0615 - 0630	0	0	0	0	0	10	0	15	0	0	19	11	0	7	22	0	84	596
0630 - 0645	0	0	0	0	0	24	0	18	0	0	37	20	0	4	19	0	122	898
0645 - 0700	0	0	0	0	0	23	0	31	0	0	43	26	0	11	24	0	158	1199
0700 - 0715	0	0	0	0	0	21	0	46	0	0	94	33	0	12	26	0	232	1414
0715 - 0730	0	0	0	0	0	32	0	60	0	0	195	31	0	26	42	0	386	1524
0730 - 0745	0	0	0	0	0	53	0	83	0	0	169	23	0	32	63	0	423	1407
0745 - 0800	0	0	0	0	0	65	0	63	0	0	135	11	0	22	77	0	373	1175
0800 - 0815	0	0	0	0	0	80	0	66	0	0	98	15	0	12	71	0	342	985
0815 - 0830	0	0	0	0	0	46	0	34	0	0	105	20	0	7	57	0	269	788
0830 - 0845	0	0	0	0	0	38	0	24	0	0	61	17	0	6	45	0	191	661
0845 - 0900	0	0	0	0	0	37	0	26	0	0	66	10	0	6	38	0	183	631
0900 - 0915	0	0	0	0	0	20	0	18	0	0	40	16	0	9	42	0	145	605
0915 - 0930	0	1	0	0	0	30	0	17	0	0	34	10	0	3	46	1	142	589
0930 - 0945	0	0	0	0	0	27	0	26	0	0	43	19	0	5	41	0	161	580
0945 - 1000	0	0	0	0	0	23	0	17	0	0	46	18	0	6	47	0	157	543
1000 - 1015	0	0	0	0	0	17	0	11	0	0	43	12	0	14	32	0	129	537
1015 - 1030	0	0	0	0	0	6	0	20	0	0	57	13	0	9	28	0	133	552
1030 - 1045	0	0	0	0	0	15	0	19	0	0	50	13	0	3	24	0	124	607
1045 - 1100	0	0	0	0	0	15	0	14	0	0	56	13	0	13	40	0	151	650
1100 - 1115	0	0	0	0	0	23	0	16	0	0	60	12	0	5	28	0	144	680
1115 - 1130	0	0	0	0	0	18	0	11	0	0	87	14	0	13	45	0	188	737
1130 - 1145	0	0	0	0	0	14	0	12	0	0	64	18	0	10	49	0	167	731
1145 - 1200	0	0	0	0	0	14	0	9	0	0	79	18	0	14	47	0	181	754
1200 - 1215	0	0	0	0	0	18	0	15	0	0	77	24	0	13	54	0	201	756
1215 - 1230	0	0	0	0	0	11	0	13	0	0	69	13	0	13	63	0	182	735
1230 - 1245	0	0	0	0	0	21	0	17	0	0	53	30	0	21	48	0	190	712
1245 - 1300	0	1	0	0	0	7	0	13	0	0	67	22	0	10	62	1	183	705
1300 - 1315	0	0	0	0	0	16	1	22	0	0	65	17	0	13	46	0	180	692
1315 - 1330	0	0	0	0	1	18	0	8	0	0	46	22	0	9	55	0	159	693
1330 - 1345	0	0	0	0	0	22	0	17	0	0	55	26	1	15	47	0	183	706
1345 - 1400	0	0	0	0	0	17	0	12	0	0	57	23	0	21	40	0	170	693
1400 - 1415	0	0	0	0	0	15	0	14	0	0	54	22	0	29	47	0	181	728
1415 - 1430	0	0	0	0	0	14	0	19	0	0	49	30	0	18	42	0	172	783
1430 - 1445	0	0	0	0	0	16	0	17	0	0	44	16	0	25	52	0	170	853
1445 - 1500	0	0	0	0	0	17	0	13	0	0	55	30	0	34	56	0	205	938
1500 - 1515	0	0	0	0	0	24	0	21	0	0	59	28	0	48	56	0	236	990
1515 - 1530	0	0	0	1	0	33	0	50	0	0	59	29	0	20	50	0	242	1104
1530 - 1545	0	0	0	0	0	30	0	28	0	0	75	38	0	27	57	0	255	1200
1545 - 1600	0	0	0	0	0	28	0	22	0	0	90	42	0	31	44	0	257	1278
1600 - 1615	0	0	0	0	0	21	0	15	0	0	119	83	0	40	72	0	350	1358
1615 - 1630	0	0	0	0	0	15	0	34	0	0	111	72	0	47	59	0	338	1380
1630 - 1645	0	0	0	1	0	23	0	21	0	0	119	62	0	35	72	0	333	1394
1645 - 1700	0	0	0	0	0	23	0	10	0	0	106	51	0	48	99	0	337	1392
1700 - 1715	0	0	0	0	0	15	0	29	0	0	112	83	0	58	75	0	372	1319
1715 - 1730	0	0	0	0	0	29	0	19	0	0	127	60	0	43	74	0	352	1228
1730 - 1745	0	0	0	0	0	28	0	27	0	0	112	39	1	50	74	0	331	1122
1745 - 1800	0	0	0	0	0	19	0	15	0	0	85	40	0	31	74	0	264	972
1800 - 1815	0	0	0	0	0	30	1	19	0	0	88	35	0	38	70	0	281	866
1815 - 1830	0	0	0	0	0	20	0	22	0	0	66	43	0	36	59	0	246	728
1830 - 1845	0	0	0	0	0	16	0	12	0	0	53	25	0	26	49	0	181	633
1845 - 1900	0	0	0	0	0	16	0	15	0	0	41	18	0	20	48	0	158	576
1900 - 1915	0	0	0	0	0	14	0	12	0	0	46	14	0	26	31	0	143	552
1915 - 1930	0	0	0	0	0	16	0	25	0	0	38	23	1	20	28	0	151	538
1930 - 1945	0	0	0	0	0	8	0	7	0	0	37	23	0	23	26	0	124	513
1945 - 2000	0	0	0	0	0	13	0	19	0	0	31	22	0	31	18	0	134	476
2000 - 2015	0	0	0	0	0	10	0	8	0	0	37	26	0	15	33	0	129	410
2015 - 2030	0	0	0	0	0	18	0	10	0	0	29	29	0	15	25	0	126	336
2030 - 2045	0	0	0	0	0	8	0	2	0	0	23	20	0	19	15	0	87	279
2045 - 2100	0	0	0	0	0	6	0	4	0	0	25	10	0	11	12	0	68	243
2100 - 2115	0	0	0	0	0	4	0	5	0	0	18	8	0	8	12	0	55	204
2115 - 2130	0	0	0	0	0	4	0	3	0	0	21	14	0	13	14	0	69	174
2130 - 2145	0	0	0	0	1	3	0	2	0	0	21	5	0	8	11	0	51	124
2145 - 2200	0	0	0	0	0	3	0	2	0	0	7	5	0	3	9	0	29	88
2200 - 2215	0	0	0	0	0	6	0	1	0	0	5	6	0	4	3	0	25	75
2215 - 2230	0	0	0	0	0	2	0	3	0	0	7	3	0	1	3	0	19	65
2230 - 2245	0	0	0	0	0	3	0	0	0	0	5	6	0	0	1	0	15	57
2245 - 2300	0	0	0	0	0	3	0	2	0	0	6	3	0	1	1	0	16	50
2300 - 2315	0	0	0	0	0	1	0	0	0	0	3	5	0	5	1	0	15	42
2315 - 2330	0	0	0	0	0	1	0	1	0	0	0	4	0	2	3	0	11	
2330 - 2345	0	0	0	0	0	1	0	2	0	0	2	2	0	0	1	0	8	
2345 - 0000	0	0	0	0	0	3	0	1	0	0	4	0	0	0	0	0	8	
Grand Total	0	2	0	2	2	1391	2	1343	0	0	4202	1669	3	1284	2906	2	12808	
Approach (%)	0.00	50.00	0.00	50.00	0.07	50.80	0.07	49.05	0.00	0.00	71.57	28.43	0.07	30.61	69.27	0.05		
Total (%)	0.00	0.02	0.00	0.02	0.02	10.86	0.02	10.49	0.00	0.00	32.81	13.03	0.02	10.02	22.69	0.02		
P/Cycle	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0		
Cars	0	2	0	2	2	1361	2	1322	0	0	4158	1634	3	1276	2877	2		
Single Unit Trucks	0	0	0	0	0	27	0	18	0	0	41	30	0	7	28	0		
Combination Trucks	0	0	0	0	0	3	0	1	0	0	3	5	0	0	1	0		
P/Cycle (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00		
Cars (%)	0.00	100.00	0.00	100.00	100.00	97.84	100.00	98.44	0.00	0.00	98.95	97.90	100.00	99.38	99.00	100.00		
Single Unit Trucks (%)	0.00	0.00	0.00	0.00	0.00	1.94	0.00	1.34	0.00	0.00	0.98	1.80	0.00	0.55	0.96	0.00		
Combination Trucks (%)	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.07	0.00	0.00	0.07	0.30	0.00	0.00	0.03	0.00		

Peak Rolling Hour Flow Rates

	Eastbound				Westbound				Northbound				Southbound				
	Sicard Hollow Rd (West)				Sicard Hollow Rd (East)				Blue Lake Dr				Cahaba Heights Rd				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Int
TIME	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	Total
0715 - 0730	0	0	0	0	0	32	0	60	0	0	195	31	0	26	42	0	386
0730 - 0745	0	0	0	0	0	53	0	83	0	0	169	23	0	32	63	0	423
0745 - 0800	0	0	0	0	0	65	0	63	0	0	135	11	0	22	77	0	373
0800 - 0815	0	0	0	0	0	80	0	66	0	0	98	15	0	12	71	0	342
Grand Total	0	0	0	0	0	230	0	272	0	0	597	80	0	92	253	0	**1524**
Approach (%)	0.00	0.00	0.00	0.00	0.00	45.82	0.00	54.18	0.00	0.00	88.18	11.82	0.00	26.67	73.33	0.00	
Total (%)	0.00	0.00	0.00	0.00	0.00	15.09	0.00	17.85	0.00	0.00	39.17	5.25	0.00	6.04	16.60	0.00	
PHF	0%				86%				75%				87%				90%
	0%	0%	0%	0%	0%	72%	0%	82%	0%	0%	77%	65%	0%	72%	82%	0%	
P/Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars	0	0	0	0	0	226	0	272	0	0	588	77	0	92	250	0	1505
Single Unit Trucks	0	0	0	0	0	3	0	0	0	0	9	2	0	0	3	0	17
Combination Trucks	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	2
P/Cycle (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cars (%)	0.00	0.00	0.00	0.00	0.00	98.26	0.00	100.00	0.00	0.00	98.49	96.25	0.00	100.00	98.81	0.00	98.75
Single Unit Trucks (%)	0.00	0.00	0.00	0.00	0.00	1.30	0.00	0.00	0.00	0.00	1.51	2.50	0.00	0.00	1.19	0.00	1.12
Combination Trucks (%)	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.13

Vestavia Hills, AL
Classified Turn Movement Count

Site 2 of 5
CH-97 Shades Crest Rd

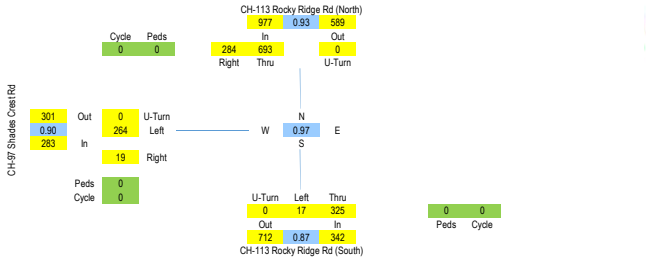
CH-113 Rocky Ridge Rd (South)
CH-113 Rocky Ridge Rd (North)

Lat/Long
33.461629°, -86.757834°

Date
Wednesday 6 February 2019

Weather
Showers
Temp: 21°C

0000 - 2400 (Weekday 24h Session)



	Eastbound CH-97 Shades Crest Rd			Northbound CH-113 Rocky Ridge Rd (South)			Southbound CH-113 Rocky Ridge Rd (North)				
TIME	U-Turn 2.1	Left 2.2	Right 2.3	U-Turn 2.4	Left 2.5	Thru 2.6	U-Turn 2.7	Thru 2.8	Right 2.9	Int Total	Rolling Hour
0000 - 0015	0	2	0	0	0	1	0	6	1	10	28
0015 - 0030	0	1	0	0	0	2	0	2	1	6	24
0030 - 0045	0	2	0	0	0	2	0	0	6	10	23
0045 - 0100	0	0	0	0	0	1	0	1	0	2	19
0100 - 0115	0	0	0	0	0	2	0	4	0	6	19
0115 - 0130	0	1	0	0	1	1	0	1	1	5	14
0130 - 0145	0	1	0	0	0	3	0	2	0	6	14
0145 - 0200	0	0	0	0	0	1	0	1	0	2	10
0200 - 0215	0	0	0	0	0	0	0	1	0	1	10
0215 - 0230	0	0	0	0	0	1	0	2	2	5	11
0230 - 0245	0	0	0	0	0	1	0	1	0	2	8
0245 - 0300	0	0	0	0	0	1	0	1	0	2	7
0300 - 0315	0	0	0	0	0	0	0	1	1	2	8
0315 - 0330	0	1	0	0	0	1	0	0	0	2	10
0330 - 0345	0	0	0	0	0	0	0	1	0	1	16
0345 - 0400	0	1	0	0	0	0	0	1	1	3	31
0400 - 0415	0	0	0	0	0	1	0	1	2	4	42
0415 - 0430	0	0	0	0	0	7	0	0	1	8	48
0430 - 0445	0	4	0	0	1	10	0	0	1	16	61
0445 - 0500	0	4	0	0	0	6	0	0	4	14	82
0500 - 0515	0	0	0	0	0	8	0	1	1	10	126
0515 - 0530	0	4	0	0	1	12	0	1	3	21	172
0530 - 0545	0	4	0	0	1	17	0	5	10	37	241
0545 - 0600	0	4	0	0	1	31	0	5	17	58	347
0600 - 0615	0	4	1	0	0	37	0	5	9	56	485
0615 - 0630	0	12	1	0	0	44	0	12	21	90	668
0630 - 0645	0	11	1	0	1	80	0	22	28	143	837
0645 - 0700	0	14	0	0	0	104	0	35	43	196	966
0700 - 0715	0	17	3	0	2	131	0	40	46	239	1039
0715 - 0730	0	30	4	0	4	128	0	61	32	259	1101
0730 - 0745	0	33	6	0	1	104	0	85	43	272	1091
0745 - 0800	0	27	5	0	0	111	0	82	44	269	1089
0800 - 0815	0	61	7	0	2	113	0	66	52	301	1085
0815 - 0830	0	32	1	0	3	126	0	51	36	249	995
0830 - 0845	0	37	2	0	1	125	0	56	49	270	971
0845 - 0900	0	29	1	0	3	106	1	74	51	265	926
0900 - 0915	0	37	2	0	2	81	0	47	42	211	890
0915 - 0930	0	34	0	0	2	92	0	61	36	225	893
0930 - 0945	0	44	0	0	4	77	0	49	51	225	871
0945 - 1000	0	34	3	0	3	96	0	51	42	229	853
1000 - 1015	0	35	2	0	3	74	0	55	45	214	816
1015 - 1030	0	47	5	0	4	59	0	53	35	203	808
1030 - 1045	0	32	2	0	1	74	0	56	42	207	873
1045 - 1100	0	33	4	0	2	58	0	64	31	192	900
1100 - 1115	0	44	3	0	4	69	0	53	33	206	981
1115 - 1130	0	50	4	0	1	99	0	74	40	268	1006
1130 - 1145	0	52	3	0	2	71	0	69	37	234	989
1145 - 1200	0	52	6	0	6	74	0	84	51	273	1010
1200 - 1215	0	33	4	0	4	65	0	83	42	231	992
1215 - 1230	0	49	3	0	4	61	0	90	44	251	1024
1230 - 1245	0	52	1	0	10	71	0	72	49	255	1020
1245 - 1300	0	58	3	0	6	78	0	70	40	255	1005
1300 - 1315	0	50	5	0	5	76	0	80	47	263	1001
1315 - 1330	0	36	5	0	2	84	0	77	43	247	1008
1330 - 1345	0	40	4	0	2	58	0	93	43	240	1030
1345 - 1400	0	49	3	0	9	65	0	82	43	251	1025
1400 - 1415	0	44	4	0	2	95	0	84	41	270	1059
1415 - 1430	0	59	6	0	3	58	0	91	52	269	1022
1430 - 1445	0	43	1	0	3	63	0	81	44	235	1035
1445 - 1500	0	57	6	0	5	64	0	112	41	285	1166
1500 - 1515	0	53	0	0	0	62	0	86	32	233	1209
1515 - 1530	0	49	4	0	1	79	0	101	48	282	1326
1530 - 1545	0	63	7	0	2	90	0	150	54	366	1413
1545 - 1600	0	59	2	0	6	105	0	114	42	328	1462
1600 - 1615	0	51	6	0	1	114	0	143	35	350	1520
1615 - 1630	0	49	3	0	1	78	1	178	59	369	1582
1630 - 1645	0	75	4	0	1	71	0	195	69	415	1602
1645 - 1700	0	53	7	0	6	92	0	153	75	386	1578
1700 - 1715	0	67	6	0	5	82	0	184	68	412	1590
1715 - 1730	0	69	2	0	5	80	0	161	72	389	1515
1730 - 1745	0	63	7	0	5	75	0	181	60	391	1430
1745 - 1800	0	53	4	0	4	78	0	190	69	398	1252
1800 - 1815	0	62	3	0	4	75	0	148	45	337	1050
1815 - 1830	0	49	2	0	3	89	0	114	47	304	900
1830 - 1845	0	44	2	0	0	48	0	82	37	213	769
1845 - 1900	0	32	1	0	2	37	0	79	45	196	694
1900 - 1915	0	42	5	0	3	36	1	74	26	187	623
1915 - 1930	0	31	1	0	2	39	0	68	32	173	572
1930 - 1945	0	19	1	0	0	30	0	66	22	138	571
1945 - 2000	0	19	0	0	0	30	1	57	18	125	564
2000 - 2015	0	34	0	0	1	18	0	70	13	136	557
2015 - 2030	0	36	3	0	2	39	0	62	30	172	521
2030 - 2045	0	26	3	0	1	36	0	51	14	131	441
2045 - 2100	0	31	0	0	0	29	0	37	21	118	375
2100 - 2115	0	17	0	0	2	26	0	39	16	100	336
2115 - 2130	0	14	1	0	1	16	0	41	19	92	276
2130 - 2145	0	8	1	0	1	14	0	32	9	65	220
2145 - 2200	0	26	0	0	1	21	0	22	9	79	184
2200 - 2215	0	4	0	0	0	10	0	24	2	40	136
2215 - 2230	0	3	1	0	1	7	0	18	6	36	126
2230 - 2245	0	3	1	0	1	9	0	12	3	29	104
2245 - 2300	0	1	1	0	0	10	0	15	4	31	94
2300 - 2315	0	5	1	0	1	6	0	13	4	30	75
2315 - 2330	0	1	1	0	0	4	0	6	2	14	
2330 - 2345	0	4	0	0	0	3	0	11	1	19	
2345 - 0000	0	1	0	0	1	6	0	3	1	12	
Grand Total	0	2616	191	0	175	4724	4	5338	2629	15677	
Approach (%)	0.00	93.20	6.80	0.00	3.57	96.43	0.05	66.97	32.98		
Total (%)	0.00	16.69	1.22	0.00	1.12	30.13	0.03	34.05	16.77		
P/Cycle	0	0	0	0	0	0	0	0	1		
Cars	0	2576	185	0	173	4672	4	5278	2584		
Single Unit Trucks	0	35	6	0	2	50	0	59	38		
Combination Trucks	0	5	0	0	0	2	0	1	6		
P/Cycle (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04		
Cars (%)	0.00	98.47	96.86	0.00	98.86	98.90	100.00	98.88	98.29		
Single Unit Trucks (%)	0.00	1.34	3.14	0.00	1.14	1.06	0.00	1.11	1.45		
Combination Trucks (%)	0.00	0.19	0.00	0.00	0.00	0.04	0.00	0.02	0.23		

Peak Rolling Hour Flow Rates

	Eastbound				Northbound				Southbound			
	CH-97 Shades Crest Rd				CH-113 Rocky Ridge Rd (South)				CH-113 Rocky Ridge Rd (North)			
	U-Turn	Left		Right	U-Turn	Left	Thru		U-Turn		Thru	Right	Int
TIME	2.1	2.2		2.3	2.4	2.5	2.6		2.7		2.8	2.9	Total
1630 - 1645	0	75		4	0	1	71		0		195	69	415
1645 - 1700	0	53		7	0	6	92		0		153	75	386
1700 - 1715	0	67		6	0	5	82		0		184	68	412
1715 - 1730	0	69		2	0	5	80		0		161	72	389
Grand Total	0	264		19	0	17	325		0		693	284	**1602**
Approach (%)	0.00	93.29		6.71	0.00	4.97	95.03		0.00		70.93	29.07	
Total (%)	0.00	16.48		1.19	0.00	1.06	20.29		0.00		43.26	17.73	
PHF	90%				87%				93%				97%
	0%	88%		68%	0%	71%	88%		0%		89%	95%	
P/Cycle	0	0		0	0	0	0		0		0	0	0
Cars	0	262		18	0	16	325		0		689	280	1590
Single Unit Trucks	0	1		1	0	1	0		0		4	3	10
Combination Trucks	0	1		0	0	0	0		0		0	1	2
P/Cycle (%)	0.00	0.00		0.00	0.00	0.00	0.00		0.00		0.00	0.00	0.00
Cars (%)	0.00	99.24		94.74	0.00	94.12	100.00		0.00		99.42	98.59	99.25
Single Unit Trucks (%)	0.00	0.38		5.26	0.00	5.88	0.00		0.00		0.58	1.06	0.62
Combination Trucks (%)	0.00	0.38		0.00	0.00	0.00	0.00		0.00		0.00	0.35	0.12

Vestavia Hills, AL
Classified Turn Movement Count

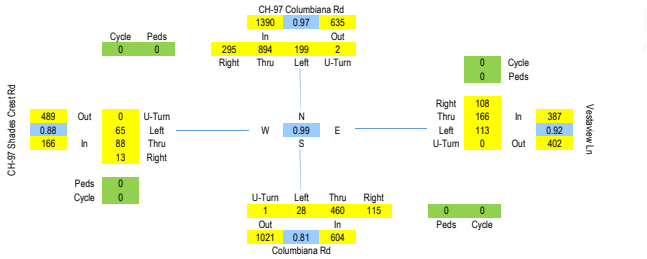
Site 3 of 5
CH-97 Shades Crest Rd
Vestaview Ln
Columbiana Rd
CH-97 Columbiana Rd

Lat/Long
33.440292°, -86.808090°

Date
Wednesday 6 February 2019

Weather
Showers
Temp: 21°C

0000 - 2400 (Weekday 24h Session)



	Eastbound CH-97 Shades Crest Rd				Westbound Vestaview Ln				Northbound Columbiana Rd				Southbound CH-97 Columbiana Rd					
TIME	U-Turn 3.1	Left 3.2	Thru 3.3	Right 3.4	U-Turn 3.5	Left 3.6	Thru 3.7	Right 3.8	U-Turn 3.9	Left 3.10	Thru 3.11	Right 3.12	U-Turn 3.13	Left 3.14	Thru 3.15	Right 3.16	Int Total	Rolling Hour
0000 - 0015	0	0	0	0	0	0	0	1	0	0	4	0	0	1	4	4	14	42
0015 - 0030	0	0	0	0	0	0	0	1	0	0	1	0	0	1	8	3	14	35
0030 - 0045	0	0	0	0	0	0	0	0	0	0	3	1	0	0	5	1	10	31
0045 - 0100	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	4	29
0100 - 0115	0	0	0	0	0	0	0	1	0	0	2	1	0	0	3	0	7	25
0115 - 0130	0	0	0	0	0	0	0	0	0	0	3	1	0	0	4	2	10	19
0130 - 0145	0	0	1	0	0	0	0	0	0	0	3	0	0	0	3	1	8	13
0145 - 0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0200 - 0215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	12
0215 - 0230	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	4	17
0230 - 0245	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	0	4	15
0245 - 0300	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	3	19
0300 - 0315	0	0	0	1	0	0	0	0	0	0	1	0	0	3	1	0	6	24
0315 - 0330	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	29
0330 - 0345	0	0	0	0	0	0	0	0	0	0	3	0	0	0	4	1	8	38
0345 - 0400	0	0	1	0	0	0	0	0	0	0	2	0	0	2	3	0	8	48
0400 - 0415	0	0	0	0	0	1	1	2	0	0	3	1	0	0	3	0	11	68
0415 - 0430	0	2	0	0	0	0	0	0	0	0	4	1	0	1	3	0	11	82
0430 - 0445	0	1	0	0	0	0	0	1	0	0	12	1	0	1	2	0	18	100
0445 - 0500	0	2	2	1	0	0	0	1	0	1	9	0	0	6	5	1	28	136
0500 - 0515	0	1	3	0	0	1	0	1	0	0	13	0	0	1	4	1	25	188
0515 - 0530	0	2	1	1	0	1	0	1	0	0	12	0	0	3	6	2	29	261
0530 - 0545	0	3	0	1	0	1	1	2	0	1	24	1	0	5	15	0	54	348
0545 - 0600	0	3	6	0	0	1	1	8	0	0	27	1	0	7	23	3	80	493
0600 - 0615	0	7	8	2	0	2	5	11	0	0	29	6	0	7	19	2	98	723
0615 - 0630	0	11	5	0	0	1	2	6	0	1	47	5	0	6	26	6	116	1016
0630 - 0645	0	17	4	3	0	4	1	13	0	2	96	7	0	9	40	3	199	1476
0645 - 0700	0	18	13	3	0	6	6	16	0	4	150	15	0	16	57	6	310	1931
0700 - 0715	0	35	13	2	0	6	7	25	0	3	202	18	0	25	54	1	391	2242
0715 - 0730	0	52	19	4	0	10	6	21	0	3	326	54	0	21	55	5	576	2418
0730 - 0745	0	47	25	2	0	15	9	33	0	4	347	83	0	29	52	8	654	2331
0745 - 0800	0	43	38	6	0	16	12	26	0	1	303	55	0	39	75	7	621	2043
0800 - 0815	0	42	27	8	0	16	7	32	0	8	280	34	0	29	73	11	567	1835
0815 - 0830	0	37	19	8	0	5	8	20	0	3	235	22	0	34	85	13	489	1691
0830 - 0845	0	25	19	6	0	7	8	26	0	0	162	20	0	19	67	7	366	1613
0845 - 0900	0	25	26	5	0	13	14	27	0	7	166	20	0	27	71	12	413	1594
0900 - 0915	0	21	20	9	0	12	6	30	0	11	182	18	0	30	67	17	423	1442
0915 - 0930	0	16	18	6	0	8	13	31	0	4	207	10	0	15	68	15	411	1225
0930 - 0945	0	25	11	6	0	11	11	23	0	9	163	11	0	14	55	8	347	1058
0945 - 1000	0	11	17	7	0	5	9	15	0	2	89	11	0	19	67	9	261	1001
1000 - 1015	0	10	15	3	0	7	6	14	0	0	71	7	0	11	50	12	206	1006
1015 - 1030	0	8	19	1	0	8	11	21	0	4	63	15	0	22	61	11	244	1092
1030 - 1045	0	20	9	1	0	6	8	17	0	4	93	17	0	21	81	13	290	1153
1045 - 1100	0	21	11	6	0	9	4	24	0	4	65	13	0	23	71	15	266	1202
1100 - 1115	0	10	12	2	0	9	11	21	0	3	73	15	0	26	95	15	292	1276
1115 - 1130	0	15	19	3	0	9	7	25	0	2	74	14	0	28	92	17	305	1316
1130 - 1145	0	17	12	3	0	15	9	28	0	9	99	27	0	20	88	12	339	1278
1145 - 1200	0	15	18	5	0	19	14	16	0	3	81	22	0	25	103	19	340	1291
1200 - 1215	0	9	17	4	0	17	13	18	0	5	81	20	1	31	99	17	332	1299
1215 - 1230	0	19	11	4	0	14	10	19	0	4	67	18	1	21	69	10	267	1292
1230 - 1245	0	15	16	1	0	17	17	22	0	10	107	13	0	26	88	20	352	1368
1245 - 1300	0	21	24	5	0	16	19	32	0	1	81	21	0	28	86	14	348	1317
1300 - 1315	0	14	12	3	0	20	18	28	0	10	83	8	0	32	85	12	325	1289
1315 - 1330	0	5	15	7	0	10	19	14	0	3	95	17	0	30	113	15	343	1296
1330 - 1345	0	19	15	6	0	10	18	22	1	2	84	16	0	10	86	12	301	1254
1345 - 1400	0	14	10	3	0	21	11	26	0	1	80	21	0	35	80	18	320	1275
1400 - 1415	0	12	17	3	0	12	11	32	0	5	79	16	0	20	106	19	332	1308
1415 - 1430	0	5	7	5	0	10	17	21	0	5	74	26	0	24	93	14	301	1313
1430 - 1445	0	8	14	4	0	18	11	35	1	4	80	17	0	28	84	18	322	1400
1445 - 1500	0	9	11	2	0	12	17	33	0	5	86	15	0	25	109	29	353	1431
1500 - 1515	0	12	10	1	0	16	19	24	0	4	91	12	0	22	106	20	337	1544
1515 - 1530	0	17	10	7	0	20	14	29	0	2	92	19	0	27	124	27	388	1749
1530 - 1545	0	6	9	2	0	9	19	20	0	3	72	17	0	30	137	29	353	1912
1545 - 1600	0	13	9	10	0	13	17	26	0	9	81	19	0	31	178	60	466	2140
1600 - 1615	0	18	10	6	0	35	23	24	0	10	128	20	0	30	175	63	542	2280
1615 - 1630	0	7	12	5	0	28	44	23	0	10	101	17	0	39	186	79	551	2382
1630 - 1645	0	13	14	4	0	24	28	46	0	6	106	19	0	33	217	71	581	2465
1645 - 1700	0	8	16	3	0	31	40	34	0	5	90	31	0	53	208	87	606	2526
1700 - 1715	0	13	16	4	0	26	44	35	1	11	148	26	0	46	195	79	644	2547
1715 - 1730	0	21	21	4	0	30	37	19	0	5	111	29	1	41	235	80	634	2398
1730 - 1745	0	14	29	4	0	27	47	26	0	7	96	33	1	49	242	67	642	2225
1745 - 1800	0	17	22	1	0	30	38	28	0	5	105	27	0	63	222	69	627	1900
1800 - 1815	0	13	26	2	0	27	21	29	0	10	80	30	0	35	174	48	495	1524
1815 - 1830	0	10	29	6	0	20	20	34	0	3	92	25	0	36	144	42	461	1253
1830 - 1845	0	16	13	5	0	19	11	20	0	7	54	23	0	28	89	32	317	1010
1845 - 1900	0	4	3	1	0	6	13	23	0	2	60	11	0	18	91	19	251	937
1900 - 1915	0	6	9	4	0	8	15	20	0	3	57	14	0	13	60	15	224	930
1915 - 1930	0	7	7	4	0	13	10	21	0	2	32	3	0	18	79	22	218	962
1930 - 1945	0	4	2	4	0	16	17	16	0	2	65	7	0	10	82	19	244	970
1945 - 2000	0	6	7	0	0	25	14	9	0	4	56	6	0	22	79	16	244	870
2000 - 2015	0	2	9	0	0	33	31	25	0	5	50	9	0	14	58	20	256	768
2015 - 2030	0	4	4	4	0	16	23	19	0	3	53	12	0	13	56	19	226	654
2030 - 2045	0	3	3	2	0	15	21	10	0	4	26	4	0	6	40	10	144	531
2045 - 2100	0	2	3	0	0	11	16	15	0	2	31	3	0	9	39	11	142	466
2100 - 2115	0	4	1	0	0	6	10	21	0	2	45	2	0	8	33	10	142	391
2115 - 2130	0	1	2	1	0	8	7	9	0	1	24	4	0	6	32	8	103	323
2130 - 2145	0	0	0	1	0	3	4	7	0	1	27	0	0	4	24	8	79	277
2145 - 2200	0	1	2	0	0	0	0	11	0	1	12	1	0	5	32	2	67	249
2200 - 2215	0	2	0	1	0	1	5	7	0	0	17	0	0	3	31	7	74	218
2215 - 2230	0	0	1	0	0	1	1	5	0	0	14	0	0	2	27	6	57	179
2230 - 2245	0	1	1	0	0	0	2	8	0	0	13	0	0	3	22	1	51	150
2245 - 2300	0	0	2	0	0	0	0	3	0	0	9	2	0	2	16	2	36	125
2300 - 2315	0	1	0	2	0	2	0	1	0	0	9	1	0	2	13	4	35	111
2315 - 2330	0	1	0	0	0	1	1	5	0	1	5	0	0	1	11	2	28	
2330 - 2345	0	1	0	0	0	0	0	2	0	0	7	0	0	0	13	3	26	
2345 - 0000	0	1	0	0	0	0	0	1	0	0	8	1	0	2	9	0	22	
Grand Total	0	961	882	240	0	921	990	1498	3	278	6800	1163	4	1581	6253	1518	**23092**	
Approach (%)	0.00	46.14	42.34	11.52	0.00	27.02	29.04	43.94	0.04	3.37	82.48	14.11	0.04	16.90	66.83	16.22		
Total (%)	0.00	4.16	3.82	1.04	0.00	3.99	4.29	6.49	0.01	1.20	29.45	5.04	0.02	6.85	27.08	6.57		
P/Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Cars	0	958	880	238	0	908	986	1487	3	275	6724	1145	4	1567	6197	1506		
Single Unit Trucks	0	2	2	2	0	13	4	11	0	3	73	18	0	14	55	12		
Combination Trucks	0	1	0	0	0	0	0	0	0	0	3	0	0	0	1	0		
P/Cycle (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Cars (%)	0.00	99.69	99.77	99.17	0.00	98.59	99.60	99.27	100.00	98.92	98.88	98.45	100.00	99.11	99.10	99.21		
Single Unit Trucks (%)	0.00	0.21	0.23	0.83	0.00	1.41	0.40	0.73	0.00	1.08	1.07	1.55	0.00	0.89	0.88	0.79		
Combination Trucks (%)	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.02	0.00		

Peak Rolling Hour Flow Rates

	Eastbound				Westbound				Northbound				Southbound				
	CH-97 Shades Crest Rd				Vestaview Ln				Columbiana Rd				CH-97 Columbiana Rd				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Int
TIME	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	3.10	3.11	3.12	3.13	3.14	3.15	3.16	Total
1700 - 1715	0	13	16	4	0	26	44	35	1	11	148	26	0	46	195	79	644
1715 - 1730	0	21	21	4	0	30	37	19	0	5	111	29	1	41	235	80	634
1730 - 1745	0	14	29	4	0	27	47	26	0	7	96	33	1	49	242	67	642
1745 - 1800	0	17	22	1	0	30	38	28	0	5	105	27	0	63	222	69	627
Grand Total	0	65	88	13	0	113	166	108	1	28	460	115	2	199	894	295	**2547**
Approach (%)	0.00	39.16	53.01	7.83	0.00	29.20	42.89	27.91	0.17	4.64	76.16	19.04	0.14	14.32	64.32	21.22	
Total (%)	0.00	2.55	3.46	0.51	0.00	4.44	6.52	4.24	0.04	1.10	18.06	4.52	0.08	7.81	35.10	11.58	
PHF	88%				92%				81%				97%				99%
	0%	77%	76%	81%	0%	94%	88%	77%	25%	64%	78%	87%	50%	79%	92%	92%	
P/Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars	0	65	88	13	0	113	166	108	1	28	460	115	2	199	894	294	2546
Single Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Combination Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P/Cycle (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cars (%)	0.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.66	99.96
Single Unit Trucks (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.04
Combination Trucks (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vestavia Hills, AL
Classified Turn Movement Count

Site 4 of 5

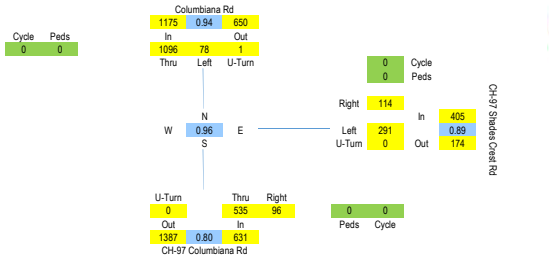
CH-97 Shades Crest Rd
CH-97 Columbiana Rd
Columbiana Rd

Lat/Long
33.441588°, -86.808259°

Date
Wednesday 6 February 2019

Weather
Showers
Temp: 21°C

0000 - 2400 (Weekday 24h Session)



	Westbound CH-97 Shades Crest Rd			Northbound CH-97 Columbiana Rd			Southbound Columbiana Rd				
TIME	U-Turn 4.1	Left 4.2	Right 4.3	U-Turn 4.4	Thru 4.5	Right 4.6	U-Turn 4.7	Left 4.8	Thru 4.9	Int Total	Rolling Hour
0000 - 0015	0	4	2	0	5	0	0	0	5	16	48
0015 - 0030	0	2	1	0	2	0	0	2	10	17	37
0030 - 0045	0	2	2	0	3	0	0	0	4	11	29
0045 - 0100	0	0	0	0	1	0	0	0	3	4	26
0100 - 0115	0	0	0	0	2	0	0	0	3	5	23
0115 - 0130	0	1	0	0	2	1	0	0	5	9	20
0130 - 0145	0	0	1	0	3	0	0	0	4	8	14
0145 - 0200	0	0	1	0	0	0	0	0	0	1	10
0200 - 0215	0	1	0	0	0	0	0	1	0	2	13
0215 - 0230	0	0	0	0	1	1	0	0	1	3	17
0230 - 0245	0	2	0	0	2	0	0	0	0	4	16
0245 - 0300	0	1	1	0	2	0	0	0	0	4	20
0300 - 0315	0	0	0	0	1	0	0	1	4	6	24
0315 - 0330	0	1	0	0	0	1	0	0	0	2	28
0330 - 0345	0	1	0	0	3	0	0	0	4	8	37
0345 - 0400	0	1	0	0	2	0	0	1	4	8	47
0400 - 0415	0	0	1	0	5	0	0	1	3	10	65
0415 - 0430	0	0	0	0	5	1	0	1	4	11	74
0430 - 0445	0	0	2	0	9	4	0	0	3	18	93
0445 - 0500	0	2	0	0	8	4	0	2	10	26	130
0500 - 0515	0	1	0	0	10	3	0	0	5	19	182
0515 - 0530	0	2	0	0	13	3	0	3	9	30	247
0530 - 0545	0	1	3	0	24	7	0	1	19	55	325
0545 - 0600	0	3	3	0	31	9	0	2	30	78	467
0600 - 0615	0	4	4	0	42	8	0	2	24	84	683
0615 - 0630	0	6	2	0	48	15	0	5	32	108	974
0630 - 0645	0	7	16	0	99	24	0	6	45	197	1397
0645 - 0700	0	11	16	0	154	34	0	11	68	294	1755
0700 - 0715	0	8	24	0	212	46	0	12	73	375	1991
0715 - 0730	0	14	28	0	332	73	1	16	67	531	2120
0730 - 0745	0	12	12	0	324	103	0	27	77	555	2027
0745 - 0800	0	17	13	0	276	98	0	22	104	530	1811
0800 - 0815	0	15	21	0	285	70	0	14	99	504	1631
0815 - 0830	0	23	7	0	235	54	0	13	106	438	1498
0830 - 0845	0	14	18	0	167	45	0	18	77	339	1446
0845 - 0900	0	15	10	0	185	30	0	11	99	350	1417
0900 - 0915	0	20	10	1	206	27	0	15	92	371	1308
0915 - 0930	0	16	23	0	230	24	0	13	80	386	1144
0930 - 0945	0	19	13	0	180	32	1	9	56	310	964
0945 - 1000	0	12	12	1	88	27	0	13	88	241	931
1000 - 1015	0	13	17	0	78	18	0	19	62	207	933
1015 - 1030	0	19	9	0	76	15	0	11	76	206	995
1030 - 1045	0	17	18	0	109	23	0	12	98	277	1069
1045 - 1100	0	23	18	0	91	18	0	10	83	243	1082
1100 - 1115	0	23	9	1	89	13	0	21	113	269	1133
1115 - 1130	0	26	9	0	99	16	0	19	111	280	1151
1130 - 1145	0	22	14	0	133	14	0	8	99	290	1108
1145 - 1200	0	28	17	0	94	18	1	17	119	294	1124
1200 - 1215	0	20	15	0	102	8	0	14	128	287	1133
1215 - 1230	0	11	12	0	85	22	0	16	91	237	1135
1230 - 1245	0	21	14	0	115	27	0	16	113	306	1204
1245 - 1300	0	28	14	0	110	25	1	24	101	303	1172
1300 - 1315	0	27	16	0	107	20	0	17	102	289	1161
1315 - 1330	0	26	18	0	100	13	0	17	132	306	1182
1330 - 1345	0	15	23	0	101	24	0	18	93	274	1149
1345 - 1400	0	22	23	0	100	23	0	13	111	292	1158
1400 - 1415	0	29	27	0	104	18	0	16	116	310	1195
1415 - 1430	0	22	18	0	87	16	0	21	109	273	1191
1430 - 1445	0	25	26	0	104	16	0	8	104	283	1275
1445 - 1500	0	33	20	0	115	19	0	11	131	329	1339
1500 - 1515	0	37	20	0	113	13	0	13	110	306	1446
1515 - 1530	0	61	26	1	121	18	0	14	116	357	1621
1530 - 1545	0	43	27	0	89	11	0	23	154	347	1739
1545 - 1600	0	46	29	0	100	19	0	20	222	436	1904
1600 - 1615	0	57	19	0	143	27	0	22	213	481	1979
1615 - 1630	0	82	27	0	113	18	0	14	221	475	2074
1630 - 1645	0	96	16	0	149	14	0	10	227	512	2155
1645 - 1700	0	99	26	0	109	19	0	13	245	511	2182
1700 - 1715	0	78	35	0	173	24	0	21	245	576	2211
1715 - 1730	0	82	32	0	123	25	0	22	272	556	2041
1730 - 1745	0	66	21	0	115	26	0	18	293	539	1873
1745 - 1800	0	65	26	0	124	21	1	17	286	540	1601
1800 - 1815	0	55	18	0	103	17	0	16	197	406	1297
1815 - 1830	0	53	20	0	111	21	0	14	169	388	1081
1830 - 1845	0	27	13	0	74	20	0	10	123	267	887
1845 - 1900	0	32	5	0	76	15	0	10	98	236	830
1900 - 1915	0	17	9	0	66	12	0	16	70	190	807
1915 - 1930	0	22	7	0	49	12	0	7	97	194	795
1930 - 1945	0	21	6	0	75	9	0	10	89	210	787
1945 - 2000	0	23	13	0	61	9	0	13	94	213	680
2000 - 2015	0	25	8	0	64	12	1	1	67	178	583
2015 - 2030	0	17	11	0	69	9	0	9	71	186	535
2030 - 2045	0	12	6	0	24	10	0	7	44	103	435
2045 - 2100	0	10	4	0	43	5	0	5	49	116	409
2100 - 2115	0	12	7	0	64	6	0	2	39	130	362
2115 - 2130	0	10	5	0	31	3	0	1	36	86	305
2130 - 2145	0	5	5	0	32	2	0	2	31	77	274
2145 - 2200	0	11	4	0	24	0	0	2	28	69	247
2200 - 2215	0	10	4	0	23	3	0	2	31	73	215
2215 - 2230	0	5	1	0	18	1	0	0	30	55	175
2230 - 2245	0	2	0	0	19	3	0	2	24	50	148
2245 - 2300	0	4	4	0	12	0	0	1	16	37	127
2300 - 2315	0	4	2	0	9	2	0	1	15	33	111
2315 - 2330	0	3	3	0	10	1	0	0	11	28	
2330 - 2345	0	2	2	0	8	2	0	1	14	29	
2345 - 0000	0	0	0	0	9	1	0	0	11	21	
Grand Total	0	1882	1044	4	7742	1520	6	869	7467	20534	
Approach (%)	0.00	64.32	35.68	0.04	83.55	16.40	0.07	10.42	89.51		
Total (%)	0.00	9.17	5.08	0.02	37.70	7.40	0.03	4.23	36.36		
P/Cycle	0	0	10	0	0	0	0	0	0		
Cars	0	1868	1002	4	7669	1503	6	839	7399		
Single Unit Trucks	0	14	32	0	69	17	0	29	67		
Combination Trucks	0	0	0	0	4	0	0	1	1		
P/Cycle (%)	0.00	0.00	0.96	0.00	0.00	0.00	0.00	0.00	0.00		
Cars (%)	0.00	99.26	95.98	100.00	99.06	98.88	100.00	96.55	99.09		
Single Unit Trucks (%)	0.00	0.74	3.07	0.00	0.89	1.12	0.00	3.34	0.90		
Combination Trucks (%)	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.12	0.01		

Peak Rolling Hour Flow Rates

	Westbound			Northbound			Southbound			
	CH-97 Shades Crest Rd			CH-97 Columbiana Rd			Columbiana Rd			
TIME	U-Turn 4.1	Left 4.2	Right 4.3	U-Turn 4.4	Thru 4.5	Right 4.6	U-Turn 4.7	Left 4.8	Thru 4.9	Int Total
1700 - 1715	0	78	35	0	173	24	0	21	245	576
1715 - 1730	0	82	32	0	123	25	0	22	272	556
1730 - 1745	0	66	21	0	115	26	0	18	293	539
1745 - 1800	0	65	26	0	124	21	1	17	286	540
Grand Total	0	291	114	0	535	96	1	78	1096	**2211**
Approach (%)	0.00	71.85	28.15	0.00	84.79	15.21	0.09	6.64	93.28	
Total (%)	0.00	13.16	5.16	0.00	24.20	4.34	0.05	3.53	49.57	
PHF	89%			80%			94%			96%
	0%	89%	81%	0%	77%	92%	25%	89%	94%	
P/Cycle	0	0	0	0	0	0	0	0	0	0
Cars	0	290	110	0	535	96	1	78	1096	2206
Single Unit Trucks	0	1	4	0	0	0	0	0	0	5
Combination Trucks	0	0	0	0	0	0	0	0	0	0
P/Cycle (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cars (%)	0.00	99.66	96.49	0.00	100.00	100.00	100.00	100.00	100.00	99.77
Single Unit Trucks (%)	0.00	0.34	3.51	0.00	0.00	0.00	0.00	0.00	0.00	0.23
Combination Trucks (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vestavia Hills, AL
Classified Turn Movement Count

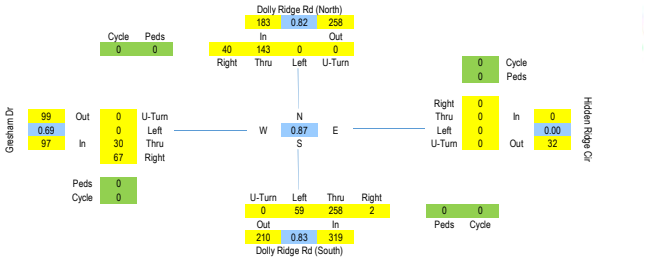
Site 5 of 5
Gresham Dr
Hidden Ridge Cir
Dolly Ridge Rd (South)
Dolly Ridge Rd (North)

Lat/Long
33.433307°, -86.757347°

Date
Wednesday 6 February 2019

Weather
Showers
Temp: 21°C

0000 - 2400 (Weekday 24h Session)



	Eastbound Gresham Dr				Westbound Hidden Ridge Cir				Northbound Dolly Ridge Rd (South)				Southbound Dolly Ridge Rd (North)					
TIME	U-Turn 5.1	Left 5.2	Thru 5.3	Right 5.4	U-Turn 5.5	Left 5.6	Thru 5.7	Right 5.8	U-Turn 5.9	Left 5.10	Thru 5.11	Right 5.12	U-Turn 5.13	Left 5.14	Thru 5.15	Right 5.16	Int Total	Rolling Hour
0000 - 0015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
0015 - 0030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
0030 - 0045	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0045 - 0100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0100 - 0115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
0115 - 0130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0130 - 0145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
0145 - 0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0200 - 0215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
0215 - 0230	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0230 - 0245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0245 - 0300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0300 - 0315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0315 - 0330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0330 - 0345	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3	7
0345 - 0400	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	5
0400 - 0415	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	3	5
0415 - 0430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0430 - 0445	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	21
0445 - 0500	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	28
0500 - 0515	0	0	1	0	0	0	0	0	0	2	5	0	0	0	1	0	9	42
0515 - 0530	0	0	0	0	0	0	0	0	0	0	7	0	0	0	3	0	10	50
0530 - 0545	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	4	8	64
0545 - 0600	0	0	0	0	0	0	0	0	0	0	8	0	0	0	5	2	15	102
0600 - 0615	0	0	1	0	0	0	0	0	0	0	12	0	0	0	1	3	17	134
0615 - 0630	0	0	0	1	0	0	0	0	0	1	15	0	0	0	5	2	24	194
0630 - 0645	0	0	4	3	0	0	0	0	0	4	20	1	0	0	8	6	46	287
0645 - 0700	0	0	0	4	0	0	0	0	0	2	21	0	0	0	13	7	47	414
0700 - 0715	0	0	5	7	0	0	0	0	0	6	23	0	0	0	25	11	77	540
0715 - 0730	0	0	2	2	0	0	0	0	0	21	47	0	0	0	33	12	117	599
0730 - 0745	0	0	15	20	0	0	0	0	0	19	76	1	0	0	29	13	173	544
0745 - 0800	0	0	8	20	0	0	0	0	0	14	75	0	0	0	43	13	173	454
0800 - 0815	0	0	5	25	0	0	0	0	0	5	60	1	0	0	38	2	136	341
0815 - 0830	0	0	0	1	0	0	0	0	0	0	37	0	0	0	22	2	62	268
0830 - 0845	0	0	2	12	0	0	0	0	0	3	36	0	0	0	29	1	83	262
0845 - 0900	0	0	0	3	0	0	0	0	0	0	38	0	0	0	18	1	60	226
0900 - 0915	0	0	2	10	0	0	0	0	0	3	26	0	0	0	21	1	63	226
0915 - 0930	0	0	4	1	0	0	0	0	1	1	28	0	0	0	20	1	56	212
0930 - 0945	0	0	2	0	0	0	0	0	0	0	22	0	0	0	23	2	49	203
0945 - 1000	0	0	1	1	0	0	0	0	0	0	31	0	0	0	24	1	58	211
1000 - 1015	0	0	2	3	0	0	0	1	0	1	20	0	0	0	19	3	49	195
1015 - 1030	0	0	5	0	0	0	0	0	0	3	21	0	0	0	17	1	47	199
1030 - 1045	0	0	3	4	0	0	0	1	0	1	29	0	0	0	19	0	57	211
1045 - 1100	0	0	1	1	0	0	0	0	0	1	21	0	0	0	17	1	42	213
1100 - 1115	0	0	1	0	0	0	0	0	1	2	15	0	0	0	31	3	53	228
1115 - 1130	0	1	3	0	0	0	0	0	0	0	28	0	0	0	26	1	59	228
1130 - 1145	0	0	4	0	0	0	0	0	0	0	32	1	0	0	20	2	59	236
1145 - 1200	0	0	3	1	0	0	0	0	1	1	30	0	0	0	19	2	57	241
1200 - 1215	0	0	0	0	0	0	0	2	0	0	28	1	0	0	20	2	53	244
1215 - 1230	0	0	1	0	0	0	0	0	0	0	31	0	0	0	34	1	67	273
1230 - 1245	0	0	5	2	0	0	0	0	0	0	27	0	0	0	26	4	64	264
1245 - 1300	0	0	2	1	0	0	0	0	0	0	26	0	0	0	31	0	61	271
1300 - 1315	0	0	3	2	0	0	0	0	0	0	35	0	0	1	38	3	82	264
1315 - 1330	0	0	0	1	0	0	0	0	0	0	26	0	0	0	27	4	58	237
1330 - 1345	0	0	6	2	0	0	0	0	0	0	31	0	0	0	29	3	71	237
1345 - 1400	0	0	2	0	0	0	0	0	0	0	25	0	0	1	24	1	53	230
1400 - 1415	0	0	1	2	0	0	0	0	0	0	22	1	0	0	24	5	55	268
1415 - 1430	0	0	0	4	0	0	0	0	0	0	20	1	0	0	27	6	58	320
1430 - 1445	0	0	1	2	0	0	0	0	0	0	24	0	0	0	32	5	64	335
1445 - 1500	0	0	4	10	0	1	0	1	0	0	40	1	0	0	28	6	91	360
1500 - 1515	0	0	18	28	0	0	0	0	0	0	25	0	0	0	32	4	107	387
1515 - 1530	0	0	2	4	0	0	0	0	0	0	34	0	0	0	32	1	73	362
1530 - 1545	0	0	7	6	0	0	0	0	0	0	34	2	0	0	39	1	89	377
1545 - 1600	0	0	5	2	0	0	0	2	0	0	61	0	0	0	46	2	118	385
1600 - 1615	0	0	3	2	0	0	0	0	0	0	39	0	0	0	38	0	82	375
1615 - 1630	0	0	2	0	0	0	0	0	0	0	29	0	0	0	53	4	88	387
1630 - 1645	0	0	6	2	0	0	0	0	0	0	25	0	0	0	62	2	97	411
1645 - 1700	0	0	1	0	0	0	0	0	0	0	47	0	0	1	58	1	108	428
1700 - 1715	0	0	5	4	0	0	0	1	0	0	23	0	0	0	60	1	94	401
1715 - 1730	0	0	1	2	0	0	0	0	0	0	54	0	0	2	52	1	112	382
1730 - 1745	0	0	5	3	0	0	0	0	0	0	43	0	0	0	59	4	114	330
1745 - 1800	0	0	6	3	0	0	0	0	0	0	37	1	0	0	30	4	81	269
1800 - 1815	0	0	2	1	0	0	0	0	0	0	30	0	0	0	41	1	75	226
1815 - 1830	0	0	1	0	0	0	0	0	0	0	34	0	0	0	24	1	60	192
1830 - 1845	0	0	2	2	0	0	0	0	0	0	23	0	0	0	25	1	53	183
1845 - 1900	0	0	1	2	0	0	0	0	0	0	21	0	0	0	14	0	38	171
1900 - 1915	0	0	0	1	0	0	0	0	0	0	21	0	0	1	18	0	41	182
1915 - 1930	0	0	0	0	0	0	0	0	0	0	18	0	0	0	33	0	51	177
1930 - 1945	0	0	1	0	0	1	0	0	0	0	16	0	0	0	23	0	41	165
1945 - 2000	0	0	1	1	0	1	0	0	0	0	20	2	0	1	23	0	49	147
2000 - 2015	0	0	0	0	0	0	0	0	0	0	12	0	0	0	23	1	36	124
2015 - 2030	0	0	0	1	0	0	0	0	0	0	12	0	0	0	23	3	39	99
2030 - 2045	0	0	1	1	0	0	0	0	0	0	10	0	0	0	9	2	23	86
2045 - 2100	0	0	0	0	0	0	0	0	0	0	10	0	0	0	15	1	26	80
2100 - 2115	0	0	0	0	0	0	0	0	0	0	5	1	0	0	5	0	11	65
2115 - 2130	0	0	0	0	0	0	0	0	0	0	3	0	0	0	23	0	26	66
2130 - 2145	0	0	0	0	0	0	0	0	0	0	6	0	0	0	11	0	17	52
2145 - 2200	0	0	0	0	0	0	0	1	0	0	2	0	0	0	8	0	11	45
2200 - 2215	0	0	0	0	0	0	0	0	0	0	4	0	0	0	8	0	12	38
2215 - 2230	0	0	0	0	0	0	0	0	0	0	4	0	0	0	8	0	12	26
2230 - 2245	0	0	0	0	0	0	0	0	0	0	2	0	0	0	7	1	10	15
2245 - 2300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	7
2300 - 2315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2315 - 2330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
2330 - 2345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	
2345 - 0000	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	
Grand Total	0	2	169	210	0	3	0	9	3	90	1831	14	0	7	1786	174	4299	
Approach (%)	0.00	0.52	44.36	55.12	0.00	25.00	0.00	75.00	0.15	4.64	94.48	0.72	0.00	0.36	90.75	8.84		
Total (%)	0.00	0.05	3.93	4.88	0.00	0.07	0.00	0.21	0.07	2.09	42.59	0.33	0.00	0.16	41.54	4.05		
P/Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Cars	0	1	146	184	0	3	0	9	3	80	1818	14	0	7	1767	157		
Single Unit Trucks	0	1	23	26	0	0	0	0	0	10	13	0	0	0	18	17		
Combination Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0		
P/Cycle (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Cars (%)	0.00	50.00	86.39	87.62	0.00	100.00	0.00	100.00	100.00	88.89	99.29	100.00	0.00	100.00	98.94	90.23		
Single Unit Trucks (%)	0.00	50.00	13.61	12.38	0.00	0.00	0.00	0.00	0.00	11.11	0.71	0.00	0.00	0.00	1.01	9.77		
Combination Trucks (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00		

Peak Rolling Hour Flow Rates

	Eastbound				Westbound				Northbound				Southbound				
	Gresham Dr				Hidden Ridge Cir				Dolly Ridge Rd (South)				Dolly Ridge Rd (North)				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Int
TIME	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	5.10	5.11	5.12	5.13	5.14	5.15	5.16	Total
0715 - 0730	0	0	2	2	0	0	0	0	0	21	47	0	0	0	33	12	117
0730 - 0745	0	0	15	20	0	0	0	0	0	19	76	1	0	0	29	13	173
0745 - 0800	0	0	8	20	0	0	0	0	0	14	75	0	0	0	43	13	173
0800 - 0815	0	0	5	25	0	0	0	0	0	5	60	1	0	0	38	2	136
Grand Total	0	0	30	67	0	0	0	0	0	59	258	2	0	0	143	40	**599**
Approach (%)	0.00	0.00	30.93	69.07	0.00	0.00	0.00	0.00	0.00	18.50	80.88	0.63	0.00	0.00	78.14	21.86	
Total (%)	0.00	0.00	5.01	11.19	0.00	0.00	0.00	0.00	0.00	9.85	43.07	0.33	0.00	0.00	23.87	6.68	
PHF	69%				0%				83%				82%				87%
	0%	0%	50%	67%	0%	0%	0%	0%	0%	70%	85%	50%	0%	0%	83%	77%	
P/Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars	0	0	27	67	0	0	0	0	0	53	257	2	0	0	139	37	582
Single Unit Trucks	0	0	3	0	0	0	0	0	0	6	1	0	0	0	4	3	17
Combination Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P/Cycle (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cars (%)	0.00	0.00	90.00	100.00	0.00	0.00	0.00	0.00	0.00	89.83	99.61	100.00	0.00	0.00	97.20	92.50	97.16
Single Unit Trucks (%)	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.17	0.39	0.00	0.00	0.00	2.80	7.50	2.84
Combination Trucks (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

