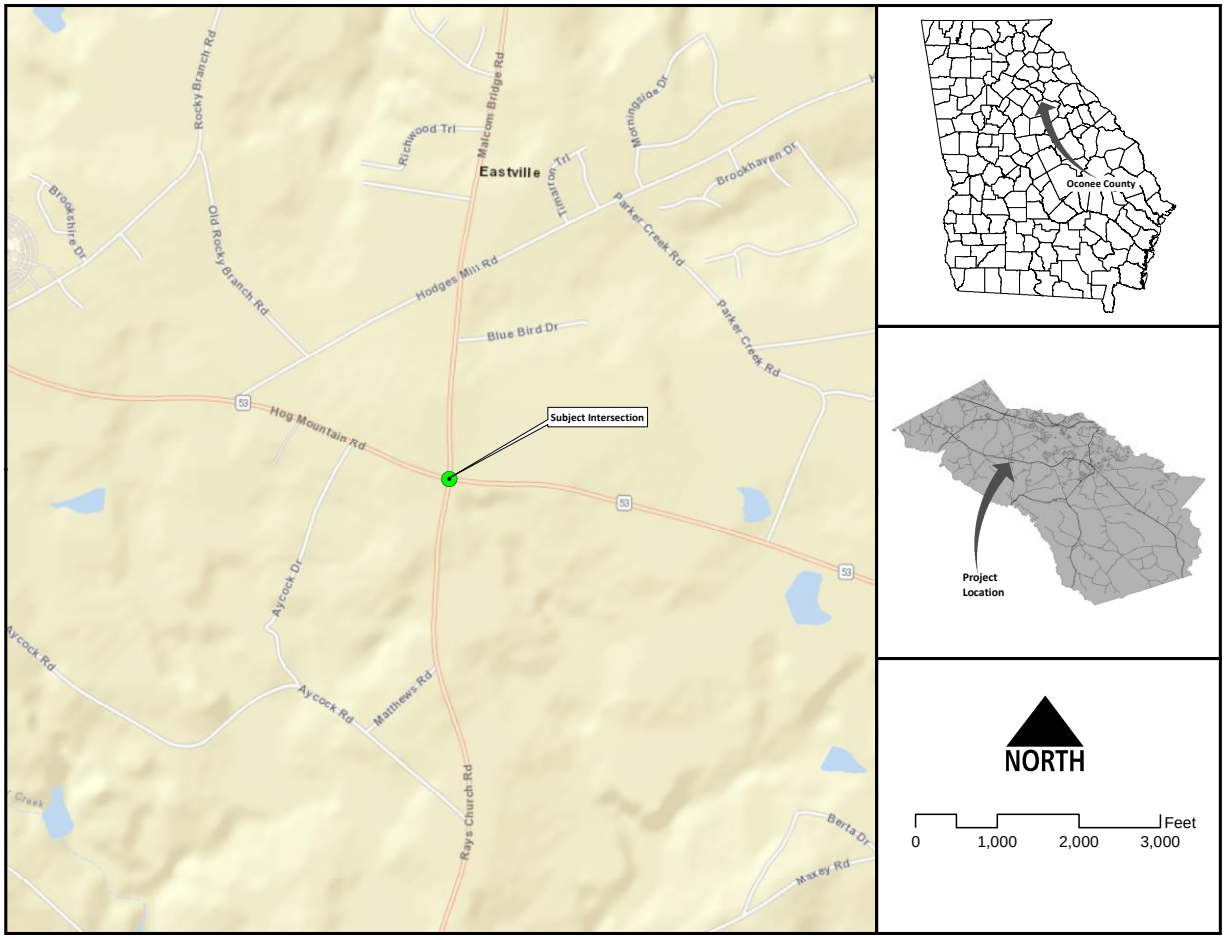
DEPARTMENT OF TRANSPORTATION

STATE OF GEORGIA

TRAFFIC ENGINEERING STUDY

February 2020



PRIMARY ROUTE: *State Route 53 / Hog Mountain Road*

SECONDARY ROUTE: *Malcom Bridge Road / Rays Church Road*

GDOT DISTRICT: 1

CONGRESSIONAL DISTRICT: 10

COUNTY: Oconee

CITY: Bogart

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Member of the SNC-Lavalin Group

GEORGIA REGISTERED No. PE042725 PROFESSIONAL ENGINEER TRAVIS L. BREWER 2/21/2020

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INTRODUCTION

Highway safety improvement projects are intended to increase safety performance by minimizing or eliminating risk to roadway users. Identification of locations within a highway system that present potential higher risk to roadway users is a critical component of achieving the Georgia Department of Transportation's (GDOT) ultimate goal of zero fatalities and injuries on Georgia's roadways. The unsignalized intersection located at State Route (SR) 53 and Malcom Bridge Road/Rays Church Road represents one such opportunity, particularly due to crash frequency and operational concerns. In order to improve safety, mobility, and non-motorized road user connectivity, GDOT commissioned Atkins to complete this traffic engineering study.

Project Location

The identified intersection is located in central Oconee County (**Figure 1**), where SR 53 intersects Malcom Bridge Road/Rays Church Road, southwest of the city of Athens, Georgia.

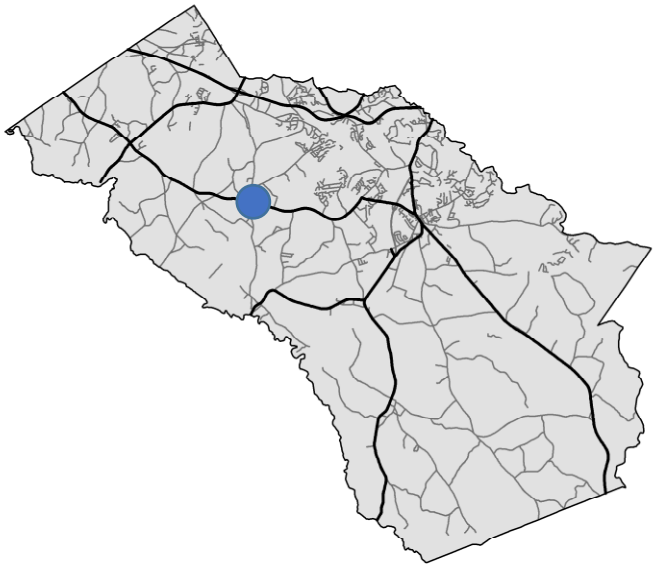


Figure 1. Study Location in Oconee County, GA

Reason for Investigation

This intersection is being investigated due to its crash history and reports of drivers failing to obey the current minor stop control condition.

LOCATION DESCRIPTION

The study location is a two-way minor stop-controlled intersection. SR 53/Mountain Hog Road and Malcom Bridge Road/Rays Church Road are both two-lane roads. All of the approaches have one lane for all turning and through movements. The southbound approach is Malcom Bridge Road. The northbound approach is Rays Church Road. The eastbound and westbound approaches are SR 53/Hog Mountain Road. The intersection geometry and approaches have been unchanged for at least the past 20 years. The terrain is generally flat and mostly agricultural in use. Street lighting at the intersection appears to be limited to one light on the southwest corner. The southbound approach contains road-mounted reflectors at the stop sign along the right edge line to improve intersection visibility. The northern leg of Malcom Bridge Road can be used to access the western portion of the city of Athens as well as several local roads, residences and businesses. The eastern leg of SR 53/Hog Mountain Road can be used for access to several local roads and residences. The southern leg of Rays Church Road can be used for access to the town of North High Shoals, which is further south near the Oconee/Morgan county line. The western leg of SR 53/Hog Mountain Road can be used for access to several local roads, residences and schools. **Figure 2** shows a map of the surrounding traffic system adjacent to the SR 53 and Malcom Bridge Road/Rays Church Road and **Figure 3** shows the aerial satellite imagery.