Birmingham, AL

File Name : 280hwy17
Site Code : 00000000
Start Date : 11/28/2018
Page No : 1

Groups Printed- Unshifted

	US 280 Westbound		ROCKY RIDGE RD Northbound		US 280 Eastbound		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	46	1072	116	34	508	34	1810
07:15 AM	64	1092	94	28	649	47	1974
07:30 AM	67	940	131	41	756	37	1972
07:45 AM	95	919	122	44	915	51	2146
Total	272	4023	463	147	2828	169	7902
08:00 AM	52	916	115	51	700	59	1893
08:15 AM	38	911	121	46	645	59	1820
08:30 AM	49	937	110	47	557	35	1735
08:45 AM	41	870	91	39	606	53	1700
Total	180	3634	437	183	2508	206	7148
11:00 AM	54	627	50	69	716	74	1590
11:15 AM	78	559	63	71	731	64	1566
11:30 AM	79	596	82	59	852	65	1733
11:45 AM	59	715	77	56	913	77	1897
Total	270	2497	272	255	3212	280	6786
12:00 PM	71	643	40	46	772	78	1650
12:15 PM	67	641	70	65	768	70	1681
12:30 PM	62	643	75	62	728	64	1634
12:45 PM	74	730	71	54	735	58	1722
Total	274	2657	256	227	3003	270	6687
04:00 PM	92	661	84	68	1099	106	2110
04:15 PM	88	710	105	100	1033	191	2227
04:30 PM	90	684	78	79	956	138	2025
04:45 PM	70	744	89	57	1217	149	2326
Total	340	2799	356	304	4305	584	8688
05:00 PM	96	723	66	59	1135	191	2270
05:15 PM	94	692	94	83	1187	262	2412
05:30 PM	101	675	63	57	1098	179	2173
05:45 PM	71	587	55	60	1316	193	2282
Total	362	2677	278	259	4736	825	9137
Grand Total	1698	18287	2062	1375	20592	2334	46348
Apprch %	8.5	91.5	60.0	40.0	89.8	10.2	
Total %	3.7	39.5	4.4	3.0	44.4	5.0	

		US 280 Westbound			ROCKY RIDGE RD Northbound			US 280 Eastbound			
Start Time	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1											
Intersection	07:15 AM										
Volume	0	278	3867	4145	462	164	626	3020	194	3214	7985
Percent		6.7	93.3		73.8	26.2		94.0	6.0		
07:45 Volume	0	95	919	1014	122	44	166	915	51	966	2146
Peak Factor											0.930
High Int.	6:45:00 AM	07:15 AM			07:30 AM			07:45 AM			
Volume	0	64	1092	1156	131	41	172	915	51	966	
Peak Factor				0.896			0.910			0.832	

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

File Name : 280hwy17
Site Code : 00000000
Start Date : 11/28/2018
Page No : 2

		US 280 Westbound			ROCKY RIDGE RD Northbound			US 280 Eastbound			
Start Time	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1											
By Approach	07:00 AM	07:00 AM			07:30 AM			07:30 AM			
Volume	0	272	4023	4295	489	182	671	3016	206	3222	
Percent		6.3	93.7		72.9	27.1		93.6	6.4		
High Int.	-	07:15 AM			07:30 AM			07:45 AM			
Volume	-	64	1092	1156	131	41	172	915	51	966	
Peak Factor	-			0.929			0.975			0.834	
Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1											
Intersection	11:30 AM										
Volume	0	276	2595	2871	269	226	495	3305	290	3595	6961
Percent		9.6	90.4		54.3	45.7		91.9	8.1		
11:45 Volume	0	59	715	774	77	56	133	913	77	990	1897
Peak Factor											0.917
High Int.		11:45 AM			11:30 AM			11:45 AM			
Volume	0	59	715	774	82	59	141	913	77	990	
Peak Factor				0.927			0.878			0.908	
Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1											
By Approach	11:00 AM	12:00 PM			11:00 AM			11:30 AM			
Volume	0	274	2657	2931	272	255	527	3305	290	3595	
Percent		9.3	90.7		51.6	48.4		91.9	8.1		
High Int.	-	12:45 PM			11:30 AM			11:45 AM			
Volume	-	74	730	804	82	59	141	913	77	990	
Peak Factor	-			0.911			0.934			0.908	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1											
Intersection	04:45 PM										
Volume	0	361	2834	3195	312	256	568	4637	781	5418	9181
Percent		11.3	88.7		54.9	45.1		85.6	14.4		
05:15 Volume	0	94	692	786	94	83	177	1187	262	1449	2412
Peak Factor											0.952
High Int.		05:00 PM			05:15 PM			05:15 PM			
Volume	0	96	723	819	94	83	177	1187	262	1449	
Peak Factor				0.975			0.802			0.935	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1											
By Approach	04:00 PM	04:15 PM			04:00 PM			05:00 PM			
Volume	0	344	2861	3205	356	304	660	4736	825	5561	
Percent		10.7	89.3		53.9	46.1		85.2	14.8		
High Int.	-	05:00 PM			04:15 PM			05:45 PM			
Volume	-	96	723	819	105	100	205	1316	193	1509	
Peak Factor	-			0.978			0.805			0.921	

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

Vestavia Hills, AL

File Name : vestavia14
Site Code : 00000000
Start Date : 05/24/2012
Page No : 1

Groups Printed- 1 - Unshifted

	HWY 31 Southbound			I-65 NB RAMPS Westbound			HWY 31 Northbound			COLUMBIANA RD Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	23	94	3	19	49	208	36	196	217	9	23	90	967
07:15 AM	19	134	5	9	84	203	68	243	239	8	18	111	1141
07:30 AM	23	212	9	11	92	158	119	195	229	29	19	166	1262
07:45 AM	22	259	9	19	97	201	124	212	224	32	24	148	1371
Total	87	699	26	58	322	770	347	846	909	78	84	515	4741
08:00 AM	25	185	12	30	98	218	123	188	197	18	6	113	1213
08:15 AM	19	191	5	30	67	163	98	225	175	13	14	115	1115
08:30 AM	21	170	8	24	84	191	64	177	210	12	21	95	1077
08:45 AM	21	184	6	29	63	204	63	152	145	9	21	108	1005
Total	86	730	31	113	312	776	348	742	727	52	62	431	4410
11:00 AM	27	274	4	35	47	108	52	191	136	21	18	109	1022
11:15 AM	32	321	7	42	48	128	40	170	147	12	13	122	1082
11:30 AM	22	289	14	53	46	121	38	172	124	17	12	121	1029
11:45 AM	23	371	13	36	44	132	47	183	124	16	9	129	1127
Total	104	1255	38	166	185	489	177	716	531	66	52	481	4260
12:00 PM	29	324	11	41	46	110	48	221	155	34	15	153	1187
12:15 PM	41	348	8	38	52	114	92	212	146	16	7	135	1209
12:30 PM	26	439	3	40	47	194	67	241	172	20	13	122	1384
12:45 PM	28	380	11	39	45	166	55	181	172	12	16	121	1226
Total	124	1491	33	158	190	584	262	855	645	82	51	531	5006
04:00 PM	19	374	12	38	73	120	53	136	155	16	12	175	1183
04:15 PM	22	398	2	35	61	126	64	153	139	22	21	196	1239
04:30 PM	24	396	6	44	62	135	33	140	158	22	12	180	1212
04:45 PM	28	448	2	45	75	153	69	170	156	26	11	213	1396
Total	93	1616	22	162	271	534	219	599	608	86	56	764	5030
05:00 PM	27	455	3	35	73	184	30	175	224	24	27	202	1459
05:15 PM	20	435	10	32	69	173	46	146	203	25	21	208	1388
05:30 PM	21	444	7	27	78	262	75	230	143	24	12	185	1508
05:45 PM	18	449	16	30	76	239	62	169	198	38	16	173	1484
Total	86	1783	36	124	296	858	213	720	768	111	76	768	5839
Grand Total	580	7574	186	781	1576	4011	1566	4478	4188	475	381	3490	29286
Apprch %	7.0	90.8	2.2	12.3	24.7	63.0	15.3	43.8	40.9	10.9	8.8	80.3	
Total %	2.0	25.9	0.6	2.7	5.4	13.7	5.3	15.3	14.3	1.6	1.3	11.9	

	HWY 31 Southbound				I-65 NB RAMPS Westbound				HWY 31 Northbound				COLUMBIANA RD Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Intersection	07:15 AM																
Volume	89	790	35	914	69	371	780	1220	434	838	889	2161	87	67	538	692	4987
Percent	9.7	86.4	3.8		5.7	30.4	63.9		20.1	38.8	41.1		12.6	9.7	77.7		
07:45 Volume	22	259	9	290	19	97	201	317	124	212	224	560	32	24	148	204	1371
Peak Factor																	0.909
High Int.	07:45 AM				08:00 AM				07:45 AM				07:30 AM				
Volume	22	259	9	290	30	98	218	346	124	212	224	560	29	19	166	214	
Peak Factor				0.788				0.882				0.965				0.808	

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

File Name : vestavia14
Site Code : 00000000
Start Date : 05/24/2012
Page No : 2

	HWY 31 Southbound				I-65 NB RAMPS Westbound				HWY 31 Northbound				COLUMBIANA RD Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																	
By Approach	07:30 AM				07:45 AM				07:15 AM				07:30 AM				
Volume	89	847	35	971	103	346	773	1222	434	838	889	2161	92	63	542	697	
Percent	9.2	87.2	3.6		8.4	28.3	63.3		20.1	38.8	41.1		13.2	9.0	77.8		
High Int.	07:45 AM				08:00 AM				07:45 AM				07:30 AM				
Volume	22	259	9	290	30	98	218	346	124	212	224	560	29	19	166	214	
Peak Factor				0.837				0.883				0.965				0.814	
Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1																	
Intersection	12:00 PM																
Volume	124	1491	33	1648	158	190	584	932	262	855	645	1762	82	51	531	664	5006
Percent	7.5	90.5	2.0		17.0	20.4	62.7		14.9	48.5	36.6		12.3	7.7	80.0		
12:30 Volume	26	439	3	468	40	47	194	281	67	241	172	480	20	13	122	155	1384
Peak Factor																	0.904
High Int.	12:30 PM				12:30 PM				12:30 PM				12:00 PM				
Volume	26	439	3	468	40	47	194	281	67	241	172	480	34	15	153	202	
Peak Factor				0.880				0.829				0.918				0.822	
Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1																	
By Approach	12:00 PM				12:00 PM				12:00 PM				11:45 AM				
Volume	124	1491	33	1648	158	190	584	932	262	855	645	1762	86	44	539	669	
Percent	7.5	90.5	2.0		17.0	20.4	62.7		14.9	48.5	36.6		12.9	6.6	80.6		
High Int.	12:30 PM				12:30 PM				12:30 PM				12:00 PM				
Volume	26	439	3	468	40	47	194	281	67	241	172	480	34	15	153	202	
Peak Factor				0.880				0.829				0.918				0.828	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Intersection	05:00 PM																
Volume	86	1783	36	1905	124	296	858	1278	213	720	768	1701	111	76	768	955	5839
Percent	4.5	93.6	1.9		9.7	23.2	67.1		12.5	42.3	45.1		11.6	8.0	80.4		
05:30 Volume	21	444	7	472	27	78	262	367	75	230	143	448	24	12	185	221	1508
Peak Factor																	0.968
High Int.	05:00 PM				05:30 PM				05:30 PM				05:15 PM				
Volume	27	455	3	485	27	78	262	367	75	230	143	448	25	21	208	254	
Peak Factor				0.982				0.871				0.949				0.940	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																	
By Approach	05:00 PM				05:00 PM				05:00 PM				04:45 PM				
Volume	86	1783	36	1905	124	296	858	1278	213	720	768	1701	99	71	808	978	
Percent	4.5	93.6	1.9		9.7	23.2	67.1		12.5	42.3	45.1		10.1	7.3	82.6		
High Int.	05:00 PM				05:30 PM				05:30 PM				05:15 PM				
Volume	27	455	3	485	27	78	262	367	75	230	143	448	25	21	208	254	
Peak Factor				0.982				0.871				0.949				0.963	

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

Vestavia Hills, AL

File Name : vestavia01
Site Code : 00000000
Start Date : 05/23/2012
Page No : 1

Groups Printed- Unshifted

	HWY 31 Southbound				SHADES CREST RD Westbound			HWY 31 Northbound				SHADES CREST RD Eastbound			
Start Time	Left	Thru	Right	uturn	Left	Thru	Right	Left	Thru	Right	uturn	Left	Thru	Right	Int. Total
07:00 AM	7	111	6	0	21	6	62	4	369	19	0	36	4	3	648
07:15 AM	6	158	8	0	33	21	54	10	495	16	0	55	5	2	863
07:30 AM	9	157	6	0	32	13	65	8	477	34	0	78	12	4	895
07:45 AM	17	172	8	0	46	14	84	7	478	28	0	90	16	4	964
Total	39	598	28	0	132	54	265	29	1819	97	0	259	37	13	3370
08:00 AM	12	214	12	0	39	11	58	4	512	32	0	79	13	4	990
08:15 AM	17	167	9	0	28	12	69	5	466	22	0	55	4	4	858
08:30 AM	16	219	10	0	20	9	51	7	388	16	0	40	16	5	797
08:45 AM	18	192	11	0	27	10	26	6	297	29	1	43	17	5	682
Total	63	792	42	0	114	42	204	22	1663	99	1	217	50	18	3327
11:00 AM	18	296	17	0	20	5	7	5	232	26	0	10	9	5	650
11:15 AM	25	331	14	0	39	11	8	10	305	29	0	16	3	8	799
11:30 AM	17	399	14	0	33	6	12	7	270	34	0	12	6	7	817
11:45 AM	20	339	25	0	33	13	10	3	336	25	0	6	11	15	836
Total	80	1365	70	0	125	35	37	25	1143	114	0	44	29	35	3102
12:00 PM	23	355	19	1	32	4	13	7	262	47	0	12	11	14	800
12:15 PM	18	332	19	3	29	13	20	3	276	34	0	18	15	11	791
12:30 PM	19	295	23	1	29	16	28	6	333	36	1	13	9	10	819
12:45 PM	29	273	17	2	43	19	25	12	321	42	1	25	4	12	825
Total	89	1255	78	7	133	52	86	28	1192	159	2	68	39	47	3235
04:00 PM	29	419	60	1	21	8	9	13	215	44	0	13	12	3	847
04:15 PM	32	458	61	1	37	10	3	10	299	31	0	9	12	3	966
04:30 PM	42	479	72	0	32	11	7	10	220	29	0	18	16	9	945
04:45 PM	57	490	83	1	37	8	11	5	242	43	0	8	22	7	1014
Total	160	1846	276	3	127	37	30	38	976	147	0	48	62	22	3772
05:00 PM	62	484	80	0	42	22	14	12	269	54	1	19	18	11	1088
05:15 PM	70	531	95	1	29	22	25	6	257	37	1	26	25	14	1139
05:30 PM	55	497	61	0	45	19	20	11	189	46	1	12	16	7	979
05:45 PM	46	453	79	1	50	22	16	11	233	33	1	14	18	17	994
Total	233	1965	315	2	166	85	75	40	948	170	4	71	77	49	4200
Grand Total	664	7821	809	12	797	305	697	182	7741	786	7	707	294	184	21006
Apprch %	7.1	84.0	8.7	0.1	44.3	17.0	38.7	2.1	88.8	9.0	0.1	59.7	24.8	15.5	
Total %	3.2	37.2	3.9	0.1	3.8	1.5	3.3	0.9	36.9	3.7	0.0	3.4	1.4	0.9	

	HWY 31 Southbound					SHADES CREST RD Westbound				HWY 31 Northbound					SHADES CREST RD Eastbound				
Start Time	Left	Thru	Right	uturn	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	uturn	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																			
Intersection	07:15 AM																		
Volume	44	701	34	0	779	150	59	261	470	29	1962	110	0	2101	302	46	14	362	3712
Percent	5.6	90.0	4.4	0.0		31.9	12.6	55.5		1.4	93.4	5.2	0.0		83.4	12.7	3.9		
08:00 Volume	12	214	12	0	238	39	11	58	108	4	512	32	0	548	79	13	4	96	990
Peak Factor																			0.937
High Int.	08:00 AM					07:45 AM				08:00 AM					07:45 AM				
Volume	12	214	12	0	238	46	14	84	144	4	512	32	0	548	90	16	4	110	

Peak Factor				0.818				0.816				0.958				0.823			

Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1

By Approach	08:00 AM					07:30 AM				07:15 AM					07:30 AM				
Volume	63	792	42	0	897	145	50	276	471	29	1962	110	0	2101	302	45	16	363	
Percent	7.0	88.3	4.7	0.0		30.8	10.6	58.6		1.4	93.4	5.2	0.0		83.2	12.4	4.4		
High Int.	08:30 AM					07:45 AM				08:00 AM					07:45 AM				
Volume	16	219	10	0	245	46	14	84	144	4	512	32	0	548	90	16	4	110	
Peak Factor				0.915				0.818				0.958				0.825			

Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1

Intersection	11:15 AM																		
Volume	85	1424	72	1	1582	137	34	43	214	27	1173	135	0	1335	46	31	44	121	3252
Percent	5.4	90.0	4.6	0.1		64.0	15.9	20.1		2.0	87.9	10.1	0.0		38.0	25.6	36.4		
11:45 Volume	20	339	25	0	384	33	13	10	56	3	336	25	0	364	6	11	15	32	836
Peak Factor																			0.972
High Int.	11:30 AM					11:15 AM				11:45 AM					12:00 PM				
Volume	17	399	14	0	430	39	11	8	58	3	336	25	0	364	12	11	14	37	
Peak Factor				0.920				0.922				0.917				0.818			

Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1

By Approach	11:30 AM					12:00 PM				12:00 PM					12:00 PM				
Volume	78	1425	77	4	1584	133	52	86	271	28	1192	159	2	1381	68	39	47	154	
Percent	4.9	90.0	4.9	0.3		49.1	19.2	31.7		2.0	86.3	11.5	0.1		44.2	25.3	30.5		
High Int.	11:30 AM					12:45 PM				12:30 PM					12:15 PM				
Volume	17	399	14	0	430	43	19	25	87	6	333	36	1	376	18	15	11	44	
Peak Factor				0.921				0.779				0.918				0.875			

Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1

Intersection	04:45 PM																		
Volume	244	2002	319	2	2567	153	71	70	294	34	957	180	3	1174	65	81	39	185	4220
Percent	9.5	78.0	12.4	0.1		52.0	24.1	23.8		2.9	81.5	15.3	0.3		35.1	43.8	21.1		
05:15 Volume	70	531	95	1	697	29	22	25	76	6	257	37	1	301	26	25	14	65	1139
Peak Factor																			0.926
High Int.	05:15 PM					05:30 PM				05:00 PM					05:15 PM				
Volume	70	531	95	1	697	45	19	20	84	12	269	54	1	336	26	25	14	65	
Peak Factor				0.921				0.875				0.874				0.712			

Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1

By Approach	04:45 PM					05:00 PM				04:15 PM					05:00 PM				
Volume	244	2002	319	2	2567	166	85	75	326	37	1030	157	1	1225	71	77	49	197	
Percent	9.5	78.0	12.4	0.1		50.9	26.1	23.0		3.0	84.1	12.8	0.1		36.0	39.1	24.9		
High Int.	05:15 PM					05:45 PM				04:15 PM					05:15 PM				
Volume	70	531	95	1	697	50	22	16	88	10	299	31	0	340	26	25	14	65	
Peak Factor				0.921				0.926				0.901				0.758			

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

Vestavia Hills, AL

File Name : vestavia05
Site Code : 00000000
Start Date : 05/17/2012
Page No : 1

Groups Printed- Unshifted

	HWY 31 Southbound				OLD CREEK TRL Westbound			HWY 31 Northbound				OLD CREEK TRL Eastbound			
Start Time	Left	Thru	Right	uturn	Left	Thru	Right	Left	Thru	Right	uturn	Left	Thru	Right	Int. Total
07:00 AM	1	100	6	0	1	1	1	2	388	5	0	15	0	6	526
07:15 AM	1	181	8	0	1	0	6	3	464	6	0	19	1	9	699
07:30 AM	3	262	6	0	6	6	10	7	492	11	0	22	3	20	848
07:45 AM	2	271	8	0	5	2	2	13	461	21	0	30	1	14	830
Total	7	814	28	0	13	9	19	25	1805	43	0	86	5	49	2903
08:00 AM	3	185	6	0	4	0	3	6	452	17	0	12	1	8	697
08:15 AM	2	197	5	0	2	1	4	9	437	13	0	13	0	5	688
08:30 AM	6	165	7	0	1	1	1	2	301	5	1	15	0	3	508
08:45 AM	6	170	5	0	5	0	5	5	335	10	1	16	0	1	559
Total	17	717	23	0	12	2	13	22	1525	45	2	56	1	17	2452
11:00 AM	4	266	6	1	3	0	3	1	266	11	2	12	3	6	584
11:15 AM	8	319	9	2	7	3	5	3	252	11	3	6	2	6	636
11:30 AM	9	329	7	0	6	0	4	3	287	9	0	11	1	5	671
11:45 AM	14	345	11	3	6	0	5	2	287	12	0	5	2	5	697
Total	35	1259	33	6	22	3	17	9	1092	43	5	34	8	22	2588
12:00 PM	7	340	12	3	3	2	3	2	281	11	1	12	1	4	682
12:15 PM	8	311	12	1	4	1	3	5	242	13	0	12	1	5	618
12:30 PM	11	330	9	4	7	2	6	3	354	7	1	13	1	1	749
12:45 PM	12	303	4	0	4	0	3	8	290	12	1	8	3	4	652
Total	38	1284	37	8	18	5	15	18	1167	43	3	45	6	14	2701
04:00 PM	8	413	13	1	4	1	2	6	232	8	0	9	1	6	704
04:15 PM	13	448	11	0	6	1	5	6	281	6	1	9	0	4	791
04:30 PM	7	437	21	1	8	5	9	5	248	11	0	16	2	5	775
04:45 PM	11	461	20	0	5	3	3	5	269	17	1	20	5	2	822
Total	39	1759	65	2	23	10	19	22	1030	42	2	54	8	17	3092
05:00 PM	6	470	23	0	8	2	8	6	272	8	0	5	1	5	814
05:15 PM	5	489	20	0	4	6	3	6	270	11	0	12	4	10	840
05:30 PM	8	448	21	2	2	1	3	10	244	5	0	12	0	6	762
05:45 PM	7	454	24	0	3	1	4	6	268	8	3	6	1	4	789
Total	26	1861	88	2	17	10	18	28	1054	32	3	35	6	25	3205
Grand Total	162	7694	274	18	105	39	101	124	7673	248	15	310	34	144	16941
Apprch %	2.0	94.4	3.4	0.2	42.9	15.9	41.2	1.5	95.2	3.1	0.2	63.5	7.0	29.5	
Total %	1.0	45.4	1.6	0.1	0.6	0.2	0.6	0.7	45.3	1.5	0.1	1.8	0.2	0.9	

	HWY 31 Southbound					OLD CREEK TRL Westbound				HWY 31 Northbound					OLD CREEK TRL Eastbound				
Start Time	Left	Thru	Right	uturn	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	uturn	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																			
Intersection	07:15 AM																		
Volume	9	899	28	0	936	16	8	21	45	29	1869	55	0	1953	83	6	51	140	3074
Percent	1.0	96.0	3.0	0.0		35.6	17.8	46.7		1.5	95.7	2.8	0.0		59.3	4.3	36.4		
07:30 Volume	3	262	6	0	271	6	6	10	22	7	492	11	0	510	22	3	20	45	848
Peak Factor																			0.906
High Int.	07:45 AM					07:30 AM				07:30 AM					07:30 AM				
Volume	2	271	8	0	281	6	6	10	22	7	492	11	0	510	22	3	20	45	

Peak Factor					0.833				0.511				0.957					0.778		

Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1

By Approach	07:30 AM					07:15 AM				07:15 AM					07:00 AM				
Volume	10	915	25	0	950	16	8	21	45	29	1869	55	0	1953	86	5	49	140	
Percent	1.1	96.3	2.6	0.0		35.6	17.8	46.7		1.5	95.7	2.8	0.0		61.4	3.6	35.0		
High Int.	07:45 AM					07:30 AM				07:30 AM					07:30 AM				
Volume	2	271	8	0	281	6	6	10	22	7	492	11	0	510	22	3	20	45	
Peak Factor					0.845				0.511				0.957					0.778	

Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1

Intersection	11:45 AM																		
Volume	40	1326	44	11	1421	20	5	17	42	12	1164	43	2	1221	42	5	15	62	2746
Percent	2.8	93.3	3.1	0.8		47.6	11.9	40.5		1.0	95.3	3.5	0.2		67.7	8.1	24.2		
12:30 Volume	11	330	9	4	354	7	2	6	15	3	354	7	1	365	13	1	1	15	749
Peak Factor																			0.917
High Int.	11:45 AM					12:30 PM				12:30 PM					12:15 PM				
Volume	14	345	11	3	373	7	2	6	15	3	354	7	1	365	12	1	5	18	
Peak Factor					0.952				0.700				0.836					0.861	

Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1

By Approach	11:45 AM					11:15 AM				12:00 PM					12:00 PM				
Volume	40	1326	44	11	1421	22	5	17	44	18	1167	43	3	1231	45	6	14	65	
Percent	2.8	93.3	3.1	0.8		50.0	11.4	38.6		1.5	94.8	3.5	0.2		69.2	9.2	21.5		
High Int.	11:45 AM					11:15 AM				12:30 PM					12:15 PM				
Volume	14	345	11	3	373	7	3	5	15	3	354	7	1	365	12	1	5	18	
Peak Factor					0.952				0.733				0.843					0.903	

Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1

Intersection	04:30 PM																		
Volume	29	1857	84	1	1971	25	16	23	64	22	1059	47	1	1129	53	12	22	87	3251
Percent	1.5	94.2	4.3	0.1		39.1	25.0	35.9		1.9	93.8	4.2	0.1		60.9	13.8	25.3		
05:15 Volume	5	489	20	0	514	4	6	3	13	6	270	11	0	287	12	4	10	26	840
Peak Factor																			0.968
High Int.	05:15 PM					04:30 PM				04:45 PM					04:45 PM				
Volume	5	489	20	0	514	8	5	9	22	5	269	17	1	292	20	5	2	27	
Peak Factor					0.959				0.727				0.967					0.806	

Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1

By Approach	04:45 PM					04:30 PM				04:15 PM					04:30 PM				
Volume	30	1868	84	2	1984	25	16	23	64	22	1070	42	2	1136	53	12	22	87	
Percent	1.5	94.2	4.2	0.1		39.1	25.0	35.9		1.9	94.2	3.7	0.2		60.9	13.8	25.3		
High Int.	05:15 PM					04:30 PM				04:15 PM					04:45 PM				
Volume	5	489	20	0	514	8	5	9	22	6	281	6	1	294	20	5	2	27	
Peak Factor					0.965				0.727				0.966					0.806	

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

Vestavia Hills, AL

File Name : vestavia06
Site Code : 00000000
Start Date : 05/17/2012
Page No : 1

Groups Printed- Unshifted

	HWY 31 Southbound				RUBY TUESDAY'S ACCESS Westbound			HWY 31 Northbound				VESTAVIA HILLS PLAZA Eastbound			
Start Time	Left	Thru	Right	uturn	Left	Thru	Right	Left	Thru	Right	uturn	Left	Thru	Right	Int. Total
07:00 AM	2	103	0	0	0	0	0	1	422	3	0	0	0	0	531
07:15 AM	1	191	0	0	4	0	0	1	475	2	0	0	0	0	674
07:30 AM	1	284	1	0	1	1	0	0	487	2	0	0	0	0	777
07:45 AM	2	312	1	0	4	0	0	1	502	5	0	1	1	0	829
Total	6	890	2	0	9	1	0	3	1886	12	0	1	1	0	2811
08:00 AM	1	197	0	0	2	0	0	2	490	5	0	1	0	1	699
08:15 AM	2	194	1	0	4	0	0	2	433	7	0	4	0	1	648
08:30 AM	1	161	0	0	3	0	0	6	309	5	1	0	0	0	486
08:45 AM	4	151	6	0	4	1	1	8	355	15	1	6	0	1	553
Total	8	703	7	0	13	1	1	18	1587	32	2	11	0	3	2386
11:00 AM	8	252	4	1	21	1	0	13	276	12	0	5	1	4	598
11:15 AM	17	306	12	1	8	0	1	5	287	17	1	4	0	1	660
11:30 AM	9	308	6	2	16	1	2	20	297	14	0	8	0	1	684
11:45 AM	9	356	7	1	18	1	2	6	320	15	0	4	0	4	743
Total	43	1222	29	5	63	3	5	44	1180	58	1	21	1	10	2685
12:00 PM	11	285	8	1	16	1	5	11	244	4	0	8	1	4	599
12:15 PM	11	300	8	3	13	1	0	6	273	14	0	4	1	9	643
12:30 PM	10	298	10	6	18	1	2	8	311	7	1	9	0	3	684
12:45 PM	6	309	6	0	8	1	1	7	312	11	0	4	1	5	671
Total	38	1192	32	10	55	4	8	32	1140	36	1	25	3	21	2597
04:00 PM	4	429	6	2	15	1	3	7	267	5	0	4	0	1	744
04:15 PM	4	421	8	2	14	0	1	7	252	2	1	7	0	3	722
04:30 PM	4	430	4	0	19	2	0	5	288	5	1	6	0	2	766
04:45 PM	5	449	5	0	19	1	0	5	271	10	1	4	0	2	772
Total	17	1729	23	4	67	4	4	24	1078	22	3	21	0	8	3004
05:00 PM	4	487	2	3	19	1	0	2	293	1	0	5	0	3	820
05:15 PM	6	464	5	3	16	0	0	4	297	4	0	2	0	4	805
05:30 PM	5	472	3	1	6	1	1	10	268	6	0	3	0	6	782
05:45 PM	3	417	4	2	9	0	1	7	270	7	0	8	2	3	733
Total	18	1840	14	9	50	2	2	23	1128	18	0	18	2	16	3140
Grand Total	130	7576	107	28	257	15	20	144	7999	178	7	97	7	58	16623
Apprch %	1.7	96.6	1.4	0.4	88.0	5.1	6.8	1.7	96.0	2.1	0.1	59.9	4.3	35.8	
Total %	0.8	45.6	0.6	0.2	1.5	0.1	0.1	0.9	48.1	1.1	0.0	0.6	0.0	0.3	

	HWY 31 Southbound					RUBY TUESDAY'S ACCESS Westbound				HWY 31 Northbound					VESTAVIA HILLS PLAZA Eastbound				
Start Time	Left	Thru	Right	uturn	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	uturn	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																			
Intersection	07:15 AM																		
Volume	5	984	2	0	991	11	1	0	12	4	1954	14	0	1972	2	1	1	4	2979
Percent	0.5	99.3	0.2	0.0		91.7	8.3	0.0		0.2	99.1	0.7	0.0		50.0	25.0	25.0		
07:45 Volume	2	312	1	0	315	4	0	0	4	1	502	5	0	508	1	1	0	2	829
Peak Factor																			0.898

High Int.	07:45 AM					07:15 AM				07:45 AM					07:45 AM				
Volume	2	312	1	0	315	4	0	0	4	1	502	5	0	508	1	1	0	2	
Peak Factor					0.787				0.750					0.970				0.500	

Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1

By Approach	07:30 AM					08:00 AM				07:15 AM					08:00 AM				
Volume	6	987	3	0	996	13	1	1	15	4	1954	14	0	1972	11	0	3	14	
Percent	0.6	99.1	0.3	0.0		86.7	6.7	6.7		0.2	99.1	0.7	0.0		78.6	0.0	21.4		
High Int.	07:45 AM					08:45 AM				07:45 AM					08:45 AM				
Volume	2	312	1	0	315	4	1	1	6	1	502	5	0	508	6	0	1	7	
Peak Factor					0.790				0.625					0.970				0.500	

Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1

Intersection	11:15 AM																		
Volume	46	1255	33	5	1339	58	3	10	71	42	1148	50	1	1241	24	1	10	35	2686
Percent	3.4	93.7	2.5	0.4		81.7	4.2	14.1		3.4	92.5	4.0	0.1		68.6	2.9	28.6		
11:45 Volume	9	356	7	1	373	18	1	2	21	6	320	15	0	341	4	0	4	8	743
Peak Factor																			0.904
High Int.	11:45 AM					12:00 PM				11:45 AM					12:00 PM				
Volume	9	356	7	1	373	16	1	5	22	6	320	15	0	341	8	1	4	13	
Peak Factor					0.897				0.807					0.910				0.673	

Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1

By Approach	11:15 AM					11:45 AM				11:00 AM					12:00 PM				
Volume	46	1255	33	5	1339	65	4	9	78	44	1180	58	1	1283	25	3	21	49	
Percent	3.4	93.7	2.5	0.4		83.3	5.1	11.5		3.4	92.0	4.5	0.1		51.0	6.1	42.9		
High Int.	11:45 AM					12:00 PM				11:45 AM					12:15 PM				
Volume	9	356	7	1	373	16	1	5	22	6	320	15	0	341	4	1	9	14	
Peak Factor					0.897				0.886					0.941				0.875	

Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1

Intersection	04:45 PM																		
Volume	20	1872	15	7	1914	60	3	1	64	21	1129	21	1	1172	14	0	15	29	3179
Percent	1.0	97.8	0.8	0.4		93.8	4.7	1.6		1.8	96.3	1.8	0.1		48.3	0.0	51.7		
05:00 Volume	4	487	2	3	496	19	1	0	20	2	293	1	0	296	5	0	3	8	820
Peak Factor																			0.969
High Int.	05:00 PM					04:45 PM				05:15 PM					05:30 PM				
Volume	4	487	2	3	496	19	1	0	20	4	297	4	0	305	3	0	6	9	
Peak Factor					0.965				0.800					0.961				0.806	

Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1

By Approach	04:45 PM					04:30 PM				04:30 PM					05:00 PM				
Volume	20	1872	15	7	1914	73	4	0	77	16	1149	20	2	1187	18	2	16	36	
Percent	1.0	97.8	0.8	0.4		94.8	5.2	0.0		1.3	96.8	1.7	0.2		50.0	5.6	44.4		
High Int.	05:00 PM					04:30 PM				05:15 PM					05:45 PM				
Volume	4	487	2	3	496	19	2	0	21	4	297	4	0	305	8	2	3	13	
Peak Factor					0.965				0.917					0.973				0.692	

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

Vestavia Hills, AL

File Name : vestavia11
Site Code : 00000000
Start Date : 05/15/2012
Page No : 1

Groups Printed- Unshifted

	HWY 31 Southbound			PIZITZ DR Westbound			HWY 31 Northbound				VESTAVIA FOREST PL Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	uturn	Left	Thru	Right	Int. Total
04:00 PM	23	348	4	45	3	36	9	258	21	2	3	2	6	760
04:15 PM	8	430	7	24	2	22	4	303	18	0	3	2	10	833
04:30 PM	11	406	1	14	1	15	6	293	26	1	2	0	11	787
04:45 PM	16	377	2	17	5	20	8	278	24	0	0	4	7	758
Total	58	1561	14	100	11	93	27	1132	89	3	8	8	34	3138
05:00 PM	13	338	4	30	2	27	13	315	28	3	1	1	7	782
05:15 PM	21	394	3	27	2	16	16	349	24	0	0	2	7	861
05:30 PM	7	343	2	22	0	11	8	297	22	2	2	1	3	720
05:45 PM	6	377	3	18	2	12	12	268	27	0	0	0	15	740
Total	47	1452	12	97	6	66	49	1229	101	5	3	4	32	3103
07:00 AM	16	108	0	15	0	17	8	386	25	1	1	3	19	599
07:15 AM	30	181	1	41	0	55	7	443	56	0	4	1	18	837
07:30 AM	70	263	4	32	6	91	21	352	52	0	8	14	10	923
07:45 AM	79	289	5	45	8	84	13	317	51	0	8	17	21	937
Total	195	841	10	133	14	247	49	1498	184	1	21	35	68	3296
08:00 AM	23	202	1	44	6	41	4	389	26	0	6	8	8	758
08:15 AM	9	213	0	17	0	21	3	408	15	0	0	1	15	702
08:30 AM	7	200	2	8	1	12	1	265	10	1	0	0	12	519
08:45 AM	11	176	2	13	0	5	4	263	8	0	0	1	14	497
Total	50	791	5	82	7	79	12	1325	59	1	6	10	49	2476
11:00 AM	7	247	2	14	2	9	3	263	5	0	0	0	10	562
11:15 AM	9	305	0	5	1	14	11	307	19	1	2	0	7	681
11:30 AM	8	275	0	12	0	18	4	284	13	0	1	0	5	620
11:45 AM	11	253	1	11	0	14	13	278	15	1	0	2	6	605
Total	35	1080	3	42	3	55	31	1132	52	2	3	2	28	2468
12:00 PM	4	300	0	27	3	16	8	273	20	1	1	1	5	659
12:15 PM	10	357	0	10	1	8	5	286	9	2	1	0	8	697
12:30 PM	14	301	0	12	0	12	4	311	9	0	2	0	8	673
12:45 PM	14	303	6	15	2	18	10	307	8	0	0	0	5	688
Total	42	1261	6	64	6	54	27	1177	46	3	4	1	26	2717
Grand Total	427	6986	50	518	47	594	195	7493	531	15	45	60	237	17198
Apprch %	5.7	93.6	0.7	44.7	4.1	51.3	2.4	91.0	6.4	0.2	13.2	17.5	69.3	
Total %	2.5	40.6	0.3	3.0	0.3	3.5	1.1	43.6	3.1	0.1	0.3	0.3	1.4	

	HWY 31 Southbound				PIZITZ DR Westbound				HWY 31 Northbound					VESTAVIA FOREST PL Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	uturn	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																		
Intersection	04:30 PM																	
Volume	61	1515	10	1586	88	10	78	176	43	1235	102	4	1384	3	7	32	42	3188
Percent	3.8	95.5	0.6		50.0	5.7	44.3		3.1	89.2	7.4	0.3		7.1	16.7	76.2		
05:15 Volume	21	394	3	418	27	2	16	45	16	349	24	0	389	0	2	7	9	861
Peak Factor																		0.926
High Int.	04:30 PM				05:00 PM				05:15 PM					04:30 PM				
Volume	11	406	1	418	30	2	27	59	16	349	24	0	389	2	0	11	13	
Peak Factor				0.949				0.746					0.889				0.808	

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

File Name : vestavia11
Site Code : 00000000
Start Date : 05/15/2012
Page No : 2

	HWY 31 Southbound				PIZITZ DR Westbound				HWY 31 Northbound					VESTAVIA FOREST PL Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	uturn	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																		
By Approach	04:00 PM				04:00 PM				04:45 PM					04:00 PM				
Volume	58	1561	14	1633	100	11	93	204	45	1239	98	5	1387	8	8	34	50	
Percent	3.6	95.6	0.9		49.0	5.4	45.6		3.2	89.3	7.1	0.4		16.0	16.0	68.0		
High Int.	04:15 PM				04:00 PM				05:15 PM					04:15 PM				
Volume	8	430	7	445	45	3	36	84	16	349	24	0	389	3	2	10	15	
Peak Factor				0.917				0.607					0.891				0.833	
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																		
Intersection	07:15 AM																	
Volume	202	935	11	1148	162	20	271	453	45	1501	185	0	1731	26	40	57	123	3455
Percent	17.6	81.4	1.0		35.8	4.4	59.8		2.6	86.7	10.7	0.0		21.1	32.5	46.3		
07:45 Volume	79	289	5	373	45	8	84	137	13	317	51	0	381	8	17	21	46	937
Peak Factor																		0.922
High Int.	07:45 AM				07:45 AM				07:15 AM					07:45 AM				
Volume	79	289	5	373	45	8	84	137	7	443	56	0	506	8	17	21	46	
Peak Factor				0.769				0.827					0.855				0.668	
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																		
By Approach	07:30 AM				07:15 AM				07:00 AM					07:00 AM				
Volume	181	967	10	1158	162	20	271	453	49	1498	184	1	1732	21	35	68	124	
Percent	15.6	83.5	0.9		35.8	4.4	59.8		2.8	86.5	10.6	0.1		16.9	28.2	54.8		
High Int.	07:45 AM				07:45 AM				07:15 AM					07:45 AM				
Volume	79	289	5	373	45	8	84	137	7	443	56	0	506	8	17	21	46	
Peak Factor				0.776				0.827					0.856				0.674	
Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1																		
Intersection	12:00 PM																	
Volume	42	1261	6	1309	64	6	54	124	27	1177	46	3	1253	4	1	26	31	2717
Percent	3.2	96.3	0.5		51.6	4.8	43.5		2.2	93.9	3.7	0.2		12.9	3.2	83.9		
12:15 Volume	10	357	0	367	10	1	8	19	5	286	9	2	302	1	0	8	9	697
Peak Factor																		0.975
High Int.	12:15 PM				12:00 PM				12:45 PM					12:30 PM				
Volume	10	357	0	367	27	3	16	46	10	307	8	0	325	2	0	8	10	
Peak Factor				0.892				0.674					0.964				0.775	
Peak Hour From 11:00 AM to 12:45 PM - Peak 1 of 1																		
By Approach	12:00 PM				12:00 PM				12:00 PM					11:45 AM				
Volume	42	1261	6	1309	64	6	54	124	27	1177	46	3	1253	4	3	27	34	
Percent	3.2	96.3	0.5		51.6	4.8	43.5		2.2	93.9	3.7	0.2		11.8	8.8	79.4		
High Int.	12:15 PM				12:00 PM				12:45 PM					12:30 PM				
Volume	10	357	0	367	27	3	16	46	10	307	8	0	325	2	0	8	10	
Peak Factor				0.892				0.674					0.964				0.850	

Appendix B – Capacity Analysis Reports

ALABAMA DEPARTMENT OF TRANSPORTATION

Capacity Analysis for Planning of Roundabouts

Instructions for Use

This tool is designed to provide a quick guide in determining a suitable layout for a proposed roundabout at planning level . Four predetermined hierarchical layouts —namely, 1x1 Rndabt , 1NS x 2 EW Rndabt, 2 NS x 1 EW Rndabt and 2x2 Rndabt (See Notice for details) — are evaluated for their operational performances.The evaluation follows the procedures set in the Highway Capacity Manual (2010 HCM), *NCHRP* Report 672 and the ALDOT Roundabout Planning, Design and Operational Manual. Final selection of a suitable layout should be based on a balanced cost and operational efficiency. The configurations presented here may be used for planning purposes only. Further analysis may be needed to achieve optimum design configuration

Steps in using this tool:

***Step 1*:** Go to the Input worksheet and fill in the required information located in the "Yellow" boxes.

Step 2: Go through the "Design Sheet" on the second page of each design worksheet and fill in the required information located in the "Yellow" boxes.

Step 3*:* Review the design on the "Result Sheet"located on the first page of each design worksheet and adjust the number of lanes (Right-turn Bypass lanes) for each approach where required.

Step 4*:* Go to the Output Worksheet and review the consolidated output of the different configurations.

Notes

1. Best practices suggest V/C ratio thresholds of between 0.85 and 0.90 for satisfactory performance of the roundabout during the design year. Higher degree of saturation (V/C > 0.85) may still perform acceptably in less critical areas (such as intersection with minor streets) where the impact of adding capacity exceeds benefit. More care may be appropriate in areas where queuing is more sensitive (e.g., closely spaced intersections, and interchange off-ramps).
2. Where a Type 2 Right-Turn Bypass lane (refer to ALDOT manual) is required, the analysis assumes zero delay and large capacity on the Bypass lane.
3. Projected Traffic Volume is the volume per day at the end of n years.
4. 1x1 Rndabt : refers to design geometry where one-lane entry conflicts with one-lane circulating lane.
5. 1NS x 2 EW Rndabt: refers to design geometry where one entry lane conflicts with two circulating lanes.
6. NS x 1 EW Rndabt: refers to design geometry where two entry lanes conflict with one circulating lanes.
7. 2x2 Rndabt : refers to design geometry where two entry lanes conflict with two circulating lanes.
8. Four SHADES OF GREEN are used to indicate different levels of acceptability of a particular performance measure; dark green indicates highly favorable and light green indicate less favorable.
9. Generally, a RED shaded cell indicate unacceptable performance measure.
10. Calibration Parameters for Capacity Equations: Refer to TABLE 2.3 in the ALDOT Roundabout Manual for values of Parameters A and B. Otherwise input site-specific values.
11. To reset the parameter values in the "Design Sheet" to their default values , simply delete the content of the cells
13. Single-lane: refers to model parameters for the single entry lane when one-lane entry conflicts with one-lane circulating lane
14 2x2, RT lane: refers to model parameters for the entry right lane when two entry lanes conflict with two circulating lanes
15. 2x2, LT lane: refers to model parameters for the entry left lane when two entry lanes conflict with two circulating lanes
16. 2x1, RT/LT lanes: refers to model parameters for each entry lane when two entry lanes conflict with one circulating lanes
17. 1x2, one lane: refers to model parameters for the entry lane when one entry lane conflicts with two circulating lanes.
18. Bypass Type1a: refers to a yielding Bypass lane opposed by one exiting lane
19. Bypass Type 1b: refers to a yielding Bypass lane opposed by two exiting lanes
20. Bypass Type 2: refers to a non-yielding Bypass lanes that merge with exiting traffic through a downstream merging operation, no empirical model exist yet, but higher entry capacities are expected

Disclaimer

This planning tool is based on the Capacity Analysis for Planning of Junctions (CAP-X) sofware developed by the Federal Highway Administration (FHWA). The CAP-X software was modified for use by Alabama Department of Transportation. Modifications include:

i. A lane utilization function to account for lane disciplane.
ii. A function to account for pedestrian traffic .
iii. A "future year" function to allow for user defined n years design period in the traffic growth model equation.
iv. A function to allow for user defined parameters in the capacity model equations.
v. A function to allow for a Right-Turn Bypass analysis.
vi. A display function of the Right-Turn Bypass lane Measures of Effectiveness (MoE's) on each "Result Sheet".
vii. A display function of each "Approach Delay" and the "Overall Intersection Delay" on each "Result Sheet".
viii. A redefined color-coded output of V/C ratios, LOS and Delays .

This tool maybe updated to reflect changing practices and experience in the State. It is the responsibility of the user to check the ALDOT website periodically for updates to this tool.

Capacity Analysis for Planning of Roundabouts

Abbreviation Definition

EB	Eastbound
pc/h	Passenger Car Per Hour
PCE	Per Car Equivalent
LT,TR	Left+ Through, Through Right
L, LTR	Left , Left +Through +Right
LTR,R	Left+Through+Right, Right
NB	Northbound
RT lane	Right Lane
LT lane	Left Lane
SB	Southbound
V/C	Volume/Capacity
Veh/h	Vehicle per hour
WB	Westbound
f_{HV}	Heavy Vehicle adjustment factor
f_{ped}	Pedestrian adjustment factor
ped/h	Pedestrian per hour

Capacity Analysis for Planning of Roundabouts

Input Worksheet

Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*
Project Number:	*SA#18-0337*
Location	*Vestavia Hills, Alabama*
Date	March 28, 2019

Traffic Volume Demand

	Volume (Veh/h)				Proportion of Trucks	Traffic Volume Growth Rate	n_{ped} (ped/h)	Lane Discipline: 2-Lane Approach
	U-Turn	Left	Thru	Right				
Eastbound	0	0	0	0	1.30%	1.00%	0	Not Sure
Westbound	0	230	0	272	1.30%	1.00%	0	Not Sure
Southbound	0	92	253	0	1.30%	1.00%	0	LT,TR
Northbound	0	0	597	80	1.30%	1.00%	0	LT,TR
Peak Hour Factor	1.00	0.88	0.90	0.83				
Truck to PCE Factor	2.00							
Design Period (years)	5							
Construction Year	2015							

Demand Flow Rate (PCE) / Adjustment Factors

	Volume (pc/h)				f_{HV}	f_{ped}	
	U-Turn	Left	Thru	Right		Single-lane entry	Multilane entry
Eastbound	0	0	0	0	0.987	1.000	1.000
Westbound	0	276	0	345	0.987	1.000	1.000
Southbound	0	110	296	0	0.987	1.000	1.000
Northbound	0	0	699	102	0.987	1.000	1.000

Notes:

1 The Traffic Volume Demand input values are movement volumes for the year of construction completion
2 The proportion of truck traffic and growth rate values are to be entered as percentile eg. If growth rate or proportion of truck traffic is 2%, enter 2 and not 0.02
3 Growth rate values ranges from 0% to 4%. If no data available, use 0.5%
4 Lane Discipline refers to existing intersection approach (2 lanes) configuration as indicated by the existing pavement markings. This may be different from the ultim roundabout entry lane configuration depending on the traffic volume redistribution (See "Design Sheet" on subsequent worksheets). If no information is available, a in the case of a new road development, select "Not Sure".
5 The design period is typically 20 years as per Section 2.2.5 of ALDOT Roundabout Manual. A user may however, select a design year per their design requiremen
6 The Peak Hour Factor input cell default value is 0.95
7 Truck to PCE factor has default value of 2.0 per section 2.2.1 of the ALDOT Roundabout Manual.

1 NS x 1 EW Roundabout

Results Sheet

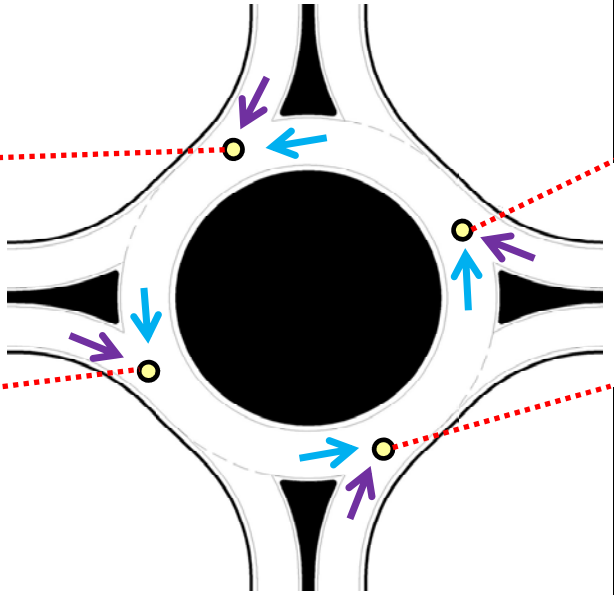
Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*	ALABAMA DEPARTMENT OF TRANSPORTATION	
Project Number:	*SA#18-0337*		
Location	*Vestavia Hills, Alabama*	**Overal Roundabout Delay, s/veh**	**21.1**
Date	March 28, 2019	**Overal Roundabout LOS**	**C**

Zone 1

Predicted approach MOE		
Lane 1	0.39	V/C
	7.7	d, s/veh
	A	LOS
	2	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	7.7	

Zone 4

Predicted approach MOE		
Lane 1	0.92	V/C
	42.2	d, s/veh
	E	LOS
	13	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	42.2	



Zone 3

Predicted approach MOE		
Lane 1	0.00	V/C
	10.3	d, s/veh
	B	LOS
	0	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	10.3	

Zone 2

Predicted approach MOE		
Lane 1	0.65	V/C
	11.5	d, s/veh
	B	LOS
	6	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	11.5	

1 NS x 1 EW Lane Roundabout

Design Sheet

Equation	A x exp(-B x Q)			
Single-Lane	A	1380	B	0.00102
Bypass Type1a	A	1380	B	0.00102
Bypass Type1b	A	1420	B	0.00085

Right-turn Bypass Lane
No
Type2 (nonyielding)
pc/h
n/a
veh/h
n/a
capacity
pc/h
n/a
veh/h
n/a
conflicting with
pc/h
n/a
V/C RATIO
n/a

pc/h	pc/h	pc/h	pc/h
0	296	110	0

Zone 1

pc/h	veh/h	V/C RATIO
406	401	0.39

Predicted approach capacity	
1041	pc/h
1028	veh/h
conflicting with	
276	pc/h
Conflicting flow	
1 Lane	

n/a	V/C RATIO	n/a	pc/h	conflicting with	n/a	veh/h	n/a	pc/h	capacity	n/a	veh/h	n/a	pc/h	No	Right-turn Bypass Lane
														Type1a (yielding)	

0.92	V/C RATIO	613	veh/h	621	pc/h

345	pc/h
0	pc/h
276	pc/h
0	pc/h

Zone 4

Predicted approach capacity	
676	pc/h
668	veh/h
conflicting with	
699	pc/h

1 Lane	Conflicting flow

Predicted approach capacity		Conflicting flow	1 Lane
688	pc/h		
679	veh/h		
conflicting with			
682	pc/h		

0	pc/h
0	pc/h
0	pc/h
0	pc/h

Zone 3

pc/h	0	V/C RATIO	0.00

Right-turn Bypass Lane	No	pc/h	n/a	veh/h	n/a	capacity	pc/h	n/a	veh/h	n/a	conflicting with	pc/h	n/a	V/C Ratio	n/a
	Type1a (yielding)														

Back to Output Worksheet

1 Lane	
Conflicting flow	
Predicted approach capacity	
1234	pc/h
1218	veh/h
conflicting with	
110	pc/h

0.65	V/C RATIO
791	veh/h
801	pc/h

0	0	599	102
pc/h	pc/h	pc/h	pc/h

Zone 2

n/a
V/C RATIO
n/a
pc/h
conflicting with
n/a
veh/h
n/a
pc/h
capacity
n/a
veh/h
n/a
pc/h
No
Type1b (yielding)
Right-turn Bypass Lane

1 NS x 2 EW Lane Roundabout

Results Sheet

Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*
Project Number:	*SA#18-0337*
Location	*Vestavia Hills, Alabama*
Date	March 28, 2019

ALABAMA DEPARTMENT OF TRANSPORTATION

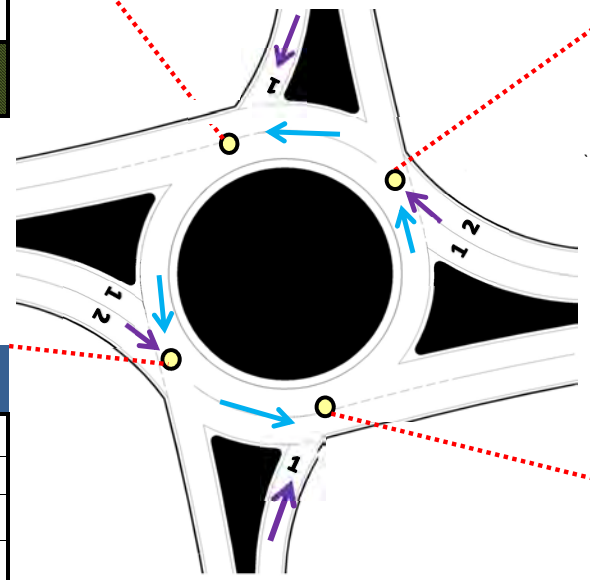
Overal Roundabout Delay, s/veh	
Overal Roundabout LOS	

Zone 1

Predicted approach capacity		
Lane 1	0.36	V/C
	6.9	d, s/veh
	A	LOS
	2	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	6.9	

Zone 4

Predicted approach capacity		
Lane 1	0.37	V/C
	9.5	d, s/veh
	A	LOS
	2	Q_{95}, veh
Lane 2	0.46	V/C
	11.2	d, s/veh
	B	LOS
	3	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	10.4	



Zone 3

Predicted approach capacity		
Lane 1	0.00	V/C
	4.8	d, s/veh
	A	LOS
	0	Q_{95}, veh
Lane 2	0.00	V/C
	4.8	d, s/veh
	A	LOS
	0	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh		

Zone 2

Predicted approach capacity		
Lane 1	0.62	V/C
	10.4	d, s/veh
	B	LOS
	5	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	10.4	

1 NS x 2 EW Lane Roundabout

Design Sheet

Equation		A x exp(-B x Q)		
1 Entry, 2 Circ.	A	1420	B	0.00085
Bypass Type1a	A	1380	B	0.00102
Bypass Type1b	A	1420	B	0.00085
2 Entry, 1 Circ.	A	1420	B	0.00091

Zone 1

pc/h	pc/h	pc/h	pc/h
0	296	110	0

Right-turn Bypass Lane
No
Type1a (yielding)
pc/h
n/a
veh/h
n/a
capacity
pc/h
n/a
veh/h
n/a
conflicting with
pc/h
n/a
V/C RATIO
n/a

pc/h
406
veh/h
401
V/C RATIO
0.36
1

Conflicting flow		
0		
276		
Lane Cap.	pc/h	veh/h
1	1123	1109

n/a	No	Right-turn Bypass Lane
V/C RATIO	Type1a (yielding)	
n/a		
pc/h		
conflicting with		
n/a		
veh/h		
n/a		
pc/h		
capacity		
n/a		
veh/h		
n/a		
pc/h		

2	0.46	V/C RATIO	341	veh/h	345	pc/h	
1	0.37	V/C RATIO	273	veh/h	276	pc/h	

345		LT,R	0.56
0		Roundabout Entry Lane Discipline	
0		Right turn to Total Flow Ratio	
276			

1	752	752	pc/h	Conflicting flow
2	742	742	veh/h	
Lane Cap.	699			

Zone 4

345	pc/h
0	pc/h
276	pc/h
0	pc/h

Back to Output Worksheet

Zone 3

pc/h	0
pc/h	0
pc/h	0
pc/h	0

Conflicting flow	682	Lane Cap.	2	1
		pc/h	763	763
		veh/h	754	754

	pc/h	0	veh/h	0	V/C RATIO	0.00	1
	pc/h	0	veh/h	0	V/C RATIO	0.00	2

Right-turn Bypass Lane	No	pc/h	n/a	veh/h	n/a	capacity	pc/h	n/a	veh/h	n/a	conflicting with	pc/h	n/a	V/C Ratio	n/a
	Type1b (yielding)														

Roundabout Entry Lane Discipline	
Right turn to Total Flow Ratio	LT,TR
#DIV/0!	