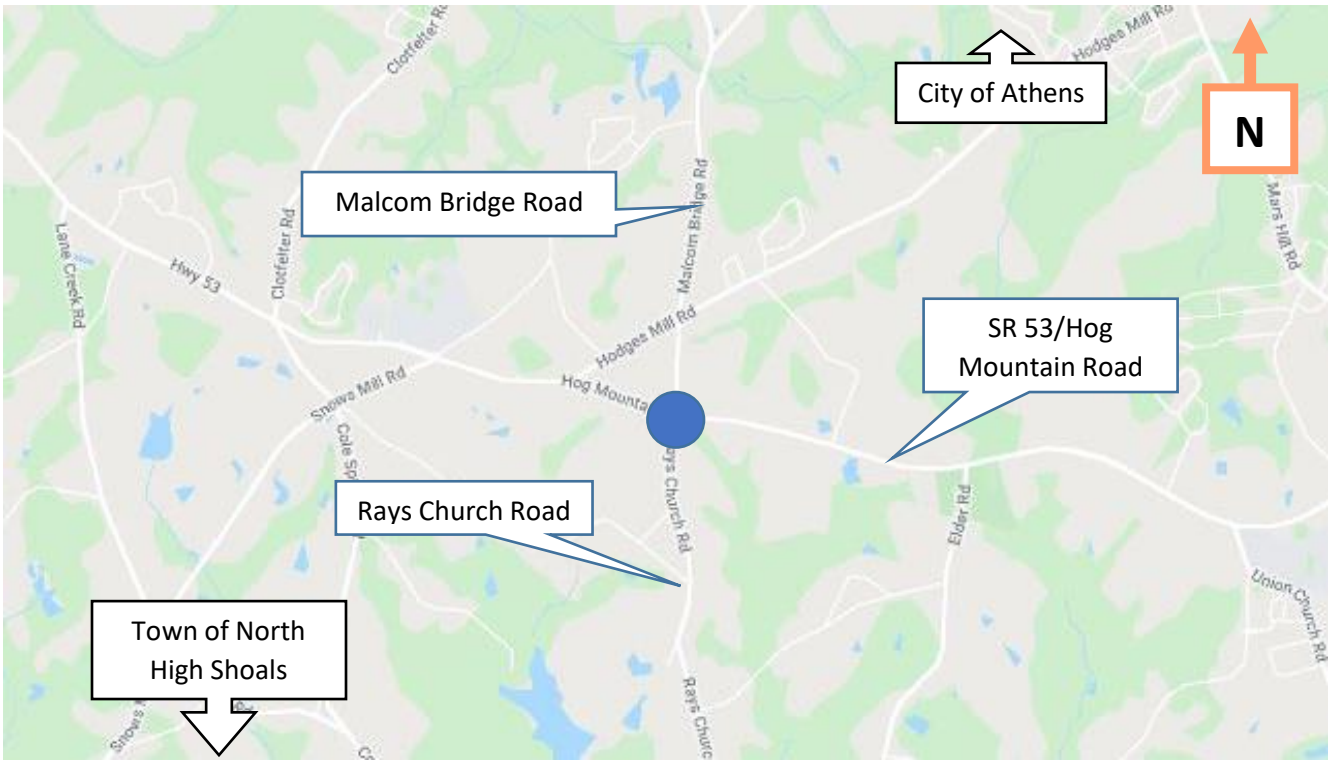


Figure 2. Surrounding Highway Network – SR 53 and Malcom Bridge Road/Rays Church Road

Figure 3. Satellite Imagery – SR 53 and Malcom Bridge Road/Rays Church Road Study Intersection

EXISTING CONDITIONS/FIELD VISIT

Atkins collected a variety of traffic engineering data specific to the project location, including historical traffic and crash data and current traffic counts as well as geometric and other roadway characteristics. Atkins also conducted a site visit on November 13th, 2019, to collect site condition data and observe the project corridor in operation.