0
0
0
0

1	1293	1277
Lane Cap.	pc/h	veh/h
0		
110		
Conflicting flow		

1
0.62
V/C RATIO
791
veh/h
801
pc/h

n/a
V/C RATIO
n/a
pc/h
conflicting with
n/a
veh/h
n/a
pc/h
capacity
n/a
veh/h
n/a
pc/h
No
Type1b (yielding)
Right-turn Bypass Lane

Zone 2

0	0	699	102
pc/h	pc/h	pc/h	pc/h

2 NS x 1 EW Lane Roundabout

Results Sheet

Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*
Project Number:	*SA#18-0337*
Location	*Vestavia Hills, Alabama*
Date	March 28, 2019

ALABAMA DEPARTMENT OF TRANSPORTATION

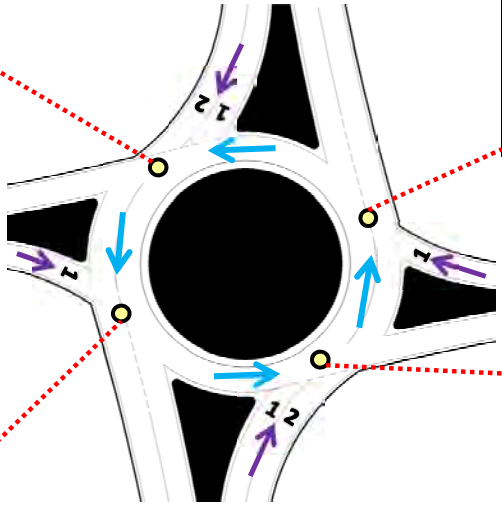
Overal Roundabout Delay, s/veh	
Overal Roundabout LOS	

Zone 1

Predicted approach capacity		
Lane 1	0.17	V/C
	4.9	d, s/veh
	A	LOS
	1	Q_{95}, veh
Lane 2	0.19	V/C
	5.1	d, s/veh
	A	LOS
	1	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	5.0	

Zone 4

Predicted approach capacity		
Lane 1	0.79	V/C
	23.9	d, s/veh
	C	LOS
	9	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	23.9	



Zone 3

Predicted approach capacity		
Lane 1	0.00	V/C
	4.6	d, s/veh
	A	LOS
	0	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh		

Zone 2

Predicted approach capacity		
Lane 1	0.29	V/C
	5.5	d, s/veh
	A	LOS
	2	Q_{95}, veh
Lane 2	0.33	V/C
	5.9	d, s/veh
	A	LOS
	2	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	5.7	

2 NS x 1 EW Lane Roundabout

Design Sheet

Right turn to Total Flow Ratio	0.00
Roundabout Entry Lane Discipline	LT,TR

pc/h	pc/h	pc/h	pc/h
0	296	110	0

0	110
215	81

Zone 1

Equation		A x exp(-B x Q)		
1 Entry, 2 Circ.	A	1420	B	0.00085
Bypass Type1a	A	1380	B	0.00102
Bypass Type1b	A	1420	B	0.00085
2 Entry, 1 Circ.	A	1420	B	0.00091

Right-turn Bypass Lane
No
Type2 (nonyielding)
pc/h
n/a
veh/h
n/a
capacity
pc/h
n/a
veh/h
n/a
conflicting with
pc/h
n/a
V/C RATIO
n/a

pc/h	pc/h
215	191
veh/h	veh/h
212	188
V/C RATIO	V/C RATIO
0.19	0.17
2	1

Conflicting flow	
276	
Lane Cap.	pc/h	veh/h
1	1105	1090
2	1105	1090

n/a	V/C RATIO	n/a	pc/h	conflicting with	n/a	veh/h	n/a	pc/h	capacity	n/a	veh/h	n/a	pc/h	No	Right-turn Bypass Lane
														Type1a (yielding)	

1	0.79	V/C RATIO	613	veh/h	621	pc/h

784	pc/h
774	veh/h
1	Lane Cap.	376	323	Conflicting flow
---	---	---	---	---

Zone 4

345	pc/h
0	pc/h
276	pc/h
0	pc/h

Back to Output Worksheet

n/a
V/C RATIO
n/a
pc/h
conflicting with
n/a
veh/h
n/a
pc/h
capacity
n/a
veh/h
n/a
pc/h
No
Type1a (yielding)
Right-turn Bypass Lane

1	2
0.29	0.33
V/C RATIO	V/C RATIO
372	419
veh/h	veh/h
376	425
pc/h	pc/h

1	1285	1268
2	1285	1268
Lane Cap.	pc/h	veh/h
110		
Conflicting flow		

pc/h	0
pc/h	0
pc/h	0
pc/h	0

Zone 3

Conflicting flow	215	467	Lane Cap.	1
			pc/h	795
			veh/h	785

pc/h	0	veh/h	0	V/C RATIO	0.00	1

Right-turn Bypass Lane	No	pc/h	n/a	veh/h	n/a	capacity	pc/h	n/a	veh/h	n/a	conflicting with	pc/h	n/a	V/C Ratio	n/a
	Type1b (yielding)														

Zone 2

0	0	699	102
pc/h	pc/h	pc/h	pc/h

0	376	323	102

Roundabout Entry Lane Discipline	LT,TR
Right turn to Total Flow Ratio	0.13

2 NS x 2 EW Lane Roundabout

Results Sheet

Project Name:	Vestavia Hills Traffic Operations Study Phase 1
Project Number:	SA#18-0337
Location	Vestavia Hills, Alabama
Date	March 28, 2019

ALABAMA DEPARTMENT OF TRANSPORTATION

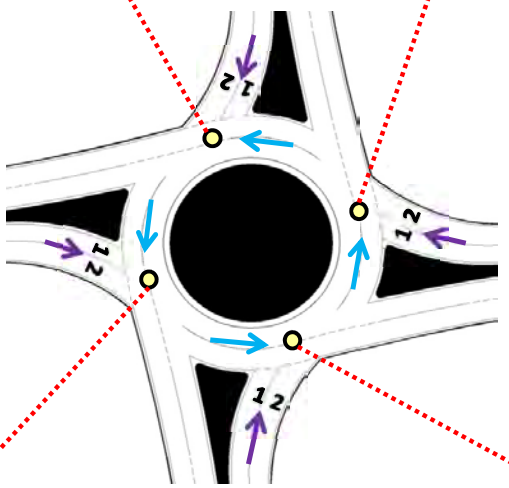
Overal Roundabout Delay, s/veh	
Overal Roundabout LOS	

Zone 1

Predicted approach capacity		
Lane 1	0.18	V/C
	5.2	d, s/veh
	A	LOS
	1	Q_{95}, veh
Lane 2	0.19	V/C
	5.0	d, s/veh
	A	LOS
	1	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	5.1	

Zone 4

Predicted approach capacity		
Lane 1	0.39	V/C
	10.3	d, s/veh
	B	LOS
	2	Q_{95}, veh
Lane 2	0.44	V/C
	10.5	d, s/veh
	B	LOS
	3	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	10.4	



Zone 3

Predicted approach capacity		
Lane 1	0.00	V/C
	5.1	d, s/veh
	A	LOS
	0	Q_{95}, veh
Lane 2	0.00	V/C
	4.6	d, s/veh
	A	LOS
	0	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh		

Zone 2

Predicted approach capacity		
Lane 1	0.31	V/C
	5.9	d, s/veh
	A	LOS
	2	Q_{95}, veh
Lane 2	0.33	V/C
	5.8	d, s/veh
	A	LOS
	2	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	5.8	

2 NS x 2 EW Lane Roundabout

Design Sheet

Equation		A x exp(-B x Q)		
LT Lane	A	1350	B	0.00092
RT Lane	A	1420	B	0.00085
Bypass Type1a	A	1380	B	0.00102
Bypass Type1b	A	1420	B	0.00085

Zone 1

Right turn to Total Flow Ratio	0.00
Roundabout Entry Lane Discipline	LT,TR

pc/h	pc/h	pc/h	pc/h
0	296	110	0

0 | 110 | 215 | 81

Right-turn Bypass Lane
No
Type2 (nonyielding)
pc/h
n/a
veh/h
n/a
capacity
pc/h
n/a
veh/h
n/a
conflicting with
pc/h
n/a
V/C RATIO
n/a

pc/h	pc/h
215	191
veh/h	veh/h
212	188
V/C RATIO	V/C RATIO
0.19	0.18
2	1

Conflicting flow	
0	
276	

Lane Cap.		
1	1047	1034
2	1123	1109

n/a	V/C RATIO	n/a	pc/h	conflicting with	n/a	veh/h	n/a	pc/h	capacity	n/a	veh/h	n/a	pc/h	No	Right-turn Bypass Lane
														Type1b (yielding)	

2	0.44	V/C RATIO	341	veh/h	345	pc/h
1	0.39	V/C RATIO	273	veh/h	276	pc/h

710	784	pc/h
701	774	veh/h
1	2	Lane Cap.
	376	323
	Conflicting flow	

Zone 4

345 | 0 | 276 | 0

LT,R	0.56
Roundabout Entry Lane Discipline	
Right turn to Total Flow Ratio	

0 | 345 | 0 | 276

Back to Output Worksheet

Zone 3

pc/h	0
pc/h	0
pc/h	0
pc/h	0

Conflicting flow	215	467
Lane Cap.	2	1
pc/h	795	721
veh/h	785	712

pc/h	0	veh/h	0	V/C RATIO	0.00	1
pc/h	0	veh/h	0	V/C RATIO	0.00	2

Right-turn Bypass Lane	No
	Type2 (nonyielding)

pc/h	n/a	veh/h	n/a	capacity	pc/h	n/a	veh/h	n/a	conflicting with	pc/h	n/a	V/C Ratio	n/a

Roundabout Entry Lane Discipline	LT,TR
Right turn to Total Flow Ratio	#DIV/0!

0 | 0 | 0 | 0

1	1220	1204
2	1293	1277
Lane Cap.	pc/h	veh/h
110		
0		
Conflicting flow		

1	2
0.31	0.33
V/C RATIO	V/C RATIO
372	419
veh/h	veh/h
376	425
pc/h	pc/h

n/a
V/C RATIO
n/a
pc/h
conflicting with
n/a
veh/h
n/a
pc/h
capacity
n/a
veh/h
n/a
pc/h
No
Type1a (yielding)
Right-turn Bypass Lane

Zone 2

0	0	699	102
pc/h	pc/h	pc/h	pc/h

376 | 323 | 0 | 102

Roundabout Entry Lane Discipline	LT,TR
Right turn to Total Flow Ratio	0.13

Capacity Analysis for Planning of Roundabouts

Output Worksheet

Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*
Project Number:	*SA#18-0337*
Location	*Vestavia Hills, Alabama*
Date	March 28, 2019

ALABAMA DEPARTMENT OF TRANSPORTATION

Results for Roundabouts

#	TYPE OF ROUNDABOUT	Zone 1 (North)			Zone 3 (West)			Zone 2 (South)			Zone 4 (Eest)			Consolidated LOS	Ranking
		Lane 1	Lane 2	Bypass Lane	Lane 1	Lane 2	Bypass Lane	Lane 1	Lane 2	Bypass Lane	Lane 1	Lane 2	Bypass Lane		
1.0	1 X 1	LOS A		n/a	LOS B		n/a	LOS B		n/a	LOS E		n/a	LOS C	#DIV/0!
1.2	1 X 2	LOS A		n/a	LOS A	LOS A	n/a	LOS B		n/a	LOS A	LOS B	n/a	#DIV/0!	#DIV/0!
1.3	2 X 1	LOS A	LOS A	n/a	LOS A		n/a	LOS A	LOS A	n/a	LOS C		n/a	#DIV/0!	#DIV/0!
1.4	2 X 2	LOS A	LOS A	n/a	LOS A	LOS A	n/a	LOS A	LOS A	n/a	LOS B	LOS B	n/a	#DIV/0!	#DIV/0!

ALABAMA DEPARTMENT OF TRANSPORTATION

Capacity Analysis for Planning of Roundabouts

Instructions for Use

This tool is designed to provide a quick guide in determining a suitable layout for a proposed roundabout at planning level . Four predetermined hierarchical layouts —namely, 1x1 Rndabt , 1NS x 2 EW Rndabt, 2 NS x 1 EW Rndabt and 2x2 Rndabt (See Notice for details) — are evaluated for their operational performances.The evaluation follows the procedures set in the Highway Capacity Manual (2010 HCM), *NCHRP* Report 672 and the ALDOT Roundabout Planning, Design and Operational Manual. Final selection of a suitable layout should be based on a balanced cost and operational efficiency. The configurations presented here may be used for planning purposes only. Further analysis may be needed to achieve optimum design configuration

Steps in using this tool:

***Step 1*:** Go to the Input worksheet and fill in the required information located in the "Yellow" boxes.

Step 2: Go through the "Design Sheet" on the second page of each design worksheet and fill in the required information located in the "Yellow" boxes.

Step 3*:* Review the design on the "Result Sheet"located on the first page of each design worksheet and adjust the number of lanes (Right-turn Bypass lanes) for each approach where required.

Step 4*:* Go to the Output Worksheet and review the consolidated output of the different configurations.

Notes

1. Best practices suggest V/C ratio thresholds of between 0.85 and 0.90 for satisfactory performance of the roundabout during the design year. Higher degree of saturation (V/C > 0.85) may still perform acceptably in less critical areas (such as intersection with minor streets) where the impact of adding capacity exceeds benefit. More care may be appropriate in areas where queuing is more sensitive (e.g., closely spaced intersections, and interchange off-ramps).
2. Where a Type 2 Right-Turn Bypass lane (refer to ALDOT manual) is required, the analysis assumes zero delay and large capacity on the Bypass lane.
3. Projected Traffic Volume is the volume per day at the end of n years.
4. 1x1 Rndabt : refers to design geometry where one-lane entry conflicts with one-lane circulating lane.
5. 1NS x 2 EW Rndabt: refers to design geometry where one entry lane conflicts with two circulating lanes.
6. NS x 1 EW Rndabt: refers to design geometry where two entry lanes conflict with one circulating lanes.
7. 2x2 Rndabt : refers to design geometry where two entry lanes conflict with two circulating lanes.
8. Four SHADES OF GREEN are used to indicate different levels of acceptability of a particular performance measure; dark green indicates highly favorable and light green indicate less favorable.
9. Generally, a RED shaded cell indicate unacceptable performance measure.
10. Calibration Parameters for Capacity Equations: Refer to TABLE 2.3 in the ALDOT Roundabout Manual for values of Parameters A and B. Otherwise input site-specific values.
11. To reset the parameter values in the "Design Sheet" to their default values , simply delete the content of the cells
13. Single-lane: refers to model parameters for the single entry lane when one-lane entry conflicts with one-lane circulating lane
14 2x2, RT lane: refers to model parameters for the entry right lane when two entry lanes conflict with two circulating lanes
15. 2x2, LT lane: refers to model parameters for the entry left lane when two entry lanes conflict with two circulating lanes
16. 2x1, RT/LT lanes: refers to model parameters for each entry lane when two entry lanes conflict with one circulating lanes
17. 1x2, one lane: refers to model parameters for the entry lane when one entry lane conflicts with two circulating lanes.
18. Bypass Type1a: refers to a yielding Bypass lane opposed by one exiting lane
19. Bypass Type 1b: refers to a yielding Bypass lane opposed by two exiting lanes
20. Bypass Type 2: refers to a non-yielding Bypass lanes that merge with exiting traffic through a downstream merging operation, no empirical model exist yet, but higher entry capacities are expected

Disclaimer

This planning tool is based on the Capacity Analysis for Planning of Junctions (CAP-X) sofware developed by the Federal Highway Administration (FHWA). The CAP-X software was modified for use by Alabama Department of Transportation. Modifications include:

i. A lane utilization function to account for lane disciplane.
ii. A function to account for pedestrian traffic .
iii. A "future year" function to allow for user defined n years design period in the traffic growth model equation.
iv. A function to allow for user defined parameters in the capacity model equations.
v. A function to allow for a Right-Turn Bypass analysis.
vi. A display function of the Right-Turn Bypass lane Measures of Effectiveness (MoE's) on each "Result Sheet".
vii. A display function of each "Approach Delay" and the "Overall Intersection Delay" on each "Result Sheet".
viii. A redefined color-coded output of V/C ratios, LOS and Delays .

This tool maybe updated to reflect changing practices and experience in the State. It is the responsibility of the user to check the ALDOT website periodically for updates to this tool.

Capacity Analysis for Planning of Roundabouts

Abbreviation Definition

EB	Eastbound
pc/h	Passenger Car Per Hour
PCE	Per Car Equivalent
LT,TR	Left+ Through, Through Right
L, LTR	Left , Left +Through +Right
LTR,R	Left+Through+Right, Right
NB	Northbound
RT lane	Right Lane
LT lane	Left Lane
SB	Southbound
V/C	Volume/Capacity
Veh/h	Vehicle per hour
WB	Westbound
f_{HV}	Heavy Vehicle adjustment factor
f_{ped}	Pedestrian adjustment factor
ped/h	Pedestrian per hour

Capacity Analysis for Planning of Roundabouts

Input Worksheet

Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*
Project Number:	*SA#18-0337*
Location	*Vestavia Hills, Alabama*
Date	March 28, 2019

Traffic Volume Demand

	Volume (Veh/h)				Proportion of Trucks	Traffic Volume Growth Rate	n_{ped} (ped/h)	Lane Discipline: 2-Lane Approach
	U-Turn	Left	Thru	Right				
Eastbound	0	0	0	0	1.30%	1.00%	0	Not Sure
Westbound	0	90	0	79	1.30%	1.00%	0	Not Sure
Southbound	0	184	320	0	1.30%	1.00%	0	LT,TR
Northbound	0	0	464	256	1.30%	1.00%	0	LT,TR
Peak Hour Factor	0.94	0.94	0.94	0.94				
Truck to PCE Factor	2.00							
Design Period (years)	5							
Construction Year	2015							

Demand Flow Rate (PCE) / Adjustment Factors

	Volume (pc/h)				f_{HV}	f_{ped}	
	U-Turn	Left	Thru	Right		Single-lane entry	Multilane entry
Eastbound	0	0	0	0	0.987	1.000	1.000
Westbound	0	101	0	89	0.987	1.000	1.000
Southbound	0	206	359	0	0.987	1.000	1.000
Northbound	0	0	520	287	0.987	1.000	1.000

Notes:

1 The Traffic Volume Demand input values are movement volumes for the year of construction completion
2 The proportion of truck traffic and growth rate values are to be entered as percentile eg. If growth rate or proportion of truck traffic is 2%, enter 2 and not 0.02
3 Growth rate values ranges from 0% to 4%. If no data available, use 0.5%
4 Lane Discipline refers to existing intersection approach (2 lanes) configuration as indicated by the existing pavement markings. This may be different from the ultim roundabout entry lane configuration depending on the traffic volume redistribution (See "Design Sheet" on subsequent worksheets). If no information is available, a in the case of a new road development, select "Not Sure".
5 The design period is typically 20 years as per Section 2.2.5 of ALDOT Roundabout Manual. A user may however, select a design year per their design requiremen
6 The Peak Hour Factor input cell default value is 0.95
7 Truck to PCE factor has default value of 2.0 per section 2.2.1 of the ALDOT Roundabout Manual.

1 NS x 1 EW Roundabout

Results Sheet

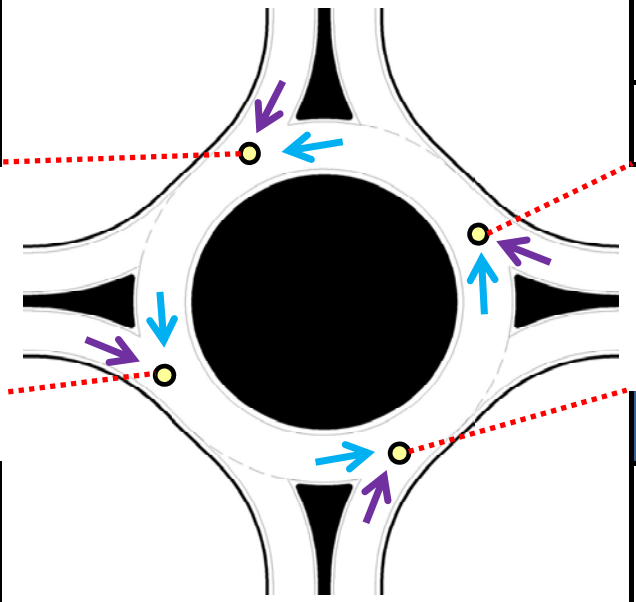
Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*	ALABAMA DEPARTMENT OF TRANSPORTATION	
Project Number:	*SA#18-0337*		
Location	*Vestavia Hills, Alabama*	Overal Roundabout Delay, s/veh	11.2
Date	March 28, 2019	Overal Roundabout LOS	B

Zone 1

Predicted approach MOE		
Lane 1	0.45	V/C
	7.6	d, s/veh
	A	LOS
	3	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	7.6	

Zone 4

Predicted approach MOE		
Lane 1	0.23	V/C
	7.0	d, s/veh
	A	LOS
	1	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	7.0	



Zone 3

Predicted approach MOE		
Lane 1	0.00	V/C
	10.2	d, s/veh
	B	LOS
	0	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	10.2	

Zone 2

Predicted approach MOE		
Lane 1	0.72	V/C
	14.8	d, s/veh
	B	LOS
	7	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	14.8	

1 NS x 1 EW Lane Roundabout

Design Sheet

Equation	A x exp(-B x Q)			
Single-Lane	A	1380	B	0.00102
Bypass Type1a	A	1380	B	0.00102
Bypass Type1b	A	1420	B	0.00085

Zone 1

Right-turn Bypass Lane
No
Type2 (nonyielding)
pc/h
n/a
veh/h
n/a
capacity
pc/h
n/a
veh/h
n/a
conflicting with
pc/h
n/a
V/C RATIO
n/a

pc/h	pc/h	pc/h	pc/h
0	359	206	0

pc/h
565
veh/h
558
V/C RATIO
0.45

Predicted approach capacity	
1245	pc/h
1229	veh/h
conflicting with	
101	pc/h
Conflicting flow	
1 Lane	

Zone 2

0.72
V/C RATIO
797
veh/h
807
pc/h

1 Lane
Conflicting flow
Predicted approach capacity
1118 pc/h
1104 veh/h
conflicting with
206 pc/h

0	0	520	287
pc/h	pc/h	pc/h	pc/h

n/a
V/C RATIO
n/a
pc/h
conflicting with
n/a
veh/h
n/a
pc/h
capacity
n/a
veh/h
n/a
pc/h
No
Type1b (yielding)
Right-turn Bypass Lane

Zone 3

pc/h	0
pc/h	0
pc/h	0
pc/h	0

Predicted approach capacity		Conflicting flow	1 Lane
700	pc/h		
691	veh/h		
conflicting with			
666	pc/h		

pc/h	0	veh/h	0	V/C RATIO	0.00

Right-turn Bypass Lane	No	pc/h	n/a	veh/h	n/a	capacity	pc/h	n/a	veh/h	n/a	conflicting with	pc/h	n/a	V/C Ratio	n/a
	Type1a (yielding)														

Back to Output Worksheet

Zone 4

n/a	V/C RATIO	n/a	pc/h	conflicting with	n/a	veh/h	n/a	pc/h	capacity	n/a	veh/h	n/a	pc/h	No	Right-turn Bypass Lane
														Type1a (yielding)	

0.23	V/C RATIO	188	veh/h	190	pc/h

Predicted approach capacity		Conflicting flow	1 Lane
812	pc/h		
802	veh/h		
conflicting with			
520	pc/h		

89	pc/h
0	pc/h
101	pc/h
0	pc/h

1 NS x 2 EW Lane Roundabout

Results Sheet

Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*
Project Number:	*SA#18-0337*
Location	*Vestavia Hills, Alabama*
Date	March 28, 2019

ALABAMA DEPARTMENT OF TRANSPORTATION

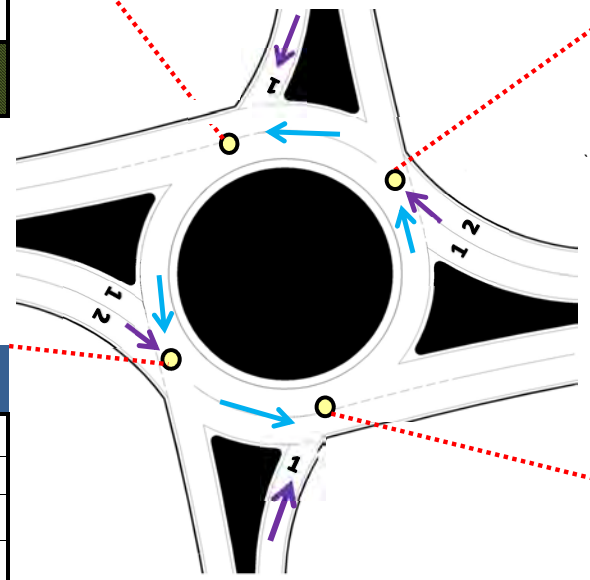
Overal Roundabout Delay, s/veh	
Overal Roundabout LOS	

Zone 1

Predicted approach capacity		
Lane 1	0.43	V/C
	7.1	d, s/veh
	A	LOS
	3	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	7.1	

Zone 4

Predicted approach capacity		
Lane 1	0.11	V/C
	5.2	d, s/veh
	A	LOS
	1	Q_{95}, veh
Lane 2	0.10	V/C
	5.1	d, s/veh
	A	LOS
	1	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	5.2	



Zone 3

Predicted approach capacity		
Lane 1	0.00	V/C
	4.7	d, s/veh
	A	LOS
	0	Q_{95}, veh
Lane 2	0.00	V/C
	4.7	d, s/veh
	A	LOS
	0	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh		

Zone 2

Predicted approach capacity		
Lane 1	0.68	V/C
	12.6	d, s/veh
	B	LOS
	6	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	12.6	

1 NS x 2 EW Lane Roundabout

Design Sheet

Equation		A x exp(-B x Q)		
1 Entry, 2 Circ.	A	1420	B	0.00085
Bypass Type1a	A	1380	B	0.00102
Bypass Type1b	A	1420	B	0.00085
2 Entry, 1 Circ.	A	1420	B	0.00091

Zone 1

pc/h	pc/h	pc/h	pc/h
0	359	206	0

Right-turn Bypass Lane
No
Type1a (yielding)
pc/h
n/a
veh/h
n/a
capacity
pc/h
n/a
veh/h
n/a
conflicting with
pc/h
n/a
V/C RATIO
n/a

pc/h
565
veh/h
558
V/C RATIO
0.43
1

Conflicting flow		
0		
101		
Lane Cap.	pc/h	veh/h
1	1303	1287

n/a	V/C RATIO	n/a	pc/h	conflicting with	n/a	veh/h	n/a	pc/h	capacity	n/a	veh/h	n/a	pc/h	No	Right-turn Bypass Lane
														Type1a (yielding)	

2	0.10	V/C RATIO	88	veh/h	89 pc/h
1	0.11	V/C RATIO	100	veh/h	101 pc/h

1	873	885	pc/h	Conflicting flow
			veh/h	
2	873	885	Lane Cap.	520

0	89	L,TR	0.47
0		Roundabout Entry Lane Discipline	Right turn to Total Flow Ratio
101			

Zone 4

89	pc/h
0	pc/h
101	pc/h
0	pc/h

Back to Output Worksheet

Zone 3

pc/h	0
pc/h	0
pc/h	0
pc/h	0

Conflicting flow	666	Lane Cap.	2	1
		pc/h	775	775
		veh/h	765	765

	pc/h	0	veh/h	0	V/C RATIO	0.00 1
	pc/h	0	veh/h	0	V/C RATIO	0.00 2

Right-turn Bypass Lane	No	pc/h	n/a	veh/h	n/a	capacity	pc/h	n/a	veh/h	n/a	conflicting with	pc/h	n/a	V/C Ratio	n/a
	Type1b (yielding)														

Roundabout Entry Lane Discipline	Right turn to Total Flow Ratio
LT,TR	#DIV/0!

0	0	0	0

1	1192	1177
Lane Cap.	pc/h	veh/h
0		
206		
Conflicting flow		

1
0.68
V/C RATIO
797
veh/h
807
pc/h

n/a
V/C RATIO
n/a
pc/h
conflicting with
n/a
veh/h
n/a
pc/h
capacity
n/a
veh/h
n/a
pc/h
No
Type1b (yielding)
Right-turn Bypass Lane

Zone 2

0	0	520	287
pc/h	pc/h	pc/h	pc/h

2 NS x 1 EW Lane Roundabout

Results Sheet

Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*
Project Number:	*SA#18-0337*
Location	*Vestavia Hills, Alabama*
Date	March 28, 2019

ALABAMA DEPARTMENT OF TRANSPORTATION

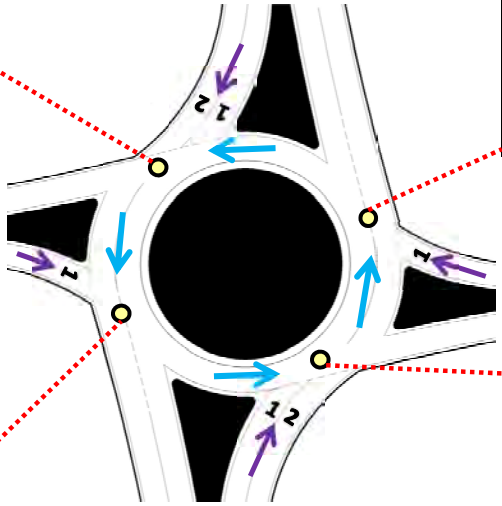
Overal Roundabout Delay, s/veh	
Overal Roundabout LOS	

Zone 1

Predicted approach capacity		
Lane 1	0.20	V/C
	4.6	d, s/veh
	A	LOS
	1	Q_{95}, veh
Lane 2	0.23	V/C
	4.8	d, s/veh
	A	LOS
	1	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	4.7	

Zone 4

Predicted approach capacity		
Lane 1	0.21	V/C
	6.1	d, s/veh
	A	LOS
	1	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	6.1	



Zone 3

Predicted approach capacity		
Lane 1	0.00	V/C
	4.5	d, s/veh
	A	LOS
	0	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh		

Zone 2

Predicted approach capacity		
Lane 1	0.32	V/C
	6.2	d, s/veh
	A	LOS
	2	Q_{95}, veh
Lane 2	0.36	V/C
	6.7	d, s/veh
	A	LOS
	2	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	6.5	

2 NS x 1 EW Lane Roundabout

Design Sheet

Right turn to Total Flow Ratio	0.00
Roundabout Entry Lane Discipline	LT,TR

pc/h	pc/h	pc/h	pc/h
0	359	206	0

0 — 206 — 299 — 60

Zone 1

Equation	*A x exp(-B x Q)*			
1 Entry, 2 Circ.	A	1420	B	0.00085
Bypass Type1a	A	1380	B	0.00102
Bypass Type1b	A	1420	B	0.00085
2 Entry, 1 Circ.	A	1420	B	0.00091

Right-turn Bypass Lane
No
Type2 (nonyielding)
pc/h
n/a
veh/h
n/a
capacity
pc/h
n/a
veh/h
n/a
conflicting with
pc/h
n/a
V/C RATIO
n/a

pc/h	pc/h
299	266
veh/h	veh/h
296	262
V/C RATIO	V/C RATIO
0.23	0.20
2	1

Conflicting flow	
101	
Lane Cap.	pc/h	veh/h
1	1295	1279
2	1295	1279

n/a	V/C RATIO	n/a	pc/h	conflicting with	n/a	veh/h	n/a	pc/h	capacity	n/a	veh/h	n/a	pc/h	No	Right-turn Bypass Lane
														Type1a (yielding)	

1	0.21	V/C RATIO	188	veh/h	190	pc/h

913	pc/h			
901	veh/h			
1	Lane Cap.	379	141	Conflicting flow

Zone 4

89	pc/h
0	pc/h
101	pc/h
0	pc/h

Back to Output Worksheet

0	pc/h
0	pc/h
0	pc/h
0	pc/h

Zone 3

Conflicting flow	299	367	Lane Cap.	1
			pc/h	806
			veh/h	796

pc/h	0	veh/h	0	V/C RATIO	0.00	1

Right-turn Bypass Lane	No	pc/h	n/a	veh/h	n/a	capacity	pc/h	n/a	veh/h	n/a	conflicting with	pc/h	n/a	V/C Ratio	n/a
	Type1b (yielding)														

1	2
0.32	0.36
V/C RATIO	V/C RATIO
374	422
veh/h	veh/h
379	428
pc/h	pc/h

1	1177	1162
2	1177	1162
Lane Cap.	pc/h	veh/h
206		
Conflicting flow		

n/a
V/C RATIO
n/a
pc/h
conflicting with
n/a
veh/h
n/a
pc/h
capacity
n/a
veh/h
n/a
pc/h
No
Type1a (yielding)
Right-turn Bypass Lane

Zone 2

0	0	520	287
pc/h	pc/h	pc/h	pc/h

	379	141	
0			287

Roundabout Entry Lane Discipline	LT,TR
Right turn to Total Flow Ratio	0.36

2 NS x 2 EW Lane Roundabout

Results Sheet

Project Name:	Vestavia Hills Traffic Operations Study Phase 1
Project Number:	SA#18-0337
Location	Vestavia Hills, Alabama
Date	March 28, 2019

ALABAMA DEPARTMENT OF TRANSPORTATION

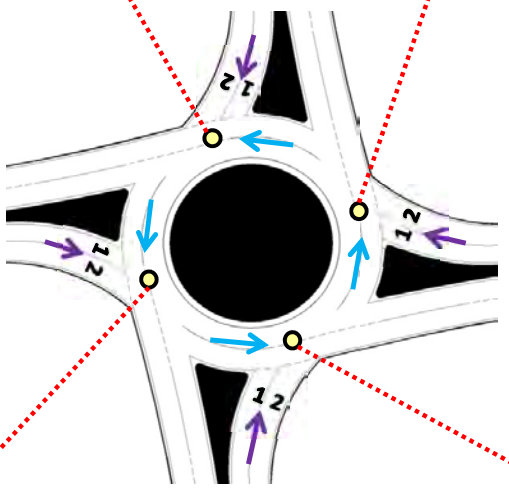
Overal Roundabout Delay, s/veh	
Overal Roundabout LOS	

Zone 1

Predicted approach capacity		
Lane 1	0.22	V/C
	4.9	d, s/veh
	A	LOS
	1	Q_{95}, veh
Lane 2	0.23	V/C
	4.8	d, s/veh
	A	LOS
	1	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	4.8	

Zone 4

Predicted approach capacity		
Lane 1	0.12	V/C
	5.6	d, s/veh
	A	LOS
	1	Q_{95}, veh
Lane 2	0.10	V/C
	4.9	d, s/veh
	A	LOS
	1	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	5.3	



Zone 3

Predicted approach capacity		
Lane 1	0.00	V/C
	5.0	d, s/veh
	A	LOS
	0	Q_{95}, veh
Lane 2	0.00	V/C
	4.5	d, s/veh
	A	LOS
	0	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh		

Zone 2

Predicted approach capacity		
Lane 1	0.34	V/C
	6.6	d, s/veh
	A	LOS
	2	Q_{95}, veh
Lane 2	0.36	V/C
	6.6	d, s/veh
	A	LOS
	2	Q_{95}, veh
Right-turn Bypass	n/a	V/C
	n/a	d, s/veh
	n/a	LOS
	n/a	Q_{95}, veh
Approach delay, s/veh	6.6	

2 NS x 2 EW Lane Roundabout

Design Sheet

Equation		A x exp(-B x Q)		
LT Lane	A	1350	B	0.00092
RT Lane	A	1420	B	0.00085
Bypass Type1a	A	1380	B	0.00102
Bypass Type1b	A	1420	B	0.00085

Zone 1

Right turn to Total Flow Ratio	0.00
Roundabout Entry Lane Discipline	LT,TR

pc/h	pc/h	pc/h	pc/h
0	359	206	0

0 | 206 | 299 | 60

Right-turn Bypass Lane
No
Type2 (nonyielding)
pc/h
n/a
veh/h
n/a
capacity
pc/h
n/a
veh/h
n/a
conflicting with
pc/h
n/a
V/C RATIO
n/a

pc/h	pc/h
299	266
veh/h	veh/h
296	262
V/C RATIO	V/C RATIO
0.23	0.22
2	1

Conflicting flow	
0	
101	

Lane Cap.		
1	1230	1214
2	1303	1287

n/a	V/C RATIO	n/a	pc/h	conflicting with	n/a	veh/h	n/a	pc/h	capacity	n/a	veh/h	n/a	pc/h	No / Type1b (yielding)	Right-turn Bypass Lane

2	0.10	V/C RATIO	88	veh/h	89 pc/h
1	0.12	V/C RATIO	100	veh/h	101 pc/h

Conflicting flow					
837	913	pc/h			
826	901	veh/h			
1	2	Lane Cap.	379	141	

Zone 4

89	pc/h
0	pc/h
101	pc/h
0	pc/h

0 | 89 | 0 | 101

L,TR	0.47
Roundabout Entry Lane Discipline	Right turn to Total Flow Ratio

Back to Output Worksheet

Zone 3

pc/h	0
pc/h	0
pc/h	0
pc/h	0

Conflicting flow				
299	367	Lane Cap.	2	1
		pc/h	806	732
		veh/h	796	722

pc/h	0	veh/h	0	V/C RATIO	0.00	1
pc/h	0	veh/h	0	V/C RATIO	0.00	2

Right-turn Bypass Lane	No / Type2 (nonyielding)	pc/h	n/a	veh/h	n/a	capacity	pc/h	n/a	veh/h	n/a	conflicting with	pc/h	n/a	V/C Ratio	n/a

Roundabout Entry Lane Discipline	LT,TR
Right turn to Total Flow Ratio	#DIV/0!

0 | 0 | 0 | 0

1	1117	1103
2	1192	1177
Lane Cap.	pc/h	veh/h
206		
0		
Conflicting flow		

1	2
0.34	0.36
V/C RATIO	V/C RATIO
374	422
veh/h	veh/h
379	428
pc/h	pc/h

n/a
V/C RATIO
n/a
pc/h
conflicting with
n/a
veh/h
n/a
pc/h
capacity
n/a
veh/h
n/a
pc/h
No
Type1a (yielding)
Right-turn Bypass Lane

Zone 2

0	0	520	287
pc/h	pc/h	pc/h	pc/h

379 | 141 | 0 | 287

Roundabout Entry Lane Discipline	LT,TR
Right turn to Total Flow Ratio	0.36

Capacity Analysis for Planning of Roundabouts

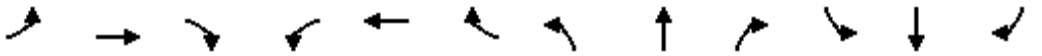
Output Worksheet

Project Name:	*Vestavia Hills Traffic Operations Study Phase 1*
Project Number:	*SA#18-0337*
Location	*Vestavia Hills, Alabama*
Date	March 28, 2019

ALABAMA DEPARTMENT OF TRANSPORTATION

Results for Roundabouts

#	TYPE OF ROUNDABOUT	Zone 1 (North)			Zone 3 (West)			Zone 2 (South)			Zone 4 (Eest)			Consolidated LOS	Ranking
		Lane 1	Lane 2	Bypass Lane	Lane 1	Lane 2	Bypass Lane	Lane 1	Lane 2	Bypass Lane	Lane 1	Lane 2	Bypass Lane		
1.0	1 X 1	LOS A		n/a	LOS B		n/a	LOS B		n/a	LOS A		n/a	LOS B	#DIV/0!
1.2	1 X 2	LOS A		n/a	LOS A	LOS A	n/a	LOS B		n/a	LOS A	LOS A	n/a	#DIV/0!	#DIV/0!
1.3	2 X 1	LOS A	LOS A	n/a	LOS A		n/a	LOS A	LOS A	n/a	LOS A		n/a	#DIV/0!	#DIV/0!
1.4	2 X 2	LOS A	LOS A	n/a	LOS A	LOS A	n/a	LOS A	LOS A	n/a	LOS A	LOS A	n/a	#DIV/0!	#DIV/0!



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	7	5	104	4	158	6	707	102	68	292	13
Future Volume (vph)	18	7	5	104	4	158	6	707	102	68	292	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	75		0	0		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978			0.920			0.981			0.994	
Flt Protected		0.971			0.981		0.950			0.950		
Satd. Flow (prot)	0	1769	0	0	1681	0	1770	1827	0	1770	1852	0
Flt Permitted		0.737			0.848		0.496			0.117		
Satd. Flow (perm)	0	1343	0	0	1453	0	924	1827	0	218	1852	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			94			18			5	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.54	0.54	0.54	0.74	0.74	0.74	0.84	0.84	0.84	0.76	0.76	0.76
Adj. Flow (vph)	33	13	9	141	5	214	7	842	121	89	384	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	55	0	0	360	0	7	963	0	89	401	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6			2		
Detector Phase	8	8		4	4		6	6		2	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	24.0	24.0		24.0	24.0		52.0	52.0		52.0	52.0	
Total Split (%)	31.6%	31.6%		31.6%	31.6%		68.4%	68.4%		68.4%	68.4%	
Maximum Green (s)	20.0	20.0		20.0	20.0		46.9	46.9		46.9	46.9	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	0.0	0.0		0.0	0.0		1.1	1.1		1.1	1.1	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0			4.0		5.1	5.1		5.1	5.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.7	2.7		2.7	2.7		3.2	3.2		3.2	3.2	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		16.6			16.6		39.2	39.2		39.2	39.2	
Actuated g/C Ratio		0.25			0.25		0.60	0.60		0.60	0.60	
v/c Ratio		0.16			0.82		0.01	0.88		0.68	0.36	
Control Delay		19.9			35.7		5.7	22.2		41.5	7.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		19.9			35.7		5.7	22.2		41.5	7.9	
LOS		B			D		A	C		D	A	
Approach Delay		19.9			35.7			22.0			14.0	
Approach LOS		B			D			C			B	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Stops (vph)		20			166		3	584		46	133	
Fuel Used(gal)		0			4		0	8		1	2	
CO Emissions (g/hr)		19			276		2	583		68	131	
NOx Emissions (g/hr)		4			54		0	113		13	25	
VOC Emissions (g/hr)		4			64		1	135		16	30	
Dilemma Vehicles (#)		0			17		0	0		0	0	
Queue Length 50th (ft)		17			118		1	320		24	81	
Queue Length 95th (ft)		24			158		5	439		#82	102	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)							75					
Base Capacity (vph)		441			534		675	1340		159	1355	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.12			0.67		0.01	0.72		0.56	0.30	

Intersection Summary			
Area Type:	Other		
Cycle Length: 76			
Actuated Cycle Length: 65.5			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 22.5		Intersection LOS: C	
Intersection Capacity Utilization 80.9%		ICU Level of Service D	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd

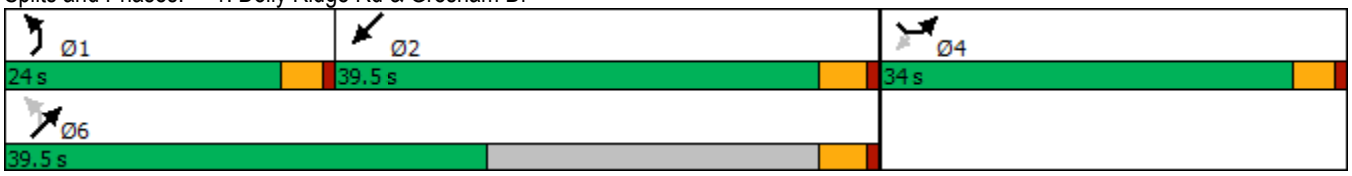
Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	190	371	635	258	143	56
Future Volume (vph)	190	371	635	258	143	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50	0	100			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.951	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1787	1599	1787	1881	1789	0
Flt Permitted	0.950		0.447			
Satd. Flow (perm)	1787	1599	841	1881	1789	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		640			32	
Link Speed (mph)	25			35	35	
Link Distance (ft)	737			474	400	
Travel Time (s)	20.1			9.2	7.8	
Peak Hour Factor	0.58	0.58	0.57	0.83	0.82	0.57
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	328	640	1114	311	174	98
Shared Lane Traffic (%)						
Lane Group Flow (vph)	328	640	1114	311	272	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6	6		
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	12.0	12.0	10.0	20.0	20.0	
Minimum Split (s)	16.0	16.0	14.0	24.5	24.5	
Total Split (s)	34.0	34.0	24.0	39.5	39.5	
Total Split (%)	34.9%	34.9%	24.6%	40.5%	40.5%	
Maximum Green (s)	30.0	30.0	20.0	35.0	35.0	
Yellow Time (s)	3.0	3.0	3.0	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.5	4.5	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.0	4.0	4.0	4.5	4.5	
Recall Mode	None	None	None	Max	Max	
Act Effct Green (s)	24.0	24.0	59.7	59.2	35.1	
Actuated g/C Ratio	0.26	0.26	0.65	0.64	0.38	
v/c Ratio	0.70	0.72	1.48	0.26	0.39	
Control Delay	39.1	7.4	240.2	8.4	21.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	39.1	7.4	240.2	8.4	21.0	
LOS	D	A	F	A	C	
Approach Delay	18.2			189.6	21.0	

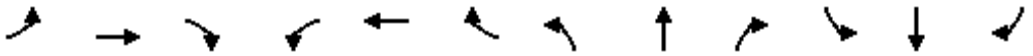
Lane Group	SEL	SER	NEL	NET	SWT	SWR
Approach LOS	B			F	C	
Stops (vph)	163	37	305	105	124	
Fuel Used(gal)	3	3	36	2	2	
CO Emissions (g/hr)	233	212	2483	148	165	
NOx Emissions (g/hr)	45	41	483	29	32	
VOC Emissions (g/hr)	54	49	575	34	38	
Dilemma Vehicles (#)	0	0	0	10	11	
Queue Length 50th (ft)	172	0	~915	72	100	
Queue Length 95th (ft)	151	0	#466	116	158	
Internal Link Dist (ft)	657			394	320	
Turn Bay Length (ft)	50		100			
Base Capacity (vph)	586	954	754	1213	704	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.56	0.67	1.48	0.26	0.39	

Intersection Summary

Area Type: Other
Cycle Length: 97.5
Actuated Cycle Length: 91.8
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.48
Intersection Signal Delay: 110.1 Intersection LOS: F
Intersection Capacity Utilization 72.8% ICU Level of Service C
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Dolly Ridge Rd & Gresham Dr





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	12	5	224	6	354	6	707	405	222	292	13
Future Volume (vph)	18	12	5	224	6	354	6	707	405	222	292	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	75		0	0		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981			0.918			0.945			0.994	
Flt Protected		0.975			0.981		0.950			0.950		
Satd. Flow (prot)	0	1782	0	0	1678	0	1770	1760	0	1770	1852	0
Flt Permitted		0.671			0.846		0.485			0.087		
Satd. Flow (perm)	0	1226	0	0	1447	0	903	1760	0	162	1852	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			99			69			5	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.54	0.54	0.54	0.74	0.74	0.74	0.84	0.84	0.84	0.76	0.76	0.76
Adj. Flow (vph)	33	22	9	303	8	478	7	842	482	292	384	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	64	0	0	789	0	7	1324	0	292	401	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6			2		
Detector Phase	8	8		4	4		6	6		2	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	12.0	12.0		12.0	12.0		20.0	20.0		20.0	20.0	
Total Split (s)	25.0	25.0		25.0	25.0		51.0	51.0		51.0	51.0	
Total Split (%)	32.9%	32.9%		32.9%	32.9%		67.1%	67.1%		67.1%	67.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0		46.0	46.0		46.0	46.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.7	2.7		2.7	2.7		3.2	3.2		3.2	3.2	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		20.0			20.0		46.0	46.0		46.0	46.0	
Actuated g/C Ratio		0.26			0.26		0.61	0.61		0.61	0.61	
v/c Ratio		0.19			1.74		0.01	1.21		2.98	0.36	
Control Delay		21.2			364.7		6.2	122.7		932.7	8.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		21.2			364.7		6.2	122.7		932.7	8.6	
LOS		C			F		A	F		F	A	
Approach Delay		21.2			364.7			122.1			398.0	
Approach LOS		C			F			F			F	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Stops (vph)		25			384		3	842		190	141	
Fuel Used(gal)		0			48		0	34		44	2	
CO Emissions (g/hr)		23			3352		2	2408		3053	137	
NOx Emissions (g/hr)		4			652		0	469		594	27	
VOC Emissions (g/hr)		5			777		1	558		708	32	
Dilemma Vehicles (#)		0			22		0	0		0	0	
Queue Length 50th (ft)		20			~533		1	~770		~201	84	
Queue Length 95th (ft)		28			#564		5	#908		#280	106	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)							75					
Base Capacity (vph)		329			453		546	1092		98	1122	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.19			1.74		0.01	1.21		2.98	0.36	

Intersection Summary			
Area Type:	Other		
Cycle Length: 76			
Actuated Cycle Length: 76			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 2.98			
Intersection Signal Delay: 252.9		Intersection LOS: F	
Intersection Capacity Utilization 126.2%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd

Intersection	
Int Delay, s/veh	327.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	230	0	272	0	597	80	92	253	0
Future Vol, veh/h	0	0	0	230	0	272	0	597	80	92	253	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	86	86	86	75	75	75	87	87	87
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	0	0	0	267	0	316	0	796	107	106	291	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1353	1406	291	1353	1353	850	291	0	0	903	0	0
Stage 1	503	503	-	850	850	-	-	-	-	-	-	-
Stage 2	850	903	-	503	503	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	128	140	751	~ 128	151	362	1276	-	-	757	-	-
Stage 1	553	543	-	357	378	-	-	-	-	-	-	-
Stage 2	357	357	-	553	543	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	14	117	751	~ 112	126	362	1276	-	-	757	-	-
Mov Cap-2 Maneuver	14	117	-	~ 112	126	-	-	-	-	-	-	-
Stage 1	553	452	-	357	378	-	-	-	-	-	-	-
Stage 2	45	357	-	461	452	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	$ 1054.2	0	2.8
HCM LOS	A	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1276	-	-	-	181	757	-	-
HCM Lane V/C Ratio	-	-	-	-	3.225	0.14	-	-
HCM Control Delay (s)	0	-	-	$	$ 1054.2	10.5	0	-
HCM Lane LOS	A	-	-	A	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	-	54.4	0.5	-	-

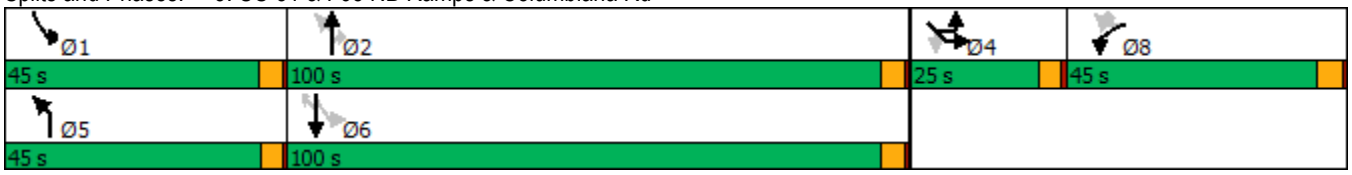
Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

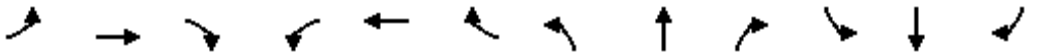
Lane Group	WBL	WBR	WBR2	NBL	NBT	NBR	SBL	SBT	SBR	SEL2	SEL	SER
Lane Configurations												
Traffic Volume (vph)	71	384	808	449	838	889	92	818	36	90	69	557
Future Volume (vph)	71	384	808	449	838	889	92	818	36	90	69	557
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175	0		400		0	360		230		0	230
Storage Lanes	1	2		2		1	1		1		2	1
Taper Length (ft)	25			25			25				25	
Lane Util. Factor	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00	1.00	1.00	0.88
Frt		0.850	0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	0.950	
Satd. Flow (prot)	1770	1583	1583	3433	3539	1583	1770	3539	1583	1770	1770	2787
Flt Permitted	0.950			0.126			0.250			0.950	0.950	
Satd. Flow (perm)	1770	1583	1583	455	3539	1583	466	3539	1583	1770	1770	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			362			666			56			688
Link Speed (mph)	25				40			40			40	
Link Distance (ft)	478				683			562			543	
Travel Time (s)	13.0				11.6			9.6			9.3	
Peak Hour Factor	0.88	0.88	0.88	0.96	0.96	0.96	0.79	0.79	0.79	0.81	0.81	0.81
Adj. Flow (vph)	81	436	918	468	873	926	116	1035	46	111	85	688
Shared Lane Traffic (%)												
Lane Group Flow (vph)	81	436	918	468	873	926	116	1035	46	111	85	688
Turn Type	Prot	Perm	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	Prot	Perm
Protected Phases	8			5	2		1	6		4	4	
Permitted Phases		8	8	2		2	6		6			4
Detector Phase	8	8	8	5	2	2	1	6	6	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	20.0	20.0	7.0	20.0	20.0	7.0	7.0	7.0
Minimum Split (s)	12.0	12.0	12.0	11.5	25.0	25.0	12.0	25.0	25.0	12.0	12.0	12.0
Total Split (s)	45.0	45.0	45.0	45.0	100.0	100.0	45.0	100.0	100.0	25.0	25.0	25.0
Total Split (%)	20.9%	20.9%	20.9%	20.9%	46.5%	46.5%	20.9%	46.5%	46.5%	11.6%	11.6%	11.6%
Maximum Green (s)	40.0	40.0	40.0	41.0	95.0	95.0	40.5	95.0	95.0	20.5	20.5	20.5
Yellow Time (s)	4.0	4.0	4.0	3.5	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.5	5.0	5.0	4.5	4.5	4.5
Lead/Lag				Lead	Lag	Lag	Lead	Lag	Lag			
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	Yes			
Vehicle Extension (s)	4.0	4.0	4.0	4.0	5.0	5.0	3.0	5.0	5.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	Min	Min	None	Min	Min	None	None	None
Act Effct Green (s)	40.9	40.9	40.9	94.7	78.6	78.6	81.2	70.1	70.1	16.2	16.2	16.2
Actuated g/C Ratio	0.25	0.25	0.25	0.57	0.47	0.47	0.49	0.42	0.42	0.10	0.10	0.10
v/c Ratio	0.19	1.12	1.38	0.77	0.52	0.84	0.37	0.69	0.07	0.65	0.49	0.77
Control Delay	56.9	135.9	208.6	32.0	31.2	17.5	20.3	41.2	4.6	92.9	84.9	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.9	135.9	208.6	32.0	31.2	17.5	20.3	41.2	4.6	92.9	84.9	11.2
LOS	E	F	F	C	C	B	C	D	A	F	F	B
Approach Delay	178.0				25.8			37.8			28.6	
Approach LOS	F				C			D			C	

Lane Group	WBL	WBR	WBR2	NBL	NBT	NBR	SBL	SBT	SBR	SEL2	SEL	SER
Stops (vph)	56	293	356	230	555	296	44	637	3	84	63	38
Fuel Used(gal)	1	13	39	7	15	10	1	16	0	3	2	4
CO Emissions (g/hr)	93	931	2725	508	1024	713	81	1136	14	200	144	259
NOx Emissions (g/hr)	18	181	530	99	199	139	16	221	3	39	28	50
VOC Emissions (g/hr)	21	216	631	118	237	165	19	263	3	46	33	60
Dilemma Vehicles (#)	0	0	0	0	22	0	0	19	0	0	0	0
Queue Length 50th (ft)	77	~613	~1097	130	344	288	57	476	0	126	95	0
Queue Length 95th (ft)	136	#889	#1400	204	428	554	80	503	13	185	147	14
Internal Link Dist (ft)	398				603			482			463	
Turn Bay Length (ft)	175			400			360		230			230
Base Capacity (vph)	436	390	663	1014	2075	1203	591	2075	951	224	224	953
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	1.12	1.38	0.46	0.42	0.77	0.20	0.50	0.05	0.50	0.38	0.72

Intersection Summary			
Area Type:	Other		
Cycle Length: 215			
Actuated Cycle Length: 165.6			
Natural Cycle: 120			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.38			
Intersection Signal Delay: 66.5		Intersection LOS: E	
Intersection Capacity Utilization 81.5%		ICU Level of Service D	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: US-31 & I-65 NB Ramps & Columbiana Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	313	48	14	155	61	270	30	2032	114	46	726	35
Future Volume (vph)	313	48	14	155	61	270	30	2032	114	46	726	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	35		0	300		175	0		375
Storage Lanes	0		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.995			0.878				0.850			0.850
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1779	0	1770	1635	0	1770	3539	1583	1770	3539	1583
Flt Permitted		0.146		0.735			0.276			0.030		
Satd. Flow (perm)	0	271	0	1369	1635	0	514	3539	1583	56	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			104				36			43
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		482			504			393			502	
Travel Time (s)		11.0			11.5			6.0			7.6	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.96	0.96	0.96	0.82	0.82	0.82
Adj. Flow (vph)	382	59	17	189	74	329	31	2117	119	56	885	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	458	0	189	403	0	31	2117	119	56	885	43
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	20.0	20.0	7.0	20.0	20.0
Minimum Split (s)	29.5	29.5		29.5	29.5		12.0	25.0	25.0	12.0	25.0	25.0
Total Split (s)	60.0	60.0		50.0	50.0		20.0	130.0	130.0	20.0	130.0	130.0
Total Split (%)	28.6%	28.6%		23.8%	23.8%		9.5%	61.9%	61.9%	9.5%	61.9%	61.9%
Maximum Green (s)	55.5	55.5		45.5	45.5		15.5	125.0	125.0	15.5	125.0	125.0
Yellow Time (s)	3.5	3.5		3.5	3.5		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		0.5	1.0	1.0	0.5	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		4.5		4.5	4.5		4.5	5.0	5.0	4.5	5.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0							
Flash Dont Walk (s)	18.0	18.0		18.0	18.0							
Pedestrian Calls (#/hr)	0	0		0	0							
Act Effct Green (s)		55.5		55.5	55.5		139.2	131.0	131.0	143.7	135.1	135.1
Actuated g/C Ratio		0.26		0.26	0.26		0.66	0.62	0.62	0.68	0.64	0.64
v/c Ratio		6.36		0.52	0.79		0.08	0.96	0.12	0.49	0.39	0.04
Control Delay		2451.6		72.1	65.3		10.7	48.6	11.7	42.4	18.8	3.5
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		2451.6		72.1	65.3		10.7	48.6	11.7	42.4	18.8	3.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		F		E	E		B	D	B	D	B	A
Approach Delay		2451.6			67.5			46.1			19.5	
Approach LOS		F			E			D			B	
Stops (vph)		254		132	237		10	1757	32	21	336	3
Fuel Used(gal)		190		4	7		0	47	1	1	9	0
CO Emissions (g/hr)		13315		253	489		19	3295	67	56	652	12
NOx Emissions (g/hr)		2591		49	95		4	641	13	11	127	2
VOC Emissions (g/hr)		3086		59	113		4	764	16	13	151	3
Dilemma Vehicles (#)		0		0	0		0	47	0	0	17	0
Queue Length 50th (ft)		~1120		226	403		13	1391	44	25	306	0
Queue Length 95th (ft)		#1227		288	474		26	#1681	81	69	315	15
Internal Link Dist (ft)		402			424			313			422	
Turn Bay Length (ft)				35			300		175			375
Base Capacity (vph)		72		361	508		447	2207	1000	165	2276	1033
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0
Storage Cap Reductn		0		0	0		0	0	0	0	0	0
Reduced v/c Ratio		6.36		0.52	0.79		0.07	0.96	0.12	0.34	0.39	0.04

Intersection Summary

Area Type: Other
Cycle Length: 210
Actuated Cycle Length: 210
Offset: 51 (24%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 6.36
Intersection Signal Delay: 299.1 Intersection LOS: F
Intersection Capacity Utilization 108.4% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US-31 & Shades Crest Rd

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	274	3867	3020	191	448	159
Future Volume (vph)	274	3867	3020	191	448	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350			0	100	100
Storage Lanes	2			1	1	1
Taper Length (ft)	75				75	
Lane Util. Factor	0.97	0.91	0.91	1.00	0.94	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3433	5085	5085	1583	4990	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3433	5085	5085	1583	4990	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				79		88
Link Speed (mph)		55	55		40	
Link Distance (ft)		616	491		414	
Travel Time (s)		7.6	6.1		7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	298	4203	3283	208	487	173
Shared Lane Traffic (%)						
Lane Group Flow (vph)	298	4203	3283	208	487	173
Turn Type	Prot	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases				6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	8.0	12.0	12.0	12.0	8.0	8.0
Minimum Split (s)	12.5	24.5	24.5	24.5	22.5	22.5
Total Split (s)	40.0	200.0	160.0	160.0	40.0	40.0
Total Split (%)	16.7%	83.3%	66.7%	66.7%	16.7%	16.7%
Maximum Green (s)	35.5	193.5	153.5	153.5	35.5	35.5
Yellow Time (s)	3.5	5.5	5.5	5.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.5	6.5	6.5	4.5	4.5
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max	Max	Max	None	None
Walk Time (s)		7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0
Act Effct Green (s)	25.4	193.5	163.6	163.6	28.1	28.1
Actuated g/C Ratio	0.11	0.83	0.70	0.70	0.12	0.12
v/c Ratio	0.79	0.99	0.92	0.18	0.81	0.65
Control Delay	116.8	31.0	34.8	8.2	110.8	58.5
Queue Delay	0.0	0.0	0.0	0.0	0.3	0.2
Total Delay	116.8	31.0	34.8	8.2	111.1	58.7

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
LOS	F	C	C	A	F	E
Approach Delay		36.7	33.3		97.4	
Approach LOS		D	C		F	
Stops (vph)	263	3074	2378	40	431	75
Fuel Used(gal)	12	97	75	2	16	3
CO Emissions (g/hr)	872	6753	5242	116	1091	215
NOx Emissions (g/hr)	170	1314	1020	23	212	42
VOC Emissions (g/hr)	202	1565	1215	27	253	50
Dilemma Vehicles (#)	0	81	19	0	0	0
Queue Length 50th (ft)	234	2025	1478	61	263	128
Queue Length 95th (ft)	295	#2509	1793	118	311	227
Internal Link Dist (ft)		536	411		334	
Turn Bay Length (ft)	350				100	100
Base Capacity (vph)	524	4231	3577	1136	761	316
Starvation Cap Reductn	0	0	0	0	39	9
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.99	0.92	0.18	0.67	0.56

Intersection Summary			
Area Type:	Other		
Cycle Length: 240			
Actuated Cycle Length: 232.6			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.99			
Intersection Signal Delay: 39.9		Intersection LOS: D	
Intersection Capacity Utilization 92.4%		ICU Level of Service F	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

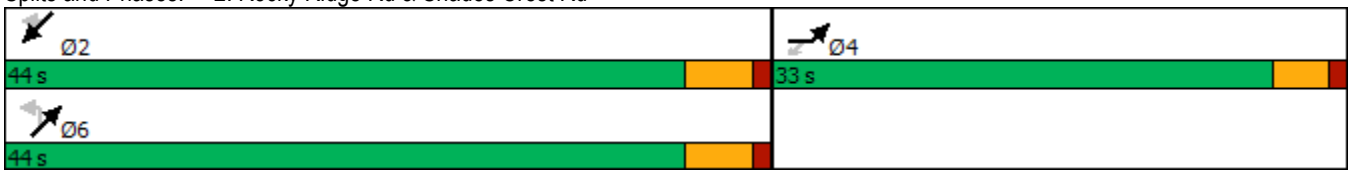
Splits and Phases: 1: Rocky Ridge Rd & US-280

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	151	22	7	456	294	171
Future Volume (vph)	151	22	7	456	294	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	100	125			0
Storage Lanes	1	1	1			1
Taper Length (ft)	75		75			
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950			0.999		
Satd. Flow (prot)	1770	1583	0	3536	1863	1583
Flt Permitted	0.950			0.950		
Satd. Flow (perm)	1770	1583	0	3362	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		24				186
Link Speed (mph)	25			40	40	
Link Distance (ft)	484			376	414	
Travel Time (s)	13.2			6.4	7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	164	24	8	496	320	186
Shared Lane Traffic (%)						
Lane Group Flow (vph)	164	24	0	504	320	186
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			6	2	
Permitted Phases		4	6			2
Detector Phase	4	4	6	6	2	2
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0	12.0	12.0	12.0
Minimum Split (s)	22.5	22.5	23.0	23.0	23.0	23.0
Total Split (s)	33.0	33.0	44.0	44.0	44.0	44.0
Total Split (%)	42.9%	42.9%	57.1%	57.1%	57.1%	57.1%
Maximum Green (s)	28.7	28.7	39.0	39.0	39.0	39.0
Yellow Time (s)	3.1	3.1	3.8	3.8	3.8	3.8
All-Red Time (s)	1.2	1.2	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.3	4.3		5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	1.5	1.5	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	8.0	8.0	8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	28.7	28.7		39.0	39.0	39.0
Actuated g/C Ratio	0.37	0.37		0.51	0.51	0.51
v/c Ratio	0.25	0.04		0.30	0.34	0.21
Control Delay	18.0	6.9		11.6	12.6	2.4
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	18.0	6.9		11.6	12.6	2.4

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
LOS	B	A		B	B	A
Approach Delay	16.6			11.6	8.8	
Approach LOS	B			B	A	
Stops (vph)	100	6		253	165	16
Fuel Used(gal)	2	0		5	3	1
CO Emissions (g/hr)	109	10		333	224	50
NOx Emissions (g/hr)	21	2		65	44	10
VOC Emissions (g/hr)	25	2		77	52	12
Dilemma Vehicles (#)	0	0		30	19	0
Queue Length 50th (ft)	53	0		69	86	0
Queue Length 95th (ft)	96	14		100	139	29
Internal Link Dist (ft)	404			296	334	
Turn Bay Length (ft)		100				
Base Capacity (vph)	659	605		1702	943	893
Starvation Cap Reductn	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0
Reduced v/c Ratio	0.25	0.04		0.30	0.34	0.21

Intersection Summary			
Area Type:	Other		
Cycle Length: 77			
Actuated Cycle Length: 77			
Natural Cycle: 50			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.34			
Intersection Signal Delay: 11.2		Intersection LOS: B	
Intersection Capacity Utilization 33.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: Rocky Ridge Rd & Shades Crest Rd



Intersection	
Int Delay, s/veh	178.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	291	114	537	96	78	1097
Future Vol, veh/h	291	114	537	96	78	1097
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	-	-	160	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	80	80	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	327	128	671	120	83	1167

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1421	336	0	0	671	0
Stage 1	671	-	-	-	-	-
Stage 2	750	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	~ 127	660	-	-	915	-
Stage 1	470	-	-	-	-	-
Stage 2	427	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 115	660	-	-	915	-
Mov Cap-2 Maneuver	~ 115	-	-	-	-	-
Stage 1	470	-	-	-	-	-
Stage 2	388	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 978.7	0	0.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	150	915	-
HCM Lane V/C Ratio	-	-	3.034	0.091	-
HCM Control Delay (s)	-	-	$ 978.7	9.3	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	42.2	0.3	-

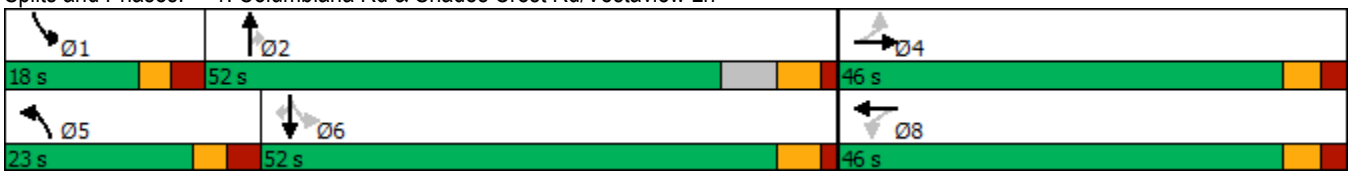
Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	88	13	113	166	108	28	460	115	199	894	295
Future Volume (vph)	65	88	13	113	166	108	28	460	115	199	894	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	115		0	140		350
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.989			0.962				0.850			0.850
Flt Protected		0.981			0.986		0.950			0.950		
Satd. Flow (prot)	0	1807	0	0	1767	0	1770	3539	1583	1770	3539	1583
Flt Permitted		0.676			0.833		0.950			0.300		
Satd. Flow (perm)	0	1245	0	0	1493	0	1770	3539	1583	559	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			17				142			304
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		493			298			271			469	
Travel Time (s)		11.2			6.8			4.1			7.1	
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.81	0.81	0.81	0.97	0.97	0.97
Adj. Flow (vph)	74	100	15	123	180	117	35	568	142	205	922	304
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	189	0	0	420	0	35	568	142	205	922	304
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		5.0	18.0	18.0	5.0	18.0	18.0
Minimum Split (s)	23.0	23.0		22.5	22.5		12.0	23.5	23.5	12.0	23.5	23.5
Total Split (s)	46.0	46.0		46.0	46.0		23.0	52.0	52.0	18.0	52.0	52.0
Total Split (%)	38.0%	38.0%		38.0%	38.0%		19.0%	43.0%	43.0%	14.9%	43.0%	43.0%
Maximum Green (s)	40.0	40.0		40.0	40.0		17.0	46.5	46.5	12.0	46.5	46.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.5	2.5		2.5	2.5		3.0	1.5	1.5	3.0	1.5	1.5
Lost Time Adjust (s)		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0			6.0		6.0	5.5	5.5	6.0	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.5	3.5	2.0	3.5	3.5
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)	7.0	7.0										
Flash Dont Walk (s)	10.0	10.0										
Pedestrian Calls (#/hr)	0	0										
Act Effct Green (s)		29.9			29.9		6.7	28.6	28.6	43.8	38.4	38.4
Actuated g/C Ratio		0.34			0.34		0.08	0.33	0.33	0.50	0.44	0.44
v/c Ratio		0.44			0.81		0.26	0.49	0.23	0.49	0.59	0.35
Control Delay		27.3			39.7		50.4	25.7	5.1	16.9	23.3	3.8
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		27.3			39.7		50.4	25.7	5.1	16.9	23.3	3.8

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C			D		D	C	A	B	C	A
Approach Delay		27.3			39.7			23.0			18.2	
Approach LOS		C			D			C			B	
Stops (vph)		115			310		26	338	13	99	646	24
Fuel Used(gal)		2			6		1	7	0	3	15	1
CO Emissions (g/hr)		153			400		46	519	34	176	1048	99
NOx Emissions (g/hr)		30			78		9	101	7	34	204	19
VOC Emissions (g/hr)		36			93		11	120	8	41	243	23
Dilemma Vehicles (#)		0			0		0	21	0	0	43	0
Queue Length 50th (ft)		80			206		20	136	0	62	230	0
Queue Length 95th (ft)		165			#416		52	181	29	117	346	52
Internal Link Dist (ft)		413			218			191			389	
Turn Bay Length (ft)							115			140		350
Base Capacity (vph)		608			735		366	2219	1045	457	2003	1028
Starvation Cap Reductn		0			0		0	0	0	0	0	0
Spillback Cap Reductn		0			0		0	0	0	0	0	0
Storage Cap Reductn		0			0		0	0	0	0	0	0
Reduced v/c Ratio		0.31			0.57		0.10	0.26	0.14	0.45	0.46	0.30

Intersection Summary			
Area Type:	Other		
Cycle Length: 121			
Actuated Cycle Length: 87.5			
Natural Cycle: 65			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 23.3		Intersection LOS: C	
Intersection Capacity Utilization 69.0%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Columbiana Rd & Shades Crest Rd/Vestaview Ln

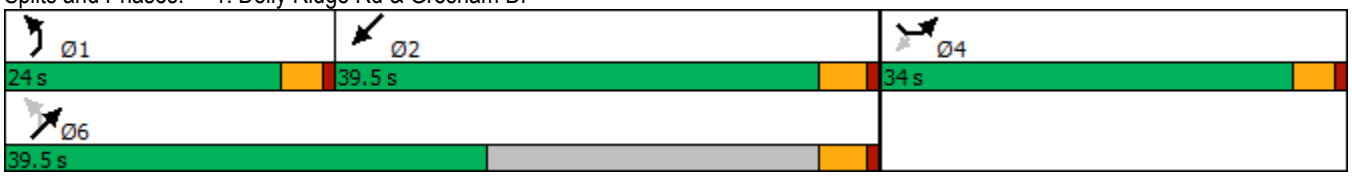


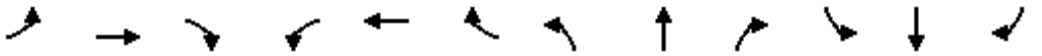
Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	12	9	0	167	229	7
Future Volume (vph)	12	9	0	167	229	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50	0	100			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.996	
Flt Protected	0.950					
Satd. Flow (prot)	1787	1599	1881	1881	1874	0
Flt Permitted	0.950					
Satd. Flow (perm)	1787	1599	1881	1881	1874	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		16			2	
Link Speed (mph)	25			35	35	
Link Distance (ft)	737			474	400	
Travel Time (s)	20.1			9.2	7.8	
Peak Hour Factor	0.58	0.58	0.77	0.77	0.95	0.95
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	21	16	0	217	241	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	21	16	0	217	248	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6	6		
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	12.0	12.0	10.0	20.0	20.0	
Minimum Split (s)	16.0	16.0	14.0	24.5	24.5	
Total Split (s)	34.0	34.0	24.0	39.5	39.5	
Total Split (%)	34.9%	34.9%	24.6%	40.5%	40.5%	
Maximum Green (s)	30.0	30.0	20.0	35.0	35.0	
Yellow Time (s)	3.0	3.0	3.0	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.5	4.5	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	Min	Min	
Act Effct Green (s)	12.2	12.2		35.1	35.1	
Actuated g/C Ratio	0.29	0.29		0.82	0.82	
v/c Ratio	0.04	0.03		0.14	0.16	
Control Delay	12.3	7.0		3.8	3.8	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	12.3	7.0		3.8	3.8	
LOS	B	A		A	A	
Approach Delay	10.0			3.8	3.8	

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Approach LOS	B			A	A	
Stops (vph)	11	5		49	69	
Fuel Used(gal)	0	0		1	1	
CO Emissions (g/hr)	10	6		75	97	
NOx Emissions (g/hr)	2	1		15	19	
VOC Emissions (g/hr)	2	1		17	22	
Dilemma Vehicles (#)	0	0		9	13	
Queue Length 50th (ft)	3	0		0	0	
Queue Length 95th (ft)	9	5		42	58	
Internal Link Dist (ft)	657			394	320	
Turn Bay Length (ft)	50					
Base Capacity (vph)	1277	1147		1881	1690	
Starvation Cap Reductn	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	
Storage Cap Reductn	0	0		0	0	
Reduced v/c Ratio	0.02	0.01		0.12	0.15	

Intersection Summary			
Area Type:	Other		
Cycle Length: 97.5			
Actuated Cycle Length: 42.6			
Natural Cycle: 55			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.16			
Intersection Signal Delay: 4.3		Intersection LOS: A	
Intersection Capacity Utilization 33.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 1: Dolly Ridge Rd & Gresham Dr





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	12	9	102	8	90	16	375	67	109	691	35
Future Volume (vph)	30	12	9	102	8	90	16	375	67	109	691	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	75		0	0		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.975			0.940			0.977			0.993	
Flt Protected		0.972			0.975		0.950			0.950		
Satd. Flow (prot)	0	1765	0	0	1707	0	1770	1820	0	1770	1850	0
Flt Permitted		0.788			0.808		0.197			0.381		
Satd. Flow (perm)	0	1431	0	0	1415	0	367	1820	0	710	1850	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			52			21			6	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.85	0.85	0.85	0.83	0.83	0.83	0.80	0.80	0.80	0.89	0.89	0.89
Adj. Flow (vph)	35	14	11	123	10	108	20	469	84	122	776	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	60	0	0	241	0	20	553	0	122	815	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6			2		
Detector Phase	8	8		4	4		6	6		2	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	12.0	12.0		12.0	12.0		20.0	20.0		20.0	20.0	
Total Split (s)	25.0	25.0		25.0	25.0		51.0	51.0		51.0	51.0	
Total Split (%)	32.9%	32.9%		32.9%	32.9%		67.1%	67.1%		67.1%	67.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0		46.0	46.0		46.0	46.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.7	2.7		2.7	2.7		3.2	3.2		3.2	3.2	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		13.0			13.0		31.2	31.2		31.2	31.2	
Actuated g/C Ratio		0.24			0.24		0.57	0.57		0.57	0.57	
v/c Ratio		0.17			0.64		0.10	0.53		0.30	0.78	
Control Delay		18.3			25.6		7.3	9.4		9.1	15.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		18.3			25.6		7.3	9.4		9.1	15.5	
LOS		B			C		A	A		A	B	
Approach Delay		18.3			25.6			9.3			14.7	
Approach LOS		B			C			A			B	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Stops (vph)		33			131		8	224		49	492	
Fuel Used(gal)		0			3		0	3		1	7	
CO Emissions (g/hr)		31			182		7	202		49	457	
NOx Emissions (g/hr)		6			35		1	39		10	89	
VOC Emissions (g/hr)		7			42		2	47		11	106	
Dilemma Vehicles (#)		0			13		0	0		0	0	
Queue Length 50th (ft)		12			53		3	88		17	169	
Queue Length 95th (ft)		43			133		11	164		53	371	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)							75					
Base Capacity (vph)		571			590		303	1507		586	1529	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.11			0.41		0.07	0.37		0.21	0.53	

Intersection Summary			
Area Type:	Other		
Cycle Length: 76			
Actuated Cycle Length: 55.2			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 14.6		Intersection LOS: B	
Intersection Capacity Utilization 76.8%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd

Intersection	
Int Delay, s/veh	34.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	90	0	79	0	464	256	184	320	0
Future Vol, veh/h	0	0	0	90	0	79	0	464	256	184	320	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	88	88	88	92	92	92	86	86	86
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	0	0	0	102	0	90	0	504	278	214	372	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1443	1582	372	1443	1443	643	372	0	0	782	0	0
Stage 1	800	800	-	643	643	-	-	-	-	-	-	-
Stage 2	643	782	-	800	800	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	111	109	676	111	133	475	1192	-	-	840	-	-
Stage 1	380	399	-	464	470	-	-	-	-	-	-	-
Stage 2	464	406	-	380	399	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	68	74	676	~ 83	90	475	1192	-	-	840	-	-
Mov Cap-2 Maneuver	68	74	-	~ 83	90	-	-	-	-	-	-	-
Stage 1	380	271	-	464	470	-	-	-	-	-	-	-
Stage 2	376	406	-	258	271	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	265.6	0	3.9
HCM LOS	A	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1192	-	-	-	140	840	-	-
HCM Lane V/C Ratio	-	-	-	-	1.372	0.255	-	-
HCM Control Delay (s)	0	-	-	0	265.6	10.7	0	-
HCM Lane LOS	A	-	-	A	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	-	12.3	1	-	-

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

Lane Group	WBL	WBR	WBR2	NBL	NBT	NBR	SBL	SBT	SBR	SEL2	SEL	SER
Lane Configurations												
Traffic Volume (vph)	128	307	888	221	746	795	89	1846	37	115	79	795
Future Volume (vph)	128	307	888	221	746	795	89	1846	37	115	79	795
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175	0		400		0	360		230		0	230
Storage Lanes	1	2		2		1	1		1		2	1
Taper Length (ft)	25			25			25				25	
Lane Util. Factor	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00	1.00	1.00	0.88
Frt		0.850	0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	0.950	
Satd. Flow (prot)	1770	1583	1583	3433	3539	1583	1770	3539	1583	1770	1770	2787
Flt Permitted	0.950			0.040			0.297			0.950	0.950	
Satd. Flow (perm)	1770	1583	1583	145	3539	1583	553	3539	1583	1770	1770	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			373			669			56			603
Link Speed (mph)	25				40			40			40	
Link Distance (ft)	478				683			562			543	
Travel Time (s)	13.0				11.6			9.6			9.3	
Peak Hour Factor	0.87	0.87	0.87	0.95	0.95	0.95	0.98	0.98	0.98	0.94	0.94	0.94
Adj. Flow (vph)	147	353	1021	233	785	837	91	1884	38	122	84	846
Shared Lane Traffic (%)												
Lane Group Flow (vph)	147	353	1021	233	785	837	91	1884	38	122	84	846
Turn Type	Prot	Perm	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	Prot	Perm
Protected Phases	8			5	2		1	6		4	4	
Permitted Phases		8	8	2		2	6		6			4
Detector Phase	8	8	8	5	2	2	1	6	6	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	20.0	20.0	7.0	20.0	20.0	7.0	7.0	7.0
Minimum Split (s)	12.0	12.0	12.0	11.5	25.0	25.0	12.0	25.0	25.0	12.0	12.0	12.0
Total Split (s)	45.0	45.0	45.0	45.0	100.0	100.0	45.0	100.0	100.0	25.0	25.0	25.0
Total Split (%)	20.9%	20.9%	20.9%	20.9%	46.5%	46.5%	20.9%	46.5%	46.5%	11.6%	11.6%	11.6%
Maximum Green (s)	40.0	40.0	40.0	41.0	95.0	95.0	40.5	95.0	95.0	20.5	20.5	20.5
Yellow Time (s)	4.0	4.0	4.0	3.5	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.5	5.0	5.0	4.5	4.5	4.5
Lead/Lag				Lead	Lag	Lag	Lead	Lag	Lag			
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	Yes			
Vehicle Extension (s)	4.0	4.0	4.0	4.0	5.0	5.0	3.0	5.0	5.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	Min	Min	None	Min	Min	None	None	None
Act Effct Green (s)	40.0	40.0	40.0	116.1	101.1	101.1	105.0	95.0	95.0	20.5	20.5	20.5
Actuated g/C Ratio	0.21	0.21	0.21	0.61	0.53	0.53	0.55	0.50	0.50	0.11	0.11	0.11
v/c Ratio	0.40	1.06	1.63	0.64	0.42	0.72	0.25	1.07	0.05	0.64	0.44	1.01
Control Delay	68.8	134.6	315.5	49.7	27.7	9.8	17.4	86.2	2.2	97.8	87.9	55.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.8	134.6	315.5	49.7	27.7	9.8	17.4	86.2	2.2	97.8	87.9	55.9
LOS	E	F	F	D	C	A	B	F	A	F	F	E
Approach Delay	249.7				22.4			81.5			63.3	
Approach LOS	F				C			F			E	

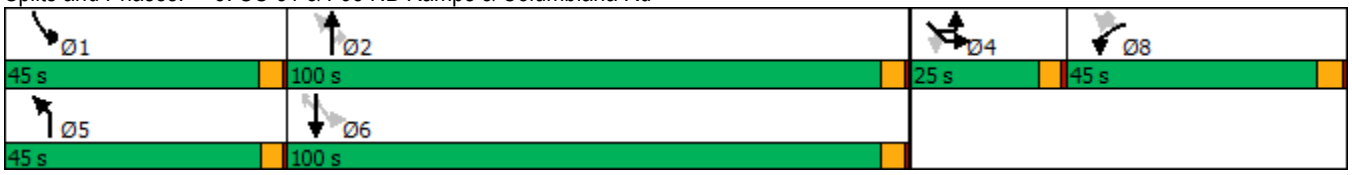
Lane Group	WBL	WBR	WBR2	NBL	NBT	NBR	SBL	SBT	SBR	SEL2	SEL	SER
Stops (vph)	110	265	338	137	436	156	39	1641	2	109	73	217
Fuel Used(gal)	3	11	62	5	12	7	1	56	0	4	2	14
CO Emissions (g/hr)	191	746	4330	322	836	476	73	3883	12	265	169	986
NOx Emissions (g/hr)	37	145	842	63	163	93	14	756	2	51	33	192
VOC Emissions (g/hr)	44	173	1004	75	194	110	17	900	3	61	39	228
Dilemma Vehicles (#)	0	0	0	0	15	0	0	45	0	0	0	0
Queue Length 50th (ft)	161	~483	~1451	94	305	147	46	~1361	0	149	100	~213
Queue Length 95th (ft)	235	#683	#1654	145	368	324	74	#1530	12	232	168	#382
Internal Link Dist (ft)	398				603			482			463	
Turn Bay Length (ft)	175			400			360		230			230
Base Capacity (vph)	372	333	627	797	1881	1155	595	1768	819	190	190	838
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	1.06	1.63	0.29	0.42	0.72	0.15	1.07	0.05	0.64	0.44	1.01

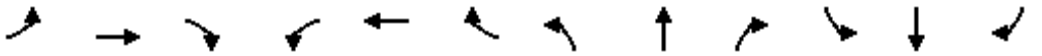
Intersection Summary	
Area Type:	Other
Cycle Length: 215	
Actuated Cycle Length: 190.1	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.63	
Intersection Signal Delay: 101.2	Intersection LOS: F
Intersection Capacity Utilization 88.0%	ICU Level of Service E
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: US-31 & I-65 NB Ramps & Columbiana Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	84	40	158	74	72	35	991	186	253	2073	330
Future Volume (vph)	67	84	40	158	74	72	35	991	186	253	2073	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	35		0	300		175	0		375
Storage Lanes	0		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.972			0.926				0.850			0.850
Flt Protected		0.983		0.950			0.950			0.950		
Satd. Flow (prot)	0	1780	0	1770	1725	0	1770	3539	1583	1770	3539	1583
Flt Permitted		0.581		0.439			0.031			0.187		
Satd. Flow (perm)	0	1052	0	818	1725	0	58	3539	1583	348	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			22				147			194
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		482			504			393			502	
Travel Time (s)		11.0			11.5			6.0			7.6	
Peak Hour Factor	0.71	0.71	0.71	0.88	0.88	0.88	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	94	118	56	180	84	82	40	1139	214	275	2253	359
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	268	0	180	166	0	40	1139	214	275	2253	359
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	20.0	20.0	7.0	20.0	20.0
Minimum Split (s)	29.5	29.5		29.5	29.5		12.0	25.0	25.0	12.0	25.0	25.0
Total Split (s)	45.0	45.0		45.0	45.0		40.0	135.0	135.0	20.0	115.0	115.0
Total Split (%)	22.5%	22.5%		22.5%	22.5%		20.0%	67.5%	67.5%	10.0%	57.5%	57.5%
Maximum Green (s)	40.5	40.5		40.5	40.5		35.5	130.0	130.0	15.5	110.0	110.0
Yellow Time (s)	3.5	3.5		3.5	3.5		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		0.5	1.0	1.0	0.5	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		4.5		4.5	4.5		4.5	5.0	5.0	4.5	5.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0							
Flash Dont Walk (s)	18.0	18.0		18.0	18.0							
Pedestrian Calls (#/hr)	0	0		0	0							
Act Effct Green (s)		40.5		40.5	40.5		139.4	130.9	130.9	150.5	139.9	139.9
Actuated g/C Ratio		0.20		0.20	0.20		0.70	0.65	0.65	0.75	0.70	0.70
v/c Ratio		1.24		1.09	0.45		0.37	0.49	0.20	0.75	0.91	0.31
Control Delay		198.2		165.5	64.9		27.3	18.6	4.7	21.8	32.4	5.9
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		198.2		165.5	64.9		27.3	18.6	4.7	21.8	32.4	5.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		F		F	E		C	B	A	C	C	A
Approach Delay		198.2			117.3			16.7			28.1	
Approach LOS		F			F			B			C	
Stops (vph)		148		130	110		11	489	23	75	1643	56
Fuel Used(gal)		9		7	3		0	12	1	3	41	2
CO Emissions (g/hr)		643		466	218		29	864	66	201	2857	151
NOx Emissions (g/hr)		125		91	42		6	168	13	39	556	29
VOC Emissions (g/hr)		149		108	50		7	200	15	47	662	35
Dilemma Vehicles (#)		0		0	0		0	25	0	0	51	0
Queue Length 50th (ft)		~428		~265	169		12	393	31	98	1271	73
Queue Length 95th (ft)		#436		#431	248		43	423	62	137	1448	128
Internal Link Dist (ft)		402			424			313			422	
Turn Bay Length (ft)				35			300		175			375
Base Capacity (vph)		217		165	366		347	2317	1087	372	2475	1165
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0
Storage Cap Reductn		0		0	0		0	0	0	0	0	0
Reduced v/c Ratio		1.24		1.09	0.45		0.12	0.49	0.20	0.74	0.91	0.31

Intersection Summary

Area Type: Other
Cycle Length: 200
Actuated Cycle Length: 200
Offset: 188 (94%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.24
Intersection Signal Delay: 40.5 Intersection LOS: D
Intersection Capacity Utilization 97.9% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US-31 & Shades Crest Rd

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	309	2834	4637	668	324	265
Future Volume (vph)	309	2834	4637	668	324	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350			0	100	100
Storage Lanes	2			1	1	1
Taper Length (ft)	75				75	
Lane Util. Factor	0.97	0.91	0.91	1.00	0.94	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3433	5085	5085	1583	4990	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3433	5085	5085	1583	4990	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				180		202
Link Speed (mph)		55	55		40	
Link Distance (ft)		616	491		414	
Travel Time (s)		7.6	6.1		7.1	
Peak Hour Factor	0.98	0.98	0.93	0.93	0.80	0.80
Adj. Flow (vph)	315	2892	4986	718	405	331
Shared Lane Traffic (%)						
Lane Group Flow (vph)	315	2892	4986	718	405	331
Turn Type	Prot	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases				6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	8.0	12.0	12.0	12.0	8.0	8.0
Minimum Split (s)	12.5	24.5	24.5	24.5	22.5	22.5
Total Split (s)	40.0	200.0	160.0	160.0	40.0	40.0
Total Split (%)	16.7%	83.3%	66.7%	66.7%	16.7%	16.7%
Maximum Green (s)	35.5	193.5	153.5	153.5	35.5	35.5
Yellow Time (s)	3.5	5.5	5.5	5.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.5	6.5	6.5	4.5	4.5
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max	Max	Max	None	None
Walk Time (s)		7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0
Act Effct Green (s)	26.5	193.7	162.6	162.6	27.6	27.6
Actuated g/C Ratio	0.11	0.83	0.70	0.70	0.12	0.12
v/c Ratio	0.80	0.68	1.40	0.62	0.68	0.90
Control Delay	116.4	9.0	212.0	16.9	104.0	66.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.7
Total Delay	116.4	9.0	212.0	16.9	104.0	67.3

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
LOS	F	A	F	B	F	E
Approach Delay		19.6	187.5		87.5	
Approach LOS		B	F		F	
Stops (vph)	298	1047	3335	276	305	110
Fuel Used(gal)	14	36	277	10	11	5
CO Emissions (g/hr)	983	2496	19331	664	753	379
NOx Emissions (g/hr)	191	486	3761	129	146	74
VOC Emissions (g/hr)	228	579	4480	154	174	88
Dilemma Vehicles (#)	0	61	22	0	0	0
Queue Length 50th (ft)	247	554	~3718	421	215	214
Queue Length 95th (ft)	311	703	#3894	667	227	267
Internal Link Dist (ft)		536	411		334	
Turn Bay Length (ft)	350				100	100
Base Capacity (vph)	524	4238	3559	1162	763	413
Starvation Cap Reductn	0	0	0	0	0	9
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.68	1.40	0.62	0.53	0.82

Intersection Summary			
Area Type:	Other		
Cycle Length: 240			
Actuated Cycle Length: 232.3			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.40			
Intersection Signal Delay: 124.0		Intersection LOS: F	
Intersection Capacity Utilization 118.0%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

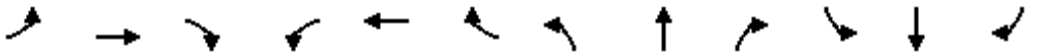
Splits and Phases: 1: Rocky Ridge Rd & US-280

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	264	19	17	325	693	284
Future Volume (vph)	264	19	17	325	693	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	100	125			0
Storage Lanes	1	1	1			1
Taper Length (ft)	75		75			
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950			0.997		
Satd. Flow (prot)	1770	1583	0	3529	1863	1583
Flt Permitted	0.950			0.894		
Satd. Flow (perm)	1770	1583	0	3164	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		21				305
Link Speed (mph)	25			40	40	
Link Distance (ft)	484			376	414	
Travel Time (s)	13.2			6.4	7.1	
Peak Hour Factor	0.90	0.90	0.87	0.87	0.93	0.93
Adj. Flow (vph)	293	21	20	374	745	305
Shared Lane Traffic (%)						
Lane Group Flow (vph)	293	21	0	394	745	305
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			6	2	
Permitted Phases		4	6			2
Detector Phase	4	4	6	6	2	2
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0	12.0	12.0	12.0
Minimum Split (s)	22.5	22.5	23.0	23.0	23.0	23.0
Total Split (s)	32.0	32.0	45.0	45.0	45.0	45.0
Total Split (%)	41.6%	41.6%	58.4%	58.4%	58.4%	58.4%
Maximum Green (s)	27.7	27.7	40.0	40.0	40.0	40.0
Yellow Time (s)	3.1	3.1	3.8	3.8	3.8	3.8
All-Red Time (s)	1.2	1.2	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.3	4.3		5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	1.5	1.5	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	8.0	8.0	8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	27.7	27.7		40.0	40.0	40.0
Actuated g/C Ratio	0.36	0.36		0.52	0.52	0.52
v/c Ratio	0.46	0.04		0.24	0.77	0.32
Control Delay	21.8	7.4		10.6	21.6	2.2
Queue Delay	0.0	0.0		0.0	10.4	0.0
Total Delay	21.8	7.4		10.6	32.0	2.2

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
LOS	C	A		B	C	A
Approach Delay	20.9			10.6	23.4	
Approach LOS	C			B	C	
Stops (vph)	196	6		176	536	21
Fuel Used(gal)	3	0		3	10	1
CO Emissions (g/hr)	211	9		234	717	79
NOx Emissions (g/hr)	41	2		46	140	15
VOC Emissions (g/hr)	49	2		54	166	18
Dilemma Vehicles (#)	0	0		22	45	0
Queue Length 50th (ft)	106	0		51	267	0
Queue Length 95th (ft)	175	14		73	415	35
Internal Link Dist (ft)	404			296	334	
Turn Bay Length (ft)		100				
Base Capacity (vph)	636	582		1643	967	968
Starvation Cap Reductn	0	0		0	200	0
Spillback Cap Reductn	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0
Reduced v/c Ratio	0.46	0.04		0.24	0.97	0.32

Intersection Summary			
Area Type:	Other		
Cycle Length: 77			
Actuated Cycle Length: 77			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 20.1		Intersection LOS: C	
Intersection Capacity Utilization 58.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: Rocky Ridge Rd & Shades Crest Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	11	15	82	11	86	14	314	55	92	500	35
Future Volume (vph)	26	11	15	82	11	86	14	314	55	92	500	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	75		0	0		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.960			0.935			0.977			0.990	
Flt Protected		0.976			0.978		0.950			0.950		
Satd. Flow (prot)	0	1745	0	0	1703	0	1770	1820	0	1770	1844	0
Flt Permitted		0.849			0.822		0.293			0.499		
Satd. Flow (perm)	0	1518	0	0	1432	0	546	1820	0	930	1844	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20			59			22			9	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.76	0.76	0.76	0.88	0.88	0.88	0.88	0.88	0.88	0.77	0.77	0.77
Adj. Flow (vph)	34	14	20	93	13	98	16	357	63	119	649	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	68	0	0	204	0	16	420	0	119	694	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6			2		
Detector Phase	8	8		4	4		6	6		2	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	24.0	24.0		24.0	24.0		52.0	52.0		52.0	52.0	
Total Split (%)	31.6%	31.6%		31.6%	31.6%		68.4%	68.4%		68.4%	68.4%	
Maximum Green (s)	20.0	20.0		20.0	20.0		46.9	46.9		46.9	46.9	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	0.0	0.0		0.0	0.0		1.1	1.1		1.1	1.1	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0			4.0		5.1	5.1		5.1	5.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.7	2.7		2.7	2.7		3.2	3.2		3.2	3.2	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		10.8			10.8		27.5	27.5		27.5	27.5	
Actuated g/C Ratio		0.22			0.22		0.57	0.57		0.57	0.57	
v/c Ratio		0.19			0.55		0.05	0.40		0.22	0.66	
Control Delay		14.5			19.3		5.6	7.0		6.8	10.8	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		14.5			19.3		5.6	7.0		6.8	10.8	
LOS		B			B		A	A		A	B	
Approach Delay		14.5			19.3			6.9			10.2	
Approach LOS		B			B			A			B	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Stops (vph)		30			105		7	167		39	319	
Fuel Used(gal)		0			2		0	2		1	4	
CO Emissions (g/hr)		27			141		6	148		38	284	
NOx Emissions (g/hr)		5			27		1	29		7	55	
VOC Emissions (g/hr)		6			33		1	34		9	66	
Dilemma Vehicles (#)		0			13		0	0		0	0	
Queue Length 50th (ft)		9			29		2	45		12	97	
Queue Length 95th (ft)		37			109		9	122		36	197	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)							75					
Base Capacity (vph)		683			667		500	1669		852	1690	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.10			0.31		0.03	0.25		0.14	0.41	

Intersection Summary			
Area Type:	Other		
Cycle Length: 76			
Actuated Cycle Length: 48			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 10.7		Intersection LOS: B	
Intersection Capacity Utilization 65.4%		ICU Level of Service C	
Analysis Period (min) 15			

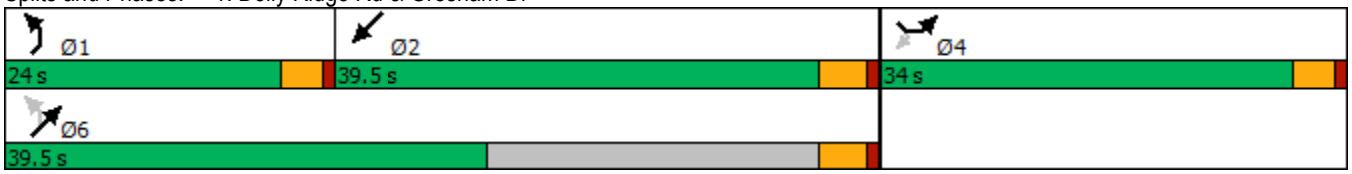
Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd

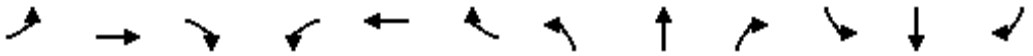
Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	75	298	205	154	149	107
Future Volume (vph)	75	298	205	154	149	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50	0	100			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.948	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1787	1599	1787	1881	1783	0
Flt Permitted	0.950		0.478			
Satd. Flow (perm)	1787	1599	899	1881	1783	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		608			36	
Link Speed (mph)	25			35	35	
Link Distance (ft)	737			474	400	
Travel Time (s)	20.1			9.2	7.8	
Peak Hour Factor	0.49	0.49	0.94	0.83	0.82	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	153	608	218	186	182	114
Shared Lane Traffic (%)						
Lane Group Flow (vph)	153	608	218	186	296	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6	6		
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	12.0	12.0	10.0	20.0	20.0	
Minimum Split (s)	16.5	16.5	14.5	24.5	24.5	
Total Split (s)	34.0	34.0	24.0	39.5	39.5	
Total Split (%)	34.9%	34.9%	24.6%	40.5%	40.5%	
Maximum Green (s)	30.0	30.0	20.0	35.0	35.0	
Yellow Time (s)	3.0	3.0	3.0	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.5	4.5	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	Max	Max	
Walk Time (s)					7.0	
Flash Dont Walk (s)					11.0	
Pedestrian Calls (#/hr)					0	
Act Effct Green (s)	14.4	14.4	50.2	49.7	35.2	
Actuated g/C Ratio	0.20	0.20	0.69	0.68	0.48	
v/c Ratio	0.43	0.76	0.29	0.14	0.34	
Control Delay	29.5	9.3	5.6	4.9	12.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Total Delay	29.5	9.3	5.6	4.9	12.3	
LOS	C	A	A	A	B	
Approach Delay	13.3			5.3	12.3	
Approach LOS	B			A	B	
Stops (vph)	61	34	67	50	133	
Fuel Used(gal)	1	3	1	1	2	
CO Emissions (g/hr)	81	179	101	74	166	
NOx Emissions (g/hr)	16	35	20	14	32	
VOC Emissions (g/hr)	19	42	23	17	39	
Dilemma Vehicles (#)	0	0	0	8	17	
Queue Length 50th (ft)	60	0	24	21	61	
Queue Length 95th (ft)	58	0	73	57	133	
Internal Link Dist (ft)	657			394	320	
Turn Bay Length (ft)	50		100			
Base Capacity (vph)	741	1019	867	1535	881	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.21	0.60	0.25	0.12	0.34	

Intersection Summary			
Area Type:	Other		
Cycle Length: 97.5			
Actuated Cycle Length: 72.6			
Natural Cycle: 60			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 10.9		Intersection LOS: B	
Intersection Capacity Utilization 48.4%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 1: Dolly Ridge Rd & Gresham Dr



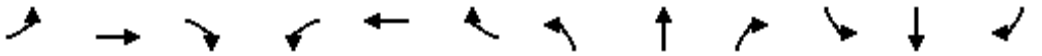


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	27	15	221	30	231	14	314	137	229	500	35
Future Volume (vph)	26	27	15	221	30	231	14	314	137	229	500	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	75		0	0		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.970			0.935			0.954			0.990	
Flt Protected		0.981			0.978		0.950			0.950		
Satd. Flow (prot)	0	1773	0	0	1703	0	1770	1777	0	1770	1844	0
Flt Permitted		0.786			0.810		0.220			0.366		
Satd. Flow (perm)	0	1420	0	0	1411	0	410	1777	0	682	1844	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			59			52			8	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.76	0.76	0.76	0.88	0.88	0.88	0.88	0.88	0.88	0.77	0.77	0.77
Adj. Flow (vph)	34	36	20	251	34	263	16	357	156	297	649	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	90	0	0	548	0	16	513	0	297	694	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6			2		
Detector Phase	8	8		4	4		6	6		2	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	12.0	12.0		12.0	12.0		20.0	20.0		20.0	20.0	
Total Split (s)	25.0	25.0		25.0	25.0		51.0	51.0		51.0	51.0	
Total Split (%)	32.9%	32.9%		32.9%	32.9%		67.1%	67.1%		67.1%	67.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0		46.0	46.0		46.0	46.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.7	2.7		2.7	2.7		3.2	3.2		3.2	3.2	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		20.6			20.6		31.4	31.4		31.4	31.4	
Actuated g/C Ratio		0.33			0.33		0.50	0.50		0.50	0.50	
v/c Ratio		0.19			1.08		0.08	0.56		0.87	0.74	
Control Delay		17.4			89.5		7.6	11.2		38.8	16.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		17.4			89.5		7.6	11.2		38.8	16.9	
LOS		B			F		A	B		D	B	
Approach Delay		17.4			89.5			11.1			23.4	
Approach LOS		B			F			B			C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Stops (vph)		42			305		7	237		177	365	
Fuel Used(gal)		1			12		0	3		3	5	
CO Emissions (g/hr)		39			872		6	221		229	348	
NOx Emissions (g/hr)		8			170		1	43		44	68	
VOC Emissions (g/hr)		9			202		1	51		53	81	
Dilemma Vehicles (#)		0			30		0	0		0	0	
Queue Length 50th (ft)		19			~226		3	105		88	183	
Queue Length 95th (ft)		51			#493		10	165		143	215	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)							75					
Base Capacity (vph)		481			506		312	1365		519	1405	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.19			1.08		0.05	0.38		0.57	0.49	

Intersection Summary			
Area Type:	Other		
Cycle Length: 76			
Actuated Cycle Length: 62.3			
Natural Cycle: 65			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.08			
Intersection Signal Delay: 37.0		Intersection LOS: D	
Intersection Capacity Utilization 88.1%		ICU Level of Service E	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd



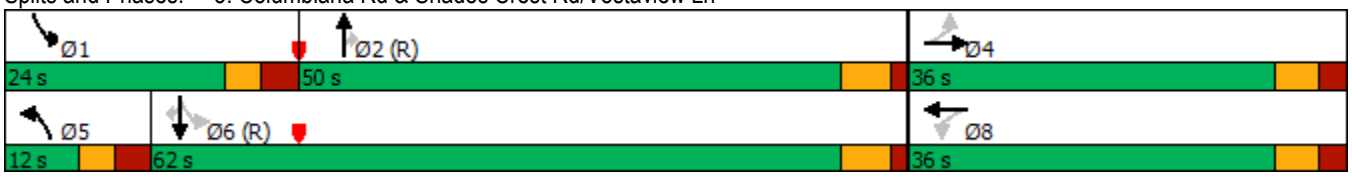
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	109	20	57	34	112	16	1256	226	118	255	31
Future Volume (vph)	184	109	20	57	34	112	16	1256	226	118	255	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	115		0	140		350
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.991			0.925				0.850			0.850
Flt Protected		0.971			0.986		0.950			0.950		
Satd. Flow (prot)	0	1792	0	0	1699	0	1770	3539	1583	1770	3539	1583
Flt Permitted		0.638			0.825		0.950			0.071		
Satd. Flow (perm)	0	1178	0	0	1422	0	1770	3539	1583	132	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			55				207			89
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		493			298			271			469	
Travel Time (s)		11.2			6.8			4.1			7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	200	118	22	62	37	122	17	1365	246	128	277	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	340	0	0	221	0	17	1365	246	128	277	34
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		5.0	18.0	18.0	5.0	18.0	18.0
Minimum Split (s)	24.0	24.0		24.0	24.0		12.0	23.5	23.5	24.0	23.5	23.5
Total Split (s)	36.0	36.0		36.0	36.0		12.0	50.0	50.0	24.0	62.0	62.0
Total Split (%)	32.7%	32.7%		32.7%	32.7%		10.9%	45.5%	45.5%	21.8%	56.4%	56.4%
Maximum Green (s)	30.0	30.0		30.0	30.0		6.0	44.5	44.5	18.0	56.5	56.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.5	2.5		2.5	2.5		3.0	1.5	1.5	3.0	1.5	1.5
Lost Time Adjust (s)		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0			6.0		6.0	5.5	5.5	6.0	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.5	3.5	2.0	3.5	3.5
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	C-Min
Walk Time (s)	7.0	7.0										
Flash Dont Walk (s)	10.0	10.0										
Pedestrian Calls (#/hr)	0	0										
Act Effct Green (s)		30.7			30.7		5.5	53.3	53.3	66.8	63.0	63.0
Actuated g/C Ratio		0.28			0.28		0.05	0.48	0.48	0.61	0.57	0.57
v/c Ratio		1.03			0.51		0.19	0.80	0.28	0.62	0.14	0.04
Control Delay		97.1			29.7		55.1	28.5	4.7	31.5	10.5	0.5
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		97.1			29.7		55.1	28.5	4.7	31.5	10.5	0.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		F			C		E	C	A	C	B	A
Approach Delay		97.1			29.7			25.2			15.9	
Approach LOS		F			C			C			B	
Stops (vph)		257			129		17	1016	29	59	114	1
Fuel Used(gal)		9			2		0	22	1	2	3	0
CO Emissions (g/hr)		616			169		29	1547	68	129	192	8
NOx Emissions (g/hr)		120			33		6	301	13	25	37	1
VOC Emissions (g/hr)		143			39		7	359	16	30	44	2
Dilemma Vehicles (#)		0			0		0	57	0	0	10	0
Queue Length 50th (ft)		~261			98		12	400	14	41	46	0
Queue Length 95th (ft)		#446			177		35	541	62	106	63	0
Internal Link Dist (ft)		413			218			191			389	
Turn Bay Length (ft)							115			140		350
Base Capacity (vph)		331			436		96	1714	873	348	2026	944
Starvation Cap Reductn		0			0		0	0	0	0	0	0
Spillback Cap Reductn		0			0		0	0	0	0	0	0
Storage Cap Reductn		0			0		0	0	0	0	0	0
Reduced v/c Ratio		1.03			0.51		0.18	0.80	0.28	0.37	0.14	0.04

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green, Master Intersection
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 33.3 Intersection LOS: C
Intersection Capacity Utilization 89.1% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Columbiana Rd & Shades Crest Rd/Vestaview Ln



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	58	74	1210	342	79	346
Future Volume (vph)	58	74	1210	342	79	346
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		160	150	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	0.924			0.850		
Flt Protected	0.978				0.950	
Satd. Flow (prot)	1683	0	3539	1583	1770	3539
Flt Permitted	0.978				0.158	
Satd. Flow (perm)	1683	0	3539	1583	294	3539
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	52			329		
Link Speed (mph)	30		45			45
Link Distance (ft)	299		469			333
Travel Time (s)	6.8		7.1			5.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	80	1315	372	86	376
Shared Lane Traffic (%)						
Lane Group Flow (vph)	143	0	1315	372	86	376
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0		18.0	18.0	5.0	18.0
Minimum Split (s)	22.5		22.5	22.5	9.5	22.5
Total Split (s)	26.0		71.0	71.0	13.0	84.0
Total Split (%)	23.6%		64.5%	64.5%	11.8%	76.4%
Maximum Green (s)	21.5		66.5	66.5	8.5	79.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	5.0		3.0	3.0	3.0	3.0
Recall Mode	None		C-Min	C-Min	None	C-Min
Walk Time (s)			7.0	7.0		7.0
Flash Dont Walk (s)			11.0	11.0		11.0
Pedestrian Calls (#/hr)			0	0		0
Act Effct Green (s)	13.3		78.5	78.5	87.7	87.7
Actuated g/C Ratio	0.12		0.71	0.71	0.80	0.80
v/c Ratio	0.57		0.52	0.30	0.27	0.13
Control Delay	37.1		4.0	0.4	5.0	3.0
Queue Delay	0.0		0.2	0.3	0.0	0.0
Total Delay	37.1		4.2	0.7	5.0	3.0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	D		A	A	A	A
Approach Delay	37.1		3.4			3.4
Approach LOS	D		A			A
Stops (vph)	78		258	1	17	74
Fuel Used(gal)	2		8	1	0	2
CO Emissions (g/hr)	121		550	76	32	131
NOx Emissions (g/hr)	24		107	15	6	26
VOC Emissions (g/hr)	28		128	18	7	30
Dilemma Vehicles (#)	0		40	0	0	16
Queue Length 50th (ft)	61		94	0	10	25
Queue Length 95th (ft)	119		m42	m0	26	46
Internal Link Dist (ft)	219		389			253
Turn Bay Length (ft)				160	150	
Base Capacity (vph)	370		2524	1223	348	2820
Starvation Cap Reductn	0		437	358	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.39		0.63	0.43	0.25	0.13

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 15 (14%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 5.5		Intersection LOS: A	
Intersection Capacity Utilization 56.8%		ICU Level of Service B	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Columbiana Rd & Shades Crest Rd

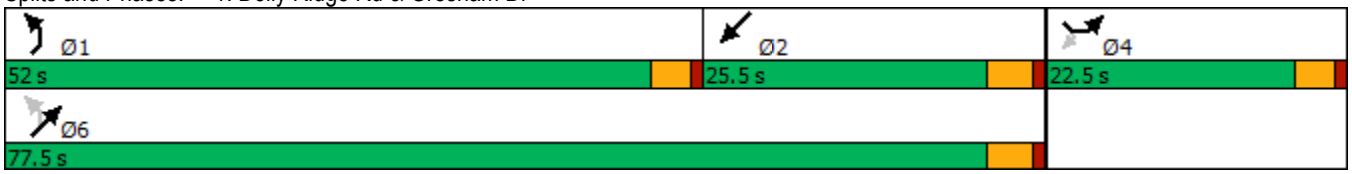
Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	190	371	635	258	143	56
Future Volume (vph)	190	371	635	258	143	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.951	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1787	1599	1787	1881	1789	0
Flt Permitted	0.950		0.263			
Satd. Flow (perm)	1787	1599	495	1881	1789	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		640			26	
Link Speed (mph)	25			35	35	
Link Distance (ft)	737			474	400	
Travel Time (s)	20.1			9.2	7.8	
Peak Hour Factor	0.58	0.58	0.57	0.83	0.82	0.57
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	328	640	1114	311	174	98
Shared Lane Traffic (%)						
Lane Group Flow (vph)	328	640	1114	311	272	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	12.0	12.0	10.0	20.0	20.0	
Minimum Split (s)	16.0	16.0	14.0	24.5	24.5	
Total Split (s)	22.5	22.5	52.0	77.5	25.5	
Total Split (%)	22.5%	22.5%	52.0%	77.5%	25.5%	
Maximum Green (s)	18.5	18.5	48.0	73.0	21.0	
Yellow Time (s)	3.0	3.0	3.0	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.5	4.5	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.0	5.0	3.0	3.2	3.2	
Recall Mode	None	None	None	Min	Min	
Act Effct Green (s)	18.5	18.5	72.9	72.4	20.4	
Actuated g/C Ratio	0.19	0.19	0.73	0.73	0.21	
v/c Ratio	0.99	0.78	1.13	0.23	0.70	
Control Delay	88.6	10.8	91.8	4.9	43.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	88.6	10.8	91.8	4.9	43.9	
LOS	F	B	F	A	D	
Approach Delay	37.2			72.8	43.9	

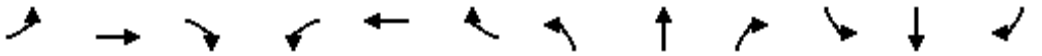
Lane Group	SEL	SER	NEL	NET	SWT	SWR
Approach LOS	D			E	D	
Stops (vph)	163	39	449	75	165	
Fuel Used(gal)	5	3	17	2	4	
CO Emissions (g/hr)	367	231	1217	119	251	
NOx Emissions (g/hr)	71	45	237	23	49	
VOC Emissions (g/hr)	85	53	282	28	58	
Dilemma Vehicles (#)	0	0	0	9	9	
Queue Length 50th (ft)	208	0	~737	54	146	
Queue Length 95th (ft)	184	0	325	75	208	
Internal Link Dist (ft)	657			394	320	
Turn Bay Length (ft)			300			
Base Capacity (vph)	332	818	986	1381	398	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.99	0.78	1.13	0.23	0.68	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 99.4			
Natural Cycle: 140			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.13			
Intersection Signal Delay: 56.9		Intersection LOS: E	
Intersection Capacity Utilization 72.8%		ICU Level of Service C	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Dolly Ridge Rd & Gresham Dr





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	313	48	14	155	61	270	30	2032	114	46	726	35
Future Volume (vph)	313	48	14	155	61	270	30	2032	114	46	726	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	250		0	300		175	0		375
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.966			0.878				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1799	0	1770	1635	0	1770	3539	1583	1770	3539	1583
Flt Permitted	0.140			0.697			0.950			0.030		
Satd. Flow (perm)	261	1799	0	1298	1635	0	1770	3539	1583	56	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			87				55			55
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		482			504			393			502	
Travel Time (s)		11.0			11.5			6.0			7.6	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.96	0.96	0.96	0.82	0.82	0.82
Adj. Flow (vph)	382	59	17	189	74	329	31	2117	119	56	885	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	382	76	0	189	403	0	31	2117	119	56	885	43
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8					2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	20.0	20.0	7.0	20.0	20.0
Minimum Split (s)	12.0	29.5		12.0	29.5		12.0	25.0	25.0	12.0	25.0	25.0
Total Split (s)	30.0	30.0		30.0	30.0		20.0	130.0	130.0	20.0	130.0	130.0
Total Split (%)	14.3%	14.3%		14.3%	14.3%		9.5%	61.9%	61.9%	9.5%	61.9%	61.9%
Maximum Green (s)	25.5	25.5		25.5	25.5		15.5	125.0	125.0	15.5	125.0	125.0
Yellow Time (s)	3.5	3.5		3.5	3.5		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		0.5	1.0	1.0	0.5	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	5.0	5.0	4.5	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	4.0		3.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	C-Min
Walk Time (s)		7.0			7.0							
Flash Dont Walk (s)		18.0			18.0							
Pedestrian Calls (#/hr)		0			0							
Act Effct Green (s)	53.1	28.6		47.9	25.5		10.2	131.0	131.0	141.2	132.6	132.6
Actuated g/C Ratio	0.25	0.14		0.23	0.12		0.05	0.62	0.62	0.67	0.63	0.63
v/c Ratio	1.53	0.30		0.55	1.47		0.36	0.96	0.12	0.49	0.40	0.04
Control Delay	302.5	80.1		70.5	272.8		107.6	48.6	9.0	44.7	20.2	2.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	302.5	80.1		70.5	272.8		107.6	48.6	9.0	44.7	20.2	2.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	F		E	F		F	D	A	D	C	A
Approach Delay		265.6			208.2			47.3			20.8	
Approach LOS		F			F			D			C	
Stops (vph)	192	51		130	176		29	1757	24	22	349	2
Fuel Used(gal)	22	2		4	21		1	47	1	1	10	0
CO Emissions (g/hr)	1504	107		248	1440		76	3295	56	59	678	11
NOx Emissions (g/hr)	293	21		48	280		15	641	11	11	132	2
VOC Emissions (g/hr)	348	25		58	334		18	764	13	14	157	2
Dilemma Vehicles (#)	0	0		0	0		0	47	0	0	17	0
Queue Length 50th (ft)	~692	90		218	~652		43	1391	33	26	317	0
Queue Length 95th (ft)	#813	138		275	#768		85	#1681	69	70	336	9
Internal Link Dist (ft)		402			424			313			422	
Turn Bay Length (ft)	250			250			300		175			375
Base Capacity (vph)	249	250		372	274		130	2207	1008	165	2234	1020
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	1.53	0.30		0.51	1.47		0.24	0.96	0.12	0.34	0.40	0.04

Intersection Summary

Area Type: Other
Cycle Length: 210
Actuated Cycle Length: 210
Offset: 51 (24%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.53
Intersection Signal Delay: 86.6 Intersection LOS: F
Intersection Capacity Utilization 105.0% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US-31 & Shades Crest Rd

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	274	3867	3020	191	448	159
Future Volume (vph)	274	3867	3020	191	448	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350			0	100	100
Storage Lanes	2			1	0	0
Taper Length (ft)	75				75	
Lane Util. Factor	0.97	0.91	0.91	1.00	0.94	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3433	5085	5085	1583	4990	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3433	5085	5085	1583	4990	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				79		173
Link Speed (mph)		55	55		40	
Link Distance (ft)		616	491		414	
Travel Time (s)		7.6	6.1		7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	298	4203	3283	208	487	173
Shared Lane Traffic (%)						
Lane Group Flow (vph)	298	4203	3283	208	487	173
Turn Type	Prot	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases				6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	8.0	12.0	12.0	12.0	8.0	8.0
Minimum Split (s)	12.5	24.5	24.5	24.5	22.5	22.5
Total Split (s)	40.0	200.0	160.0	160.0	40.0	40.0
Total Split (%)	16.7%	83.3%	66.7%	66.7%	16.7%	16.7%
Maximum Green (s)	35.5	193.5	153.5	153.5	35.5	35.5
Yellow Time (s)	3.5	5.5	5.5	5.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.5	6.5	6.5	4.5	4.5
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max	Max	Max	None	None
Walk Time (s)		7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0
Act Effct Green (s)	25.4	193.5	163.6	163.6	28.1	28.1
Actuated g/C Ratio	0.11	0.83	0.70	0.70	0.12	0.12
v/c Ratio	0.79	0.99	0.92	0.18	0.81	0.50
Control Delay	116.8	31.0	34.8	8.2	110.8	15.0
Queue Delay	0.0	0.0	0.0	0.0	0.3	0.1
Total Delay	116.8	31.0	34.8	8.2	111.1	15.1

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
LOS	F	C	C	A	F	B
Approach Delay		36.7	33.3		85.9	
Approach LOS		D	C		F	
Stops (vph)	263	3074	2378	40	431	16
Fuel Used(gal)	12	97	75	2	16	1
CO Emissions (g/hr)	872	6753	5242	116	1091	76
NOx Emissions (g/hr)	170	1314	1020	23	212	15
VOC Emissions (g/hr)	202	1565	1215	27	253	18
Dilemma Vehicles (#)	0	81	19	0	0	0
Queue Length 50th (ft)	234	2025	1478	61	263	0
Queue Length 95th (ft)	295	#2509	1793	118	311	85
Internal Link Dist (ft)		536	411		334	
Turn Bay Length (ft)	350				100	100
Base Capacity (vph)	524	4231	3577	1136	761	388
Starvation Cap Reductn	0	0	0	0	39	9
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.99	0.92	0.18	0.67	0.46

Intersection Summary

Area Type: Other
Cycle Length: 240
Actuated Cycle Length: 232.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 39.1 Intersection LOS: D
Intersection Capacity Utilization 92.4% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

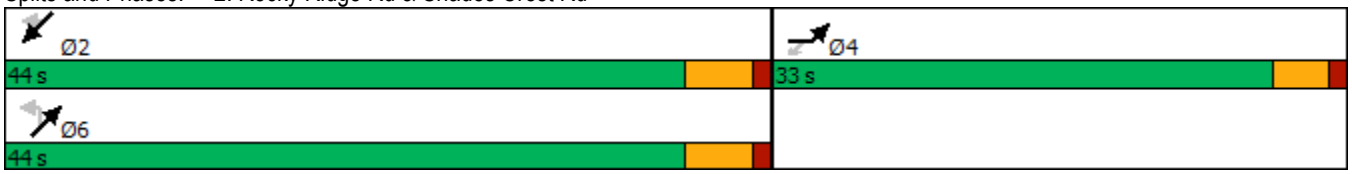
Splits and Phases: 1: Rocky Ridge Rd & US-280

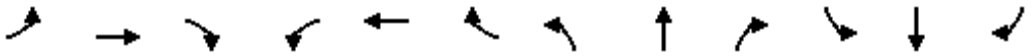
Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	151	22	7	456	294	171
Future Volume (vph)	151	22	7	456	294	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	100	125			0
Storage Lanes	1	1	1			1
Taper Length (ft)	75		75			
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950			0.999		
Satd. Flow (prot)	1770	1583	0	3536	1863	1583
Flt Permitted	0.950			0.950		
Satd. Flow (perm)	1770	1583	0	3362	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		24				186
Link Speed (mph)	25			40	40	
Link Distance (ft)	484			376	414	
Travel Time (s)	13.2			6.4	7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	164	24	8	496	320	186
Shared Lane Traffic (%)						
Lane Group Flow (vph)	164	24	0	504	320	186
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			6	2	
Permitted Phases		4	6			2
Detector Phase	4	4	6	6	2	2
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0	12.0	12.0	12.0
Minimum Split (s)	22.5	22.5	23.0	23.0	23.0	23.0
Total Split (s)	33.0	33.0	44.0	44.0	44.0	44.0
Total Split (%)	42.9%	42.9%	57.1%	57.1%	57.1%	57.1%
Maximum Green (s)	28.7	28.7	39.0	39.0	39.0	39.0
Yellow Time (s)	3.1	3.1	3.8	3.8	3.8	3.8
All-Red Time (s)	1.2	1.2	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.3	4.3		5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	1.5	1.5	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	8.0	8.0	8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	28.7	28.7		39.0	39.0	39.0
Actuated g/C Ratio	0.37	0.37		0.51	0.51	0.51
v/c Ratio	0.25	0.04		0.30	0.34	0.21
Control Delay	18.0	6.9		11.6	12.6	2.4
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	18.0	6.9		11.6	12.6	2.4