Traffic Volume History

Annual average daily traffic (AADT) counts from the online GDOT database were collected specific to SR 53 and Malcom Bridge Road/Rays Church Road from 2014 to 2018. The closest count station along SR 53 is located approximately 1.00 mile east, to the east of Parker Creek Road, where the observed AADT for 2018 was 9,810.. The closest count station along Malcom Bridge Road is located approximately 1.71 miles north, just south of Rocky Branch Road, where the estimated AADT for 2018 was 3,380. It should be noted that with this distance between the subject intersection and the count station, the accuracy of the data as it relates to the intersection will vary. There were no count stations present along Rays Church Road south of the intersection within the project intersection scope. **Table 1** summarizes these counts.

Table 1: Historical AADT Volumes Adjacent to SR 53 at Malcom Bridge Road/Rays Church Road Study Intersection, GDOT Online Database

Year	SR 53 (ST# 2190145)		Malcom Bridge Road (ST# 2190288)	
	AADT	Percent Trucks	AADT	Percent Trucks
2014	8,790	-	3,810	-
2015	8,730	-	3,650	-
2016	8,990	7.00%	3,740	7.00%
2017	9,890	-	3,820	-
2018	9,810	-	3,880	-
Average	**9,242**	**7.00%**	**3,780**	**7.00%**

Historical traffic volumes along SR 53 and Malcom Bridge Road adjacent to the study intersection have generally increased over the last four years after decreasing between 2014 and 2015. On average, SR 53 served approximately 9,242 vehicles per day (vpd), while Malcom Bridge Road served 3,780 vpd during the five-year study period. Truck volumes represent approximately seven percent of all traffic along SR 53 and Malcom Bridge Road. However, data for this was only present for 2016. To perform subsequent operation analyses, Atkins also performed turning movement counts for the morning (7AM-9AM) and evening (4PM-6PM) peak periods at the study location in August 2019. **Table 2** provides a summary of the morning (AM) and evening (PM) peak hour period. Full details can be found in **Appendix D** and **Appendix E**.

Table 2. Total Entering Volumes at SR 53 at Malcom Bridge Road/Rays Church Road Intersection

Time Period	Major Route (SR 53)			Minor Route Malcom Bridge Rd/Rays Church Rd			Entering Intersection Total
	EB	WB	Total	NB	SB	Total	
AM Peak Hour (7:15 to 8:15)	438	367	805	134	98	232	1,037
PM Peak Hour (5:00 to 6:00)	452	472	924	60	150	210	1,134
Total (7-9 AM & 4-6 PM)	**1,518**	**1,490**	**3,008**	**379**	**439**	**818**	**3,826**

The AM peak hour occurs between 7:15 AM and 8:15 AM with a total approach volume of 1,037 vehicles per hour. The PM peak hour occurred between 5:00 PM and 6:00 PM with a total approach volume of 1,134 vehicles per hour. Overall, the SR 53 and Malcom Bridge Road/Rays Church Road intersection served 3,826 daily vehicles during the turning movement counts, roughly 29.4 percent of the combined SR 53 and Malcom Bridge Road volumes for 2018 obtained from the previously listed GDOT count stations. The approach with the greatest contribution to the traffic volumes was the eastbound approach of SR 53 with 1,518 vehicles during the four hours of collected counts.

The SR 53 and Malcom Bridge Road/Rays Church Road approaches all exhibit typical AM and PM peak periods, with a slightly higher volume in the evening. Across the day the volumes go through other fluctuations, but the eastbound approach of SR 53/Hog Mountain Road remains the approach with the highest amount of volume across the day. The westbound approach of SR 53/Hog Mountain Road has primarily the second highest approach volume. Throughout the day, the southbound approach of Malcom Bridge Road and northbound approach of Rays Church Road have the lowest volumes where compared to the other approaches.

Atkins performed traffic volume forecasts for the study intersection to reflect future projected growth. An expected annual growth rate was developed based upon historical data obtained from the GDOT traffic count locations and population growth estimates for Oconee County. Actual traffic counts collected by GDOT were given preference over the estimated traffic counts provided in the GDOT traffic count database to calculate an average annual historic growth rate. **Table 3** provides annual growth rates from each source; the average is used for estimating the future year traffic growth. The Oconee County population shows a rate of increase of 1.7 percent, while the historical counts show an increase of 2.3 percent. The results from the MACORTS Travel Demand Model showed a 2.0% growth. For operational analyses, a growth rate of 2.0 percent was calculated from these figures.

Table 3. Estimated Annual Growth in Traffic Volume

GDOT Historical Counts	Oconee County Population	Model MPO/GSM	Average
2.3%	1.7%	2.0%	2.0%

Existing Traffic Control

The northbound and southbound approaches to the intersection are currently stop controlled (Flashing beacon warning signs are installed in advance of the stop sign for each approach). The eastbound and westbound approaches are free flow and do not currently have any traffic control.

Adjacent Signalized Intersections

The nearest adjacent signalized intersection is approximately 4.07 miles away at the intersection of SR 53/Hog Mountain Road with Mars Hill Road. This intersection is not within the proximity to the study intersection to be expected to have any functional impact on its operation.

Vehicular Speeds

The posted speed on SR 53 is 55 miles per hour (MPH), both east and west of the study intersection. Malcom Bridge Road to the north of the study intersection is posted at 45 MPH and Rays Church Road to the south of the study intersection is posted at 55 MPH.

Sight Distance

On Malcom Bridge Road, sight distance was measured to be 425' looking to the east and 568' looking to the west. On Rays Church Road, sight distance was measured to be 506' looking to the east and 596' looking to the west. Sight distance is limited in each direction by horizontal/vertical curvature in the roadway and trees/vegetation. At 55 MPH on SR 53, the required Stopping Sight Distance would be 495 feet and the required Intersection Sight Distance would be 610 feet. Under these requirements, the sight distance between the Malcom Bridge Road southbound approach and the SR 53 westbound approach fails to meet Stopping Sight Distance and all approaches fail to meet the Intersection Sight Distance.

Pedestrian Movements

The study intersection and adjacent unsignalized intersections do not currently have pedestrian facilities. During the field visit, there were no pedestrians or bicyclists spotted within the area of the subject intersection. It should also be noted that due to the rural nature around the intersection as well as much of the surrounding right-of-way belonging to the state, pedestrian generators are also limited.

Other Modes of Transportation Present

GDOT vehicle classification count data indicates that trucks accounted for approximately 7.0 percent of the total vehicular volume through the subject intersection.

Planned Projects Adjacent to the Study Area

There were no planned projects that could be identified from GeoPi adjacent to the study location.

Parking

There is no on-street parking along any of the roadways involved in the subject intersection within the study location. There is one parking lot at the northwest quadrant of the intersection that appears to be used for an HVAC contractor facility.

CRASH HISTORY

Atkins collected historical traffic crash data from the most recent five-year period (7/1/2014 – 7/1/2019) from the Georgia Electronic Accident Reporting System to perform a comprehensive safety analysis of the study intersection. **Table 4** provides a summary of the historical traffic crash data, including fatal, injury, and property damage only (PDO) crashes, specific to the SR 53 and Malcom Bridge Road/Rays Church Road intersection. Entering traffic volumes were estimated based upon traffic counts collected by Atkins, and historical crash rates are provided in crashes per one million entering vehicles.