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
LOS	B	A		B	B	A
Approach Delay	16.6			11.6	8.8	
Approach LOS	B			B	A	
Stops (vph)	100	6		253	165	16
Fuel Used(gal)	2	0		5	3	1
CO Emissions (g/hr)	109	10		333	224	50
NOx Emissions (g/hr)	21	2		65	44	10
VOC Emissions (g/hr)	25	2		77	52	12
Dilemma Vehicles (#)	0	0		30	19	0
Queue Length 50th (ft)	53	0		69	86	0
Queue Length 95th (ft)	96	14		100	139	29
Internal Link Dist (ft)	404			296	334	
Turn Bay Length (ft)		100				
Base Capacity (vph)	659	605		1702	943	893
Starvation Cap Reductn	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0
Reduced v/c Ratio	0.25	0.04		0.30	0.34	0.21

Intersection Summary			
Area Type:	Other		
Cycle Length: 77			
Actuated Cycle Length: 77			
Natural Cycle: 50			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.34			
Intersection Signal Delay: 11.2		Intersection LOS: B	
Intersection Capacity Utilization 33.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: Rocky Ridge Rd & Shades Crest Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	12	5	224	6	354	6	707	405	222	292	13
Future Volume (vph)	18	12	5	224	6	354	6	707	405	222	292	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	75		200	0		0
Storage Lanes	0		0	0		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981				0.850			0.850		0.994	
Flt Protected		0.975			0.954		0.950			0.950		
Satd. Flow (prot)	0	1782	0	0	1777	1583	1770	1863	1583	1770	1852	0
Flt Permitted		0.629			0.725		0.526			0.085		
Satd. Flow (perm)	0	1149	0	0	1350	1583	980	1863	1583	158	1852	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9				265			412		4	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.54	0.54	0.54	0.74	0.74	0.74	0.84	0.84	0.84	0.76	0.76	0.76
Adj. Flow (vph)	33	22	9	303	8	478	7	842	482	292	384	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	64	0	0	311	478	7	842	482	292	401	0
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4		4	6		6	2		
Detector Phase	8	8		4	4	4	1	6	6	5	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	19.0	19.0		19.0	19.0	19.0	12.0	20.0	20.0	12.0	20.0	
Total Split (s)	26.0	26.0		26.0	26.0	26.0	12.0	50.0	50.0	14.0	52.0	
Total Split (%)	28.9%	28.9%		28.9%	28.9%	28.9%	13.3%	55.6%	55.6%	15.6%	57.8%	
Maximum Green (s)	22.0	22.0		22.0	22.0	22.0	8.0	45.0	45.0	10.0	47.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0	5.0	4.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.7	2.7		2.7	2.7	2.7	3.0	3.2	3.2	3.0	3.2	
Recall Mode	None	None		None	None	None	None	Min	Min	None	Min	
Walk Time (s)	4.0	4.0		4.0	4.0	4.0		4.0	4.0		4.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0		11.0	11.0		11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0	0		0	
Act Effct Green (s)		21.5			21.5	21.5	51.1	43.0	43.0	57.9	54.9	
Actuated g/C Ratio		0.25			0.25	0.25	0.58	0.49	0.49	0.66	0.63	
v/c Ratio		0.22			0.94	0.81	0.01	0.92	0.49	1.01	0.35	
Control Delay		26.5			71.3	26.6	5.3	37.8	4.3	81.0	9.5	
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		26.5			71.3	26.6	5.3	37.8	4.3	81.0	9.5	

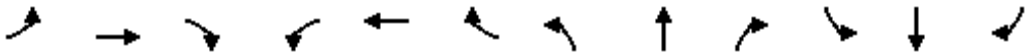
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C			E	C	A	D	A	F	A	
Approach Delay		26.5			44.2			25.5			39.6	
Approach LOS		C			D			C			D	
Stops (vph)		24			193	152	3	589	50	118	139	
Fuel Used(gal)		0			5	4	0	10	1	5	2	
CO Emissions (g/hr)		25			382	286	2	698	95	334	140	
NOx Emissions (g/hr)		5			74	56	0	136	19	65	27	
VOC Emissions (g/hr)		6			88	66	1	162	22	77	32	
Dilemma Vehicles (#)		0			11	0	0	0	0	0	0	
Queue Length 50th (ft)		25			174	116	1	417	20	~124	88	
Queue Length 95th (ft)		32			#240	149	5	#592	56	#206	153	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)						200	75		200			
Base Capacity (vph)		296			340	597	654	959	1015	288	1162	
Starvation Cap Reductn		0			0	0	0	0	0	0	0	
Spillback Cap Reductn		0			0	0	0	0	0	0	0	
Storage Cap Reductn		0			0	0	0	0	0	0	0	
Reduced v/c Ratio		0.22			0.91	0.80	0.01	0.88	0.47	1.01	0.35	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 87.6			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.01			
Intersection Signal Delay: 34.1		Intersection LOS: C	
Intersection Capacity Utilization 79.7%		ICU Level of Service D	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd

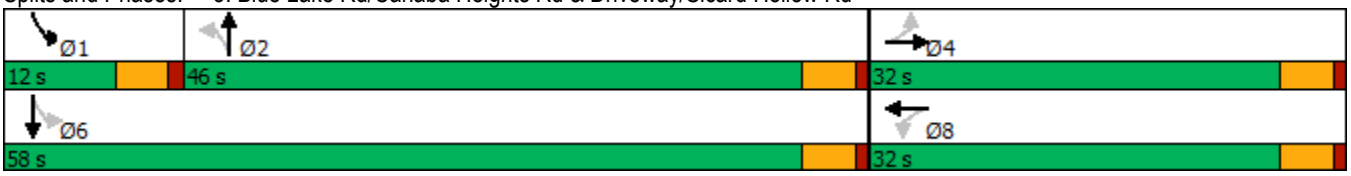


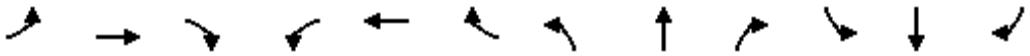
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	230	0	272	0	597	80	92	253	0
Future Volume (vph)	0	0	0	230	0	272	0	597	80	92	253	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	180		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt					0.927			0.984				
Flt Protected					0.978					0.950	0.998	
Satd. Flow (prot)	0	1881	0	0	1705	0	0	1851	0	1698	1784	0
Flt Permitted					0.853					0.082	0.695	
Satd. Flow (perm)	0	1881	0	0	1488	0	0	1851	0	147	1242	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					73			10				
Link Speed (mph)		15			35			35			35	
Link Distance (ft)		267			530			435			521	
Travel Time (s)		12.1			10.3			8.5			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.86	0.86	0.86	0.75	0.75	0.75	0.87	0.87	0.87
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	0	0	267	0	316	0	796	107	106	291	0
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	0	0	0	0	583	0	0	903	0	95	302	0
Turn Type				Perm	NA			NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		12.0	12.0		5.0	12.0	
Minimum Split (s)	12.0	12.0		12.0	12.0		22.5	22.5		12.0	22.5	
Total Split (s)	32.0	32.0		32.0	32.0		46.0	46.0		12.0	58.0	
Total Split (%)	35.6%	35.6%		35.6%	35.6%		51.1%	51.1%		13.3%	64.4%	
Maximum Green (s)	27.5	27.5		27.5	27.5		41.5	41.5		7.5	53.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		4.5			4.5			4.5		4.5	4.5	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		None	Max	
Act Effct Green (s)					27.5			44.0		53.5	53.5	
Actuated g/C Ratio					0.31			0.49		0.59	0.59	
v/c Ratio					1.15			0.99		0.46	0.39	
Control Delay					117.8			53.7		16.9	10.7	
Queue Delay					0.0			0.0		0.0	0.0	
Total Delay					117.8			53.7		16.9	10.7	
LOS					F			D		B	B	
Approach Delay					117.8			53.7			12.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					F			D			B	
Stops (vph)					365			532		36	122	
Fuel Used(gal)					17			14		1	2	
CO Emissions (g/hr)					1165			945		61	173	
NOx Emissions (g/hr)					227			184		12	34	
VOC Emissions (g/hr)					270			219		14	40	
Dilemma Vehicles (#)					23			30		0	28	
Queue Length 50th (ft)					~365			~564		22	81	
Queue Length 95th (ft)					#529			#575		51	123	
Internal Link Dist (ft)		187			450			355			441	
Turn Bay Length (ft)										180		
Base Capacity (vph)					505			910		216	773	
Starvation Cap Reductn					0			0		0	0	
Spillback Cap Reductn					0			0		0	0	
Storage Cap Reductn					0			0		0	0	
Reduced v/c Ratio					1.15			0.99		0.44	0.39	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Natural Cycle: 140			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.15			
Intersection Signal Delay: 64.8		Intersection LOS: E	
Intersection Capacity Utilization 83.9%		ICU Level of Service E	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Blue Lake Rd/Cahaba Heights Rd & Driveway/Sicard Hollow Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	12	5	224	6	354	6	707	405	222	292	13
Future Volume (vph)	18	12	5	224	6	354	6	707	405	222	292	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	75		0	0		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981			0.918			0.945			0.994	
Flt Protected		0.975			0.981		0.950			0.950		
Satd. Flow (prot)	0	1782	0	0	1678	0	1770	1760	0	1770	1852	0
Flt Permitted		0.672			0.852		0.524			0.056		
Satd. Flow (perm)	0	1228	0	0	1457	0	976	1760	0	104	1852	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			62			31			3	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.54	0.54	0.54	0.74	0.74	0.74	0.84	0.84	0.84	0.76	0.76	0.76
Adj. Flow (vph)	33	22	9	303	8	478	7	842	482	292	384	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	64	0	0	789	0	7	1324	0	292	401	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4			6			2		
Detector Phase	8	8		4	4		1	6		5	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	15.0		7.0	15.0	
Minimum Split (s)	12.0	12.0		12.0	12.0		12.0	20.0		12.0	20.0	
Total Split (s)	45.0	45.0		45.0	45.0		12.0	69.0		16.0	73.0	
Total Split (%)	34.6%	34.6%		34.6%	34.6%		9.2%	53.1%		12.3%	56.2%	
Maximum Green (s)	41.0	41.0		41.0	41.0		8.0	64.0		12.0	68.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0			4.0		4.0	5.0		4.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.7	2.7		2.7	2.7		3.0	3.2		3.0	3.2	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		41.0			41.0		72.0	64.0		81.0	77.8	
Actuated g/C Ratio		0.32			0.32		0.55	0.49		0.62	0.60	
v/c Ratio		0.16			1.57		0.01	1.50		1.34	0.36	
Control Delay		30.0			297.8		9.7	258.9		211.9	15.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		30.0			297.8		9.7	258.9		211.9	15.1	
LOS		C			F		A	F		F	B	
Approach Delay		30.0			297.8			257.6			98.0	
Approach LOS		C			F			F			F	

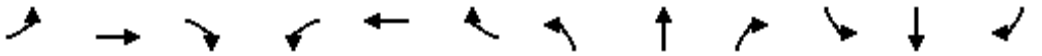
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Stops (vph)		22			382		3	786		128	153	
Fuel Used(gal)		0			40		0	65		11	2	
CO Emissions (g/hr)		27			2794		3	4542		752	170	
NOx Emissions (g/hr)		5			544		1	884		146	33	
VOC Emissions (g/hr)		6			648		1	1053		174	39	
Dilemma Vehicles (#)		0			14		0	0		0	0	
Queue Length 50th (ft)		34			~912		2	~1544		~272	155	
Queue Length 95th (ft)		40			#867		8	#1638		#347	216	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)							75					
Base Capacity (vph)		392			501		596	882		218	1109	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.16			1.57		0.01	1.50		1.34	0.36	

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Natural Cycle: 140			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.57			
Intersection Signal Delay: 225.1		Intersection LOS: F	
Intersection Capacity Utilization 124.3%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd

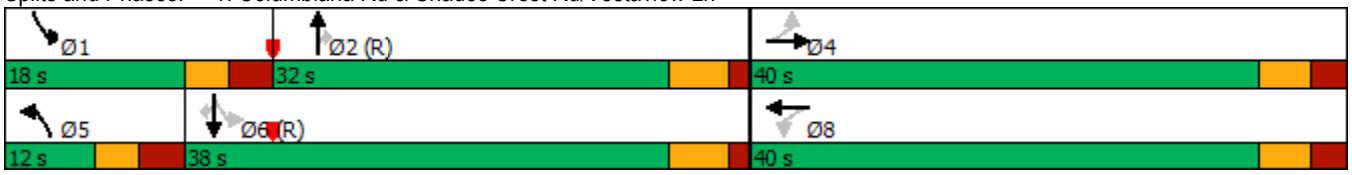


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	88	13	113	166	108	28	460	115	199	894	295
Future Volume (vph)	65	88	13	113	166	108	28	460	115	199	894	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	115		0	140		350
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.989			0.962				0.850			0.850
Flt Protected		0.981			0.986		0.950			0.950		
Satd. Flow (prot)	0	1807	0	0	1767	0	1770	3539	1583	1770	3539	1583
Flt Permitted		0.662			0.831		0.950			0.314		
Satd. Flow (perm)	0	1220	0	0	1489	0	1770	3539	1583	585	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			25				142			304
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		493			298			271			469	
Travel Time (s)		11.2			6.8			4.1			7.1	
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.81	0.81	0.81	0.97	0.97	0.97
Adj. Flow (vph)	74	100	15	123	180	117	35	568	142	205	922	304
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	189	0	0	420	0	35	568	142	205	922	304
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		5.0	18.0	18.0	5.0	18.0	18.0
Minimum Split (s)	23.0	23.0		23.0	23.0		12.0	23.5	23.5	12.0	23.5	23.5
Total Split (s)	40.0	40.0		40.0	40.0		12.0	32.0	32.0	18.0	38.0	38.0
Total Split (%)	44.4%	44.4%		44.4%	44.4%		13.3%	35.6%	35.6%	20.0%	42.2%	42.2%
Maximum Green (s)	34.0	34.0		34.0	34.0		6.0	26.5	26.5	12.0	32.5	32.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.5	2.5		2.5	2.5		3.0	1.5	1.5	3.0	1.5	1.5
Lost Time Adjust (s)		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0			6.0		6.0	5.5	5.5	6.0	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.5	3.5	2.0	3.5	3.5
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0							
Flash Dont Walk (s)	10.0	10.0		10.0	10.0							
Pedestrian Calls (#/hr)	0	0		0	0							
Act Effct Green (s)		28.4			28.4		5.8	34.4	34.4	49.0	42.7	42.7
Actuated g/C Ratio		0.32			0.32		0.06	0.38	0.38	0.54	0.47	0.47
v/c Ratio		0.49			0.86		0.31	0.42	0.20	0.46	0.55	0.33
Control Delay		27.3			44.6		47.5	23.5	5.2	10.5	14.0	1.5
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.1	0.0
Total Delay		27.3			44.6		47.5	23.5	5.2	10.5	14.0	1.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C			D		D	C	A	B	B	A
Approach Delay		27.3			44.6			21.1			10.9	
Approach LOS		C			D			C			B	
Stops (vph)		124			332		28	336	16	59	554	29
Fuel Used(gal)		2			6		1	7	1	2	12	1
CO Emissions (g/hr)		157			436		47	502	37	123	850	94
NOx Emissions (g/hr)		31			85		9	98	7	24	165	18
VOC Emissions (g/hr)		36			101		11	116	8	29	197	22
Dilemma Vehicles (#)		0			0		0	26	0	0	42	0
Queue Length 50th (ft)		82			207		19	125	0	29	238	25
Queue Length 95th (ft)		130			305		45	171	31	68	165	2
Internal Link Dist (ft)		413			218			191			389	
Turn Bay Length (ft)							115			140		350
Base Capacity (vph)		464			578		120	1353	693	479	1680	911
Starvation Cap Reductn		0			0		0	0	0	0	72	0
Spillback Cap Reductn		0			0		0	0	0	0	0	0
Storage Cap Reductn		0			0		0	0	0	0	0	0
Reduced v/c Ratio		0.41			0.73		0.29	0.42	0.20	0.43	0.57	0.33

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green, Master Intersection			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 19.8		Intersection LOS: B	
Intersection Capacity Utilization 69.0%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 1: Columbiana Rd & Shades Crest Rd/Vestaview Ln



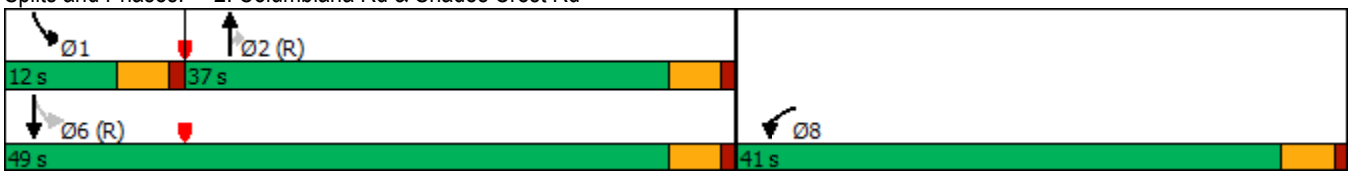
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	291	114	537	96	78	1097
Future Volume (vph)	291	114	537	96	78	1097
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		160	150	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	0.962			0.850		
Flt Protected	0.965				0.950	
Satd. Flow (prot)	1729	0	3539	1583	1770	3539
Flt Permitted	0.965				0.292	
Satd. Flow (perm)	1729	0	3539	1583	544	3539
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	26			120		
Link Speed (mph)	30		45			45
Link Distance (ft)	299		469			333
Travel Time (s)	6.8		7.1			5.0
Peak Hour Factor	0.89	0.89	0.80	0.80	0.94	0.94
Adj. Flow (vph)	327	128	671	120	83	1167
Shared Lane Traffic (%)						
Lane Group Flow (vph)	455	0	671	120	83	1167
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0		18.0	18.0	5.0	18.0
Minimum Split (s)	22.5		22.5	22.5	12.0	22.5
Total Split (s)	41.0		37.0	37.0	12.0	49.0
Total Split (%)	45.6%		41.1%	41.1%	13.3%	54.4%
Maximum Green (s)	36.5		32.5	32.5	7.5	44.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	5.0		3.0	3.0	3.0	3.0
Recall Mode	None		C-Min	C-Min	None	C-Min
Walk Time (s)			7.0	7.0		7.0
Flash Dont Walk (s)			11.0	11.0		11.0
Pedestrian Calls (#/hr)			0	0		0
Act Effct Green (s)	29.5		42.0	42.0	51.5	51.5
Actuated g/C Ratio	0.33		0.47	0.47	0.57	0.57
v/c Ratio	0.78		0.41	0.15	0.20	0.58
Control Delay	35.0		10.9	0.9	11.7	14.8
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	35.0		10.9	0.9	11.7	14.8

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	C		B	A	B	B
Approach Delay	35.0		9.4			14.6
Approach LOS	C		A			B
Stops (vph)	332		172	2	37	684
Fuel Used(gal)	6		5	0	1	14
CO Emissions (g/hr)	396		347	23	57	991
NOx Emissions (g/hr)	77		68	5	11	193
VOC Emissions (g/hr)	92		80	5	13	230
Dilemma Vehicles (#)	0		21	0	0	61
Queue Length 50th (ft)	215		80	1	20	212
Queue Length 95th (ft)	291		67	m2	48	323
Internal Link Dist (ft)	219		389			253
Turn Bay Length (ft)				160	150	
Base Capacity (vph)	716		1649	802	416	2025
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.64		0.41	0.15	0.20	0.58

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 16.7		Intersection LOS: B	
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Columbiana Rd & Shades Crest Rd

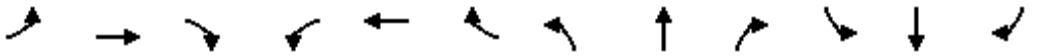


Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	12	9	0	167	229	7
Future Volume (vph)	12	9	0	167	229	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.996	
Flt Protected	0.950					
Satd. Flow (prot)	1787	1599	1881	1881	1874	0
Flt Permitted	0.950					
Satd. Flow (perm)	1787	1599	1881	1881	1874	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		16			3	
Link Speed (mph)	25			35	35	
Link Distance (ft)	737			474	400	
Travel Time (s)	20.1			9.2	7.8	
Peak Hour Factor	0.58	0.58	0.77	0.77	0.95	0.95
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	21	16	0	217	241	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	21	16	0	217	248	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases		4	2	2		
Detector Phase	4	4	5	2	6	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0	12.0	12.0	
Minimum Split (s)	14.0	14.0	12.0	16.5	16.5	
Total Split (s)	20.0	20.0	12.0	60.0	48.0	
Total Split (%)	25.0%	25.0%	15.0%	75.0%	60.0%	
Maximum Green (s)	16.0	16.0	8.0	55.5	43.5	
Yellow Time (s)	3.0	3.0	3.0	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.5	4.5	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	4.5	4.5	3.0	3.2	3.2	
Recall Mode	None	None	None	Min	Min	
Act Effct Green (s)	10.2	10.2		28.9	28.9	
Actuated g/C Ratio	0.29	0.29		0.82	0.82	
v/c Ratio	0.04	0.03		0.14	0.16	
Control Delay	11.0	6.7		3.5	3.6	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	11.0	6.7		3.5	3.6	
LOS	B	A		A	A	
Approach Delay	9.1			3.5	3.6	

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Approach LOS	A			A	A	
Stops (vph)	11	6		51	71	
Fuel Used(gal)	0	0		1	1	
CO Emissions (g/hr)	10	6		75	97	
NOx Emissions (g/hr)	2	1		15	19	
VOC Emissions (g/hr)	2	1		17	22	
Dilemma Vehicles (#)	0	0		13	18	
Queue Length 50th (ft)	2	0		0	0	
Queue Length 95th (ft)	8	4		37	51	
Internal Link Dist (ft)	657			394	320	
Turn Bay Length (ft)						
Base Capacity (vph)	826	748		1881	1857	
Starvation Cap Reductn	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	
Storage Cap Reductn	0	0		0	0	
Reduced v/c Ratio	0.03	0.02		0.12	0.13	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 35.3			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.16			
Intersection Signal Delay: 4.0		Intersection LOS: A	
Intersection Capacity Utilization 27.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 1: Dolly Ridge Rd & Gresham Dr



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	84	40	158	74	72	35	991	186	253	2073	330
Future Volume (vph)	67	84	40	158	74	72	35	991	186	253	2073	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	250		0	300		175	0		375
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.952			0.926				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1773	0	1770	1725	0	1770	3539	1583	1770	3539	1583
Flt Permitted	0.464			0.446			0.950			0.187		
Satd. Flow (perm)	864	1773	0	831	1725	0	1770	3539	1583	348	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			22				147			194
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		480			504			393			502	
Travel Time (s)		10.9			11.5			6.0			7.6	
Peak Hour Factor	0.71	0.71	0.71	0.88	0.88	0.88	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	94	118	56	180	84	82	40	1139	214	275	2253	359
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	174	0	180	166	0	40	1139	214	275	2253	359
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	20.0	20.0	7.0	20.0	20.0
Minimum Split (s)	29.5	29.5		29.5	29.5		12.0	25.0	25.0	12.0	25.0	25.0
Total Split (s)	45.0	45.0		45.0	45.0		40.0	135.0	135.0	20.0	115.0	115.0
Total Split (%)	22.5%	22.5%		22.5%	22.5%		20.0%	67.5%	67.5%	10.0%	57.5%	57.5%
Maximum Green (s)	40.5	40.5		40.5	40.5		35.5	130.0	130.0	15.5	110.0	110.0
Yellow Time (s)	3.5	3.5		3.5	3.5		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		0.5	1.0	1.0	0.5	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	5.0	5.0	4.5	5.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0							
Flash Dont Walk (s)	18.0	18.0		18.0	18.0							
Pedestrian Calls (#/hr)	0	0		0	0							
Act Effct Green (s)	40.5	40.5		40.5	40.5		10.9	130.9	130.9	149.5	136.9	136.9
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.05	0.65	0.65	0.75	0.68	0.68
v/c Ratio	0.54	0.47		1.07	0.45		0.42	0.49	0.20	0.76	0.93	0.31
Control Delay	84.3	70.7		160.2	64.9		103.5	18.6	4.7	23.1	36.4	6.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.3	70.7		160.2	64.9		103.5	18.6	4.7	23.1	36.4	6.6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	E		F	E		F	B	A	C	D	A
Approach Delay		75.4			114.5			18.9			31.4	
Approach LOS		E			F			B			C	
Stops (vph)	61	102		133	110		33	489	23	76	1685	61
Fuel Used(gal)	2	3		7	3		1	12	1	3	43	2
CO Emissions (g/hr)	121	197		455	218		86	864	66	207	3012	159
NOx Emissions (g/hr)	24	38		89	42		17	168	13	40	586	31
VOC Emissions (g/hr)	28	46		105	50		20	200	15	48	698	37
Dilemma Vehicles (#)	0	0		0	0		0	25	0	0	51	0
Queue Length 50th (ft)	112	192		~261	169		52	393	31	98	1345	78
Queue Length 95th (ft)	141	212		#427	248		95	423	62	148	#1592	140
Internal Link Dist (ft)		400			424			313			422	
Turn Bay Length (ft)	250			250			300		175			375
Base Capacity (vph)	174	367		168	366		314	2317	1087	370	2422	1144
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.47		1.07	0.45		0.13	0.49	0.20	0.74	0.93	0.31

Intersection Summary

Area Type: Other
Cycle Length: 200
Actuated Cycle Length: 200
Offset: 188 (94%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 36.1 Intersection LOS: D
Intersection Capacity Utilization 94.2% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US-31 & Shades Crest Rd

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	309	2834	4637	668	324	265
Future Volume (vph)	309	2834	4637	668	324	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350			0	100	100
Storage Lanes	2			1	0	0
Taper Length (ft)	75				75	
Lane Util. Factor	0.97	0.91	0.91	1.00	0.94	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3433	5085	5085	1583	4990	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3433	5085	5085	1583	4990	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				180		205
Link Speed (mph)		55	55		40	
Link Distance (ft)		616	491		414	
Travel Time (s)		7.6	6.1		7.1	
Peak Hour Factor	0.98	0.98	0.93	0.93	0.80	0.80
Adj. Flow (vph)	315	2892	4986	718	405	331
Shared Lane Traffic (%)						
Lane Group Flow (vph)	315	2892	4986	718	405	331
Turn Type	Prot	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases				6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	8.0	12.0	12.0	12.0	8.0	8.0
Minimum Split (s)	12.5	24.5	24.5	24.5	22.5	22.5
Total Split (s)	40.0	200.0	160.0	160.0	40.0	40.0
Total Split (%)	16.7%	83.3%	66.7%	66.7%	16.7%	16.7%
Maximum Green (s)	35.5	193.5	153.5	153.5	35.5	35.5
Yellow Time (s)	3.5	5.5	5.5	5.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.5	6.5	6.5	4.5	4.5
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max	Max	Max	None	None
Walk Time (s)		7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0
Act Effct Green (s)	26.5	193.7	162.7	162.7	27.4	27.4
Actuated g/C Ratio	0.11	0.83	0.70	0.70	0.12	0.12
v/c Ratio	0.81	0.68	1.40	0.62	0.69	0.90
Control Delay	116.4	8.9	211.2	16.8	104.3	65.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.6
Total Delay	116.4	8.9	211.2	16.8	104.3	65.8

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
LOS	F	A	F	B	F	E
Approach Delay		19.5	186.7		87.0	
Approach LOS		B	F		F	
Stops (vph)	298	1041	3338	275	306	107
Fuel Used(gal)	14	36	276	9	11	5
CO Emissions (g/hr)	983	2485	19280	662	755	371
NOx Emissions (g/hr)	191	483	3751	129	147	72
VOC Emissions (g/hr)	228	576	4468	153	175	86
Dilemma Vehicles (#)	0	61	22	0	0	0
Queue Length 50th (ft)	246	544	~3702	416	215	209
Queue Length 95th (ft)	311	703	#3894	667	227	262
Internal Link Dist (ft)		536	411		334	
Turn Bay Length (ft)	350				100	100
Base Capacity (vph)	525	4243	3564	1163	763	415
Starvation Cap Reductn	0	0	0	0	0	9
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.68	1.40	0.62	0.53	0.82

Intersection Summary			
Area Type:	Other		
Cycle Length: 240			
Actuated Cycle Length: 232.1			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.40			
Intersection Signal Delay: 123.5		Intersection LOS: F	
Intersection Capacity Utilization 118.0%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

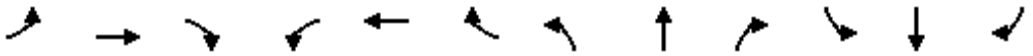
Splits and Phases: 1: Rocky Ridge Rd & US-280

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	264	19	17	325	693	284
Future Volume (vph)	264	19	17	325	693	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	100	125			0
Storage Lanes	1	1	1			1
Taper Length (ft)	75		75			
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950			0.997		
Satd. Flow (prot)	1770	1583	0	3529	1863	1583
Flt Permitted	0.950			0.894		
Satd. Flow (perm)	1770	1583	0	3164	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		21				305
Link Speed (mph)	25			40	40	
Link Distance (ft)	484			376	414	
Travel Time (s)	13.2			6.4	7.1	
Peak Hour Factor	0.90	0.90	0.87	0.87	0.93	0.93
Adj. Flow (vph)	293	21	20	374	745	305
Shared Lane Traffic (%)						
Lane Group Flow (vph)	293	21	0	394	745	305
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			6	2	
Permitted Phases		4	6			2
Detector Phase	4	4	6	6	2	2
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0	12.0	12.0	12.0
Minimum Split (s)	22.5	22.5	23.0	23.0	23.0	23.0
Total Split (s)	32.0	32.0	45.0	45.0	45.0	45.0
Total Split (%)	41.6%	41.6%	58.4%	58.4%	58.4%	58.4%
Maximum Green (s)	27.7	27.7	40.0	40.0	40.0	40.0
Yellow Time (s)	3.1	3.1	3.8	3.8	3.8	3.8
All-Red Time (s)	1.2	1.2	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.3	4.3		5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	1.5	1.5	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	8.0	8.0	8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	27.7	27.7		40.0	40.0	40.0
Actuated g/C Ratio	0.36	0.36		0.52	0.52	0.52
v/c Ratio	0.46	0.04		0.24	0.77	0.32
Control Delay	21.8	7.4		10.6	21.6	2.2
Queue Delay	0.0	0.0		0.0	10.4	0.0
Total Delay	21.8	7.4		10.6	32.0	2.2

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
LOS	C	A		B	C	A
Approach Delay	20.9			10.6	23.4	
Approach LOS	C			B	C	
Stops (vph)	196	6		176	536	21
Fuel Used(gal)	3	0		3	10	1
CO Emissions (g/hr)	211	9		234	717	79
NOx Emissions (g/hr)	41	2		46	140	15
VOC Emissions (g/hr)	49	2		54	166	18
Dilemma Vehicles (#)	0	0		22	45	0
Queue Length 50th (ft)	106	0		51	267	0
Queue Length 95th (ft)	175	14		73	415	35
Internal Link Dist (ft)	404			296	334	
Turn Bay Length (ft)		100				
Base Capacity (vph)	636	582		1643	967	968
Starvation Cap Reductn	0	0		0	200	0
Spillback Cap Reductn	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0
Reduced v/c Ratio	0.46	0.04		0.24	0.97	0.32

Intersection Summary			
Area Type:	Other		
Cycle Length: 77			
Actuated Cycle Length: 77			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 20.1		Intersection LOS: C	
Intersection Capacity Utilization 58.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: Rocky Ridge Rd & Shades Crest Rd

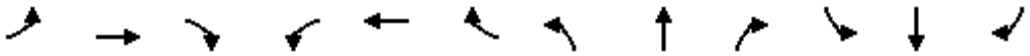


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	12	9	102	8	90	16	375	67	109	691	35
Future Volume (vph)	30	12	9	102	8	90	16	375	67	109	691	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	75		200	0		0
Storage Lanes	0		0	0		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.975				0.850			0.850		0.993	
Flt Protected		0.972			0.956		0.950			0.950		
Satd. Flow (prot)	0	1765	0	0	1781	1583	1770	1863	1583	1770	1850	0
Flt Permitted		0.771			0.699		0.244			0.363		
Satd. Flow (perm)	0	1400	0	0	1302	1583	455	1863	1583	676	1850	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11				108			84		5	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.85	0.85	0.85	0.83	0.83	0.83	0.80	0.80	0.80	0.89	0.89	0.89
Adj. Flow (vph)	35	14	11	123	10	108	20	469	84	122	776	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	60	0	0	133	108	20	469	84	122	815	0
Turn Type	Perm	NA		Perm	NA	custom	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4		8	6		6	2		
Detector Phase	8	8		4	4	8	1	6	6	5	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	22.0	22.0		22.0	22.0	22.0	12.0	23.0	23.0	12.0	23.0	
Total Split (s)	22.0	22.0		22.0	22.0	22.0	12.0	41.0	41.0	12.0	41.0	
Total Split (%)	29.3%	29.3%		29.3%	29.3%	29.3%	16.0%	54.7%	54.7%	16.0%	54.7%	
Maximum Green (s)	18.0	18.0		18.0	18.0	18.0	8.0	36.0	36.0	8.0	36.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0	5.0	4.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.7	2.7		2.7	2.7	2.7	3.0	3.2	3.2	3.0	3.2	
Recall Mode	None	None		None	None	None	None	Min	Min	None	Min	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0		11.0	11.0		11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0	0		0	
Act Effct Green (s)		10.8			10.8	10.8	32.5	27.5	27.5	35.4	34.7	
Actuated g/C Ratio		0.21			0.21	0.21	0.63	0.53	0.53	0.68	0.67	
v/c Ratio		0.20			0.49	0.26	0.04	0.47	0.10	0.20	0.66	
Control Delay		18.9			27.8	7.2	4.3	13.8	3.2	4.8	13.4	
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		18.9			27.8	7.2	4.3	13.8	3.2	4.8	13.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		B			C	A	A	B	A	A	B	
Approach Delay		18.9			18.5			11.9			12.3	
Approach LOS		B			B			B			B	
Stops (vph)		36			89	18	6	245	10	35	402	
Fuel Used(gal)		0			2	1	0	3	0	1	6	
CO Emissions (g/hr)		32			113	37	5	216	15	37	401	
NOx Emissions (g/hr)		6			22	7	1	42	3	7	78	
VOC Emissions (g/hr)		7			26	9	1	50	4	9	93	
Dilemma Vehicles (#)		0			7	0	0	0	0	0	0	
Queue Length 50th (ft)		12			36	0	2	106	0	11	132	
Queue Length 95th (ft)		44			92	30	8	185	16	34	#540	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)						200	75		200			
Base Capacity (vph)		523			480	652	507	1364	1181	640	1356	
Starvation Cap Reductn		0			0	0	0	0	0	0	0	
Spillback Cap Reductn		0			0	0	0	0	0	0	0	
Storage Cap Reductn		0			0	0	0	0	0	0	0	
Reduced v/c Ratio		0.11			0.28	0.17	0.04	0.34	0.07	0.19	0.60	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 51.9			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 13.3		Intersection LOS: B	
Intersection Capacity Utilization 64.7%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd



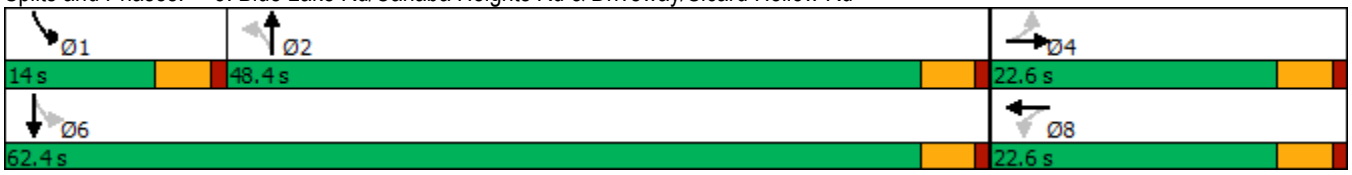
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	90	0	79	0	464	256	184	320	0
Future Volume (vph)	0	0	0	90	0	79	0	464	256	184	320	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	180		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.937			0.952				
Flt Protected					0.974					0.950		
Satd. Flow (prot)	0	1881	0	0	1717	0	0	1791	0	1787	1881	0
Flt Permitted					0.833					0.181		
Satd. Flow (perm)	0	1881	0	0	1468	0	0	1791	0	340	1881	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					77			48				
Link Speed (mph)		15			35			35			35	
Link Distance (ft)		267			530			435			521	
Travel Time (s)		12.1			10.3			8.5			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.92	0.92	0.92	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	0	0	102	0	90	0	504	278	214	372	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	192	0	0	782	0	214	372	0
Turn Type				Perm	NA			NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		12.0	22.5	
Total Split (s)	22.6	22.6		22.6	22.6		48.4	48.4		14.0	62.4	
Total Split (%)	26.6%	26.6%		26.6%	26.6%		56.9%	56.9%		16.5%	73.4%	
Maximum Green (s)	18.1	18.1		18.1	18.1		43.9	43.9		9.5	57.9	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		4.5			4.5			4.5		4.5	4.5	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		None	Max	
Act Effct Green (s)					11.6			45.5		58.1	58.1	
Actuated g/C Ratio					0.15			0.58		0.74	0.74	
v/c Ratio					0.68			0.74		0.54	0.27	
Control Delay					31.6			18.6		8.9	4.5	
Queue Delay					0.0			0.0		0.0	0.0	
Total Delay					31.6			18.6		8.9	4.5	
LOS					C			B		A	A	
Approach Delay					31.6			18.6			6.1	

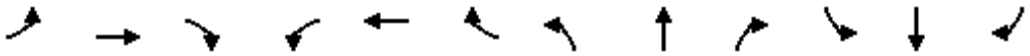
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					C			B			A	
Stops (vph)					94			485		53	97	
Fuel Used(gal)					2			9		1	2	
CO Emissions (g/hr)					171			603		99	156	
NOx Emissions (g/hr)					33			117		19	30	
VOC Emissions (g/hr)					40			140		23	36	
Dilemma Vehicles (#)					9			38		0	20	
Queue Length 50th (ft)					53			245		25	47	
Queue Length 95th (ft)					114			#549		57	99	
Internal Link Dist (ft)		187			450			355			441	
Turn Bay Length (ft)										180		
Base Capacity (vph)					397			1054		426	1388	
Starvation Cap Reductn					0			0		0	0	
Spillback Cap Reductn					0			0		0	0	
Storage Cap Reductn					0			0		0	0	
Reduced v/c Ratio					0.48			0.74		0.50	0.27	

Intersection Summary			
Area Type:	Other		
Cycle Length: 85			
Actuated Cycle Length: 78.7			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 15.5		Intersection LOS: B	
Intersection Capacity Utilization 77.9%		ICU Level of Service D	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Blue Lake Rd/Cahaba Heights Rd & Driveway/Sicard Hollow Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	12	9	102	8	90	16	375	67	109	691	35
Future Volume (vph)	30	12	9	102	8	90	16	375	67	109	691	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	75		0	0		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.975			0.940			0.977			0.993	
Flt Protected		0.972			0.975		0.950			0.950		
Satd. Flow (prot)	0	1765	0	0	1707	0	1770	1820	0	1770	1850	0
Flt Permitted		0.769			0.808		0.207			0.274		
Satd. Flow (perm)	0	1397	0	0	1415	0	386	1820	0	510	1850	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			54			20			6	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.85	0.85	0.85	0.83	0.83	0.83	0.80	0.80	0.80	0.89	0.89	0.89
Adj. Flow (vph)	35	14	11	123	10	108	20	469	84	122	776	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	60	0	0	241	0	20	553	0	122	815	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4			6			2		
Detector Phase	8	8		4	4		1	6		5	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	15.0		7.0	15.0	
Minimum Split (s)	12.0	12.0		12.0	12.0		12.0	20.0		12.0	20.0	
Total Split (s)	15.0	15.0		15.0	15.0		12.0	38.0		12.0	38.0	
Total Split (%)	23.1%	23.1%		23.1%	23.1%		18.5%	58.5%		18.5%	58.5%	
Maximum Green (s)	11.0	11.0		11.0	11.0		8.0	33.0		8.0	33.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0			4.0		4.0	5.0		4.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.7	2.7		2.7	2.7		3.0	3.2		3.0	3.2	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		10.5			10.5		29.7	23.3		32.6	30.2	
Actuated g/C Ratio		0.20			0.20		0.57	0.45		0.63	0.58	
v/c Ratio		0.21			0.73		0.05	0.67		0.24	0.75	
Control Delay		19.8			33.7		3.6	16.3		4.6	15.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		19.8			33.7		3.6	16.3		4.6	15.1	
LOS		B			C		A	B		A	B	
Approach Delay		19.8			33.7			15.9			13.8	
Approach LOS		B			C			B			B	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Stops (vph)		37			121		6	311		33	451	
Fuel Used(gal)		0			3		0	4		1	6	
CO Emissions (g/hr)		33			200		5	279		36	437	
NOx Emissions (g/hr)		6			39		1	54		7	85	
VOC Emissions (g/hr)		8			46		1	65		8	101	
Dilemma Vehicles (#)		0			16		0	0		0	0	
Queue Length 50th (ft)		12			52		2	133		12	141	
Queue Length 95th (ft)		44			#165		6	186		24	#467	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)							75					
Base Capacity (vph)		316			353		447	1209		521	1259	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.19			0.68		0.04	0.46		0.23	0.65	

Intersection Summary			
Area Type:	Other		
Cycle Length: 65			
Actuated Cycle Length: 51.9			
Natural Cycle: 65			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 17.3		Intersection LOS: B	
Intersection Capacity Utilization 68.5%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

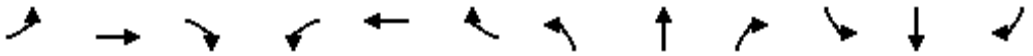
Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	75	298	205	154	149	107
Future Volume (vph)	75	298	205	154	149	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.948	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1787	1599	1787	1881	1783	0
Flt Permitted	0.950		0.373			
Satd. Flow (perm)	1787	1599	702	1881	1783	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		608			34	
Link Speed (mph)	25			35	35	
Link Distance (ft)	737			474	400	
Travel Time (s)	20.1			9.2	7.8	
Peak Hour Factor	0.49	0.49	0.94	0.83	0.82	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	153	608	218	186	182	114
Shared Lane Traffic (%)						
Lane Group Flow (vph)	153	608	218	186	296	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0	12.0	12.0	
Minimum Split (s)	14.0	14.0	12.0	16.5	16.5	
Total Split (s)	38.0	38.0	23.0	52.0	29.0	
Total Split (%)	42.2%	42.2%	25.6%	57.8%	32.2%	
Maximum Green (s)	34.0	34.0	19.0	47.5	24.5	
Yellow Time (s)	3.0	3.0	3.0	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.5	4.5	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.0	5.0	3.0	3.2	3.2	
Recall Mode	None	None	None	Min	Min	
Act Effct Green (s)	15.8	15.8	29.2	28.7	15.1	
Actuated g/C Ratio	0.30	0.30	0.55	0.54	0.28	
v/c Ratio	0.29	0.67	0.38	0.18	0.56	
Control Delay	16.9	6.1	9.3	7.9	20.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	16.9	6.1	9.3	7.9	20.5	
LOS	B	A	A	A	C	
Approach Delay	8.2			8.6	20.5	

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Approach LOS	A			A	C	
Stops (vph)	50	31	93	69	177	
Fuel Used(gal)	1	2	2	1	3	
CO Emissions (g/hr)	64	165	125	90	220	
NOx Emissions (g/hr)	13	32	24	18	43	
VOC Emissions (g/hr)	15	38	29	21	51	
Dilemma Vehicles (#)	0	0	0	10	17	
Queue Length 50th (ft)	33	0	29	25	64	
Queue Length 95th (ft)	47	0	87	69	156	
Internal Link Dist (ft)	657			394	320	
Turn Bay Length (ft)			300			
Base Capacity (vph)	1193	1270	788	1669	876	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.13	0.48	0.28	0.11	0.34	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 53.4			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 10.8		Intersection LOS: B	
Intersection Capacity Utilization 44.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 1: Dolly Ridge Rd & Gresham Dr



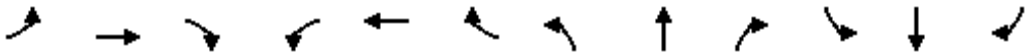
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	27	15	221	30	231	14	314	137	229	500	35
Future Volume (vph)	26	27	15	221	30	231	14	314	137	229	500	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	75		200	0		0
Storage Lanes	0		0	0		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.970				0.850			0.850		0.990	
Flt Protected		0.981			0.958		0.950			0.950		
Satd. Flow (prot)	0	1773	0	0	1785	1583	1770	1863	1583	1770	1844	0
Flt Permitted		0.790			0.759		0.325			0.369		
Satd. Flow (perm)	0	1427	0	0	1414	1583	605	1863	1583	687	1844	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20				263			156		7	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.76	0.76	0.76	0.88	0.88	0.88	0.88	0.88	0.88	0.77	0.77	0.77
Adj. Flow (vph)	34	36	20	251	34	263	16	357	156	297	649	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	90	0	0	285	263	16	357	156	297	694	0
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8		8	6		6	2		
Detector Phase	4	4		8	8	8	1	6	6	5	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	19.0	19.0		19.0	19.0	19.0	12.0	20.0	20.0	12.0	20.0	
Total Split (s)	19.0	19.0		19.0	19.0	19.0	12.0	26.0	26.0	15.0	29.0	
Total Split (%)	31.7%	31.7%		31.7%	31.7%	31.7%	20.0%	43.3%	43.3%	25.0%	48.3%	
Maximum Green (s)	15.0	15.0		15.0	15.0	15.0	8.0	21.0	21.0	11.0	24.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0	5.0	4.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	2.7	2.7		2.7	2.7	2.7	3.0	3.2	3.2	3.0	3.2	
Recall Mode	None	None		None	None	None	None	Min	Min	None	Min	
Walk Time (s)	4.0	4.0		4.0	4.0	4.0		4.0	4.0		4.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0		11.0	11.0		11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0	0		0	
Act Effct Green (s)		13.8			13.8	13.8	25.5	17.5	17.5	32.5	29.5	
Actuated g/C Ratio		0.25			0.25	0.25	0.47	0.32	0.32	0.60	0.54	
v/c Ratio		0.24			0.79	0.44	0.04	0.60	0.25	0.49	0.69	
Control Delay		16.0			39.0	5.6	5.3	20.8	4.2	8.4	16.6	
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		16.0			39.0	5.6	5.3	20.8	4.2	8.4	16.6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		B			D	A	A	C	A	A	B	
Approach Delay		16.0			23.0			15.4			14.1	
Approach LOS		B			C			B			B	
Stops (vph)		43			203	34	8	248	20	98	329	
Fuel Used(gal)		1			4	1	0	3	0	1	5	
CO Emissions (g/hr)		38			297	83	6	229	33	99	332	
NOx Emissions (g/hr)		7			58	16	1	44	6	19	65	
VOC Emissions (g/hr)		9			69	19	1	53	8	23	77	
Dilemma Vehicles (#)		0			19	0	0	0	0	0	0	
Queue Length 50th (ft)		18			85	0	2	101	0	42	137	
Queue Length 95th (ft)		42			#205	45	7	168	30	61	#293	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)						200	75		200			
Base Capacity (vph)		411			393	630	468	726	712	631	1002	
Starvation Cap Reductn		0			0	0	0	0	0	0	0	
Spillback Cap Reductn		0			0	0	0	0	0	0	0	
Storage Cap Reductn		0			0	0	0	0	0	0	0	
Reduced v/c Ratio		0.22			0.73	0.42	0.03	0.49	0.22	0.47	0.69	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 54.4
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 16.8 Intersection LOS: B
Intersection Capacity Utilization 65.6% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd



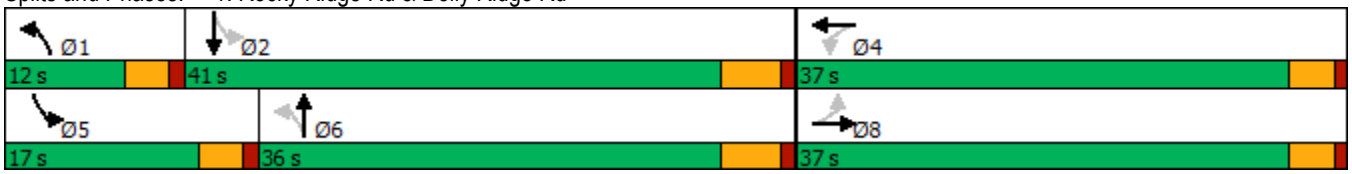
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	27	15	221	30	231	14	314	137	229	500	35
Future Volume (vph)	26	27	15	221	30	231	14	314	137	229	500	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	75		0	0		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.970			0.935			0.954			0.990	
Flt Protected		0.981			0.978		0.950			0.950		
Satd. Flow (prot)	0	1773	0	0	1703	0	1770	1777	0	1770	1844	0
Flt Permitted		0.790			0.823		0.231			0.171		
Satd. Flow (perm)	0	1427	0	0	1433	0	430	1777	0	319	1844	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			58			27			5	
Link Speed (mph)		25			35			30			30	
Link Distance (ft)		281			402			232			271	
Travel Time (s)		7.7			7.8			5.3			6.2	
Peak Hour Factor	0.76	0.76	0.76	0.88	0.88	0.88	0.88	0.88	0.88	0.77	0.77	0.77
Adj. Flow (vph)	34	36	20	251	34	263	16	357	156	297	649	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	90	0	0	548	0	16	513	0	297	694	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4			6			2		
Detector Phase	8	8		4	4		1	6		5	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	15.0		7.0	15.0	
Minimum Split (s)	12.0	12.0		12.0	12.0		12.0	20.0		12.0	20.0	
Total Split (s)	37.0	37.0		37.0	37.0		12.0	36.0		17.0	41.0	
Total Split (%)	41.1%	41.1%		41.1%	41.1%		13.3%	40.0%		18.9%	45.6%	
Maximum Green (s)	33.0	33.0		33.0	33.0		8.0	31.0		13.0	36.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0			4.0		4.0	5.0		4.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.7	2.7		2.7	2.7		3.0	3.2		3.0	3.2	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)		32.3			32.3		35.4	27.3		44.9	41.8	
Actuated g/C Ratio		0.38			0.38		0.42	0.32		0.53	0.49	
v/c Ratio		0.16			0.95		0.06	0.88		0.78	0.77	
Control Delay		16.6			52.3		10.5	43.5		29.6	25.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		16.6			52.3		10.5	43.5		29.6	25.9	
LOS		B			D		B	D		C	C	
Approach Delay		16.6			52.3			42.5			27.0	
Approach LOS		B			D			D			C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Stops (vph)		36			361		9	375		123	383	
Fuel Used(gal)		1			9		0	7		3	6	
CO Emissions (g/hr)		37			646		7	481		178	424	
NOx Emissions (g/hr)		7			126		1	94		35	82	
VOC Emissions (g/hr)		9			150		2	111		41	98	
Dilemma Vehicles (#)		0			24		0	0		0	0	
Queue Length 50th (ft)		27			277		4	250		87	276	
Queue Length 95th (ft)		49			#478		13	#401		128	405	
Internal Link Dist (ft)		201			322			152			191	
Turn Bay Length (ft)							75					
Base Capacity (vph)		567			594		310	668		391	918	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.16			0.92		0.05	0.77		0.76	0.76	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 85.3			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.95			
Intersection Signal Delay: 36.8		Intersection LOS: D	
Intersection Capacity Utilization 83.0%		ICU Level of Service E	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Rocky Ridge Rd & Dolly Ridge Rd



Appendix C – Level of Service Description

Levels of Service
Signalized Intersections

Level of service criteria for signalized intersections is defined in terms of *delay*. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. Specifically, level-of-service criteria are stated in terms of the average stopped delay per vehicle for a 15-minute analysis period.

Level of service A describes operations with very low delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

Level of service B describes operations with delay in the range of > 10 to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.

Level of service C describes operations with delay in the range of > 20 to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level of service D describes operations with delay in the range of > 35 to 55 seconds per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high vehicle/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

Level of service E describes operations with delay in the range of > 55 to 80 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high vehicle/capacity ratios. Individual cycle failures are frequent occurrences.

Level of service F describes operations with delay in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over saturation, i.e., when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Levels of Service
Unsignalized Intersections

Level of service criteria for unsignalized intersections is stated in terms of average control delay. Control delay is defined as the total elapsed time from a vehicle joining the queue until its departure from the stopped position at the head of the queue. The criteria for each level of service are cited in the table below.

Level of Service	Average Control Delay (seconds/vehicle)
A	0 - 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

Levels of Service
Daily Volume

The criteria for daily level of service are derived from ALDOT defined roadway capacities for urban 2-lane and 3-lane arterials and are cited in the table below.

Level of Service	Daily Service Volume	
	2-lane	3-lane
A	6,500	8,200
B	9,400	11,600
C	11,600	14,400
D	14,000	17,500
E	18,700	23,300
F	> 18,700	> 23,300

Appendix D – Trip Generation Methodology

Trip Generation Methodology

The following information outlines the steps taken to perform trip generation analysis for the intersections of Dolly Ridge Road at Gresham:

- Collected count data at Dolly Ridge Road and Gresham Drive intersection on February 6, 2019. Received counts performed by Jefferson County at Rocky Ridge Road and Dolly Ridge Road intersection on January 15, 2019.
- Compiled ingress and egress traffic volumes from the 2013-2014 school year at Cahaba Heights Elementary.
- Compiled data from the Vestavia Hills City Schools website including the following:
    - Cahaba Heights Elementary School enrollment from 2014-2018
    - Dolly Ridge Elementary School estimated enrollment for 2019-2020
- Calculated average annual growth for Cahaba Heights Elementary School from 2014 through the estimated enrollment for 2019-2020 school year. Used the average annual growth rate for Cahaba Heights Elementary School to back-calculate an estimated enrollment for the 2013-2014 school year.
- Calculated a trip per student rate at Cahaba Heights Elementary for ingress and egress. Applied the trip per student rate from Cahaba Heights Elementary to the new Dolly Ridge Elementary School estimated enrollment for 2019-2020.
- Used the *ITE Trip Generation Manual* Land Use Code 210 to estimate the trips generated by the residential homes behind the new Dolly Ridge Elementary School.
- Cleared the Gresham Drive leg of all traffic volume and replaced it with volumes from the trip generation for Dolly Ridge Elementary and the residential homes.
- The following distributions were developed for school-related traffic at the intersection of Dolly Ridge Road and Gresham Drive:
    - AM Ingress (Gresham Drive northbound): 92% left turn from Dolly Ridge Road eastbound, 8% right turn from Dolly Ridge Road westbound (based on shortest path for population distribution zoned for Dolly Ridge Elementary)
    - AM Egress (Gresham Drive southbound): 67% right turn onto Dolly Ridge Road westbound, 33% left turn onto Dolly Ridge Road eastbound (estimate based on the assumption that a certain percentage will trip-chain and commute downtown via the 280 corridor)
    - PM Ingress (Gresham Drive northbound): Inverse of the AM Egress.
    - PM Egress (Gresham Drive southbound): 80% right turn onto Dolly Ridge Road westbound, 20% left turn onto Dolly Ridge Road eastbound (based on the inverse of the AM Ingress with added cushion for trip-chaining to after school activities)

- Distributions for the residential trips generated can be found in Appendix D.
- Applied all generated trips to the appropriate distributions to calculate estimated turning movement volumes once the new Dolly Ridge Elementary opens for the 2019-2020 school year.

The following information outlines the steps taken to perform trip generation analysis for the intersection of Rocky Ridge Road at Dolly Ridge Road:

- Performed a shortest path analysis on the population zoned for Dolly Ridge Elementary to estimate the percentage of traffic arriving at the intersection from each direction. Applied estimated percentages to calculate an estimated amount of trips coming from each direction at the intersection.
- Removed the equivalent volume from the intersection based on the existing left turn volume from Dolly Ridge Road to Gresham Drive and the existing right turn volume from Gresham Drive to Dolly Ridge Road. Volumes were removed based on the distribution of existing traffic at the intersection from each direction.
- Added estimated amount of trips to each approach based on the current turning movement volume distributions for AM and PM ingress and egress.