Table 4. Summary of Traffic Crash Data at SR 53 at Malcom Bridge Road/Rays Church Road (2014-2019)

Entering Traffic Volumes			Traffic Crashes						Traffic Crash Rates*					
Major	Minor	Total	K	A	B	C	O	Total	K	A	B	C	O	Total
9,242	3,780	13,022	0	3	15	3	22	43	0.00	0.13	0.63	0.13	0.93	1.81

**Traffic crashes per one million entering vehicles*

In total, 43 crashes occurred at the study intersection during the five-year period, including 21 injury crashes where three resulted in severe injuries. There were no fatal crashes at the study intersection during the five-year period. **Figure 4** shows the locations for each of these crashes.

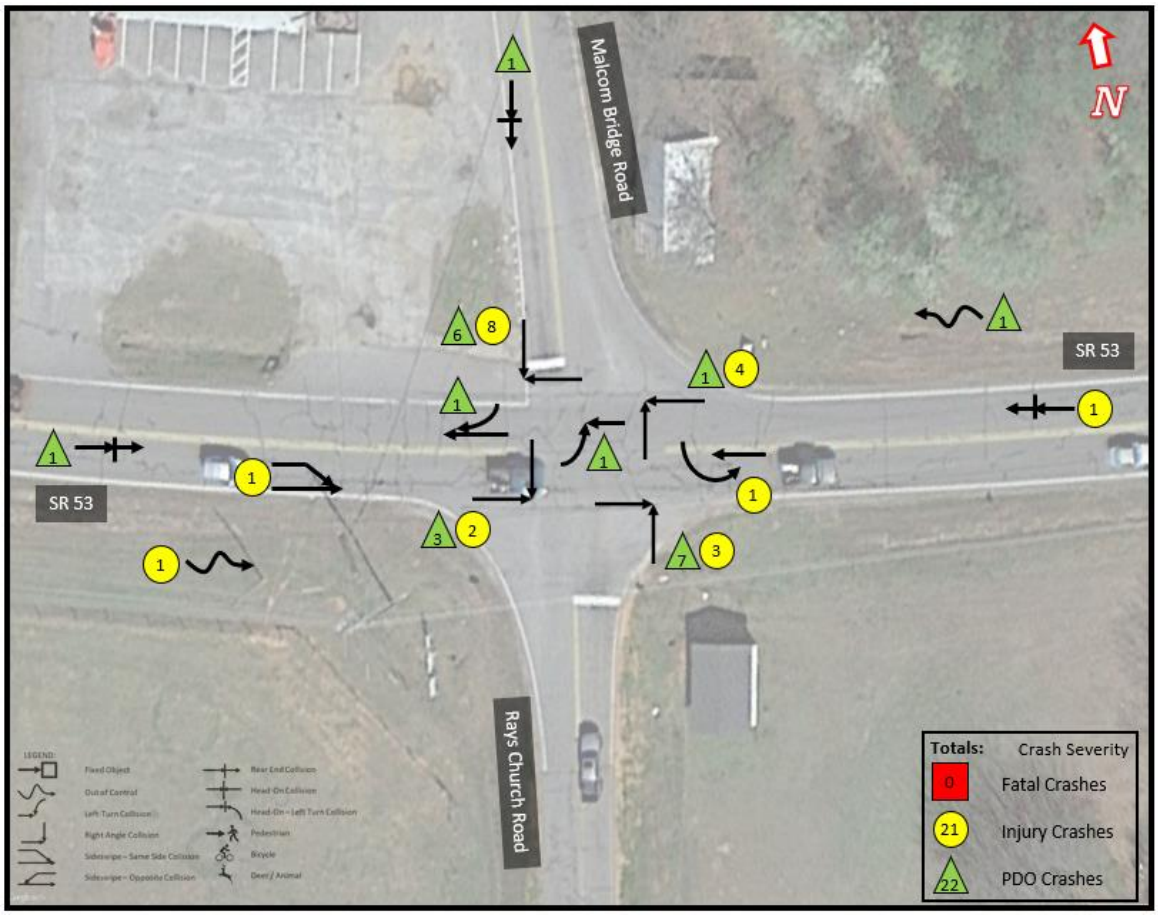


Figure 4. Collison Diagram - SR 53 at Malcom Bridge Road/Rays Church Road

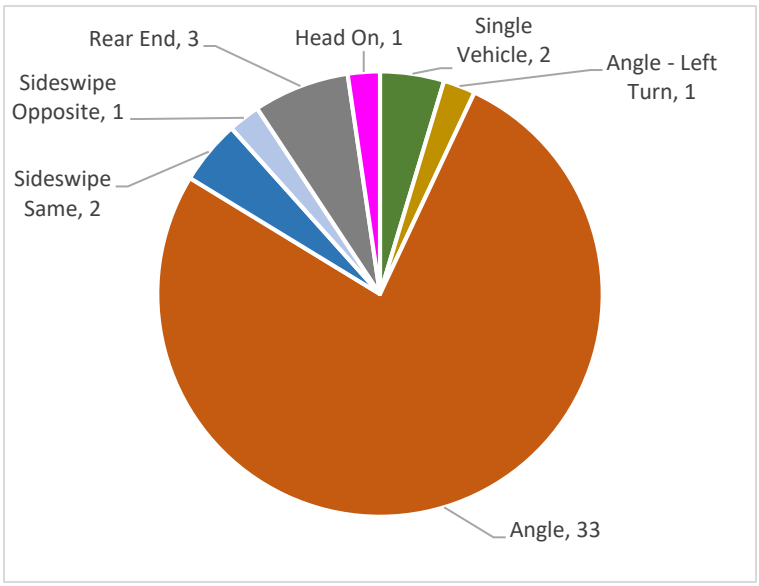


Figure 5. Distribution of Crash Types

The primary crash type at the intersection were angle type crashes making up 76.7% (33 of the 43) of the total crashes. Many of these angle crashes can likely be attributed to the limited sight distance between the quadrants. From those 33 angle crashes, 14 (42.4%) occurred involving vehicles from the southbound and westbound approaches. The other prevalent form of angle crash involved vehicles from the northbound and eastbound approaches and included 9 (27.3%) of the 33 angle crashes. The remaining forms of angle crashes involved vehicles from the southbound and eastbound approaches at 5 (15.2%) and from the northbound and westbound approaches at 5 (15.2%). The second most common crash type was rear ends making up 7.0% (3 of the 43) of the intersection's crashes. Of the three rear ends, all three occurred on a different approach including the southbound, eastbound, and westbound approaches. From all crash types, 51.2% (23 of 43) involved a vehicle from the southbound approach on Malcom Bridge Road. A collision diagram for the subject intersection is provided in **Appendix C** of this report.

EXISTING SAFETY MEASURES

GDOT and local agencies previously implemented several measures to improve safety performance at this location, including:

- Dual Indicated STOP signs

Figure 6. Dual Indicated STOP Signs

- Single Indicated STOP Ahead (W3-1) warning signs with flashing beacons

Figure 7. Single Indicated STOP Ahead Warning Sign With Flashing Beacons

- STOP AHEAD pavement markings

Figure 8. STOP AHEAD Pavement Markings

- Transverse Rumble strips

Figure 9. Transverse Rumble Strips

SAFETY ISSUES

To develop appropriate engineering countermeasures and recommendations for safety improvements, Atkins identified specific safety issues present at this location based upon the analysis of historical crash data and a site visit. Background related to the typical safety risk matrix is provided in **Appendix A**.