Vestavia Hills, AL

SA# 18-0337

		Student Trip Rate		
		Ingress	Egress	
School	AM	0.94	0.75	per student enrolled
	PM	0.41	0.50	

		Directional Distribution		
		Entering	Exiting	
Residential	AM	25%	75%	per dwelling
	PM	63%	37%	

Trip Generation Estimate

			PEAK HOURS			ITE LUC Code
			Students	In	Out	
Dolly Ridge Elementary - AM Dropoff	735	students	735	688	550	None
Dolly Ridge Elementary - PM Pickup			735	302	368	None
			Weekday	In	Out	
Homes behind Gresham - AM	15	homes	15	3	11	210
Homes behind Gresham - School PM			16	10	5	210

~~**Peak Hour Intercept Trip Rates**~~

	~~AM Peak~~	~~PM Peak~~
~~Dolly Ridge Elementary~~	~~0%~~	~~0%~~
	~~0%~~	~~0%~~

Adjusted AM Peak Hour Trips

			IN			OUT		
			Total		New	Total		New
Dolly Ridge Elementary	735	students	688		688	550		550
Residential	15	homes	15		3	-		11
	-		-		-	-		-
	-		-		-	-		-
Totals			**703**		**691**	**550**		**561**

Adjusted PM Peak Hour Trips

			IN			OUT		
			Total		New	Total		New
Dolly Ridge Elementary	735	students	302		302	368		368
Residential	15	homes	16		10	16		5
	-		0		0	0		0
	-		0		0	0		0
Totals			**318**		**312**	**384**		**373**

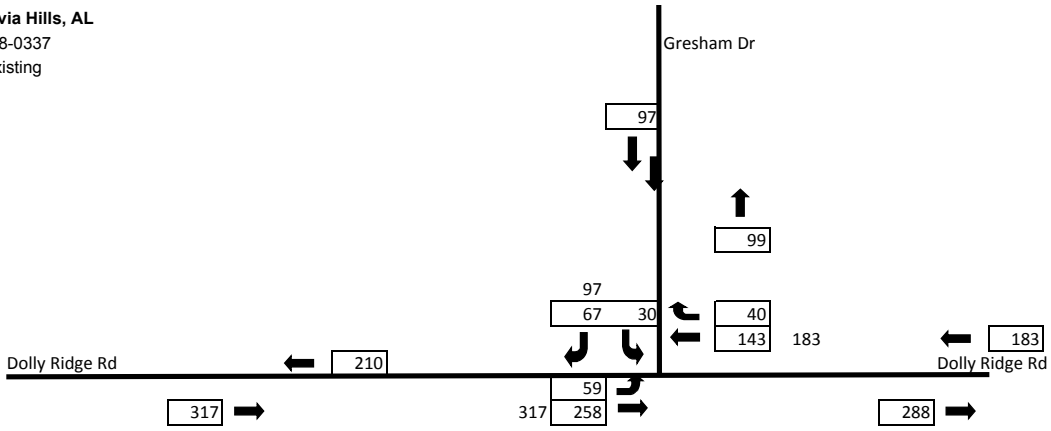
Year	Total Vestavia Hills School District Enrollment	Cahaba Heights Elem. Enrollment	Growth	Percent Growth	Data Type	
2013-14	6701	***357***			Measured	Source: Annual Report
2014-15	6760	379			Measured	Source: Annual Report
2015-16	7014	401	22	5.80%	Measured	Source: Annual Report
2016-17	7083	421	20	4.99%	Measured	Source: Annual Report
2017-18	7192	466	45	10.69%	Measured	Source: Annual Report
2018-19		469	3	0.64%	Projected	Source: VH Schools Website
2019-20		491	22	4.69%	Projected	Source: VH Schools Website
Annual Avg. Growth	1.8%			5.9%	Calculated	Used 5.9% to back-calculate CHE 2013-14 Enrollment
2014-15 to 2017-18 average annual growth at CH Elem.				7.7%	Calculated	

Cahaba Heights Elementary Volume Data (2013-14 School Year)		
	Ingress	Egress
AM	334	267
PM	147	179

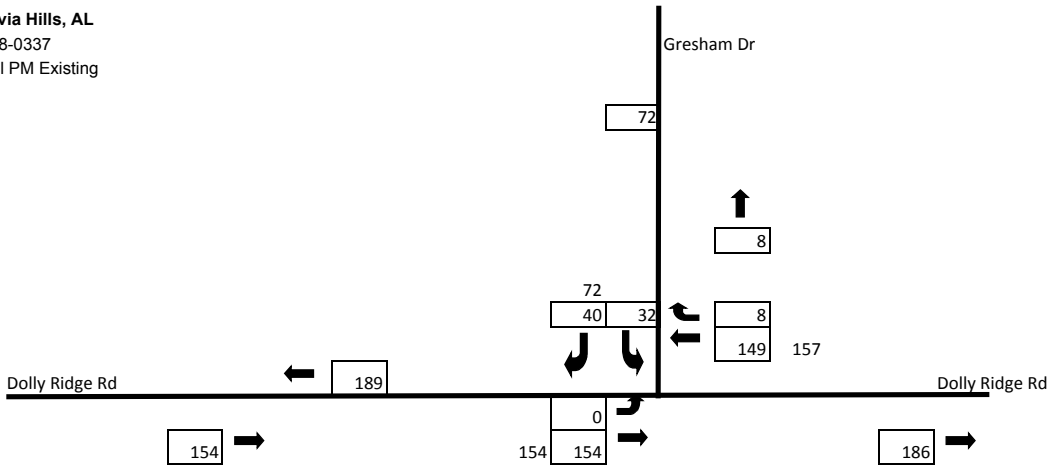
Trips Per Student - Rate		
	Ingress	Egress
AM	0.94	0.75
PM	0.41	0.50

Year	Total High School Enrollment	Estimated Freshmen	Measured Seniors	Staff		
2013-14						Source: Annual Report
2014-15	1901	475				Source: Annual Report
2015-16	1970	493				Source: Annual Report
2016-17	2023	506				Source: Annual Report
2017-18	2012	503	509	243		Source: Annual Report
2018-19	2025	506			Projected	Source: VH Schools Website
2019-20	2058	515			Calculated	Calculated based on data above
2020-2021	2092	523			Calculated	Calculated based on data above
Avg. Annual Growth	1.6%					

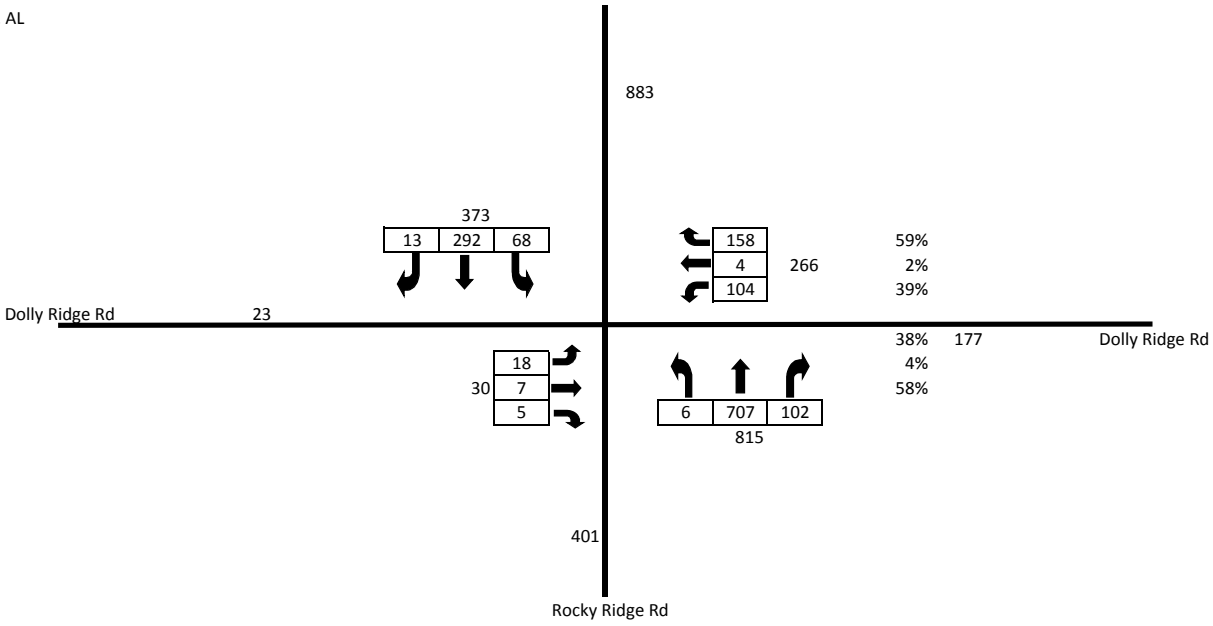
Vestavia Hills, AL
SA# 18-0337
AM Existing



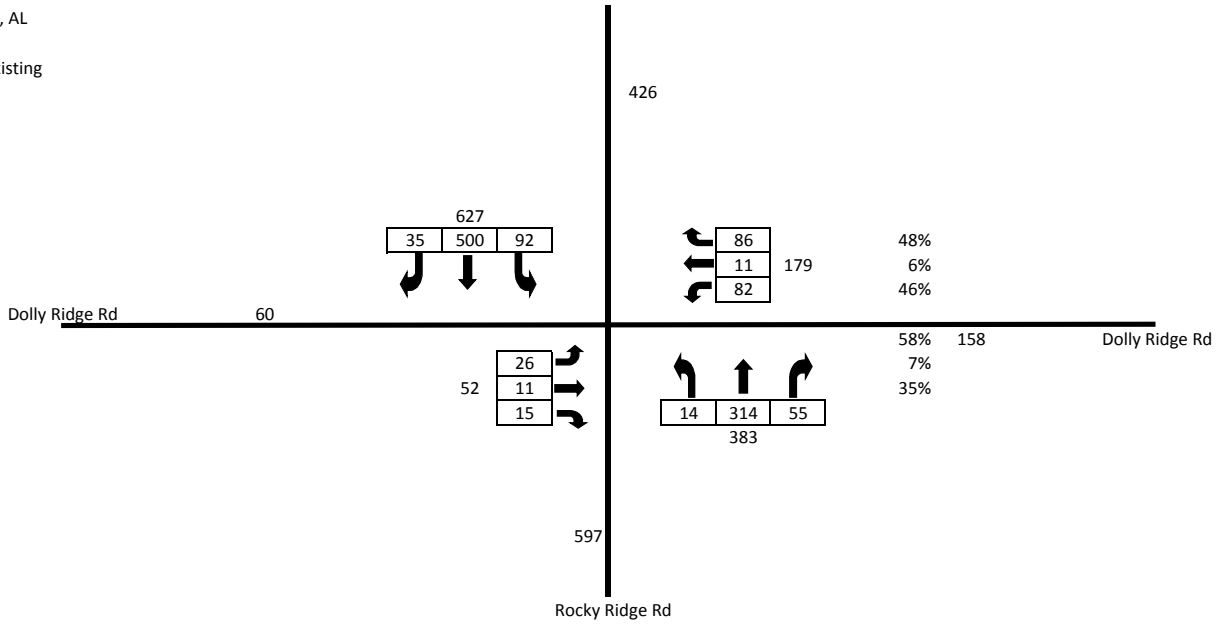
Vestavia Hills, AL
SA# 18-0337
School PM Existing



Vestavia Hills, AL
SA# 18-0337
AM Existing

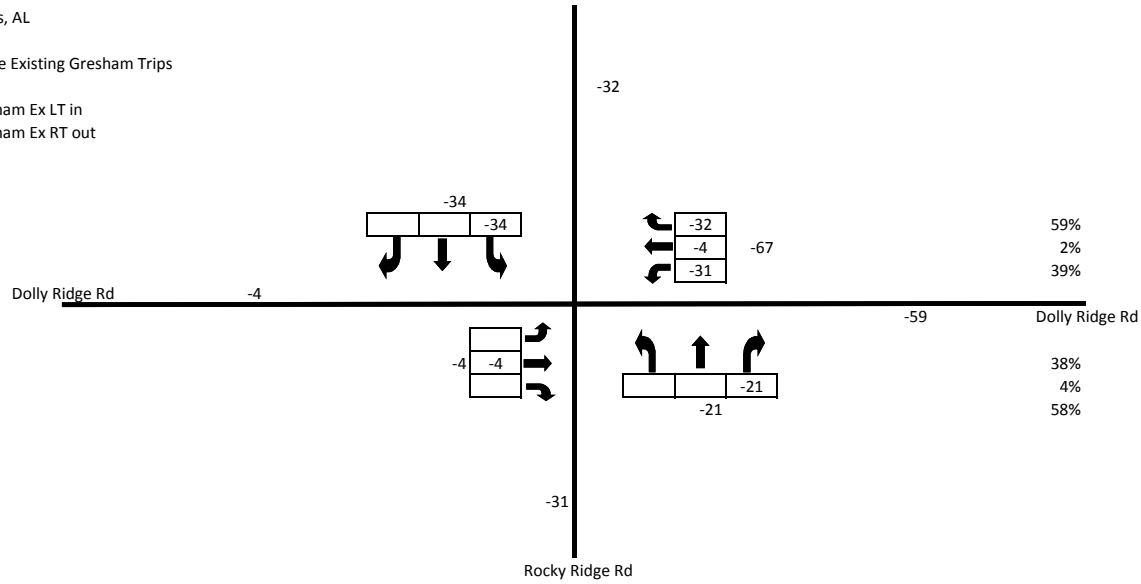


Vestavia Hills, AL
SA# 18-0337
School PM Existing



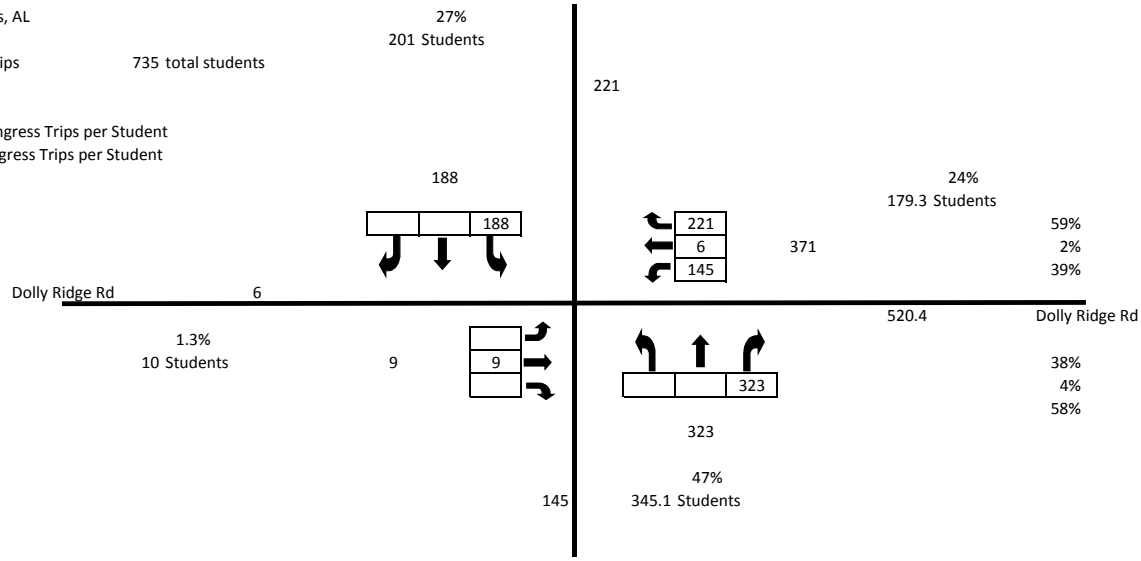
Vestavia Hills, AL
SA# 18-0337
AM - Remove Existing Gresham Trips

59 Gresham Ex LT in
67 Gresham Ex RT out

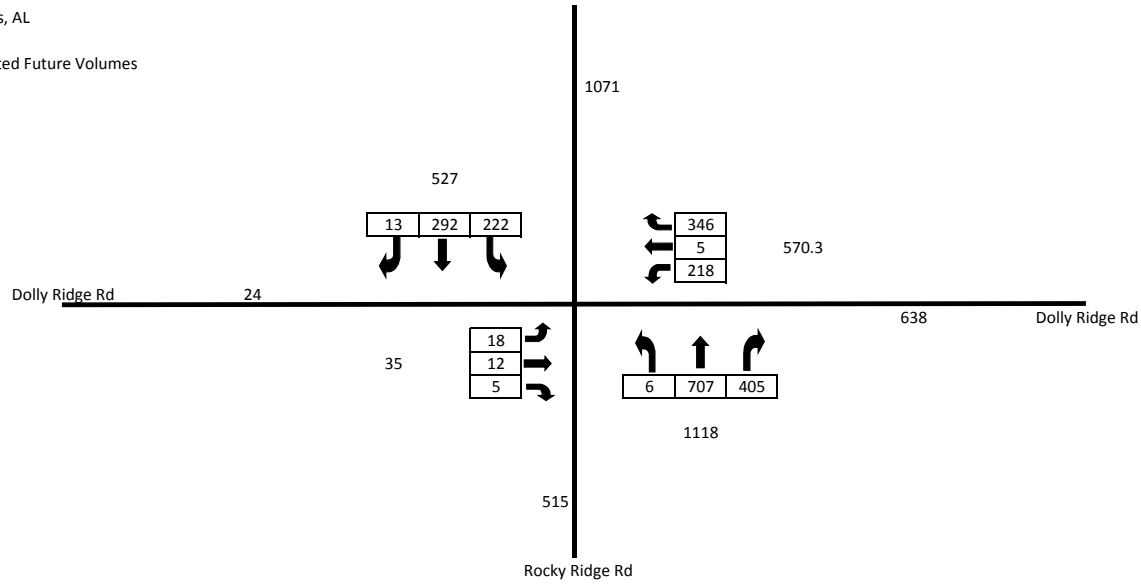


Vestavia Hills, AL
SA# 18-0337
AM - New Trips 735 total students

0.94 AM Ingress Trips per Student
0.75 AM Egress Trips per Student

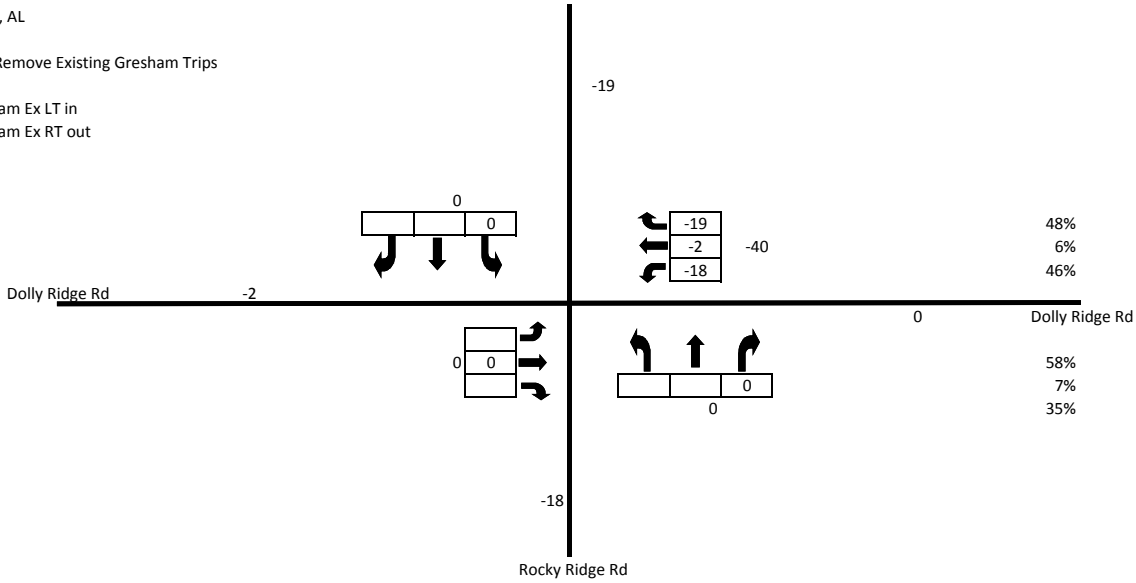


Vestavia Hills, AL
SA# 18-0337
AM - Estimated Future Volumes



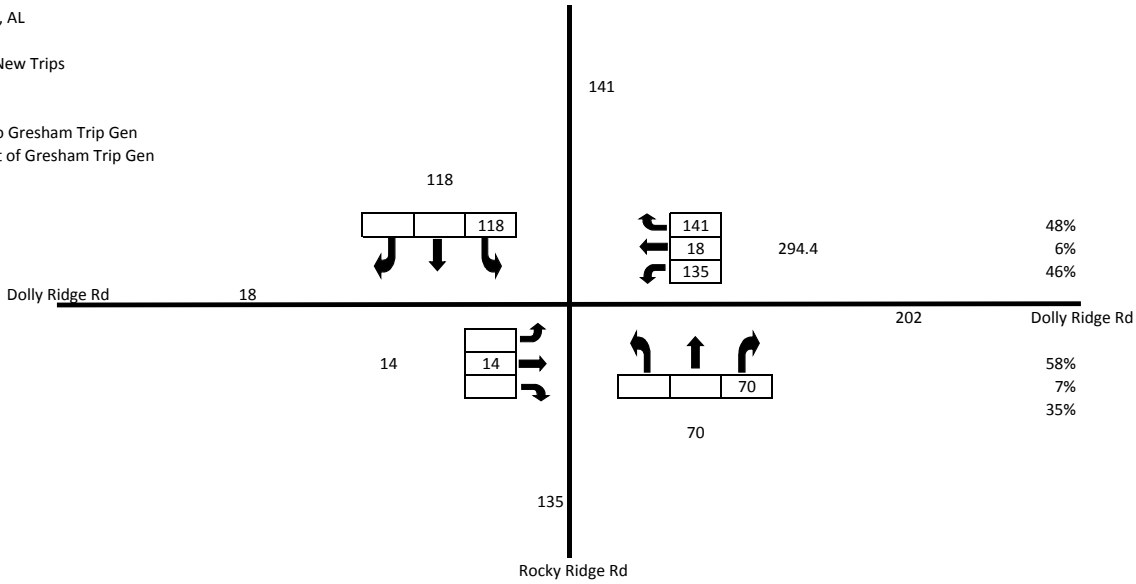
Vestavia Hills, AL
SA# 18-0337
School PM - Remove Existing Gresham Trips

0 Gresham Ex LT in
40 Gresham Ex RT out



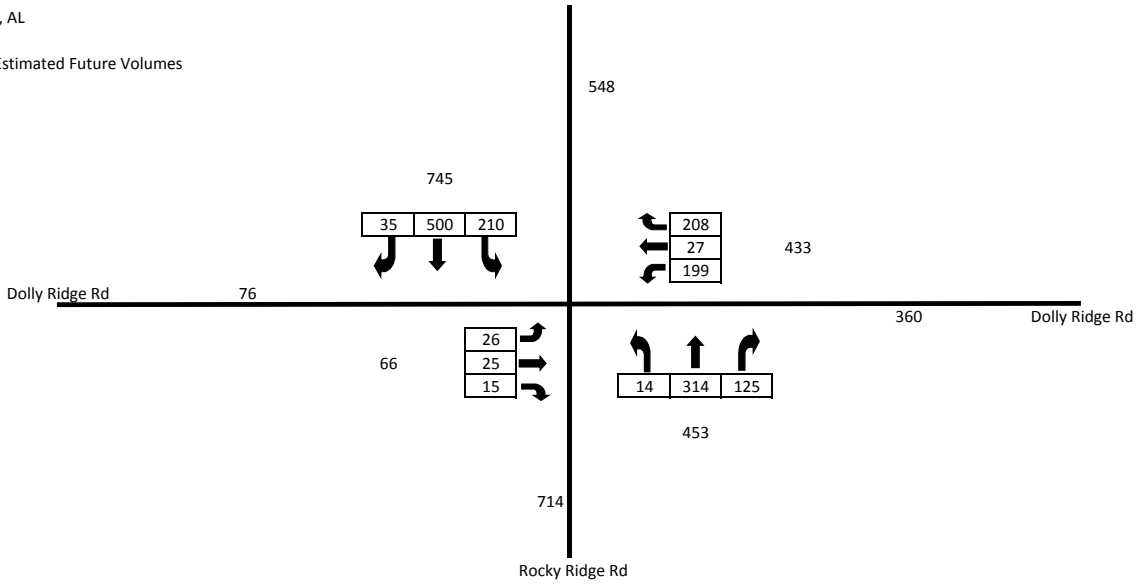
Vestavia Hills, AL
SA# 18-0337
School PM - New Trips

202 LT into Gresham Trip Gen
294 RT out of Gresham Trip Gen



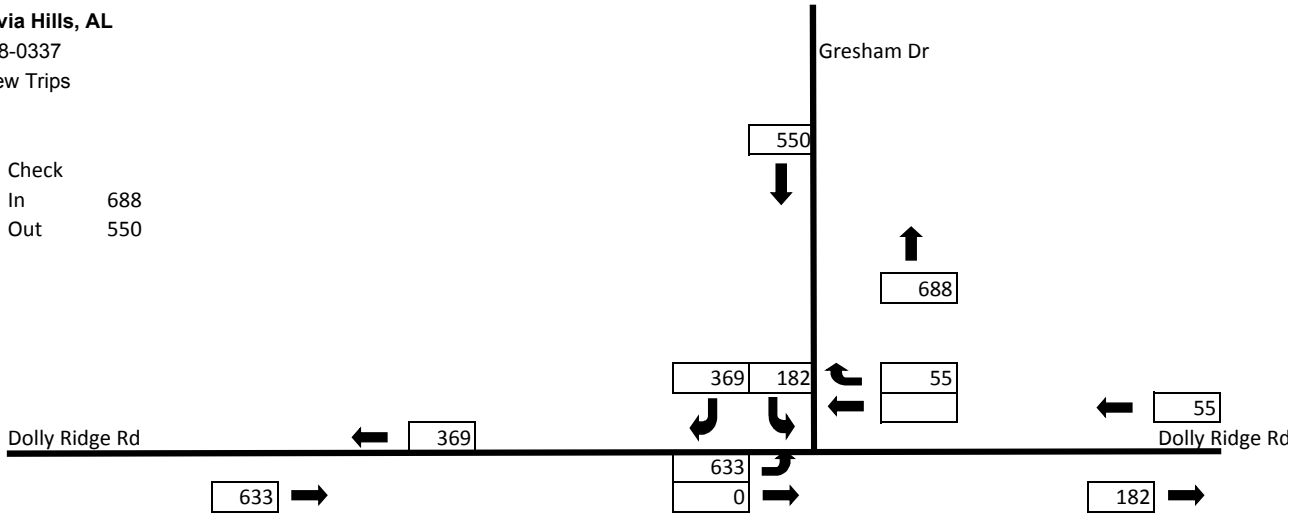
-

Vestavia Hills, AL
SA# 18-0337
School PM - Estimated Future Volumes



Vestavia Hills, AL
SA# 18-0337
AM New Trips

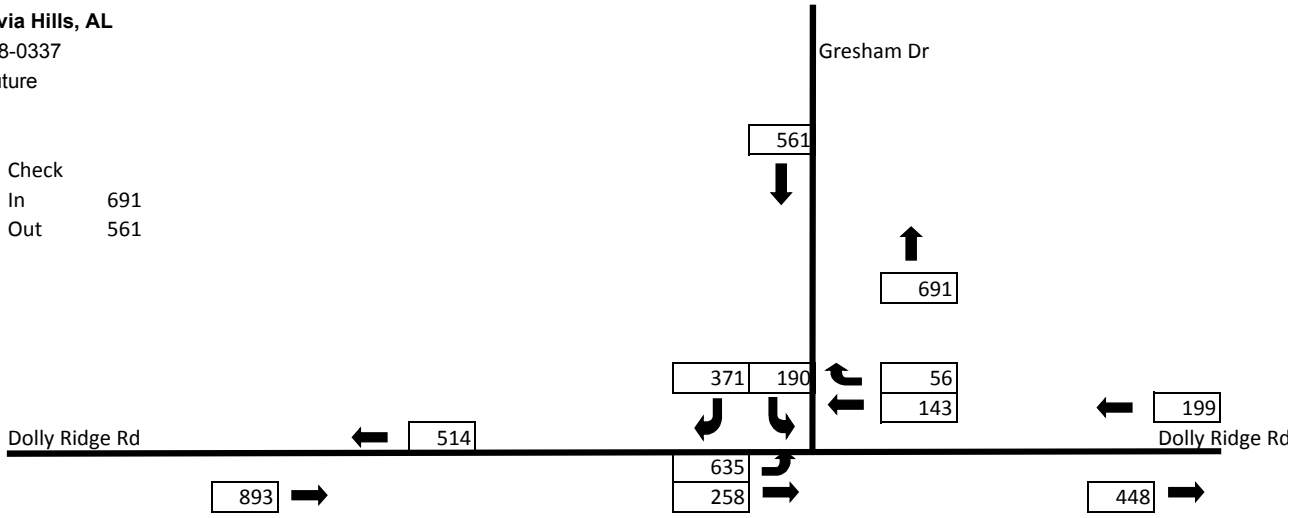
Check
In 688
Out 550



In 688
Out 550

Vestavia Hills, AL
SA# 18-0337
AM Future

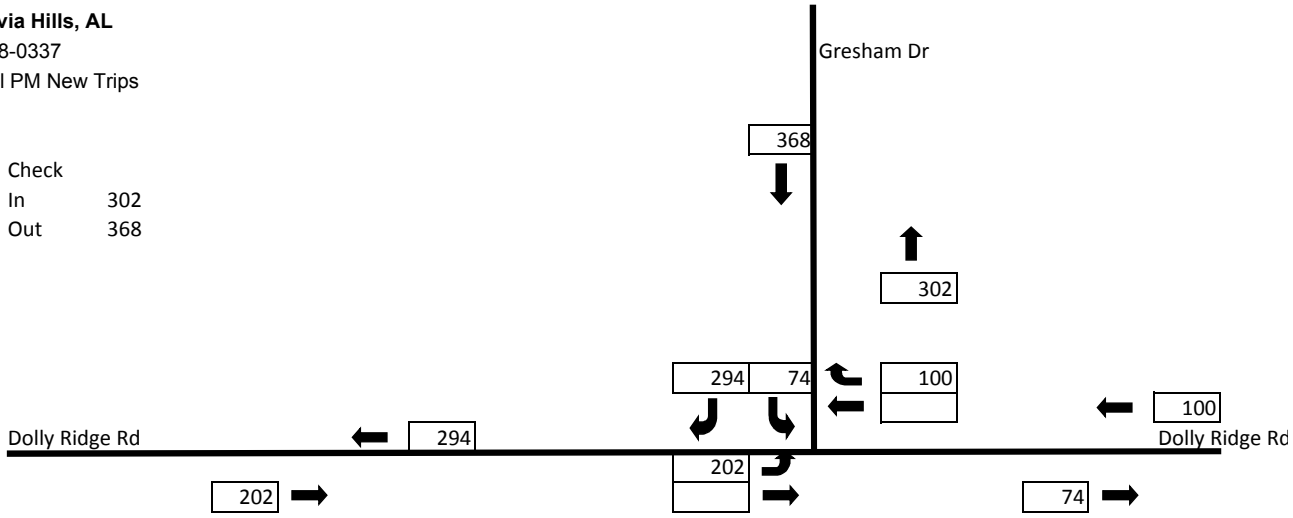
Check
In 691
Out 561



New	In	688
New	Out	550
Res	In	3
Res	Out	11
Total	In	691
Total	Out	561

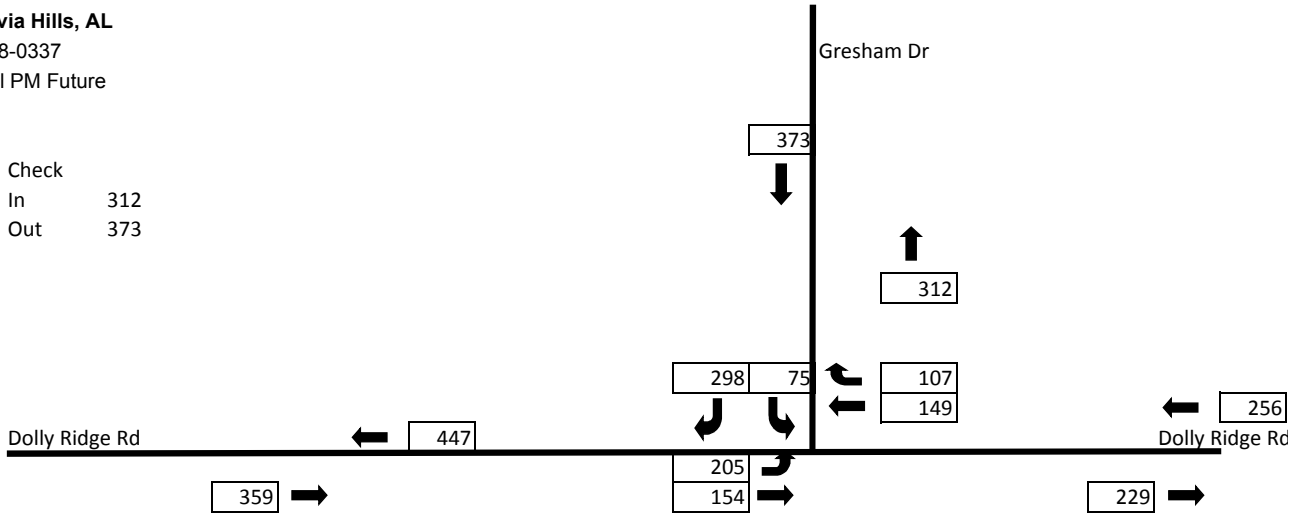
Vestavia Hills, AL
SA# 18-0337
School PM New Trips

Check
In 302
Out 368



In 302
Out 368

Vestavia Hills, AL
SA# 18-0337
School PM Future

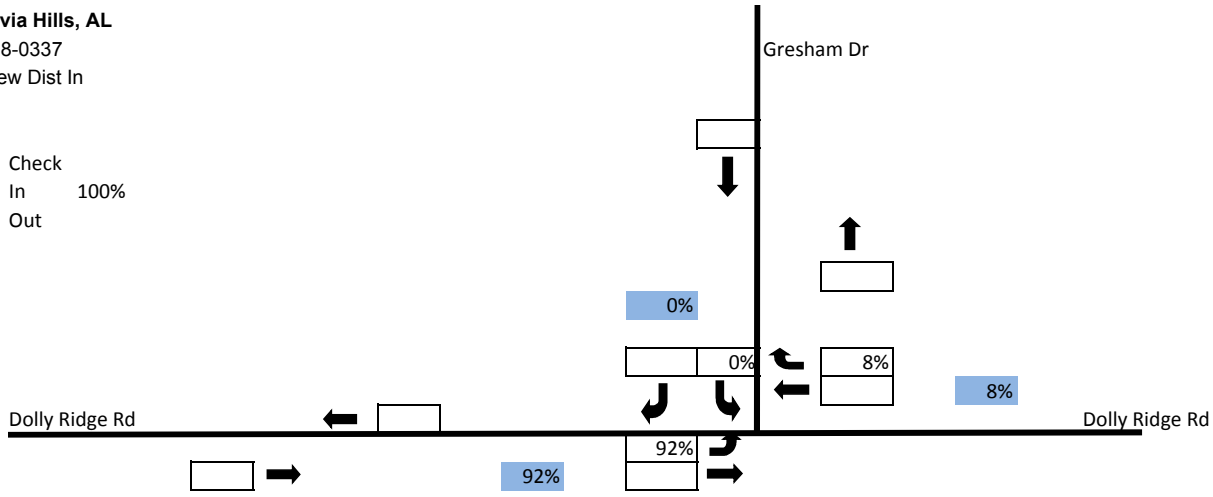


Check		
In		312
Out		373

New	In	302
New	Out	368
Res	In	10
Res	Out	5
Total	In	312
Total	Out	373

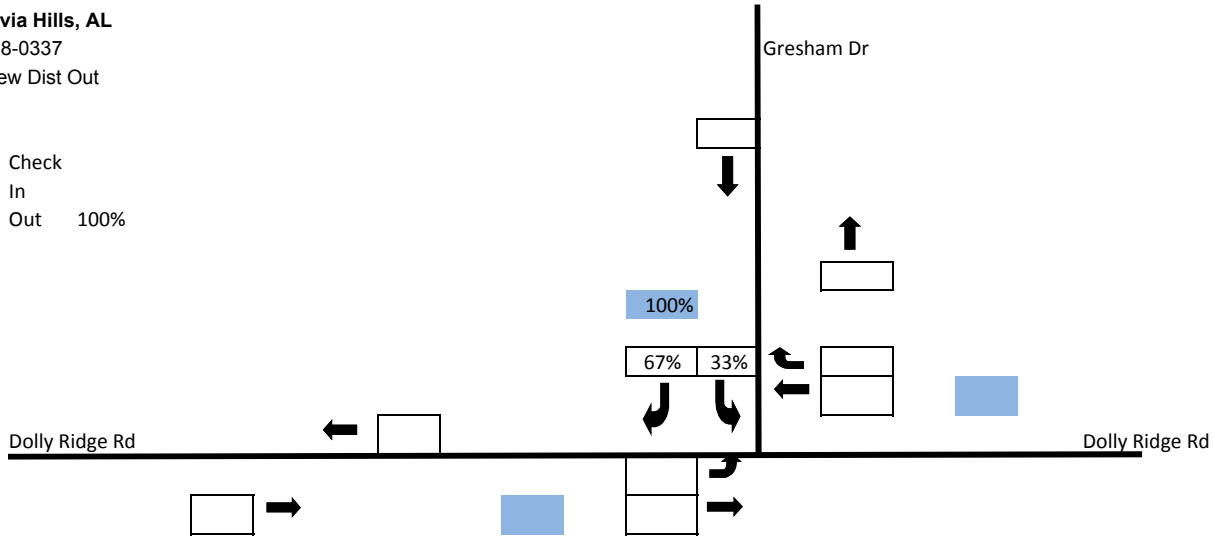
Vestavia Hills, AL
SA# 18-0337
AM New Dist In

Check
In 100%
Out

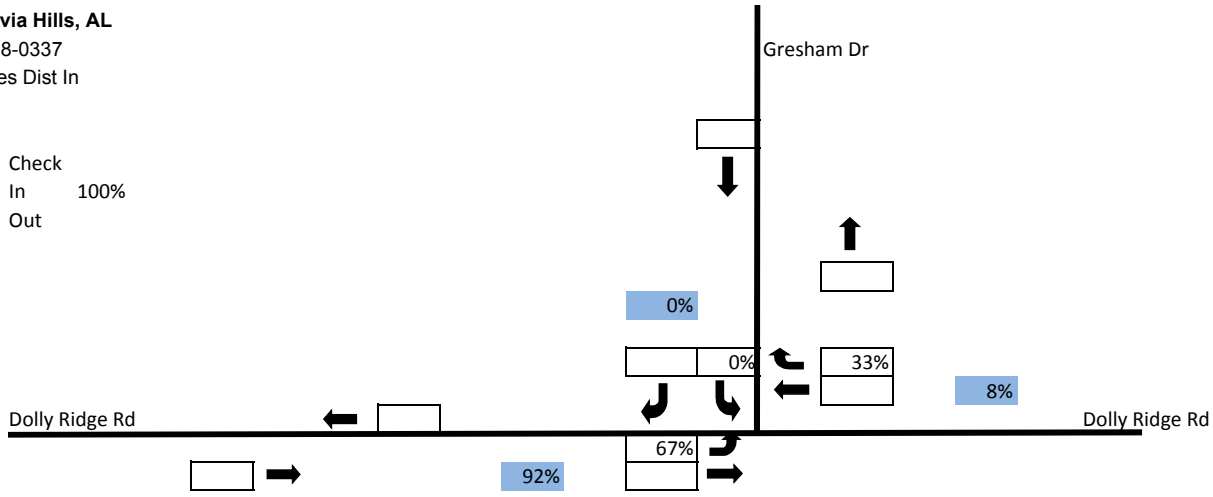


Vestavia Hills, AL
SA# 18-0337
AM New Dist Out

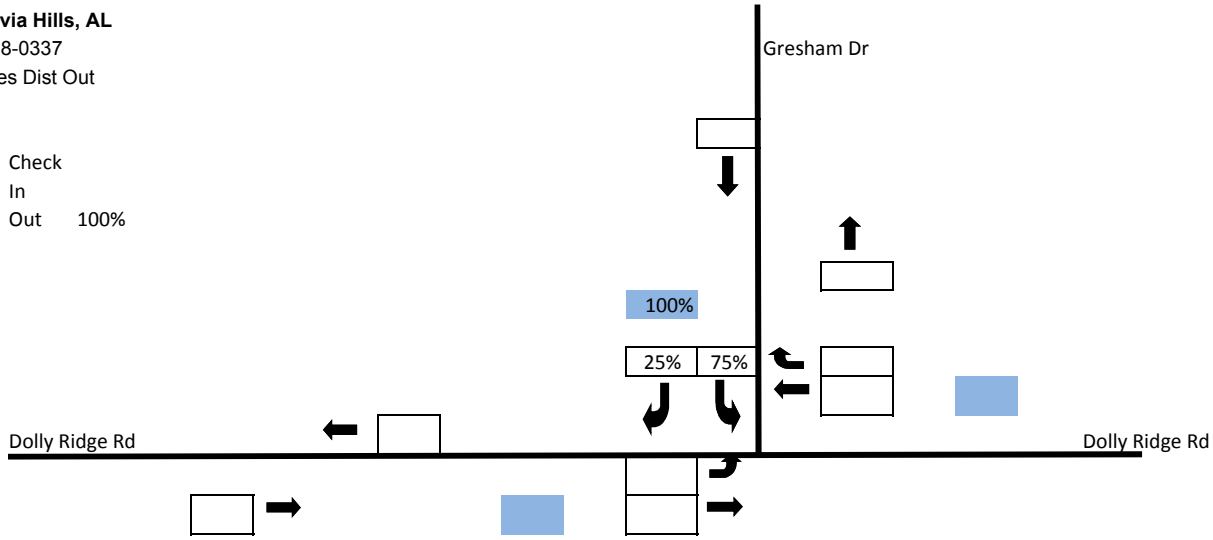
Check
In
Out 100%



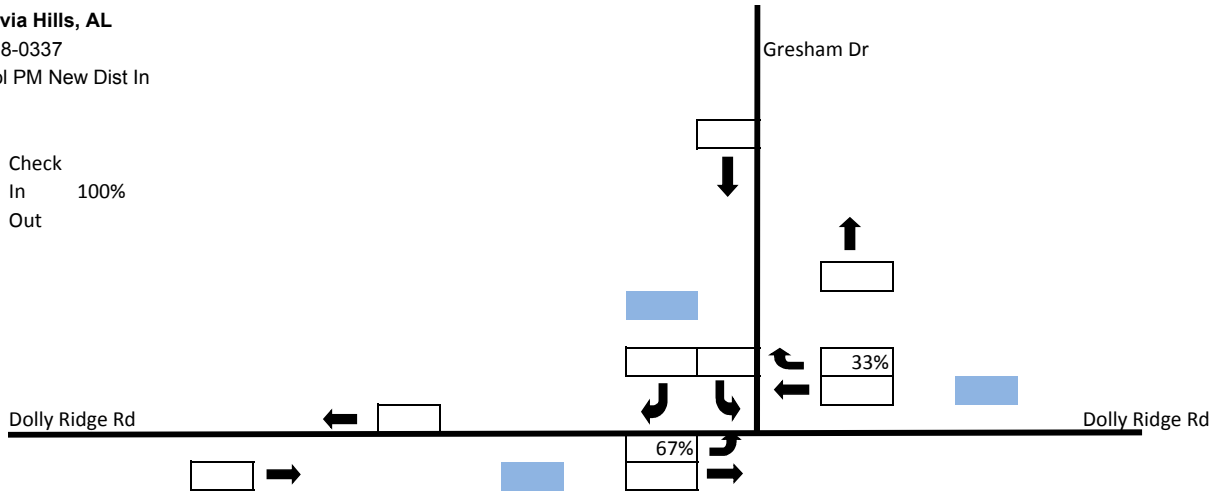
Vestavia Hills, AL
SA# 18-0337
AM Res Dist In



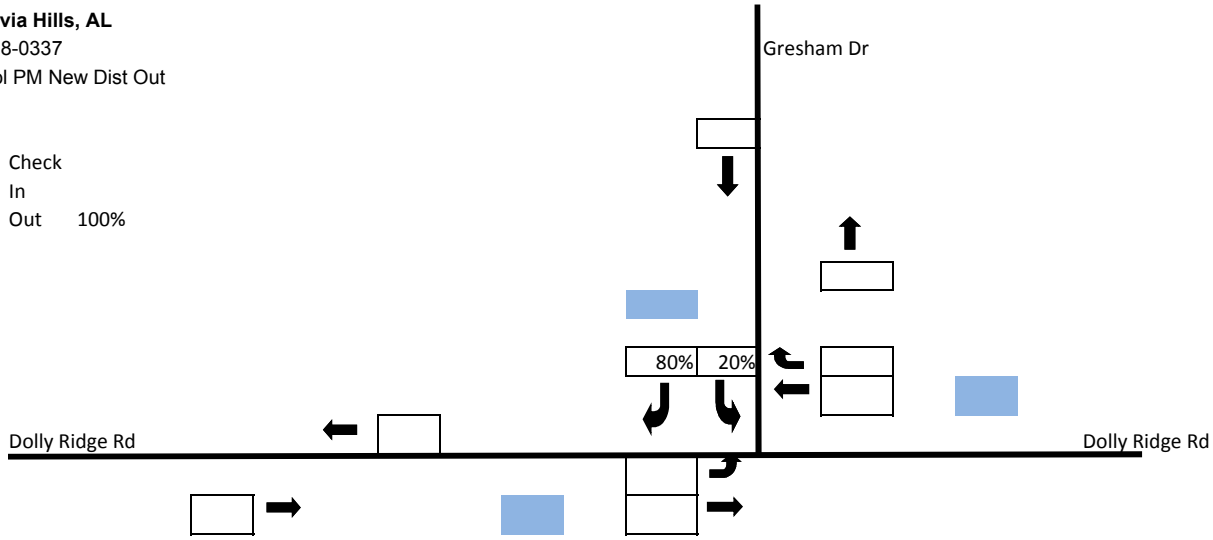
Vestavia Hills, AL
SA# 18-0337
AM Res Dist Out



Vestavia Hills, AL
SA# 18-0337
School PM New Dist In

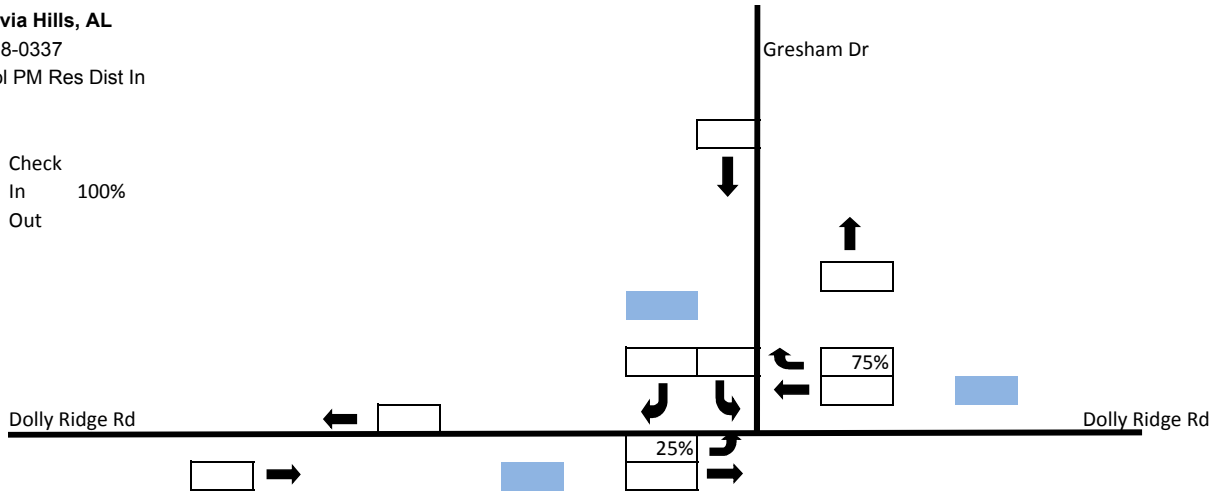


Vestavia Hills, AL
SA# 18-0337
School PM New Dist Out



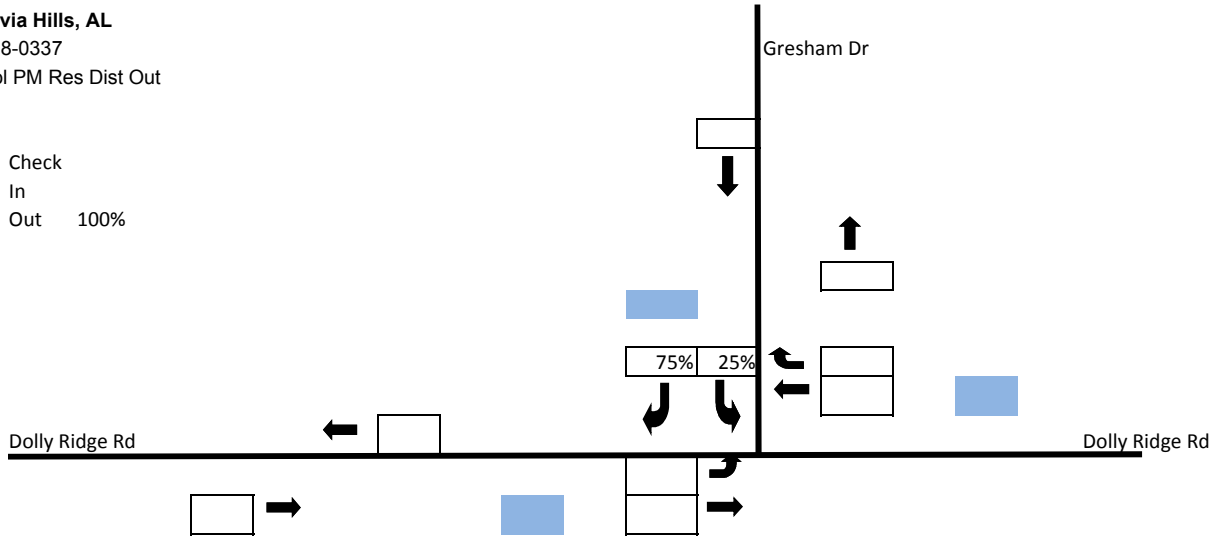
Vestavia Hills, AL
SA# 18-0337
School PM Res Dist In

Check
In 100%
Out



Vestavia Hills, AL
SA# 18-0337
School PM Res Dist Out

Check
In
Out 100%



Appendix E – Base Signal Timings

Intersection: Rocky Ridge Road at Dolly Ridge Road

Controller: EPAC 300

Fault(s): Clock is not correct.

	Phase							
Base	1	2	3	4	5	6	7	8
Min green	7	15		7	7	15		7
Passage	2.7	3.2		2.7	2.7	3.2		2.7
Max Green	8	69		41	13	64		41
Yellow	3	4		3	3	4		3
Red	1	1		1	1	1		1
Min Recall		Min				Min		
Number Lock				Y				
Dual Entry				Y				Y

Density Timings								
Phase	1	2	3	4	5	6	7	8
AINI								
MAX INI								
TIM BEF								
TIM TO								
MGAP								

Split: 0 / 0 / 1 Cycle Length: Free Offset:

Green:								

Split: AM / / Cycle Length: 130 Offset:

Green:	12	73		45	16	69		45

Split: PM / / Cycle Length: 90 Offset:

Green:	12	41		37	17	36		37

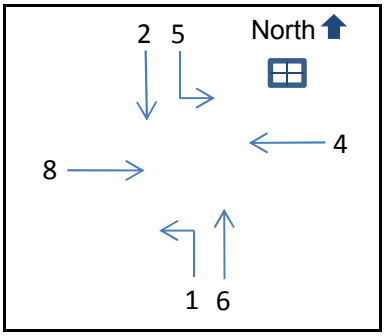
Split: / / Cycle Length: Offset:

Green:								

Split: / / Cycle Length: Offset:

Green:								

Time Of Day Plan				
SPLIT				TIME
Free				0:00
AM				7:00
Free				9:00
PM				14:00
Free				16:00



Notes: Jefferson County-owned signal. Reset clock. Detection is active.
Both left turn phase should be protected-permissive.
Use a Flashing Yellow Arrow configuration for both left turn conditions.

Intersection: Dolly Ridge Road at Gresham Drive

Controller: EPAC 300

Fault(s): Clock is not correct.

	Phase							
Base	1	2	3	4	5	6	7	8
Min green	6	12		10		12		
Passage	3	3.2		5		3.2		
Max Green	48	24.5		34		47.5		
Yellow	3	3.5		3		3.5		
Red	1	1		1		1		
Min Recall		Min				Min		
Number Lock	Y			Y				
Dual Entry								

Time Of Day Plan				
SPLIT				TIME
Free				0:00
AM				7:00
Free				8:30
PM				14:00
Free				16:00

Density Timings								
Phase	1	2	3	4	5	6	7	8
AINI								
MAX INI								
TIM BEF								
TIM TO								
MGAP								

Split: 0 / 0 / 1 Cycle Length: Free Offset:

Green:								

Split: AM / / Cycle Length: 100 Offset:

Green:	52	25.5		22.5		77.5		

Split: PM / / Cycle Length: 90 Offset:

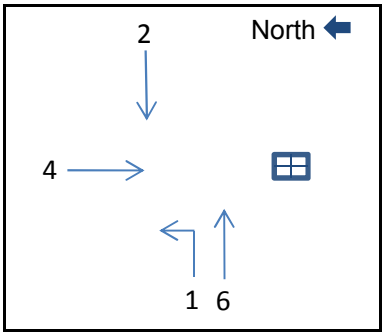
Green:	23	29		38		52		

Split: / / Cycle Length: Offset:

Green:								

Split: / / Cycle Length: Offset:

Green:								



Notes: Jefferson County-owned signal. Reset clock. Detection is active.
Dolly Ridge Road eastbound left turn phase should be protected-permissive.

Appendix F – Signal Warrant Analysis Reports

TRAFFIC SIGNAL WARRANTS

City/Town:	Vestavia Hills	Analysis Performed By:	DC
County:	Jefferson	Date Analysis Performed:	2/26/2019
Division:	RPCGB	Project Number if Applicable:	180337
Data Date:	2/6/2019	Weather Conditions:	Showers

Major Route:	Blue Lake Drive	Appr. Lanes:	1	Critical Approach Speed (mph):	35
Minor Route:	Sicard Hollow Road	Appr. Lanes:	1		

Volume Level Criteria

1. Is the critical speed of major street traffic > 70 km/h (40 mph) ? ☐ Yes ☒ No
2. Is the intersection in a built-up area or isolated community of <10,000 population? ☐ Yes ☒ No

If Question 1 or 2 above is answered "Yes", then use "70%" volume level ☐ 70% ☒ 100%

WARRANT 1 - EIGHT-HOUR VEHICULAR VOLUME

Warrant 1 is satisfied if Condition A or Condition B is "100%" satisfied.

Warrant is also satisfied if both Condition A and Condition B are "80%" satisfied, given adequate trials of other remedial measures have been tried.

Satisfied: ☐ Yes ☒ No

Adequate trial(s) of other remedial measures tried: ☐ Yes ☒ No

List Remedial Measures Tried (Required for 80% Combination of A & B)

Condition A - Minimum Vehicular Volume & Condition B - Interruption of Continuous Traffic

100% Satisfied: ☐ Yes ☒ No

(Used if neither Condition A or B is satisfied) 80% Satisfied: ☐ Yes ☒ No

	(volumes in veh/hr)	Minimum Requirements				Eight Highest Hours							
	Approach Lanes	1		2 or more		7 AM	4 PM	5 PM	3 PM	8 AM	6 PM	12 PM	2 PM
	Volume Level	100%	70%	100%	70%								
W - 1A 100%	Both Approaches on Major Street	500	350	600	420	991	1,195	1,137	753	634	715	639	603
	Highest Approach on Minor Street	150	105	200	140	423	162	181	236	351	150	115	125
	(volumes in veh/hr)	Minimum Requirements				7 AM	9 AM	10 PM	11 AM	2 PM	3 PM	4 PM	5 PM
	Approach Lanes	1		2 or more									
	Volume Level	100%	70%	100%	70%								
W - 1B 100%	Both Approaches on Major Street	750	525	900	630	991	1,195	1,137	753	634	715	639	603
	Highest Approach on Minor Street	75	53	100	70	423	162	181	236	351	150	115	125
	(volumes in veh/hr)	Minimum Requirements				7 AM	9 AM	10 PM	11 AM	2 PM	3 PM	4 PM	5 PM
	Approach Lanes	1		2 or more									
	Volume Level	100%	70%	100%	70%								
W - 1A 80%	Both Approaches on Major Street	400	280	480	336	991	1,195	1,137	753	634	715	639	603
	Highest Approach on Minor Street	120	84	160	112	423	162	181	236	351	150	115	125
	(volumes in veh/hr)	Minimum Requirements				7 AM	9 AM	10 PM	11 AM	2 PM	3 PM	4 PM	5 PM
	Approach Lanes	1		2 or more									
	Volume Level	100%	70%	100%	70%								
W - 1B 80%	Both Approaches on Major Street	600	420	720	504	991	1,195	1,137	753	634	715	639	603
	Highest Approach on Minor Street	60	42	80	56	423	162	181	236	351	150	115	125

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

TRAFFIC SIGNAL WARRANTS

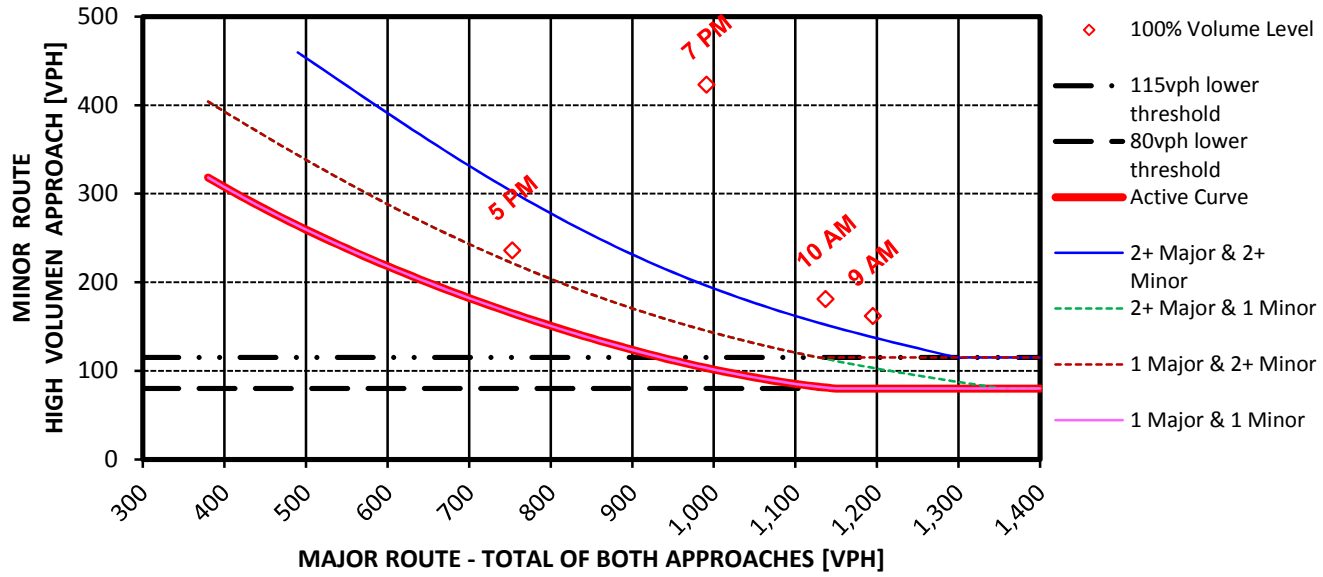
WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

Satisfied: [X] Yes [ ] No

If all four points lie above the appropriate line, then this warrant is satisfied.

(Volumes in veh/hr)	Four Highest Hours			
	7 PM	9 AM	10 AM	5 PM
SUM of Both Approaches on Major Street	991	1,195	1,137	753
Highest Minor Street Approach	423	162	181	236

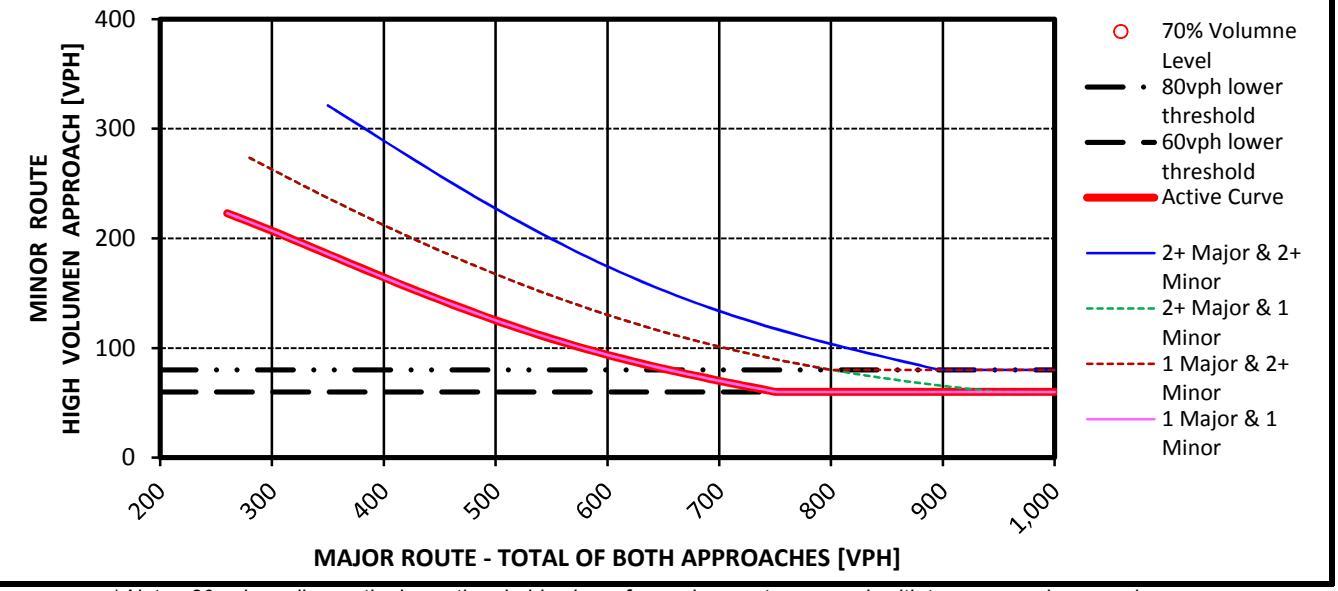
FIGURE W-2: Criteria for "100%" Volume Level



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

FIGURE W-2: Criteria for "70%" Volume Level

(Community less-than 10,000 population or speeds greater-than 70 km/hr [40 mph] on Major Street)



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

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

TRAFFIC SIGNAL WARRANTS

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME

Applicable: [ ] Yes [X] No

Satisfied: [ ] Yes [X] No

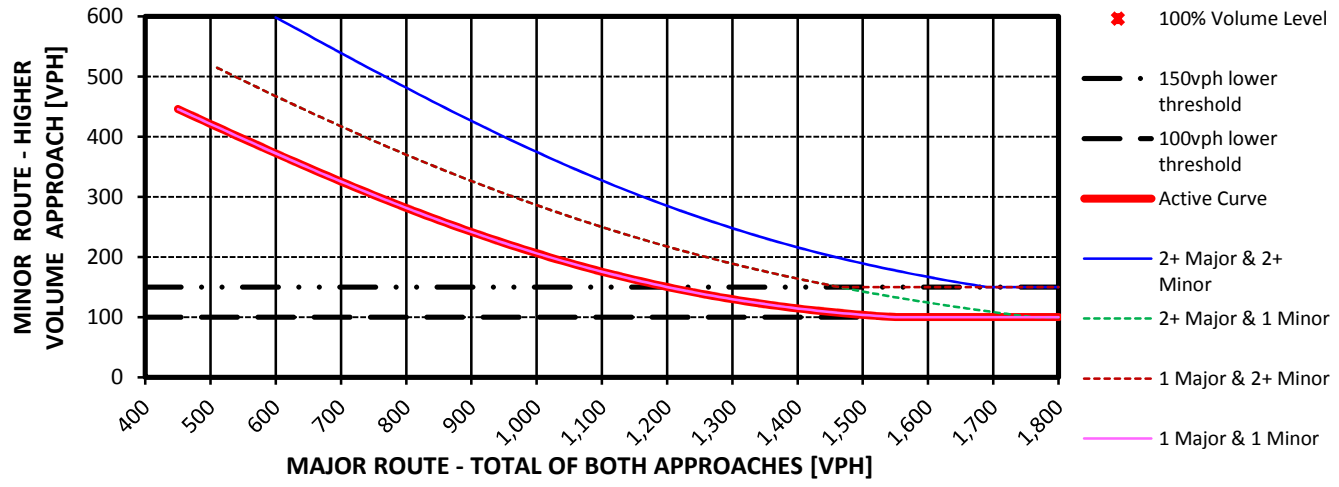
This signal warrant sahll be applied only in unsual cases, such as office complexes, manufacturing plants, industrial complexes, or high-ocupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time period.

Signalization shall be considered if a point lies above the appropriate line or the Delay criteria is met.

Unusual case(s) justifying this Warrant:

Peak Hour Data		
Peak Hour	Major Route	Minor Route

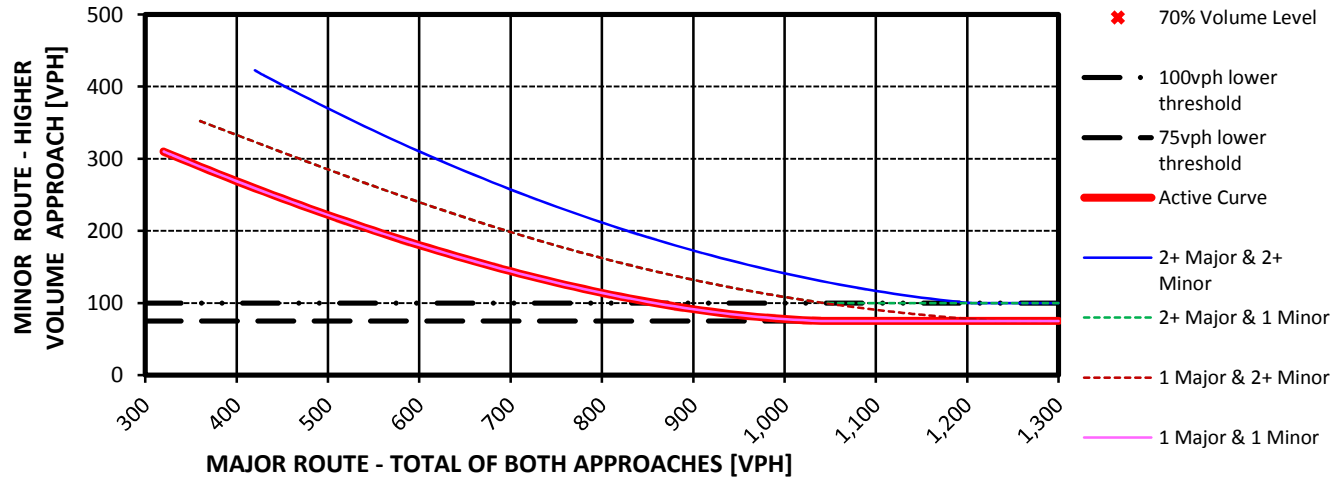
FIGURE W-3: Criteria for "100%" Volume Level



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

FIGURE W-3: Criteria for "70%" Volume Level

(Community less-than 10,000 population or speeds greater-than 70 km/hr [40 mph] on Major Street)



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

DELAY CRITERIA

1. Delay on Minor Approach (vehicle-hours)		
Approaches Lanes:	1	2
Delay Criteria:	4.0	5.0
Delay:		
Fullfilled? [ ] Yes [X] NO		

2. Volume on Minor Approach (veh/hr)		
Approaches Lanes	1	2
Volume Criteria	100	150
Volume :		
Fullfilled? [ ] Yes [X] NO		

3. Total Entering Volume (veh/hr)		
Number of Approaches: [ ] 3 [X] 4 or more		
No. of Approaches	3	4
Volume Criteria	650	800
Volume :		
Fullfilled? [ ] Yes [X] NO		

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

TRAFFIC SIGNAL WARRANTS

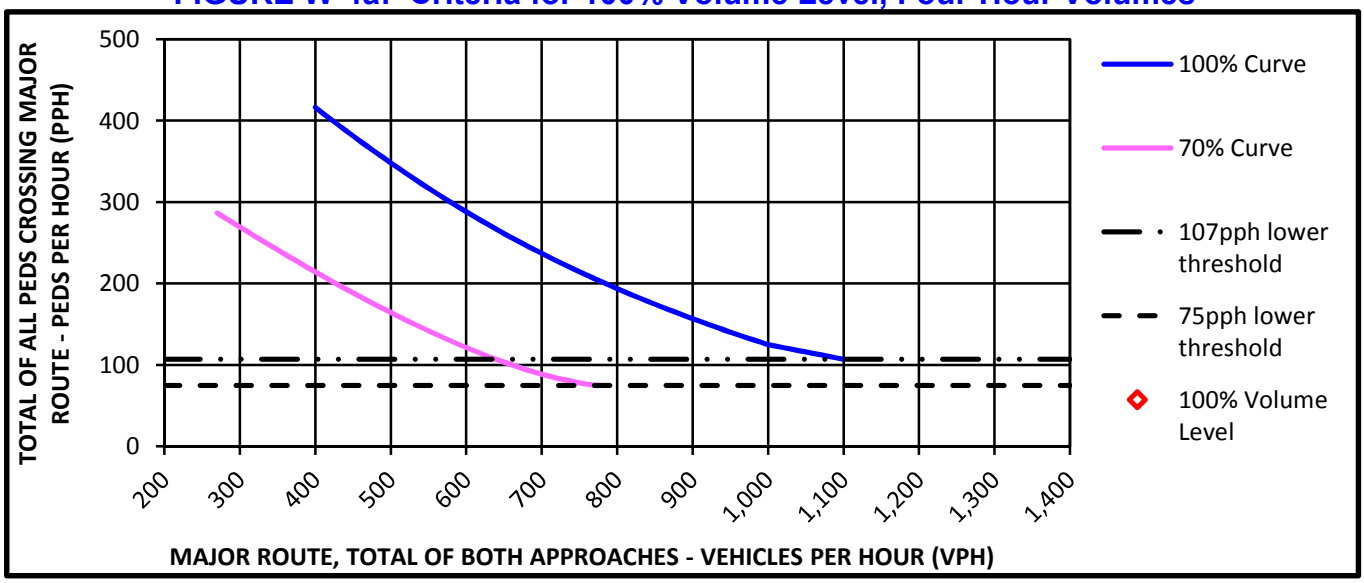
WARRANT 4 - PEDESTRIAN VOLUME

Satisfied: [ ] Yes [X] No

Pedestrian Signal Location Criteria			Fulfilled? Yes	Fulfilled? No
The nearest traffic control device (signal or STOP sign) controlling traffic on the major route is more than 90m (300 ft) away:	[ ] Yes	[X] No		X
If no above, will this proposed signal restrict the progrssive movement of traffic?	[X] Yes	[ ] No		

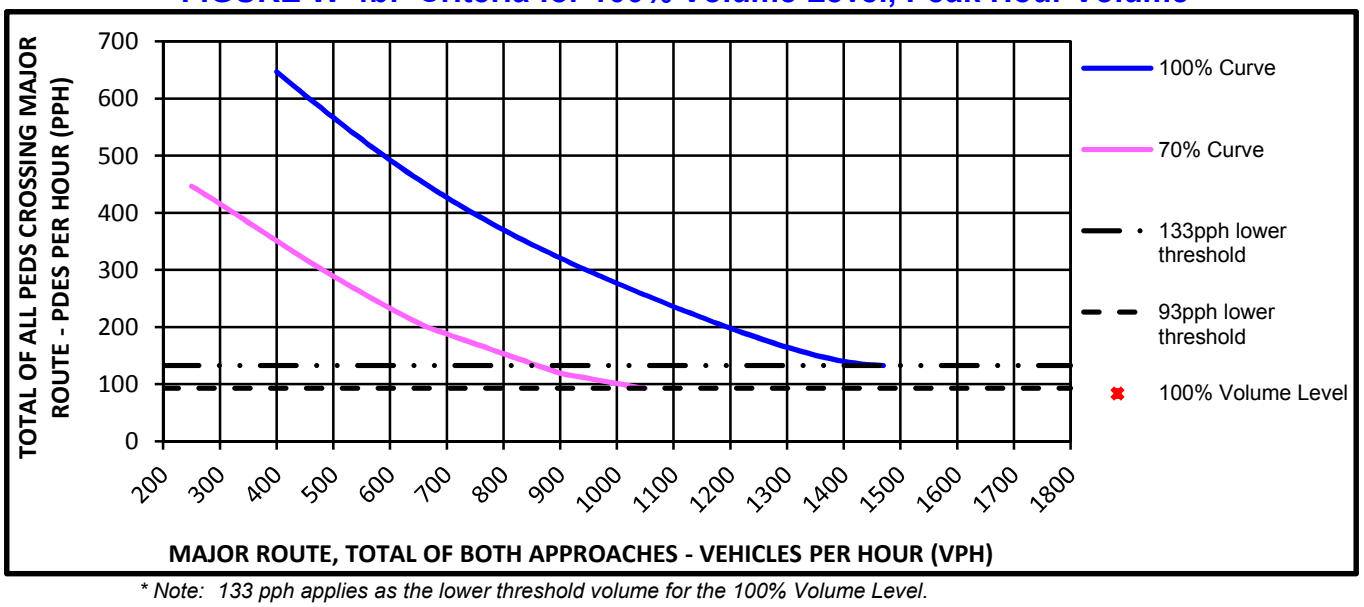
Vehicle volumes in veh/hr and Pedestrian volumnes in ped/hr	*Four Greatest Hours*				Peak Hour
SUM of Both Approaches on Major Route					
Pedestrians crossing the Major Route					

FIGURE W-4a: Criteria for 100% Volume Level, Four-Hour Volumes



** Note: 107 pph applies as the lower threshold volume for the 100% Volume Level.*
75 pph applies as the lower threshold volume for the 70% Volume Level.

FIGURE W-4b: Criteria for 100% Volume Level, Peak Hour Volume



** Note: 133 pph applies as the lower threshold volume for the 100% Volume Level.*
93 pph applies as the lower threshold volume for the 70% Volume Level.

NOTE: *The Satisfaction of a warrant or warrants shall not in itself require the installation of a traffic control signal.*

TRAFFIC SIGNAL WARRANTS

WARRANT 5 - SCHOOL CROSSING

Satisfied: ☐ Yes ☒ No

This warrant is intended for application where the fact that schoolchildren crossing the major route is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students. This warrant is satisfied if all three of the criteria below are fulfilled after remedial measures have been considered.

Any remedial measures implemented in or around the intersection to improve the safety of the students as noted in Section **4C.06 Warrant 5, School Crossing** in the MUTCD:

Criteria			Fulfilled? Yes	Fulfilled? No
1. *Enter the number of schoolchildren crossing the major route along with the hour this occurs. The hour can be any 60 minute interval (ex 2:15 PM - 3:15 PM enter 2:15 - 3:15). Requires a minimum of 20 schoolchildren durning the any hour.*	*Num. of Students*	*Highest Crossing Hour Period*		X
		-		
2. *For both the morning (AM) and afternoon (PM) periods of operation, enter the number of adequate gaps observed for each period and the number of minutes each period lasted. Requires one period to operate with fewer gaps than the number of minutes in the period.*		*Period*		X
		Minutes / *Gaps*		
	AM			
	PM			
3. *Is the nearest traffic signal along the major route more than 90m (300 ft) from this crossing?*	☐ Yes	☒ No		X
If the signal is within 90m (300 ft) of an existing signalize intersection, will it restrict progressive movement of traffic?	☒ Yes	☐ No		

WARRANT 6 - COORDINATED SIGNAL SYSTEM

Satisfied: ☐ Yes ☒ No

Progressive movement in a coordinated signal system sometimes necessitates the installtion of traffic control signals at intersections that would not otherwise be considered in order to maintain proper paltooning of vehicles. This warrant is satisfied if the below criteria is satified as follows: criteria 1 is satisfied and either criteria 2 or 3 is satisfied.

Criteria	Fulfilled? Yes	Fulfilled? No
1. *The inclusion of this proposed signal, into the coordinated system, does not result in a signal spacing of less than 305m (1,000 ft)?*		X
2. a. *On a one-way street or a street that has traffic predominantly in one direction, are the adjacent traffic control signals so far apart that they do not provide the necessary degree of vehiclular platooning?*		X
2. b. *On a two-way street, do adjacent traffic control signals **not** provide the necessary degree of platooning and will the proposed and adjacent traffic control signals collectively provide a progressive operation?*		X

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

TRAFFIC SIGNAL WARRANTS

WARRANT 7 - CRASH EXPERIENCE

Satisfied: [ ] Yes [X] No

This warrant is intended for application where the severity and frequency of crashes are the principal reasons to consider the installation of a traffic control signal. The need for a traffic control signal shall be considered if an engineering study finds that criteria 1, 2, and 3 are met.

Criteria			Fulfilled? Yes	Fulfilled? No
1. *Adequate trial of alternatives with satisfactory observance and enforcement has fialed to reduce the crash frequency as shown below:*				
				X
2. ***How many crashes within the past 12 months?*** *For this criteria to be met, five or more reported crashes, of types suseptible to correction by the installation of a traffic control signal, must have occurred.*				X
3. *If Warrant 1A or Warrant 1B are 80 percent satisfied of the current values or if Warrant 4, 4-hour or peak, is met at the 80 percent values.*	Met? Yes	Met? No		
Warrant 1, Condition A, Minimum Vehicular Volume (80 percent satisfied):		X	X	
Warrant 1, Condition B, Interruption of Continuous Traffic (80 percent satisfied):	X			
Warrant 4, Four-Hour Volume (80 percent satisfied):		X		
Warrant 4, Peak Hour Volume (80 percent satisfied):		X		

WARRANT 8 - ROADWAY NETWORK

Satisfied: [ ] Yes [X] No

This warrant is used to encourage the concentration and organization of traffic flow on a roadway network. This warrant is satisfied if one of the following 2 criteria is met and both routes meet at least on of the characteristics of a Major Route below.

Criteria			Met? Yes	Met? No	Fulfilled? Yes	Fulfilled? No
1. *Both of the criteria to the right are required in order to be met.*	a. *Please enter the total existing, or immediately projected, entering traffic volume during the peak hour of a typical weekday. Requires a minumum of 1,000 vehicles to be met.*	**Volume**		X		X
	b. *Based on an engineering study, does the 5 year projected traffic volumes, for this location, meet one or more of Warrants 1, 2, or 3 during an average weekday? **			X		
2. ***Enter the total existing, or immediately projected, entering volume for each of any 5 hours of a non-normal business day. (Saturday or Sunday).*** *1,000 vph for each hour required.*			**← Hour**			X
			← Volume			

**** Supporting data required for verification of the projected 5 year traffic Warrants.***

A major route, as used in this signal warrant, shall have at least one of the following characteristics:		Met? Yes	Met? No	Fulfilled? Yes	Fulfilled? No
Characteristics of Major Routes					
1. *Is it a part of the street or highway system that serves as the principal roadway network for through traffic flow?*	*Major Route*		X		X
	** Minor Route*		X		
2. *Does it include rural or suburban highways outside, entering, or traversing a city?*	*Major Route*		X		
	** Minor Route*		X		
3. *Does it appear as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study?*	*Major Route*		X		
	** Minor Route*		X		

**** This is a minor route, but for the purposes of this Warrant, shall be considered as the other major route.***

Note: ***Supporting data shall be required to verify the routes meet one of the characteristics of a major route.***

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

TRAFFIC SIGNAL WARRANTS

WARRANT 9 - INTERSECTION NEAR A GRADE CROSSING

Applicable ☐ Yes ☐ No

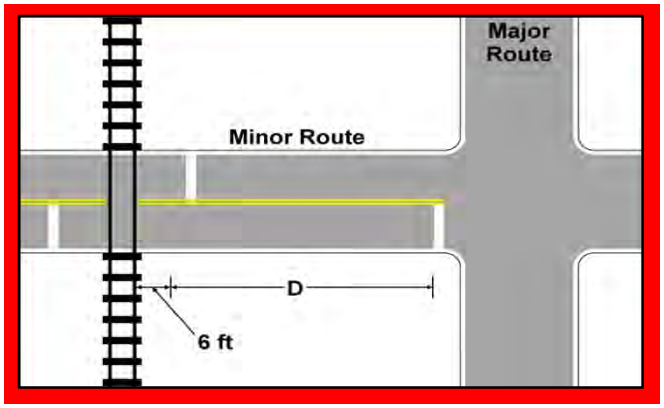
The need for a traffic control signal may be considered if an intersection that is controlled by a STOP or YIELD sign has a rail crossing within 140 feet of the stop/yield line and the highest Equivalent Minor Approach Traffic value lies above the curve represented on the graph below.

Minor Route Adjustment Factors - Enter the following:	
1. The number of occurrances of rail traffic/day:	
2. The percentage of "High-Occupancy Buses" crossing the track/day: (A high-occupancy bus is defined as a bus occupied by at least 20 people)	
3. The percentage of Tractor-trailer Trucks crossing the track/day:	

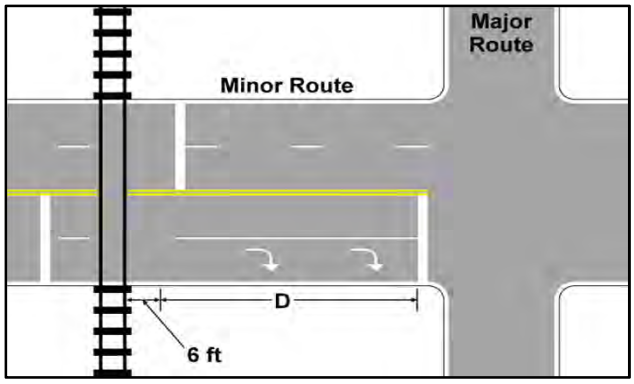
Satisfied: ☐ Yes ☐ No

Peak Hour Data		
Peak Hour	Major Route	Minor Route

Enter the distance value "D" from the STOP/YIELD bar to the track as shown below:

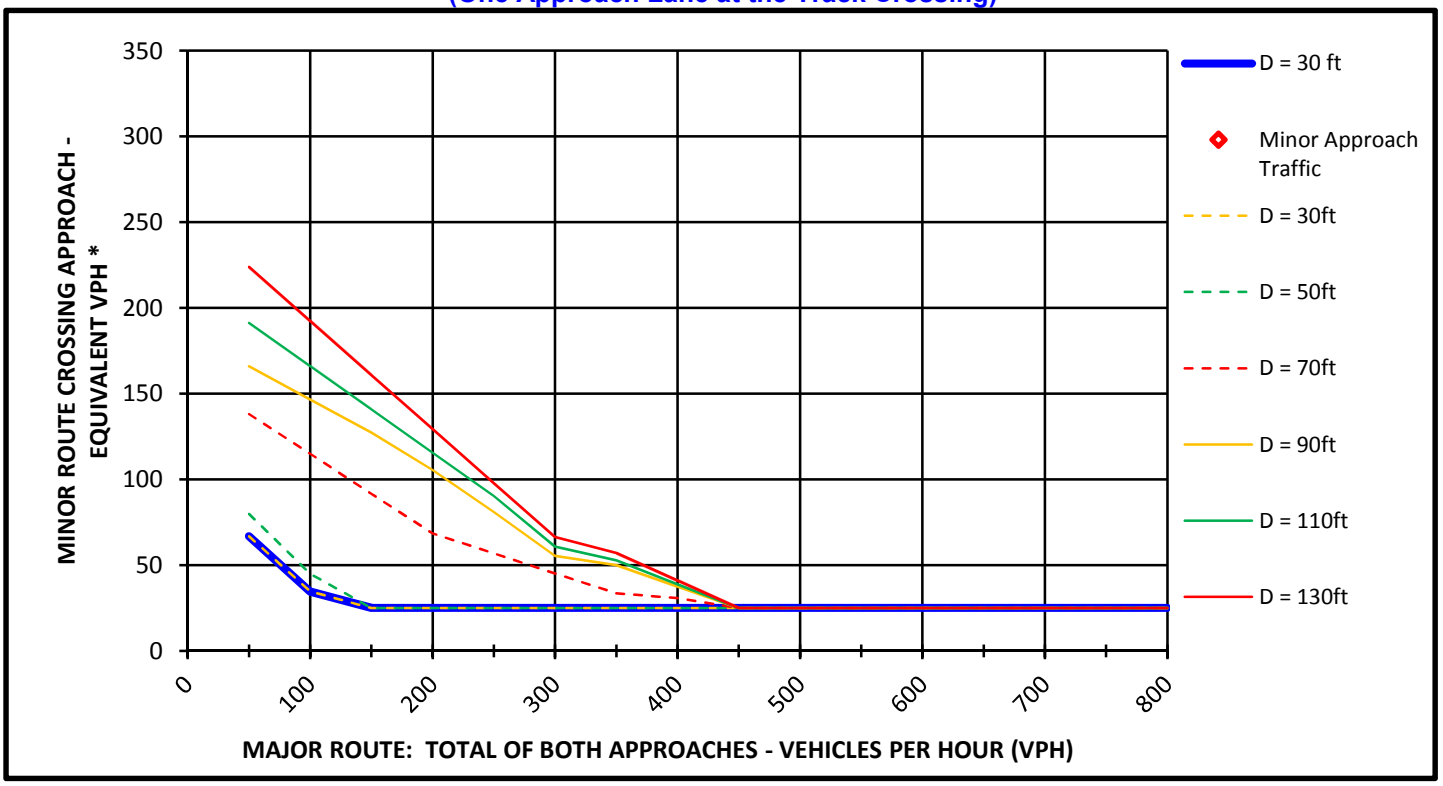


(One Approach Lane at the Track Crossing)



(Two or More Approach Lanes at the Track Crossing)

FIGURE W-9: Intersection Near a Grade Crossing
(One Approach Lane at the Track Crossing)



* *VPH after applying the adjustment factors for Rail, Bus, and Tractor-Trailer traffic*

25 vph applies as the lower threshold volume

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

TRAFFIC SIGNAL WARRANT SUMMARY

City/Town:	Vestavia Hills	Analysis Performed By:	DC
County:	Jefferson	Date Analysis Performed:	2/26/2019
Division:	RPCGB	Project Number if Applicable:	180337
Data Date:	2/6/2019	Weather Conditions:	Showers

Major Route: Blue Lake Drive — Appr. Lanes: 1 — Critical Approach Speed (mph): 35

Minor Route: Sicard Hollow Road — Appr. Lanes: 1

	SATISFIED	80% Satisfied		100% Satisfied	
Warrant #1: Eight-Hour Vehicular Volume	☐ Yes ☒ No				
1A - Minimum Vehicular Volume:		☐ Yes	☒ No	☐ Yes	☒ No
1B - Interruption of Continuous Traffic:		☒ Yes	☐ No	☐ Yes	☒ No

Any Remedial Measures Tried and their Outcome.

Warrant #2: Four-Hour Vehicular Volume ☒ Yes ☐ No

Warrant #3: Peak Hour ☐ Yes ☒ No

The Unusual Case(s) that Justifies the use of this Warrant.

Warrant #4: Pedestrian Volume ☐ Yes ☒ No

Warrant #5: School Crossing ☐ Yes ☒ No

Any Remedial Measures Implemented to improve the Safety of the Students.

Warrant #6: Coordinated Signal System ☐ Yes ☒ No

Warrant #7: Crash Experience ☐ Yes ☒ No

Other Alternatives that have failed to reduce crashes.

Warrant #8: Roadway Network ☐ Yes ☒ No

Warrant #9: Intersection Near a Grade Crossing ☐ Yes ☒ No

CONCLUSIONS

Warrants Satisfied: 2

Remarks:

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

TRAFFIC SIGNAL WARRANTS

City/Town:	Vestavia Hills	Analysis Performed By:	DC
County:	Jefferson County	Date Analysis Performed:	3/8/2019
Division:	RPCGB	Project Number if Applicable:	180337
Data Date:	2/6/2019	Weather Conditions:	Showers
Major Route:	Columbiana Rd	Appr. Lanes: 2	Critical Approach Speed (mph): 45
Minor Route:	Shades Crest Rd	Appr. Lanes: 1	

Volume Level Criteria

1. Is the critical speed of major street traffic > 70 km/h (40 mph) ? [X] Yes [ ] No
2. Is the intersection in a built-up area or isolated community of <10,000 population? [ ] Yes [ ] No

If Question 1 or 2 above is answered "Yes", then use "70%" volume level [X] 70% [ ] 100%

WARRANT 1 - EIGHT-HOUR VEHICULAR VOLUME

Warrant 1 is satisfied if Condition A or Condition B is "100%" satisfied.

Warrant is also satisfied if both Condition A and Condition B are "80%" satisfied, given adequate trials of other remedial measures have been tried.

Satisfied: [X] Yes [ ] No

Adequate trial(s) of other remedial measures tried: [ ] Yes [X] No

List Remedial Measures Tried (Required for 80% Combination of A & B)

Condition A - Minimum Vehicular Volume & Condition B - Interruption of Continuous Traffic

100% Satisfied: [X] Yes [ ] No

(Used if neither Condition A or B is satisfied) 80% Satisfied: [ ] Yes [ ] No

	(volumes in veh/hr)	Minimum Requirements				Eight Highest Hours							
	Approach Lanes	1		2 or more									
	Volume Level	100%	70%	100%	70%	5 PM	7 AM	4 PM	8 AM	3 PM	9 AM	6 PM	2 PM
W - 1A 100%	Both Approaches on Major Street	500	350	600	420	1,806	1,863	1,557	1,508	1,157	1,183	1,074	995
	Highest Approach on Minor Street	150	105	200	140	405	128	422	123	289	125	223	200
	(volumes in veh/hr)	Minimum Requirements				5 PM	7 AM	4 PM	8 AM	3 PM	9 AM	6 PM	2 PM
	Approach Lanes	1		2 or more									
	Volume Level	100%	70%	100%	70%								
W - 1B 100%	Both Approaches on Major Street	750	525	900	630	1,806	1,863	1,557	1,508	1,157	1,183	1,074	995
	Highest Approach on Minor Street	75	53	100	70	405	128	422	123	289	125	223	200
	(volumes in veh/hr)	Minimum Requirements				5 PM	7 AM	4 PM	8 AM	3 PM	9 AM	6 PM	2 PM
	Approach Lanes	1		2 or more									
	Volume Level	100%	70%	100%	70%								
W - 1A 80%	Both Approaches on Major Street	400	280	480	336	1,806	1,863	1,557	1,508	1,157	1,183	1,074	995
	Highest Approach on Minor Street	120	84	160	112	405	128	422	123	289	125	223	200
	(volumes in veh/hr)	Minimum Requirements				5 PM	7 AM	4 PM	8 AM	3 PM	9 AM	6 PM	2 PM
	Approach Lanes	1		2 or more									
	Volume Level	100%	70%	100%	70%								
W - 1B 80%	Both Approaches on Major Street	600	420	720	504	1,806	1,863	1,557	1,508	1,157	1,183	1,074	995
	Highest Approach on Minor Street	60	42	80	56	405	128	422	123	289	125	223	200

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

TRAFFIC SIGNAL WARRANTS

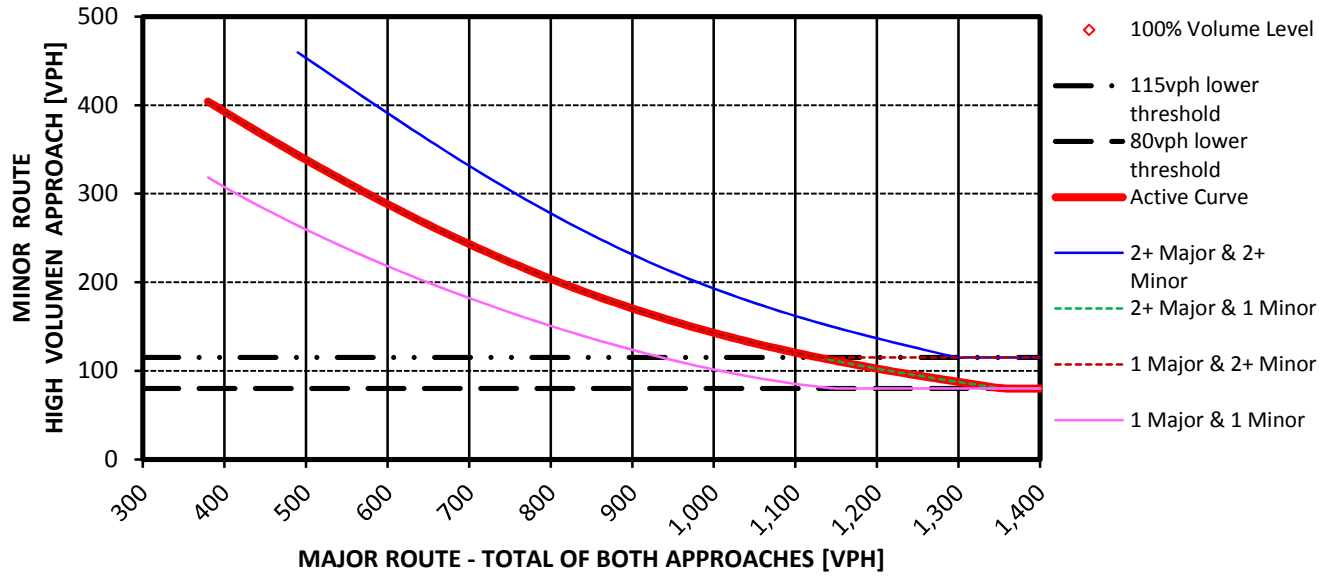
WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

Satisfied: [X] Yes [ ] No

If all four points lie above the appropriate line, then this warrant is satisfied.

(Volumes in veh/hr)	Four Highest Hours			
	5 PM	7 AM	4 PM	8 AM
SUM of Both Approaches on Major Street	1,806	1,863	1,557	1,508
Highest Minor Street Approach	405	128	422	123

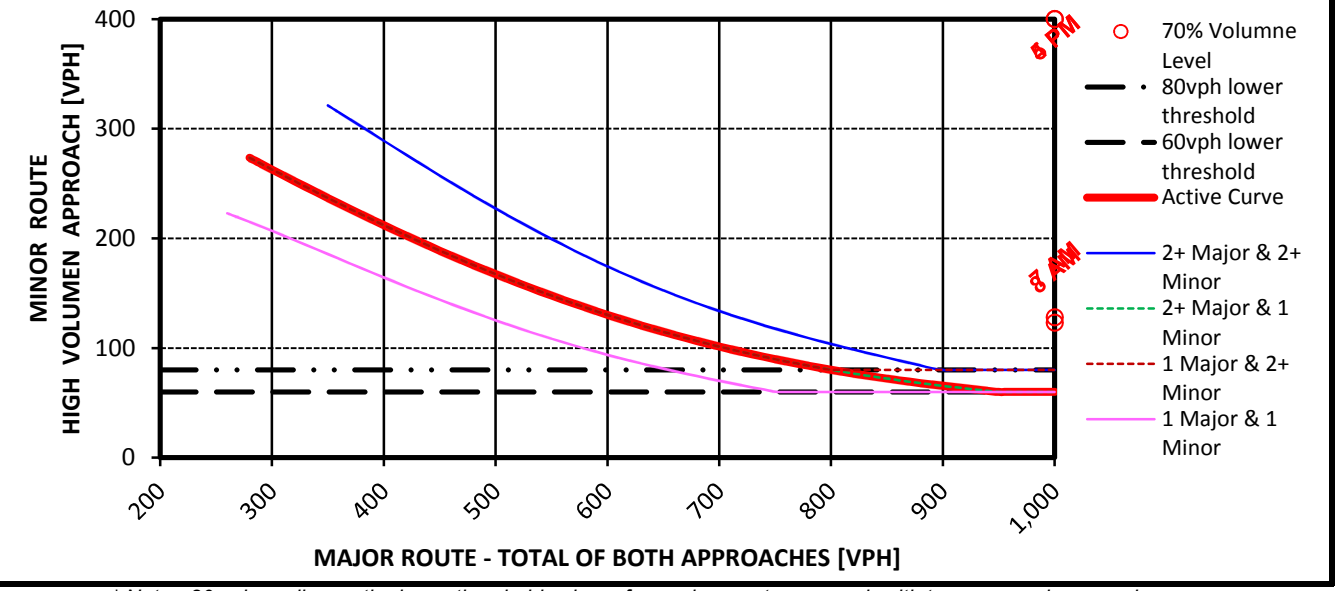
FIGURE W-2: Criteria for "100%" Volume Level



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

FIGURE W-2: Criteria for "70%" Volume Level

(Community less-than 10,000 population or speeds greater-than 70 km/hr [40 mph] on Major Street)



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

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

TRAFFIC SIGNAL WARRANTS

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME

Applicable: [ ] Yes [X] No

Satisfied: [ ] Yes [X] No

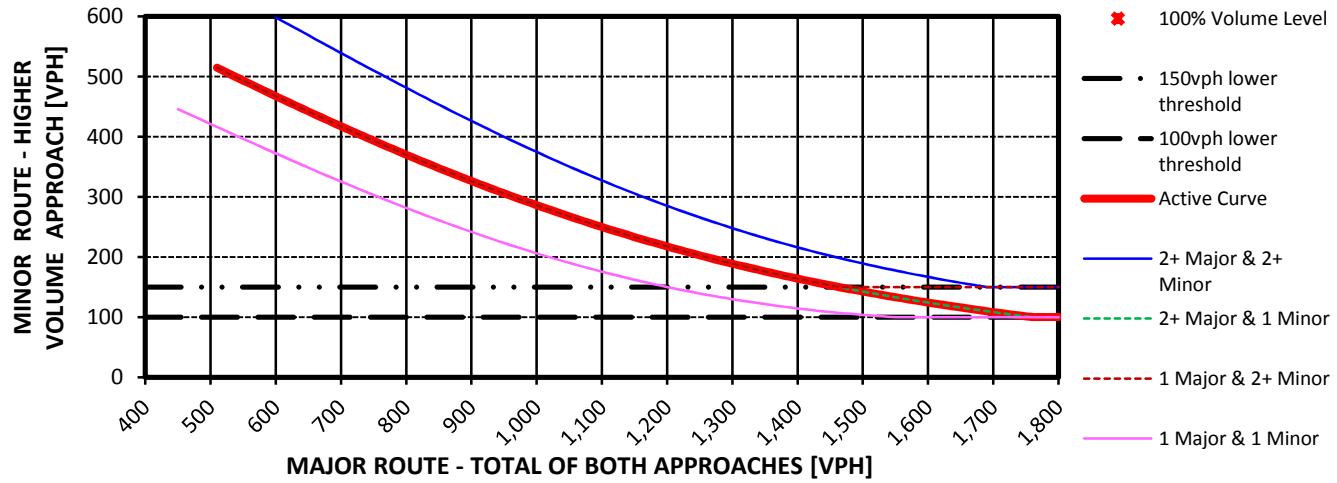
This signal warrant sahll be applied only in unsual cases, such as office complexes, manufacturing plants, industrial complexes, or high-ocupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time period.

Signalization shall be considered if a point lies above the appropriate line or the Delay criteria is met.

Unusual case(s) justifying this Warrant:

Peak Hour Data		
Peak Hour	Major Route	Minor Route

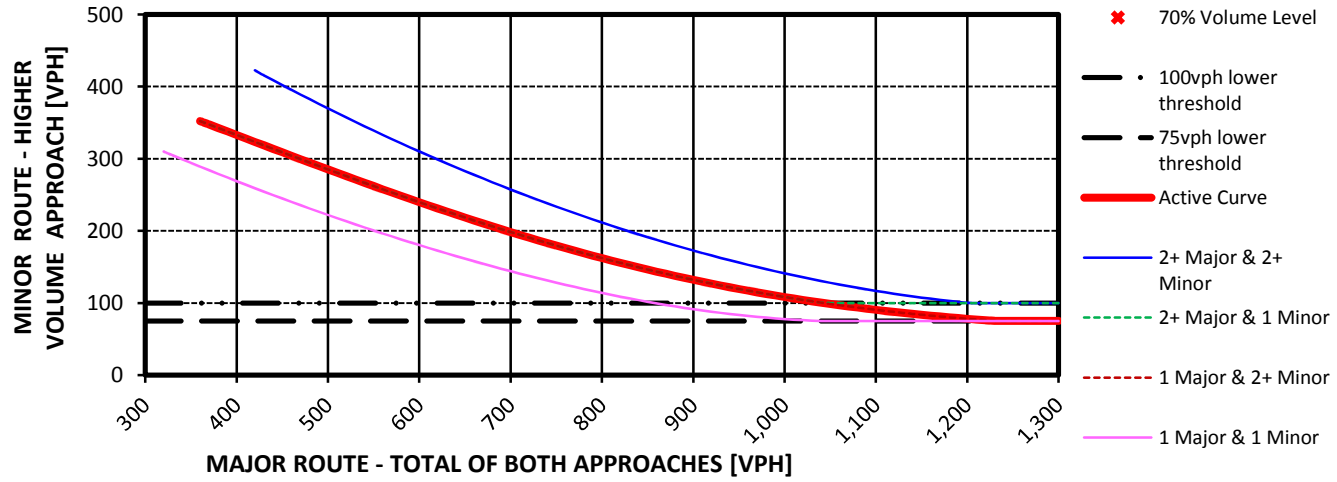
FIGURE W-3: Criteria for "100%" Volume Level



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

FIGURE W-3: Criteria for "70%" Volume Level

(Community less-than 10,000 population or speeds greater-than 70 km/hr [40 mph] on Major Street)



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

DELAY CRITERIA

1. Delay on Minor Approach (vehicle-hours)		
Approaches Lanes:	1	2
Delay Criteria:	4.0	5.0
Delay:		
Fullfilled? [ ] Yes [X] NO		

2. Volume on Minor Approach (veh/hr)		
Approaches Lanes	1	2
Volume Criteria	100	150
Volume :		
Fullfilled? [ ] Yes [X] NO		

3. Total Entering Volume (veh/hr)		
Number of Approaches	[ ] 3	[X] 4 or more
No. of Approaches	3	4
Volume Criteria	650	800
Volume :		
Fullfilled? [ ] Yes [X] NO		

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

TRAFFIC SIGNAL WARRANTS

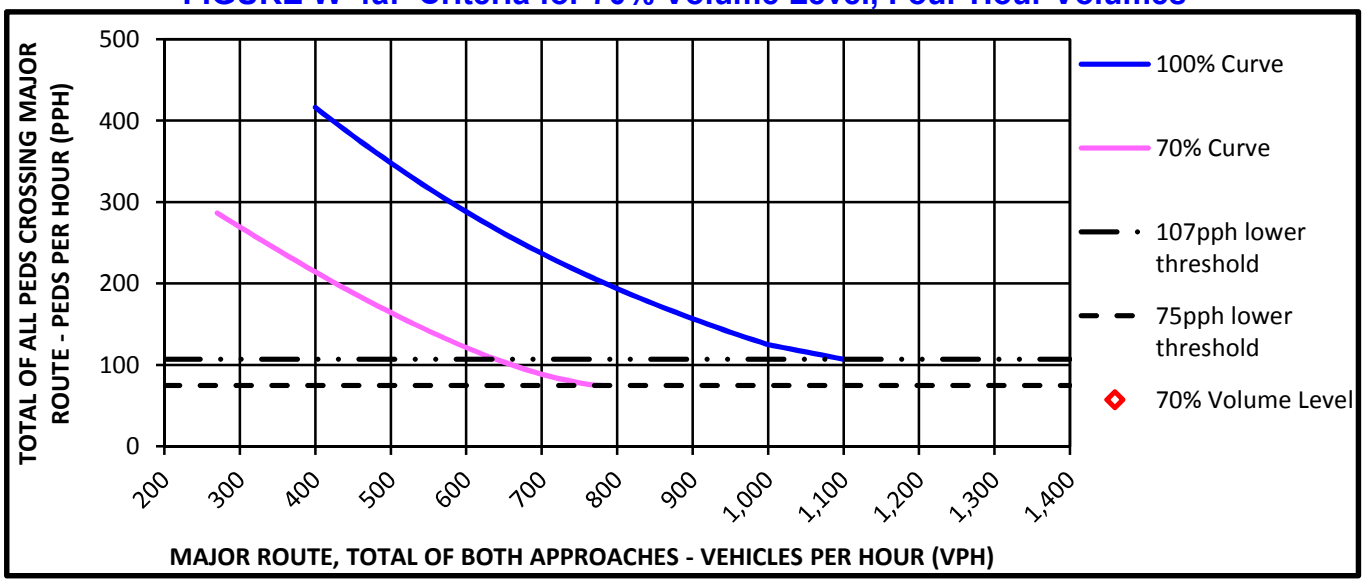
WARRANT 4 - PEDESTRIAN VOLUME

Satisfied: [ ] Yes [X] No

Pedestrian Signal Location Criteria			Fulfilled? Yes	Fulfilled? No
The nearest traffic control device (signal or STOP sign) controlling traffic on the major route is more than 90m (300 ft) away:	[ ] Yes	[X] No		X
If no above, will this proposed signal restrict the progrssive movement of traffic?	[X] Yes	[ ] No		

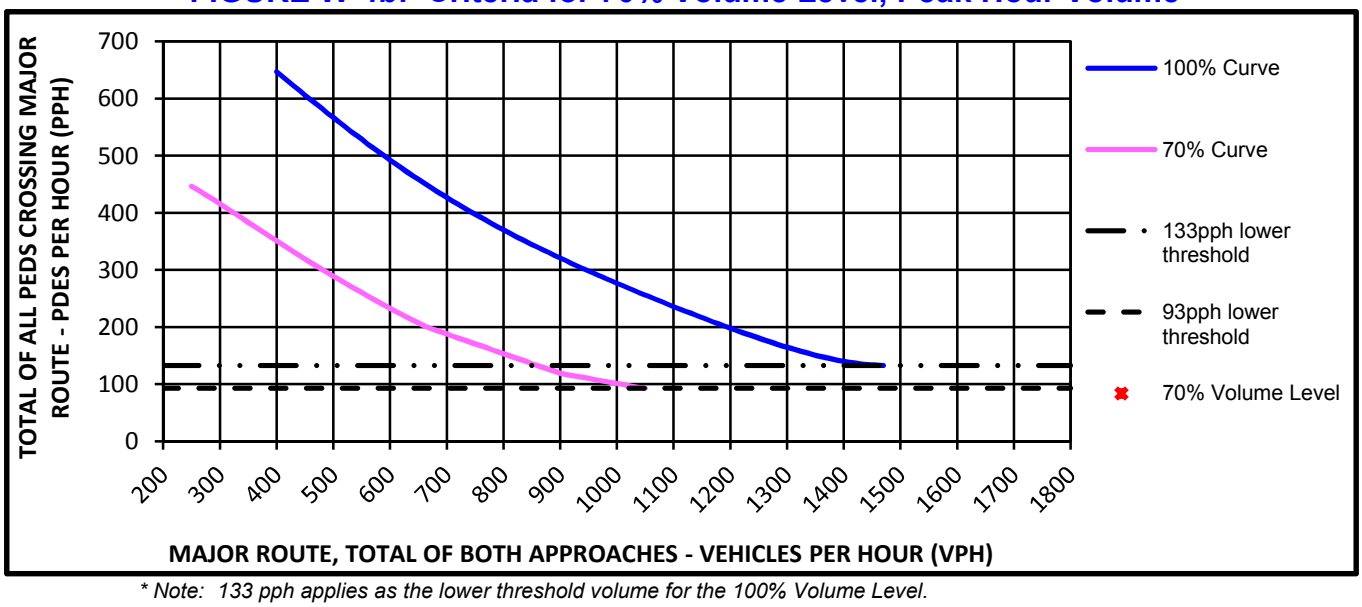
Vehicle volumes in veh/hr and Pedestrian volumnes in ped/hr	*Four Greatest Hours*				Peak Hour
SUM of Both Approaches on Major Route					
Pedestrians crossing the Major Route					

FIGURE W-4a: Criteria for 70% Volume Level, Four-Hour Volumes



** Note: 107 pph applies as the lower threshold volume for the 100% Volume Level.*
75 pph applies as the lower threshold volume for the 70% Volume Level.

FIGURE W-4b: Criteria for 70% Volume Level, Peak Hour Volume



** Note: 133 pph applies as the lower threshold volume for the 100% Volume Level.*
93 pph applies as the lower threshold volume for the 70% Volume Level.

NOTE: *The Satisfaction of a warrant or warrants shall not in itself require the installation of a traffic control signal.*

TRAFFIC SIGNAL WARRANTS

WARRANT 5 - SCHOOL CROSSING

Satisfied: ☐ Yes ☒ No

This warrant is intended for application where the fact that schoolchildren crossing the major route is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students. This warrant is satisfied if all three of the criteria below are fulfilled after remedial measures have been considered.

Any remedial measures implemented in or around the intersection to improve the safety of the students as noted in Section **4C.06 Warrant 5, School Crossing** in the MUTCD:

Criteria			Fulfilled? Yes	Fulfilled? No
1. *Enter the number of schoolchildren crossing the major route along with the hour this occurs. The hour can be any 60 minute interval (ex 2:15 PM - 3:15 PM enter 2:15 - 3:15). Requires a minimum of 20 schoolchildren durning the any hour.*	*Num. of Students*	*Highest Crossing Hour Period*		X
		-		
2. *For both the morning (AM) and afternoon (PM) periods of operation, enter the number of adequate gaps observed for each period and the number of minutes each period lasted. Requires one period to operate with fewer gaps than the number of minutes in the period.*		*Period*		X
		Minutes / *Gaps*		
	AM			
	PM			
3. *Is the nearest traffic signal along the major route more than 90m (300 ft) from this crossing?*	☐ Yes	☒ No		X
If the signal is within 90m (300 ft) of an existing signalize intersection, will it restrict progressive movement of traffic?	☒ Yes	☐ No		

WARRANT 6 - COORDINATED SIGNAL SYSTEM

Satisfied: ☐ Yes ☒ No

Progressive movement in a coordinated signal system sometimes necessitates the installtion of traffic control signals at intersections that would not otherwise be considered in order to maintain proper paltooning of vehicles. This warrant is satisfied if the below criteria is satified as follows: criteria 1 is satisfied and either criteria 2 or 3 is satisfied.

Criteria	Fulfilled? Yes	Fulfilled? No
1. *The inclusion of this proposed signal, into the coordinated system, does not result in a signal spacing of less than 305m (1,000 ft)?*		X
2. a. *On a one-way street or a street that has traffic predominantly in one direction, are the adjacent traffic control signals so far apart that they do not provide the necessary degree of vehiclular platooning?*		X
2. b. *On a two-way street, do adjacent traffic control signals **not** provide the necessary degree of platooning and will the proposed and adjacent traffic control signals collectively provide a progressive operation?*		X

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

TRAFFIC SIGNAL WARRANTS

WARRANT 7 - CRASH EXPERIENCE

Satisfied: [ ] Yes [X] No

This warrant is intended for application where the severity and frequency of crashes are the principal reasons to consider the installation of a traffic control signal. The need for a traffic control signal shall be considered if an engineering study finds that criteria 1, 2, and 3 are met.

Criteria			Fulfilled? Yes	Fulfilled? No
1. *Adequate trial of alternatives with satisfactory observance and enforcement has fialed to reduce the crash frequency as shown below:*				
				X
2. ***How many crashes within the past 12 months?*** *For this criteria to be met, five or more reported crashes, of types suseptible to correction by the installation of a traffic control signal, must have occurred.*				X
3. *If Warrant 1A or Warrant 1B are 80 percent satisfied of the current values or if Warrant 4, 4-hour or peak, is met at the 80 percent values.*	Met? Yes	Met? No		
Warrant 1, Condition A, Minimum Vehicular Volume (80 percent satisfied):	X		X	
Warrant 1, Condition B, Interruption of Continuous Traffic (80 percent satisfied):	X			
Warrant 4, Four-Hour Volume (80 percent satisfied):		X		
Warrant 4, Peak Hour Volume (80 percent satisfied):		X		

WARRANT 8 - ROADWAY NETWORK

Satisfied: [ ] Yes [X] No

This warrant is used to encourage the concentration and organization of traffic flow on a roadway network. This warrant is satisfied if one of the following 2 criteria is met and both routes meet at least on of the characteristics of a Major Route below.

Criteria			Met? Yes	Met? No	Fulfilled? Yes	Fulfilled? No
1. *Both of the criteria to the right are required in order to be met.*	a. *Please enter the total existing, or immediately projected, entering traffic volume during the peak hour of a typical weekday. Requires a minumum of 1,000 vehicles to be met.*	**Volume**		X		X
	b. *Based on an engineering study, does the 5 year projected traffic volumes, for this location, meet one or more of Warrants 1, 2, or 3 during an average weekday? **			X		
2. *Enter the total existing, or immediately projected, entering volume for each of any 5 hours of a non-normal business day.* ***(Saturday or Sunday).*** *1,000 vph for each hour required.*		← Hour				X
		← Volume				

**** Supporting data required for verification of the projected 5 year traffic Warrants.***

A major route, as used in this signal warrant, shall have at least one of the following characteristics:		Met? Yes	Met? No	Fulfilled? Yes	Fulfilled? No
Characteristics of Major Routes					
1. *Is it a part of the street or highway system that serves as the principal roadway network for through traffic flow?*	*Major Route*		X		X
	** Minor Route*		X		
2. *Does it include rural or suburban highways outside, entering, or traversing a city?*	*Major Route*		X		
	** Minor Route*		X		
3. *Does it appear as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study?*	*Major Route*		X		
	** Minor Route*		X		

**** This is a minor route, but for the purposes of this Warrant, shall be considered as the other major route.***

Note: ***Supporting data shall be required to verify the routes meet one of the characteristics of a major route.***

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

TRAFFIC SIGNAL WARRANTS

WARRANT 9 - INTERSECTION NEAR A GRADE CROSSING

Applicable ☐ Yes ☐ No

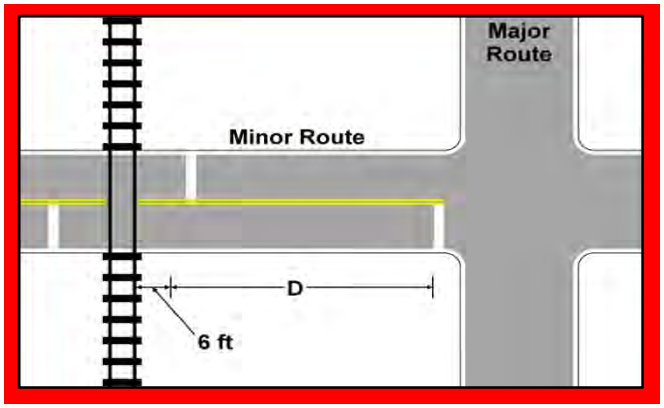
The need for a traffic control signal may be considered if an intersection that is controlled by a STOP or YIELD sign has a rail crossing within 140 feet of the stop/yield line and the highest Equivalent Minor Approach Traffic value lies above the curve represented on the graph below.

Minor Route Adjustment Factors - Enter the following:	
1. The number of occurrances of rail traffic/day:	
2. The percentage of "High-Occupancy Buses" crossing the track/day: (A high-occupancy bus is defined as a bus occupied by at least 20 people)	
3. The percentage of Tractor-trailer Trucks crossing the track/day:	

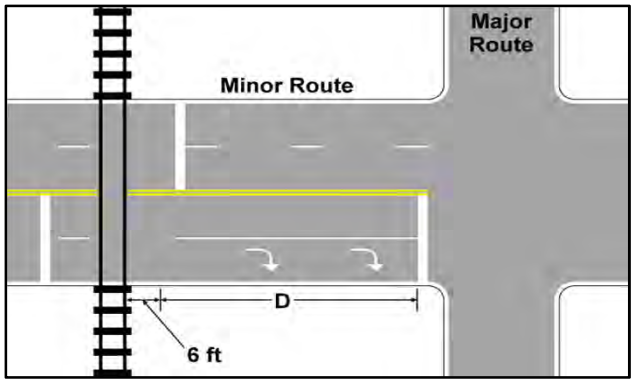
Satisfied: ☐ Yes ☐ No

Peak Hour Data		
Peak Hour	Major Route	Minor Route

Enter the distance value "D" from the STOP/YIELD bar to the track as shown below:

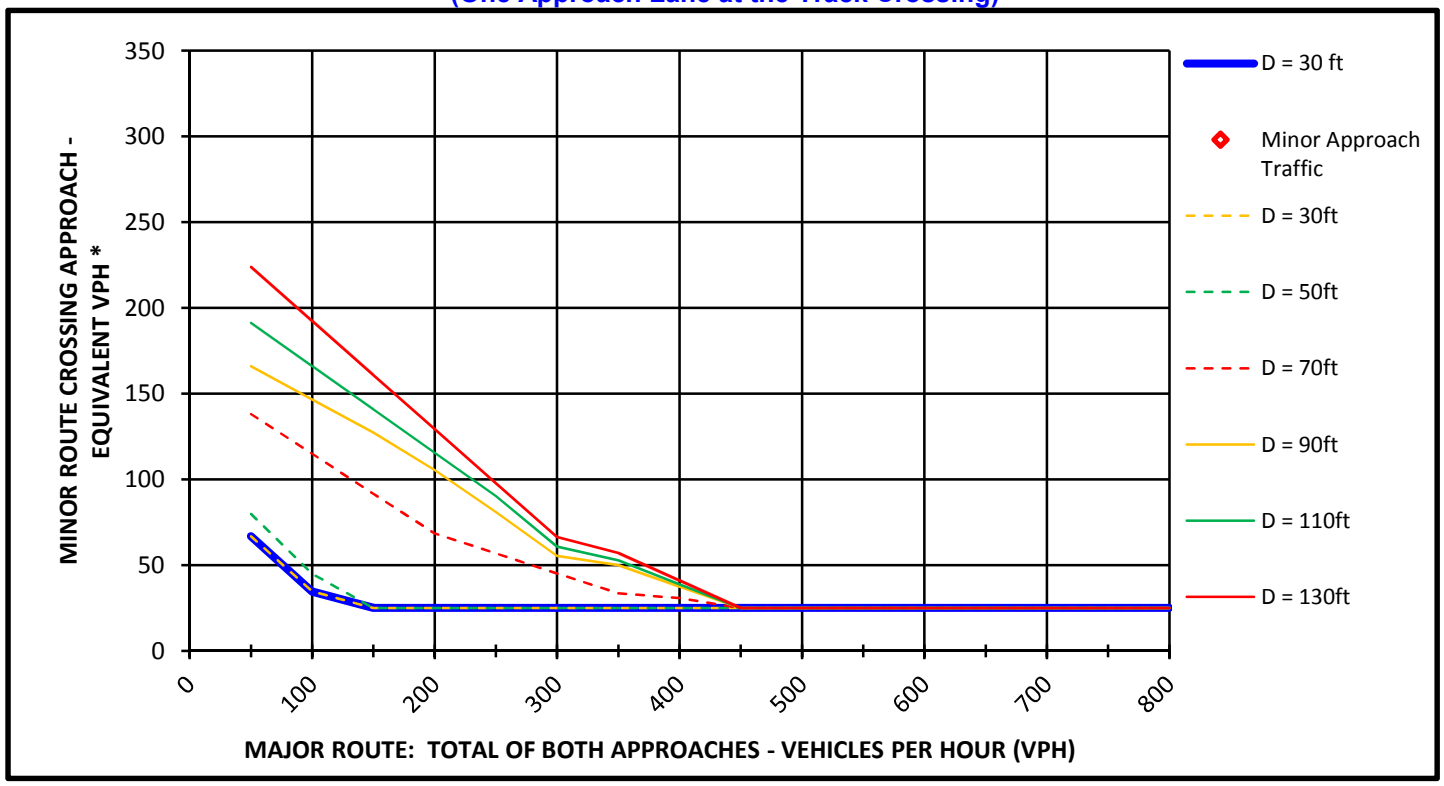


(One Approach Lane at the Track Crossing)



(Two or More Approach Lanes at the Track Crossing)

FIGURE W-9: Intersection Near a Grade Crossing
(One Approach Lane at the Track Crossing)



* *VPH after applying the adjustment factors for Rail, Bus, and Tractor-Trailer traffic*

25 vph applies as the lower threshold volume

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

TRAFFIC SIGNAL WARRANT SUMMARY

City/Town:	Vestavia Hills	Analysis Performed By:	DC
County:	Jefferson County	Date Analysis Performed:	3/8/2019
Division:	RPCGB	Project Number if Applicable:	180337
Data Date:	2/6/2019	Weather Conditions:	Showers

Major Route: Columbiana Rd — Appr. Lanes: 2 — Critical Approach Speed (mph): 45
Minor Route: Shades Crest Rd — Appr. Lanes: 1

SATISFIED

Warrant #1: Eight-Hour Vehicular Volume

[X] Yes [ ] No

	80% Satisfied		100% Satisfied	
1A - Minimum Vehicular Volume:	[X] Yes	[ ] No	[X] Yes	[ ] No
1B - Interruption of Continuous Traffic:	[X] Yes	[ ] No	[X] Yes	[ ] No

Any Remedial Measures Tried and their Outcome.

Warrant #2: Four-Hour Vehicular Volume

[X] Yes [ ] No

Warrant #3: Peak Hour

[ ] Yes [X] No

The Unusual Case(s) that Justifies the use of this Warrant.

Warrant #4: Pedestrian Volume

[ ] Yes [X] No

Warrant #5: School Crossing

[ ] Yes [X] No

Any Remedial Measures Implemented to improve the Safety of the Students.

Warrant #6: Coordinated Signal System

[ ] Yes [X] No

Warrant #7: Crash Experience

[ ] Yes [X] No

Other Alternatives that have failed to reduce crashes.

Warrant #8: Roadway Network

[ ] Yes [X] No

Warrant #9: Intersection Near a Grade Crossing

[ ] Yes [X] No

CONCLUSIONS

Warrants Satisfied: 1 2

Remarks:

Based on MUTCD 2009 Summary Page

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

rev. 05/2011

Appendix G – CARS Reports

RIEKER inc. Total Solutions

Safe Curve Speed Analysis Report

Curve: Blue Lake Drive at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Left: 25 mph
Selected RAS - Right: 20 mph

Analysis summary

Pass #	Turn Direction	Travel Direction	Point of Curvature Latitude Longitude	Point of Tangent Latitude Longitude	GPS Fit	Average Test Speed	Curve Radius	Curve Length	Deflection Angle	Curve Class.	Elevation at Apex	Curve Grade	Min. Calculated Advisory Speed	Recommended Advisory Speed (RAS)
1	Right	South-West	33.45109° -86.71785°	33.45027° -86.71828°	98.3%	35.1 mph	292 ft	346 ft	58°	F	-1.9%	A	21.3 mph	20 mph
2	Left	East	33.45031° -86.71824°	33.45115° -86.71781°	98.3%	35.9 mph	297 ft	352 ft	58°	F	-2.0%	B	25.0 mph	25 mph
3*	**Left**	**North-East**	**33.45031° -86.71823°**	**33.45116° -86.71781°**	**98.8%**	**35.0 mph**	**288 ft**	**354 ft**	**60°**	**F**	**-2.6%**	**A**	**24.3 mph**	**25 mph**
4*	**Right**	**South**	**33.45113° -86.71786°**	**33.45035° -86.71822°**	**98.3%**	**36.1 mph**	**294 ft**	**322 ft**	**55°**	**F**	**-5.3%**	**A**	**23.2 mph**	**20 mph**

Sign recommendation summary

Pass #	Differential	Curve Sign	Curve Sign Requirements	Advisory Speed Sign	Speed Sign Requirements	Chevron Sign	Chevron Spacing	Chevron Requirements	Note
1	-15 mph	W1-1	required	20 mph	required	W1-8	80 ft	required	
2	-10 mph	W1-1	required	25 mph	required	W1-8	80 ft	recommended	
3*	**-10 mph**	**W1-1**	**required**	**25 mph**	**required**	**W1-8**	**80 ft**	**recommended**	
4*	**-15 mph**	**W1-1**	**required**	**20 mph**	**required**	**W1-8**	**80 ft**	**required**	

*Selected passes shaded and in bold

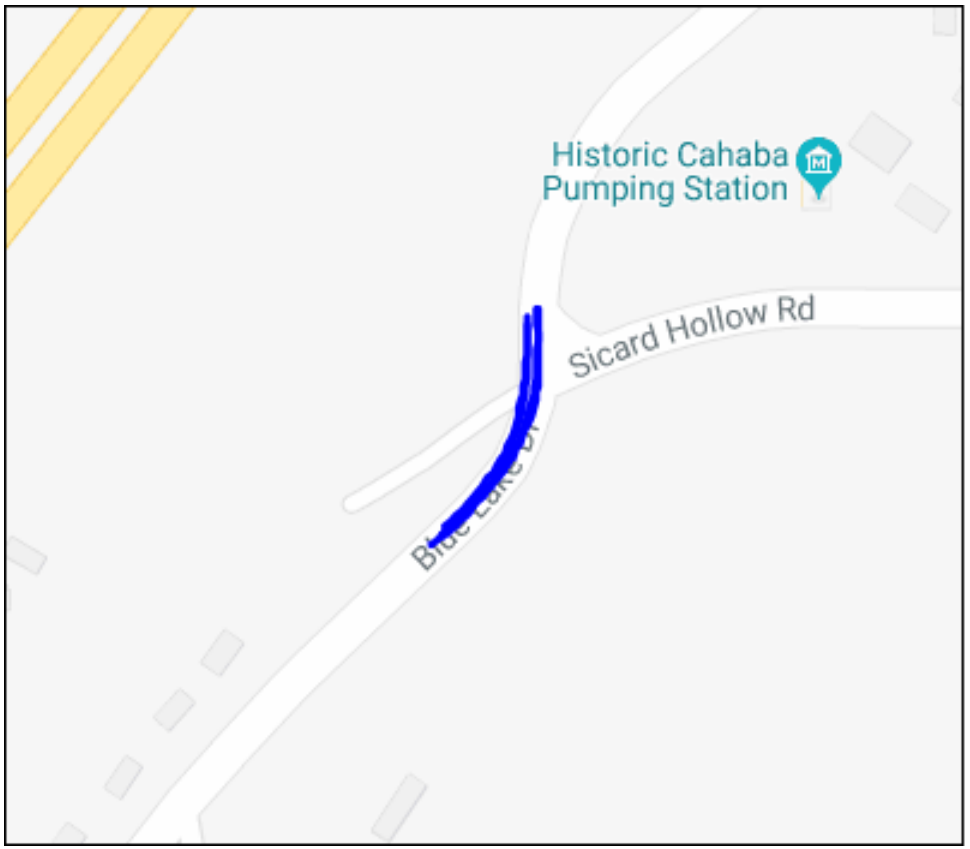
Safe Curve Speed Analysis Report

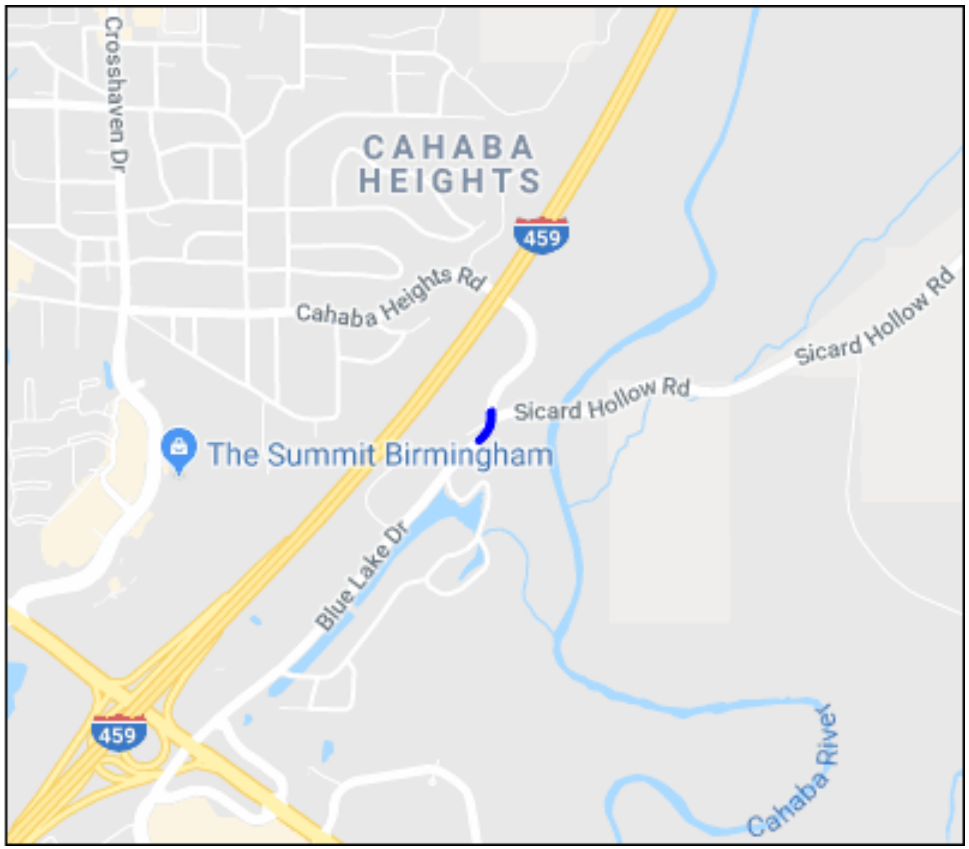
Curve: Blue Lake Drive at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Left: 25 mph
Selected RAS - Right: 20 mph

Curve map reference - Blue Lake Drive at Sicard Hollow Road





Safe Curve Speed Analysis Report

Curve: Blue Lake Drive at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Left: 25 mph
Selected RAS - Right: 20 mph

Side friction summary - Blue Lake Drive at Sicard Hollow Road, pass 3

Radius: 301 ft; Super elevation: -7.8%

Advisory Speed (mph)	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Auto Side friction guideline (deg)	16	16	16	16	14	14	12	12	12	12	12	12	12	12
Max side friction (deg)	4.8	5.7	7.3	9.4	12.2	15.5	19.3	23.4	27.8	32.3	36.8	41.2	45.4	49.4

Theoretical side friction at point generating the maximum side friction value

Safe Curve Speed Analysis Report

Curve: Blue Lake Drive at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Left: 25 mph
Selected RAS - Right: 20 mph

Side friction summary - Blue Lake Drive at Sicard Hollow Road, pass 4

Radius: 300 ft; Super elevation: -9.0%

Advisory Speed (mph)	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Auto Side friction guideline (deg)	16	16	16	16	14	14	12	12	12	12	12	12	12	12
Max side friction (deg)	5.4	6.4	7.9	10.1	12.9	16.2	19.9	24.0	28.4	32.9	37.3	41.7	45.8	49.7

Theoretical side friction at point generating the maximum side friction value

Safe Curve Speed Analysis Report

Curve: Blue Lake Drive at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Left: 25 mph
Selected RAS - Right: 20 mph

Data session summary - Blue Lake Drive at Sicard Hollow Road

Pass #	Data Session File Name	Collected On Collected By	Prior Calibration Subsequent Calibration
1	ccochran@sain.com 2017/07/11 15:37:30 SN808770	07/11/17 15:37 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
2	ccochran@sain.com 2017/07/11 15:40:49 SN808770	07/11/17 15:40 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
3	ccochran@sain.com 2017/07/11 15:44:53 SN808770	07/11/17 15:44 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
4	ccochran@sain.com 2017/07/11 15:48:22 SN808770	07/11/17 15:48 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55

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Safe Curve Speed Analysis Report

Curve: Cahaba Heights Road at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 35 mph

Analysis summary

Pass #	Turn Direction	Travel Direction	Point of Curvature Latitude Longitude	Point of Tangent Latitude Longitude	GPS Fit	Average Test Speed	Curve Radius	Curve Length	Deflection Angle	Curve Class.	Elevation at Apex	Curve Grade	Min. Calculated Advisory Speed	Recommended Advisory Speed (RAS)
1	Left	South-West	33.45192° -86.71749°	33.45132° -86.71783°	98.1%	36.5 mph	364 ft	253 ft	36°	F	8.3%	A	38.8 mph	35 mph
2*	**Right**	**East**	**33.45148° -86.71777°**	**33.45208° -86.71731°**	**99.2%**	**35.8 mph**	**368 ft**	**265 ft**	**38°**	**F**	**8.5%**	**A**	**38.3 mph**	**35 mph**
3	Right	East	33.45122° -86.71781°	33.45216° -86.71717°	98.4%	35.2 mph	381 ft	426 ft	55°	F	7.3%	A	38.9 mph	35 mph
4*	**Left**	**South-West**	**33.45216° -86.71718°**	**33.45136° -86.71784°**	**99.0%**	**35.7 mph**	**414 ft**	**373 ft**	**46°**	**F**	**6.0%**	**B**	**38.7 mph**	**35 mph**

Sign recommendation summary

Pass #	Differential	Curve Sign	Curve Sign Requirements	Advisory Speed Sign	Speed Sign Requirements	Chevron Sign	Chevron Spacing	Chevron Requirements	Note
1	N/A	W1-2	none	35 mph	none	W1-8	80 ft	none	The Recommended Advisory Speed for this pass is at or above the posted speed limit
2*	**N/A**	**W1-2**	**none**	**35 mph**	**none**	**W1-8**	**80 ft**	**none**	**The Recommended Advisory Speed for this pass is at or above the posted speed limit**
3	N/A	W1-2	none	35 mph	none	W1-8	80 ft	none	The Recommended Advisory Speed for this pass is at or above the posted speed limit
4*	**N/A**	**W1-2**	**none**	**35 mph**	**none**	**W1-8**	**120 ft**	**none**	**The Recommended Advisory Speed for this pass is at or above the posted speed limit**

*Selected passes shaded and in bold

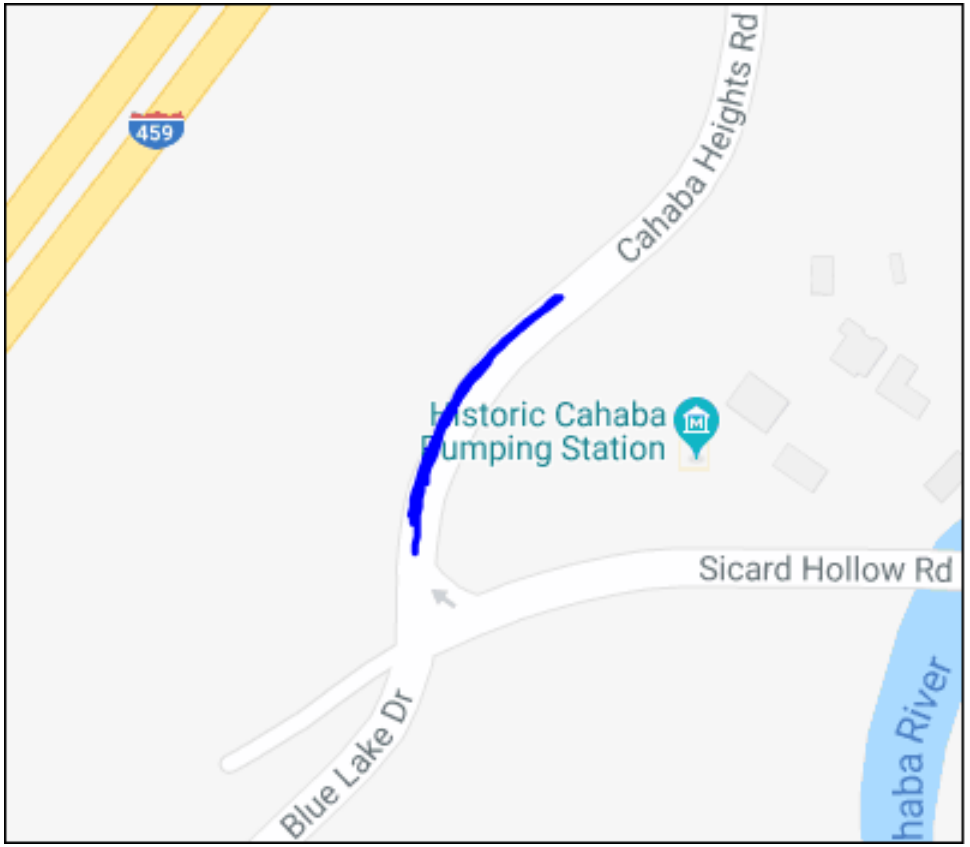
Safe Curve Speed Analysis Report

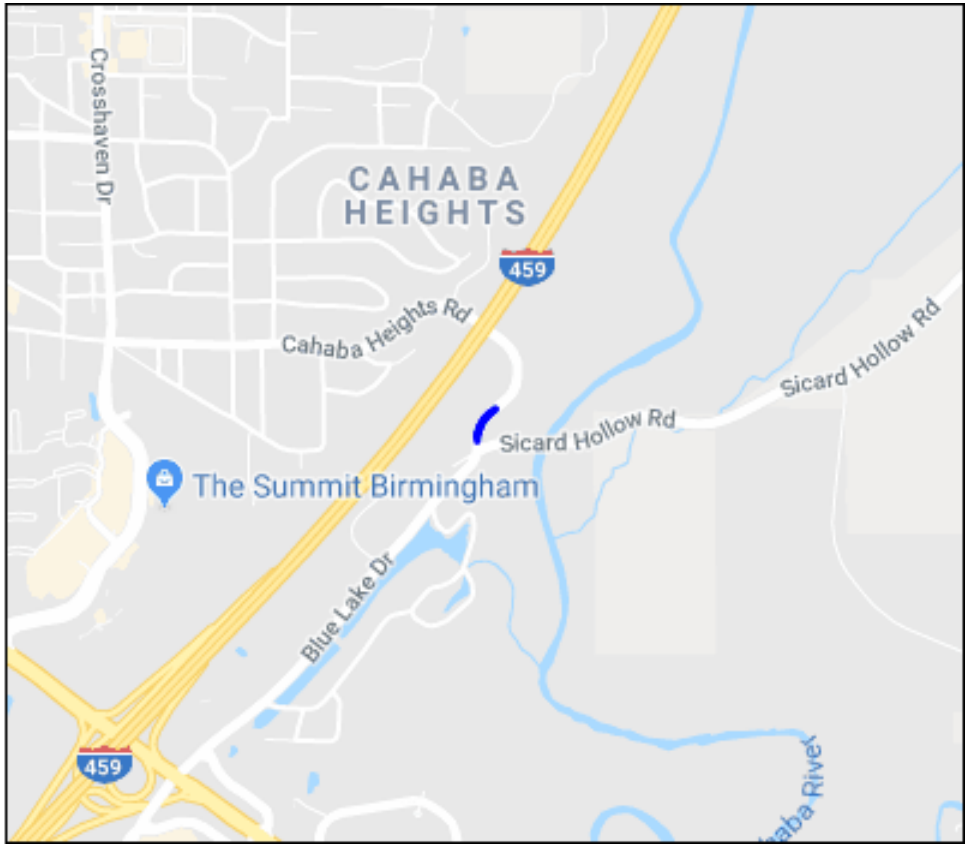
Curve: Cahaba Heights Road at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 35 mph

Curve map reference - Cahaba Heights Road at Sicard Hollow Road





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Safe Curve Speed Analysis Report

Curve: Cahaba Heights Road at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 35 mph

Side friction summary - Cahaba Heights Road at Sicard Hollow Road, pass 2

Radius: 402 ft; Super elevation: 3.5%

Advisory Speed (mph)	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Auto Side friction guideline (deg)	16	16	16	16	14	14	12	12	12	12	12	12	12	12
Max side friction (deg)	-1.8	-1.1	0.1	1.8	3.9	6.5	9.5	13.0	16.8	20.8	25.1	29.4	33.7	37.9

Theoretical side friction at point generating the maximum side friction value

RIEKER inc. Total Solutions

Safe Curve Speed Analysis Report

Curve: Cahaba Heights Road at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 35 mph

Side friction summary - Cahaba Heights Road at Sicard Hollow Road, pass 4

Radius: 417 ft; Super elevation: 3.1%

Advisory Speed (mph)	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Auto Side friction guideline (deg)	16	16	16	16	14	14	12	12	12	12	12	12	12	12
Max side friction (deg)	-1.6	-0.9	0.3	1.9	3.9	6.4	9.4	12.7	16.3	20.3	24.4	28.6	32.9	37.0

Theoretical side friction at point generating the maximum side friction value

Safe Curve Speed Analysis Report

Curve: Cahaba Heights Road at Sicard Hollow Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 35 mph

Data session summary - Cahaba Heights Road at Sicard Hollow Road

Pass #	Data Session File Name	Collected On Collected By	Prior Calibration Subsequent Calibration
1	ccochran@sain.com 2017/07/11 15:37:30 SN808770	07/11/17 15:37 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
2	ccochran@sain.com 2017/07/11 15:40:49 SN808770	07/11/17 15:40 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
3	ccochran@sain.com 2017/07/11 15:44:53 SN808770	07/11/17 15:44 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
4	ccochran@sain.com 2017/07/11 15:48:22 SN808770	07/11/17 15:48 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55

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Safe Curve Speed Analysis Report

Curve: Cahaba Heights Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 40 mph

Analysis summary

Pass #	Turn Direction	Travel Direction	Point of Curvature Latitude Longitude	Point of Tangent Latitude Longitude	GPS Fit	Average Test Speed	Curve Radius	Curve Length	Deflection Angle	Curve Class.	Elevation at Apex	Curve Grade	Min. Calculated Advisory Speed	Recommended Advisory Speed (RAS)
1	Right	South	33.45342° -86.71635°	33.45252° -86.71665°	99.1%	40.2 mph	425 ft	351 ft	43°	F	4.5%	C	38.9 mph	35 mph
2	Left	North-East	33.45245° -86.71674°	33.45411° -86.71672°	95.9%	34.5 mph	397 ft	700 ft	77°	F	10.5%	C	37.3 mph	35 mph
3*	**Right**	**South**	**33.45408° -86.71673°**	**33.45246° -86.71673°**	**97.3%**	**35.4 mph**	**382 ft**	**668 ft**	**77°**	**F**	**9.8%**	**C**	**34.7 mph**	**35 mph**
4*	**Left**	**North-East**	**33.45283° -86.71642°**	**33.45413° -86.71674°**	**97.6%**	**34.5 mph**	**383 ft**	**530 ft**	**65°**	**F**	**9.7%**	**C**	**40.5 mph**	**40 mph**
5	Right	South	33.45407° -86.71673°	33.45245° -86.71674°	97.0%	35.1 mph	382 ft	681 ft	77°	F	9.4%	C	36.7 mph	35 mph

Sign recommendation summary

Pass #	Differential	Curve Sign	Curve Sign Requirements	Advisory Speed Sign	Speed Sign Requirements	Chevron Sign	Chevron Spacing	Chevron Requirements	Note
1	N/A	W1-2	none	35 mph	none	W1-8	120 ft	none	The Recommended Advisory Speed for this pass is at or above the posted speed limit
2	N/A	W1-2	none	35 mph	none	W1-8	80 ft	none	The Recommended Advisory Speed for this pass is at or above the posted speed limit
3*	**N/A**	**W1-2**	**none**	**35 mph**	**none**	**W1-8**	**80 ft**	**none**	**The Recommended Advisory Speed for this pass is at or above the posted speed limit**
4*	**N/A**	**W1-2**	**none**	**40 mph**	**none**	**W1-8**	**80 ft**	**none**	**The Recommended Advisory Speed for this pass is at or above the posted speed limit**
5	N/A	W1-2	none	35 mph	none	W1-8	80 ft	none	The Recommended Advisory Speed for this pass is at or above the posted speed limit

*Selected passes shaded and in bold

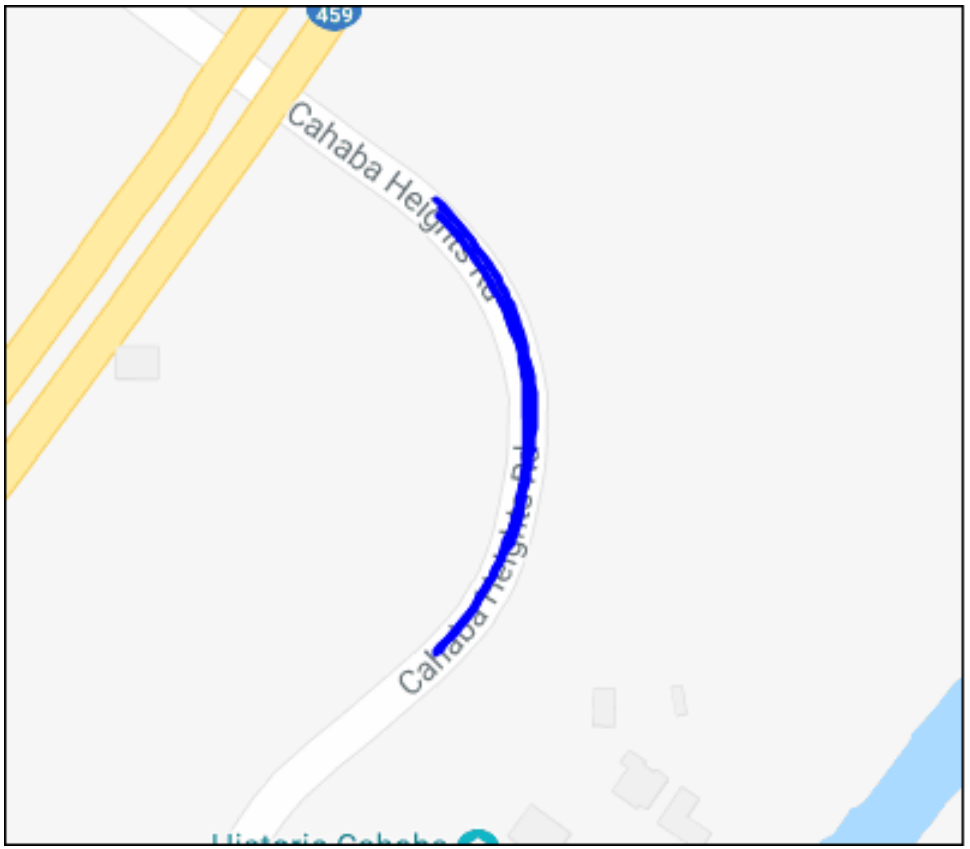
Safe Curve Speed Analysis Report

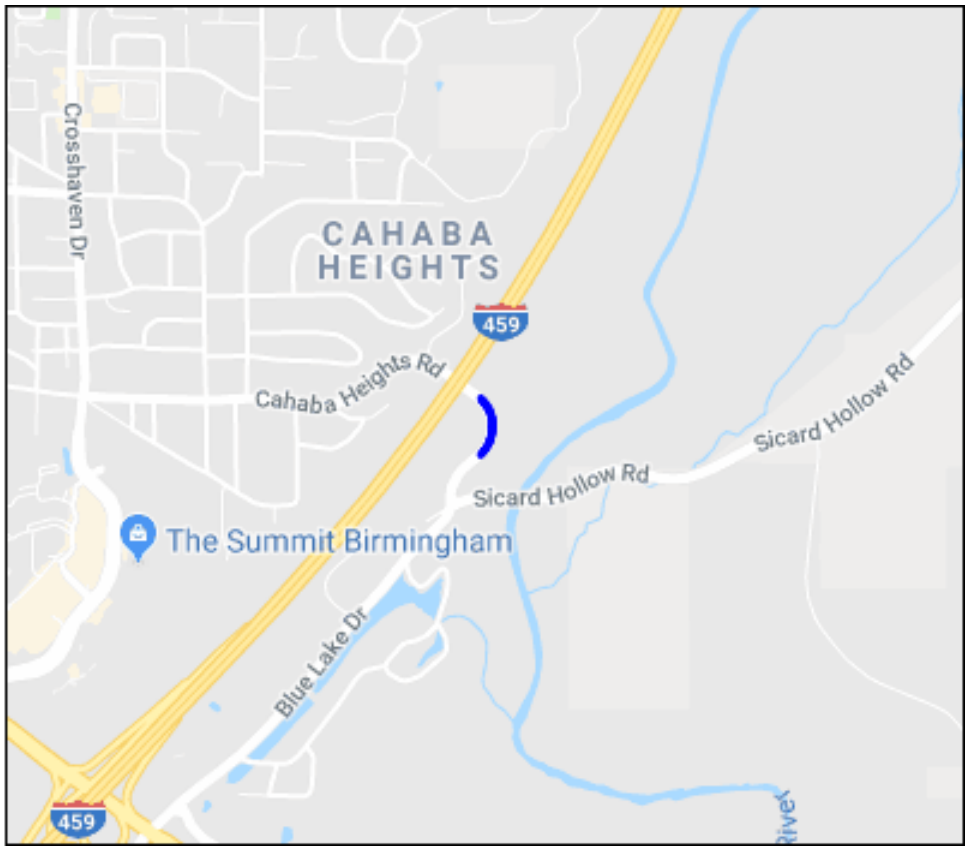
Curve: Cahaba Heights Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 40 mph

Curve map reference - Cahaba Heights Road





Safe Curve Speed Analysis Report

Curve: Cahaba Heights Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 40 mph

Side friction summary - Cahaba Heights Road, pass 3

Radius: 446 ft; Super elevation: -2.9%

Advisory Speed (mph)	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Auto Side friction guideline (deg)	16	16	16	16	14	14	12	12	12	12	12	12	12	12
Max side friction (deg)	1.8	2.5	3.6	5.0	7.0	9.3	12.0	15.0	18.3	21.9	25.7	29.6	33.4	37.3

Theoretical side friction at point generating the maximum side friction value

RIEKER inc. Total Solutions

Safe Curve Speed Analysis Report

Curve: Cahaba Heights Road
Corridor: N/A
Mile Post: N/A

Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 40 mph

Side friction summary - Cahaba Heights Road, pass 4

Radius: 402 ft; Super elevation: 6.3%

Advisory Speed (mph)	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Auto Side friction guideline (deg)	16	16	16	16	14	14	12	12	12	12	12	12	12	12
Max side friction (deg)	-3.4	-2.7	-1.5	0.2	2.3	4.9	8.0	11.4	15.3	19.4	23.7	28.1	32.5	36.9

Theoretical side friction at point generating the maximum side friction value

Safe Curve Speed Analysis Report

Curve: Cahaba Heights Road
Corridor: N/A
Mile Post: N/A

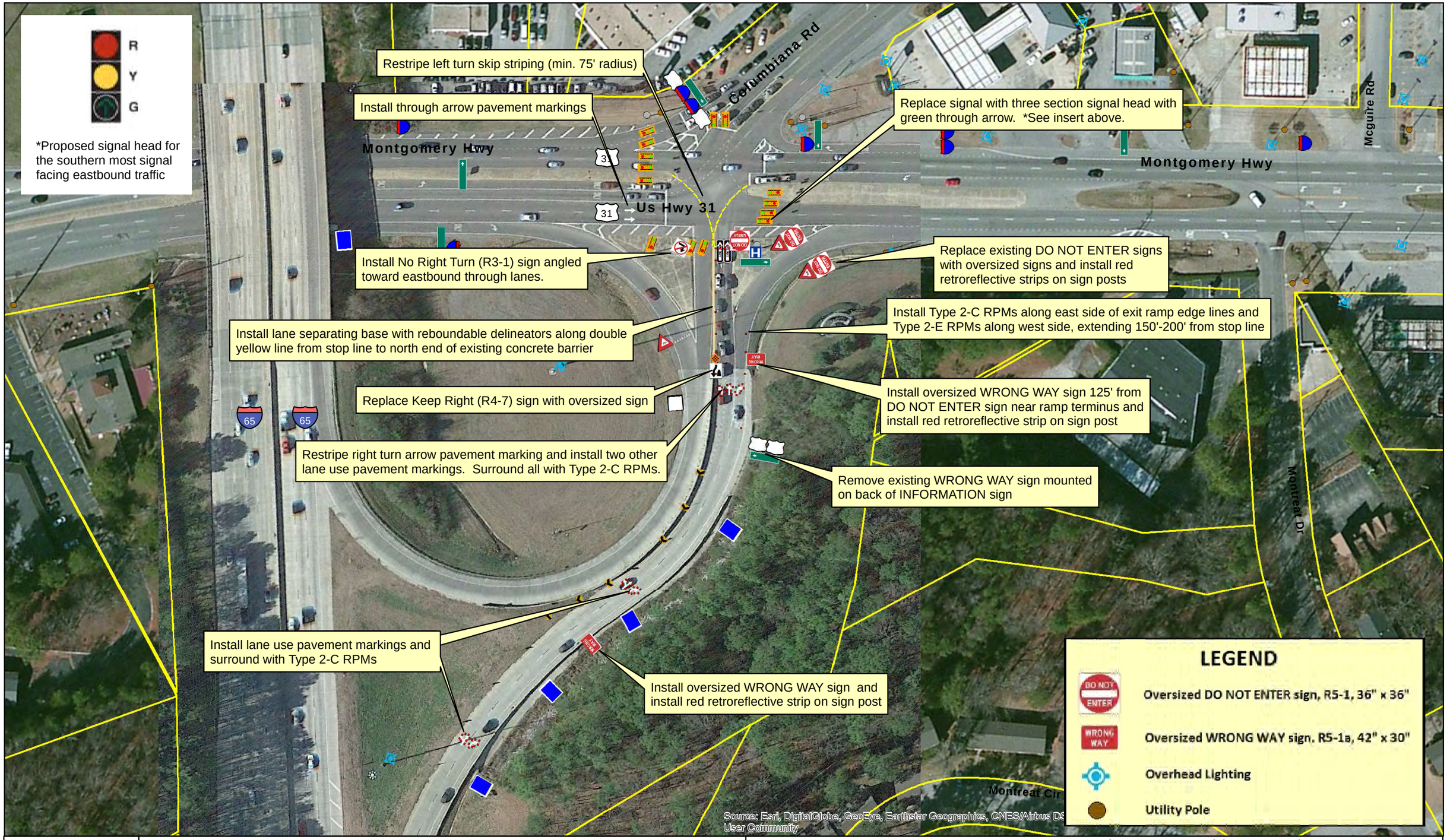
Lateral Friction Limit: 12°
Model Geometry: Parabolic

Posted Speed: 35 mph
Selected RAS - Right: 35 mph
Selected RAS - Left: 40 mph

Data session summary - Cahaba Heights Road

Pass #	Data Session File Name	Collected On Collected By	Prior Calibration Subsequent Calibration
1	ccochran@sain.com 2017/07/11 15:37:30 SN808770	07/11/17 15:37 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
2	ccochran@sain.com 2017/07/11 15:40:49 SN808770	07/11/17 15:40 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
3	ccochran@sain.com 2017/07/11 15:42:30 SN808770	07/11/17 15:42 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
4	ccochran@sain.com 2017/07/11 15:44:53 SN808770	07/11/17 15:44 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55
5	ccochran@sain.com 2017/07/11 15:48:22 SN808770	07/11/17 15:48 ccochran@sain.com	Passed on 07/11/17 15:07 Passed on 07/11/17 16:55

Appendix H – Previous Study Recommendations at US-31 and Columbiana Road/I-65 Northbound Ramps



SAIN associates
consulting engineers & surveyors

0 25 50 100 150 200
Feet

Concept Map: I-65, Exit 252, East Side, US-31/Montgomery Hwy

Potential Wrong Way Movement Assessment at Interstate Ramps
Alabama Department of Transportation

LEGEND

- Oversized DO NOT ENTER sign, R5-1, 36" x 36"
- Oversized WRONG WAY sign, R5-1a, 42" x 30"
- Overhead Lighting
- Utility Pole

Install wrong way arrow pavement marking and surround with Type 2-C RPMs

Restripe all striping and pavement markings on exit ramp

Install pair of wrong way arrow pavement markings and surround with Type 2-C RPMs

Install additional overhead lighting

Install lane use pavement markings and surround with Type 2-C RPMs

Replace existing WRONG WAY sign with oversized sign and install red retroreflective strips on sign posts

Install Type 2-C RPMs behind stop line

Replace both existing DO NOT ENTER signs with oversized signs and install red retroreflective strips on sign posts

Install Type 2-C RPMs along south side of exit ramp and Type 2-E RPMs along north side, extending 150'-200' from exit ramp terminus

Replace signal with three section signal head with green through arrow. *See insert below.

Install No Right Turn (R3-1) sign facing southbound through traffic

Install through arrow pavement markings

Montgomery Hwy

Us Hwy 31

Lorna Rd

65

R
Y
G

*Proposed signal head for the western most signal facing southbound traffic

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, ... User Community

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consulting engineers & surveyors

0 25 50 100 150 200 Feet

Concept Map: I-65, Exit 252, West Side, US-31/Montgomery Hwy

Potential Wrong Way Movement Assessment at Interstate Ramps
Alabama Department of Transportation

Appendix I – Opinion of Probable Costs

Improvement Recommendations Opinion of Probable Cost

Rocky Ridge Road @ Dolly Ridge Road (Short Term)				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Concrete Slope Paving[1]	CY	60	$250	$15,000
Installation of Left Turn Phase[2]	LS	1	$11,000	$11,000
Span Wire Reconfiguration[3]	LS	1	$13,000	$13,000
Pedestian Facilities[4]	By Others		By Others	
Traffic Control	LS	1	$10,000	$10,000
			Subtotal	$49,000
Contigency[5]			25%	$13,000
			Construction Costs	**$62,000**
Engineering Controls			1.3%	$1,000
Mobilization			9.7%	$7,000
Construction Engineering and Inspection			15%	$11,000
			Construction Subtotal	**$81,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)			17%	$14,000
Utility Relocation and Right-of-Way Cost[6]				NOT INCLUDED
			Subtotal	$95,000
			Total Estimated Project Cost (2019)[7]	**$100,000**

Notes:

1. Raised channelizing island at the right-in, right-out gas station driveway along Rocky Ridge Road just north of the intersection.
2. Left turn phase for Rocky Ridge Road northbound and southbound approaches with a flashing yellow arrow (FYA) signal head arrangement for both left turn conditions. Includes the installation of two signal heads and 2" conduit.
3. The existing span wire connection should be converted to a box arrangement. Long term recommendations should be considered in the placement of any new signal poles. Rock excavation for signal pole installation is not expected. If traditional poles are not feasible or desired, poles with double mast arms could be used; however, this would increase the construction cost by $75k to $100k.
4. Pedestrian timings, signal heads, and crosswalks in accordance with the plans for sidewalks in the area will be done by others.
5. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
6. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements may require right-of-way acquisition and/or utility relocations.
7. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

Improvement Recommendations Opinion of Probable Cost

Rocky Ridge Road @ Dolly Ridge Road (Long Term)				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Clearing & Grubbing ($4000/Acre)[1]	LS	1	$4,000	$4,000
Unclassified Excavation	CY	3600	$15	$54,000
Borrow Excavation	CY	2400	$15	$36,000
C&G Removal	LF	1000	$20	$20,000
Sidewalk (4") Removal	SY	80	$25	$2,000
Storm Pipe Removal	LF	1000	$15	$15,000
Storm Inlet Removal	EACH	8	$500	$4,000
Headwall Removal	EACH	4	$500	$2,000
Brick Wall Removal	LF	160	$300	$48,000
Retaining Wall Removal	LF	50	$500	$25,000
Remove Existing Signs[2]	LS	1	$500	$500
Brick Sign Removal	EACH	1	$600	$600
Wearing Surface (1.5")	TON	80	$90	$7,200
Binder (2-2" layers)	TON	200	$100	$20,000
Aggregate Base (6")	SY	900	$25	$22,500
Tack Coat	GALLON	60	$2	$120
Curb & Gutter	LF	1000	$20	$20,000
Concrete Sidewalk (4")	SY	80	$70	$5,600
Storm Pipe	LF	1000	$50	$50,000
Storm Inlets	EACH	8	$2,500	$20,000
Pipe End Treatment	EACH	4	$1,500	$6,000
Structure Excavation	CY	500	$15	$7,500
Foundation Backfill	CY	250	$30	$7,500
Topsoil	CY	400	$15	$6,000
Seeding and Mulching	AC	1	$2,400	$2,400
Solid Sod	SY	830	$8	$6,640
Traffic Stripe	MILE	1	$3,200	$3,200
Traffic Markings, & Legends	SF	260	$4	$1,040
Mailbox Reset	SF	2	$200	$400
Roadway Signs	EACH	40	$30	$1,200
Sign Post	LF	80	$15	$1,200
Signal Poles[3]	EACH	4	$5,000	$20,000
Retaining Wall	SF	250	$200	$50,000
Erosion Control	LS	1	$10,000	$10,000
Traffic Control	LS	1	$40,000	$40,000
			Subtotal	$519,600
Contigency[4]			25%	$130,000
			Construction Costs	**$650,000**
Engineering Controls			1.3%	$9,000
Mobilization			9.7%	$64,000
Construction Engineering and Inspection			15%	$109,000
			Construction Subtotal	**$832,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)			17%	$142,000
Utility Relocation and Right-of-Way Cost[5]				NOT INCLUDED
			Subtotal	$974,000
ALDOT Indirect Costs			13.63%	$133,000
Additional Cost Estimated For Long Term Project (2019)				**$1,110,000**
Total Estimated Project Cost (2019)[6]				**$1,210,000**

NOTE: ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST PROVIDED IS MADE ON THE BASIS OF ENGINEER'S EXPERIENCES AND QUALIFICATION AND REPRESENTS ENGINEER'S BEST JUDGMENT WITHIN THE INDUSTRY. ENGINEER DOES NOT GUARANTEE THAT PROPOSALS, BIDS, OR ACTUAL COST WILL NOT VARY FROM ENGINEER'S OPINION OF PROBABLE COST.

*See additional notes on following sheet

Rocky Ridge Road @ Dolly Ridge Road (Long Term)

Notes:

1. Clearing and grubbing includes clearing of trees in the right of way on Rocky Ridge and Dolly Ridge Roads.
2. Includes roadway and non-roadway signs.
3. Rock excavation for signal pole installation is not expected.
4. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
5. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
6. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

Improvement Recommendations Opinion of Probable Cost

Sicard Hollow Road @ Blue Lake Drive/Cahaba Heights Road (Short Term)				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Clearing and Grubbing ($4000/Acre)[1]	LS	1	$4,000	$4,000
Roadway Signs	SF	100	$30	$3,000
Signs Posts	LF	150	$15	$2,250
Roadway Lighting[2]	LS	1	$150,000	$150,000
Traffic Control	LS	1	$10,000	$10,000
			Subtotal	$169,250
Contigency[3]			25%	$43,000
			Construction Costs	**$213,000**
Engineering Controls			1.3%	$3,000
Mobilization			9.7%	$21,000
Construction Engineering and Inspection			15%	$36,000
			Construction Subtotal	**$273,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)			17%	$47,000
Utility Relocation and Right-of-Way Cost[4]				NOT INCLUDED
			Subtotal	$320,000
			Total Estimated Project Cost (2019)[5]	**$320,000**

Notes:

1. Clearing and Grubbing includes trimming vegetation to improve intersection sight distance.
2. Install lighting at the intersection to improve intersection visibility during nighttime conditions.
3. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
4. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
5. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

NOTE: ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST PROVIDED IS MADE ON THE BASIS OF ENGINEER'S EXPERIENCES AND QUALIFICATION AND REPRESENTS ENGINEER'S BEST JUDGMENT WITHIN THE INDUSTRY. ENGINEER DOES NOT GUARANTEE THAT PROPOSALS, BIDS, OR ACTUAL COST WILL NOT VARY FROM ENGINEER'S OPINION OF PROBABLE COST. ALDOT'S INDIRECT COSTS ARE NOT INCLUDED IN THE ESTIMATED PROJECT COSTS.

Improvement Recommendations Opinion of Probable Cost

Sicard Hollow Road @ Blue Lake Drive/Cahaba Heights Road (Long Term)				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Clearing & Grubbing ($4000/Acre)	LS	1	$8,000	$8,000
Unclassified Excavation[1]	CY	9000	$25	$225,000
Borrow Excavation	CY	6000	$15	$90,000
Remove Concrete Median	SY	150	$25	$3,750
Remove Existing Signs	LS	1	$500	$500
Storm Pipe Remove	LF	200	$15	$3,000
Wearing Surface (1.5")	TON	200	$90	$18,000
Binder (2-2" layers)	TON	550	$100	$55,000
Aggregate Base (6")	SY	2450	$25	$61,250
Tack Coat	GALLON	150	$2	$300
Curb & Gutter	LF	1000	$20	$20,000
Concrete Apron and Islands	SY	270	$250	$67,500
Storm Pipe	LF	1000	$50	$50,000
Storm Inlets	EACH	8	$2,500	$20,000
Pipe End Treatment	EACH	8	$1,500	$12,000
Structure Excavation	CY	500	$15	$7,500
Foundation Backfill	CY	250	$30	$7,500
Topsoil	CY	250	$15	$3,750
Seeding and Mulching	AC	2	$2,400	$4,800
Solid Sod	SY	750	$8	$6,000
Traffic Stripe	MILE	1	$3,200	$3,200
Traffic Markings, & Legends	SF	210	$4	$840
Signs	SF	100	$30	$3,000
Sign Posts	LF	150	$15	$2,250
Erosion Control	LS	1	$20,000	$20,000
Traffic Control	LS	1	$50,000	$50,000
			Subtotal	$743,140
Contigency[2]			25%	$186,000
			Construction Costs	**$930,000**
Engineering Controls			1.3%	$13,000
Mobilization			9.7%	$91,000
Construction Engineering and Inspection			15%	$156,000
			Construction Subtotal	**$1,190,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)[3]			25%	$298,000
Utility Relocation and Right-of-Way Cost[4]				NOT INCLUDED
			Subtotal	$1,488,000
ALDOT Indirect Costs			13.63%	$203,000
Additional Cost Estimated For Long Term Project (2019)				**$1,700,000**
Total Estimated Project Cost (2019)[5]				**$2,020,000**

Notes:

1. Rock excavation is anticipated.
2. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
3. Increased percentage due to the complexity of roundabout design.
4. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
5. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

NOTE: ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST PROVIDED IS MADE ON THE BASIS OF ENGINEER'S EXPERIENCES AND QUALIFICATION AND REPRESENTS ENGINEER'S BEST JUDGMENT WITHIN THE INDUSTRY. ENGINEER DOES NOT GUARANTEE THAT PROPOSALS, BIDS, OR ACTUAL COST WILL NOT VARY FROM ENGINEER'S OPINION OF PROBABLE COST.

Improvement Recommendations Opinion of Probable Cost

Rocky Ridge Road @ Shades Crest Road and US-280 (Short Term)				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Clearing & Grubbing ($4000/Acre)	LS	1	$4,000	$4,000
Unclassified Excavation[1]	CY	6400	$25	$160,000
Borrow Excavation	CY	4300	$15	$64,500
Storm Pipe Remove	LF	850	$15	$12,750
Storm Inlet Remove	EACH	4	$500	$2,000
Wearing Surface (1.5")	TON	100	$90	$9,000
Binder (2-2" layers)	TON	200	$100	$20,000
Aggregate Base (6")	SY	800	$25	$20,000
Tack Coat	GALLON	60	$2	$120
Curb & Gutter	LF	850	$20	$17,000
Storm Pipe	LF	850	$50	$42,500
Storm Inlets	EACH	6	$2,500	$15,000
Pipe End Treatment	EACH	2	$1,500	$3,000
Structure Excavation	CY	500	$15	$7,500
Foundation Backfill	CY	250	$30	$7,500
Topsoil	CY	500	$15	$7,500
Seeding and Mulching	AC	1	$2,400	$2,400
Solid Sod	SY	2000	$8	$16,000
Traffic Stripe	MILE	1	$3,200	$3,200
Traffic Markings, & Legends	SF	400	$4	$1,600
Roadway Signs	SF	60	$30	$1,800
Sign Posts	LF	60	$15	$900
Erosion Control	LS	1	$10,000	$10,000
Traffic Control	LS	1	$40,000	$40,000
			Subtotal	$468,270
Contigency[2]			25%	$118,000
			Construction Costs	**$587,000**
Engineering Controls			1.3%	$8,000
Mobilization			9.7%	$57,000
Construction Engineering and Inspection			15%	$98,000
			Construction Subtotal	**$750,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)			17%	$128,000
Utility Relocation and Right-of-Way Cost[3]				NOT INCLUDED
			Subtotal	$878,000
ALDOT Indirect Costs			13.63%	$120,000
			Total Estimated Project Cost (2019)[4]	**$1,000,000**

Notes:

1. Rock excavation is likely.
2. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
3. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
4. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

Improvement Recommendations Opinion of Probable Cost

US-31 @ Shades Crest Road (Short Term)				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Convert Left Turn Phase[1]	LS	1	$11,000	$11,000
Traffic Control	LS	1	$10,000	$10,000
			Subtotal	$21,000
Contigency[2]			25%	$6,000
			Construction Costs	**$27,000**
Engineering Controls			1.3%	$1,000
Mobilization			9.7%	$3,000
Construction Engineering and Inspection			15%	$5,000
			Construction Subtotal	**$36,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)			17%	$7,000
Utility Relocation and Right-of-Way Cost[3]				NOT INCLUDED
			Subtotal	$43,000
			Total Estimated Project Cost (2019)[4]	**$50,000**

Notes:

1. Convert US-31 northbound left turn phase to protected-only.
2. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
3. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
4. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

NOTE: ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST PROVIDED IS MADE ON THE BASIS OF ENGINEER'S EXPERIENCES AND QUALIFICATION AND REPRESENTS ENGINEER'S BEST JUDGMENT WITHIN THE INDUSTRY. ENGINEER DOES NOT GUARANTEE THAT PROPOSALS, BIDS, OR ACTUAL COST WILL NOT VARY FROM ENGINEER'S OPINION OF PROBABLE COST. ALDOT'S INDIRECT COSTS ARE NOT INCLUDED IN THE ESTIMATED PROJECT COSTS.

Improvement Recommendations Opinion of Probable Cost

US-31 @ Shades Crest Road (Long Term)				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Clearing & Grubbing ($4000/Acre)	LS	1	$4,000	$4,000
Unclassified Excavation	CY	4800	$15	$72,000
Borrow Excavation	CY	3200	$15	$48,000
Storm Pipe Removal	LF	150	$15	$2,250
Headwall Removal	EACH	4	$500	$2,000
Brick Sign Removal	EACH	3	$600	$1,800
Wearing Surface (1.5")	TON	80	$90	$7,200
Binder (2-2" layers)	TON	800	$100	$80,000
Aggregate Base (6")	SY	900	$25	$22,500
Tack Coat	GALLON	60	$2	$120
Concrete Apron and Islands	SY	375	$250	$93,750
Curb and Gutter	LF	200	$20	$4,000
Storm Pipe	LF	180	$50	$9,000
Storm Inlet	EACH	2	$2,500	$5,000
Pipe End Treatment	EACH	4	$1,500	$6,000
Structure Excavation	CY	100	$15	$1,500
Foundation Backfill	CY	50	$30	$1,500
Topsoil	CY	350	$15	$5,250
Seeding and Mulching	AC	1	$2,400	$2,400
Solid Sod	SY	750	$8	$6,000
Traffic Stripe	MILE	1	$3,200	$3,200
Traffic Markings, & Legends	SF	450	$4	$1,800
Roadway Signs	SF	30	$30	$900
Sign Posts	LF	50	$15	$750
Mail Box Reset	EACH	1	$200	$200
Flashing Yellow Arrow (FYA)	LS	1	$11,000	$11,000
Signal Poles[2]	EACH	4	$5,000	$20,000
Erosion Control	LS	1	$10,000	$10,000
Traffic Control	LS	1	$80,000	$80,000
			Subtotal	$502,120
Contigency[3]			25%	$126,000
			Construction Costs	**$629,000**
Engineering Controls			1.3%	$9,000
Mobilization			9.7%	$62,000
Construction Engineering and Inspection			15%	$105,000
			Construction Subtotal	**$805,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Desig			17%	$137,000
Utility Relocation and Right-of-Way Cost[4]				NOT INCLUDED
			Subtotal	$942,000
ALDOT Indirect Costs			13.63%	$129,000
			Additional Cost Estimated For Long Term Project (2019)	**$1,080,000**
			Total Estimated Project Cost (2019)[5]	**$1,130,000**

Notes:

1. Dual widening was assume for both both Shades Crest Rd approaches to US-31. Six feet on each side for additional turn lane.

2. Cost for installing new signal poles is included since widening of Shades Crest may impact existing pole locations. Rock excavation for signal pole installation is not expected.

3. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.

4. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.

5. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

NOTE: ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST PROVIDED IS MADE ON THE BASIS OF ENGINEER'S EXPERIENCES AND QUALIFICATION AND REPRESENTS ENGINEER'S BEST JUDGMENT WITHIN THE INDUSTRY. ENGINEER DOES NOT GUARANTEE THAT PROPOSALS, BIDS, OR ACTUAL COST WILL NOT VARY FROM ENGINEER'S OPINION OF PROBABLE COST.

Improvement Recommendations Opinion of Probable Cost

US-31 @ Columbiana Road/I-65 Northbound Ramps				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Pavement Removal	SY	850	$25	$21,250
Milling	SY	1800	$5	$9,000
Wearing Surface (1.5")	TON	150	$90	$13,500
Tack Coat	GALLON	110	$2	$220
Concrete Islands (6")	CY	2	$250	$500
Curb and Gutter	LF	950	$20	$19,000
Storm Pipe	LF	200	$50	$10,000
Storm Pipe End Treatment	EACH	2	$1,500	$3,000
Structure Excavation	CY	200	$15	$3,000
Foundation Backfill	CY	100	$30	$3,000
Topsoil	CY	150	$15	$2,250
Solid Sod	SY	850	$8	$6,800
Traffic Stripe	MILE	1	$3,200	$3,200
Traffic Markings, & Legends	SF	600	$4	$2,400
Roadway Signs	SF	50	$30	$1,500
Sign Posts	LF	75	$15	$1,125
Erosion Control	LS	1	$10,000	$10,000
Traffic Control	LS	1	$60,000	$60,000
			Subtotal	$169,745
Contigency[1]			25%	$43,000
			Construction Costs	**$213,000**
Engineering Controls			1.3%	$3,000
Mobilization			9.7%	$21,000
Construction Engineering and Inspection			15%	$36,000
			Construction Subtotal	**$273,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)			17%	$47,000
Utility Relocation and Right-of-Way Cost[2]				NOT INCLUDED
			Subtotal	$320,000
ALDOT Indirect Costs			13.63%	$44,000
		Total Estimated Project Cost (2019)[3]		**$370,000**

Notes:
1. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
2. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
3. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

NOTE: ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST PROVIDED IS MADE ON THE BASIS OF ENGINEER'S EXPERIENCES AND QUALIFICATION AND REPRESENTS ENGINEER'S BEST JUDGMENT WITHIN THE INDUSTRY. ENGINEER DOES NOT GUARANTEE THAT PROPOSALS, BIDS, OR ACTUAL COST WILL NOT VARY FROM ENGINEER'S OPINION OF PROBABLE COST.

Improvement Recommendations Opinion of Probable Cost

Columbiana Road @ Shades Crest Road/Vestaview Lane				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Clearing and Grubbing ($4000/Acre)	LS	1	$4,000	$4,000
Unclassified Excavation	CY	2000	$15	$30,000
Borrow Excavation	CY	1400	$15	$21,000
Pavement Removal	SY	700	$25	$17,500
Wearing Surface (1.5")	TON	50	$90	$4,500
Binder (2-2" layers)	TON	110	$100	$11,000
Aggregate Base (6")	SY	500	$25	$12,500
Tack Coat	GALLON	30	$2	$60
Concrete Islands (6")	CY	6	$250	$1,500
Concrete Sidewalk (4")	SY	100	$70	$7,000
Topsoil	CY	150	$15	$2,250
Solid Sod	SY	850	$8	$6,800
Traffic Stripe	MILE	1	$3,200	$3,200
Traffic Markings, & Legends	SF	600	$4	$2,400
Roadway Signs	SF	20	$30	$600
Sign Posts	LF	50	$15	$750
Pedestrian Signal Heads w/ Countdown Display	LS	1	$15,000	$15,000
Signalization[1]	LS	1	$150,000	$150,000
Erosion Control	LS	1	$10,000	$10,000
Traffic Control	LS	1	$60,000	$60,000
			Subtotal	$356,060
Contigency[2]			25%	$90,000
			Construction Costs	**$447,000**
Engineering Controls			1.3%	$6,000
Mobilization			9.7%	$44,000
Construction Engineering and Inspection			15%	$75,000
			Construction Subtotal	**$572,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)			17%	$98,000
Utility Relocation and Right-of-Way Cost[3]				NOT INCLUDED
			Subtotal	$670,000
ALDOT Indirect Costs			13.63%	$92,000
			Total Estimated Project Cost (2019)[4]	**$770,000**

Notes:

1. Cost of signalization only necessary if the city opts for signalization of the northern intersection of Columbiana Road and Shades Crest Road. Rock excavation for signal pole installation is not expected.
2. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
3. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
4. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

Improvement Recommendations Opinion of Probable Cost

US-31 @ Vestavia Plaza/City Hall				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Unclassified Excavation	CY	40	$15	$600
Borrow Excavation	CY	30	$15	$450
Concrete Sidewalk (4")	SY	330	$70	$23,100
Curb and Gutter	LF	150	$20	$3,000
Storm Pipe	LF	150	$50	$7,500
Storm Inlet	EACH	2	$2,500	$5,000
Structure Excavation	CY	80	$15	$1,200
Foundation Backfill	CY	40	$30	$1,200
Topsoil	CY	10	$15	$150
Solid Sod	SY	330	$8	$2,640
Traffic Stripe	MILE	1	$3,200	$3,200
Traffic Markings, & Legends	SF	800	$4	$3,200
Pedestrian Signal Head Pedastals w/ Countdown Display	LS	1	$21,000	$21,000
Erosion Control	LS	1	$10,000	$10,000
Traffic Control	LS	1	$50,000	$50,000
			Subtotal	$132,240
Contigency[1]			25%	$34,000
			Construction Costs	**$167,000**
Engineering Controls			1.3%	$3,000
Mobilization			9.7%	$17,000
Construction Engineering and Inspection			15%	$29,000
			Construction Subtotal	**$216,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)			17%	$37,000
Utility Relocation and Right-of-Way Cost[2]				NOT INCLUDED
			Subtotal	$253,000
			Total Estimated Project Cost (2019)[3]	**$260,000**

Notes:
1. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
2. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
3. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

NOTE: ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST PROVIDED IS MADE ON THE BASIS OF ENGINEER'S EXPERIENCES AND QUALIFICATION AND REPRESENTS ENGINEER'S BEST JUDGMENT WITHIN THE INDUSTRY. ENGINEER DOES NOT GUARANTEE THAT PROPOSALS, BIDS, OR ACTUAL COST WILL NOT VARY FROM ENGINEER'S OPINION OF PROBABLE COST. ALDOT'S INDIRECT COSTS ARE NOT INCLUDED IN THE ESTIMATED PROJECT COST.

Improvement Recommendations Opinion of Probable Cost

US-31 @ Pizitz Drive				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Unclassified Excavation	CY	80	$15	$1,200
Borrow Excavation	CY	50	$15	$750
Concrete Sidewalk (4")	SY	80	$70	$5,600
Concrete Island (6")	CY	20	$250	$5,000
Curb and Gutter	LF	150	$20	$3,000
Storm Pipe	LF	150	$50	$7,500
Storm Inlet	EACH	3	$2,500	$7,500
Structure Excavation	CY	80	$15	$1,200
Foundation Backfill	CY	40	$30	$1,200
Topsoil	CY	15	$15	$225
Solid Sod	SY	80	$8	$640
Traffic Stripe	MILE	1	$3,200	$3,200
Remove Traffic Stripe	MILE	1	$2,725	$2,725
Traffic Markings, & Legends	SF	350	$4	$1,400
Pedestrian Signal Head Pedastals w/ Countdown Display	LS	1	$15,000	$15,000
Erosion Control	LS	1	$10,000	$10,000
Traffic Control	LS	1	$50,000	$50,000
			Subtotal	$116,140
Contigency[1]			25%	$30,000
			Construction Costs	**$147,000**
Engineering Controls			1.3%	$2,000
Mobilization			9.7%	$15,000
Construction Engineering and Inspection			15%	$25,000
			Construction Subtotal	**$189,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)			17%	$33,000
Utility Relocation and Right-of-Way Cost[2]				NOT INCLUDED
			Subtotal	$222,000
			Total Estimated Project Cost (2019)[3]	**$230,000**

Notes:
1. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
2. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
3. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.

NOTE: ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST PROVIDED IS MADE ON THE BASIS OF ENGINEER'S EXPERIENCES AND QUALIFICATION AND REPRESENTS ENGINEER'S BEST JUDGMENT WITHIN THE INDUSTRY. ENGINEER DOES NOT GUARANTEE THAT PROPOSALS, BIDS, OR ACTUAL COST WILL NOT VARY FROM ENGINEER'S OPINION OF PROBABLE COST. ALDOT'S INDIRECT COSTS ARE NOT INCLUDED IN THE OVERALL PROJECT COST.

Improvement Recommendations Opinion of Probable Cost

Dolly Ridge Road @ Gresham Drive				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Amount**
Clearing & Grubbing ($4000/Acre)[1]	LS	1	$4,000	$4,000
Unclassified Excavation	CY	5800	$15	$87,000
Borrow Excavation	CY	3900	$15	$58,500
Milling	SY	5350	$5	$26,750
Wearing Surface (1.5")	TON	550	$90	$49,500
Binder (2-2" layers)	TON	300	$100	$30,000
Aggregate Base (6")	SY	1500	$25	$37,500
Tack Coat	GALLON	400	$2	$800
Topsoil	CY	750	$15	$11,250
Seeding and Mulching	AC	1	$2,400	$2,400
Traffic Stripe	MILE	1	$3,200	$3,200
Traffic Markings, & Legends	SF	500	$4	$2,000
Roadway Signs	SF	50	$30	$1,500
Sign Post	LF	150	$15	$2,250
Signal Timing Adjustment[2]	LS	1	$1,000	$1,000
Erosion Control	LS	1	$10,000	$10,000
Traffic Control	LS	1	$20,000	$20,000
			Subtotal	$347,650
Contigency[3]			25%	$87,000
			Construction Costs	**$435,000**
Engineering Controls			1.3%	$6,000
Mobilization			9.7%	$43,000
Construction Engineering and Inspection			15%	$73,000
			Construction Subtotal	**$557,000**
Preliminary Engineering (Environmental, Survey, Geotech, Traffic, Design)[4]			17%	$95,000
Utility Relocation and Right-of-Way Cost[5]				NOT INCLUDED
			Subtotal	$652,000
ALDOT Indirect Costs			13.63%	$89,000
			Total Estimated Project Cost (2019)[6]	**$750,000**

Notes:

1. Clearing and grubbing includes trimming vegetation that is blocking Dolly Ridge Road eastbound drivers' view of the signal heads at the intersection of Gresham Drive.
2. Implement base signal timings. This does not include periodic monitoring of detection.
3. Contingency cost includes miscellaneous and/or unknown items that can not be quantified at the time this study was conducted.
4. Internal school circulation plan is not included in the Preliminary Engineering fee.
5. Right-of-Way and Utility Relocation were not included in this estimate; however, some improvements will require right-of-way acquisition and/or utility relocations.
6. The total estimated project cost was prepared for the 2019 planning year. This number should be increased to account for rising costs due to inflation should the improvements not be implemented in 2019.