Safety Issue 1: Limited Sight Distance on Malcom Bridge Road approach

It was discussed briefly in the Crash History that 51.2% (23 of 43) of the intersection's crashes involved the southbound approach. This is in part due to the limited sight distance at this approach, especially on the northeast quadrant. There is a significant amount of dense vegetation and an abandoned building on this corner that limits visibility to the east. In addition, the eastern approach curves towards the north back behind the line of vegetation. This in combination with the fact that the eastern approach is coming down from a small hill significantly limits visibility in this direction. As stated above, the measured sight distance is 425 feet from Malcom Bridge Road looking east, 568 feet from Malcom Bridge Road looking west, 506 feet from Rays Church Road looking east, and 596 feet from Rays Church Road looking west.

Expected Crash Types: Angle, Angle – Left Turn
Expected Frequency: Occasional
Expected Severity: High
Risk: D

Figure 10. Views of SR 53

Safety Issue 2: No signage clarifying that cross traffic does not stop

While most of the angle crashes seemed to indicate drivers either unable to see crossing traffic due to sight distance constraints or a failure to check for crossing traffic, one trend was identified in three separate crashes where driver stated that they did not realize that the intersection was not an all-way stop-controlled intersection. This was typically the reason given for crashes occurring from the northern and southern approaches. The stop signs at the northern and southern approaches do not have any additional signage indicating that the intersection is only two-way stop-controlled or that cross traffic does not stop.

Expected Crash Types: Angle, Angle – Left Turn
Expected Frequency: Rare
Expected Severity: High
Risk: B

OPERATIONAL ANALYSIS

Capacity Analysis

Appendix B provides the background for a planning level capacity analysis procedure. The acceptable AADT for a two-lane road using this methodology is 13,300. AADT values on SR 53 were 9,242 vpd and on Malcom Bridge Road/Rays Church Road 3,780 vpd. The values obtained from the count stations were also 9,810 vpd on SR 53 and 3,880 vpd on Malcom Bridge Road/Rays Church Road for 2018. None of these values exceeds the value of 13,300 vpd and so all the roadways of the subject intersection are to currently be considered operating under capacity.

Delay

Atkins conducted a capacity analysis for the subject intersection using the traffic operations software, Synchro, version 9 and the 2010 Highway Capacity Manual (HCM).

The analysis for the subject intersection assumes that a level of service (LOS) D or better will be considered adequate (or acceptable). LOS worse than D would indicate that an intersection or approach is nearing unacceptable levels of operation and would be unable to accommodate substantial increases in traffic without significant increases in congestion and delay. The subject intersection was analyzed as a two-way stop-controlled intersection. **Table 5** summarizes results from the Synchro model.

Table 5. SR 53 at Malcom Bridge Rd/Rays Church Rd – No-Build Intersection LOS Summary (HCM: TWSC)

Analysis Year	Peak Period	Delay (LOS)								Max V/C Ratio
		EB		WB		NB		SB		
2019	AM	0.1	-	0.7	-	60.4	(F)	111.4	(F)	0.877
	PM	0.2	-	0.2	-	28.2	(D)	105.0	(F)	0.958
2022	AM	0.1	-	0.7	-	81.3	(F)	213.5	(F)	>1.000
	PM	0.2	-	0.2	-	33.7	(D)	167.6	(F)	>1.000
2042	AM	0.1	-	0.8	-	>999.9	(F)	>999.9	(F)	>1.000
	PM	0.2	-	0.2	-	>999.9	(F)	>999.9	(F)	>1.000

The southbound approach of Malcom Bridge Road in the AM hours experiences the highest levels of delay, currently over 111 seconds/vehicle. If all delays are expected to increase then the greatest delay by the design

year of 2042 would be over 1,000 seconds on the same southbound approach in the AM hours. This is true for the northbound and southbound approaches in both the AM and PM hours as well. As such, both the northbound and southbound approaches would have the highest levels of delay. This delay would give those approaches at worst a LOS F.

One of the countermeasures is to convert the intersection into an all-way stop controlled intersection. The subject intersection was analyzed as an all-way stop-controlled intersection for the analysis. **Table 6** summarizes results from the Synchro model.

Table 6. SR 53 at Malcom Bridge Rd/Rays Church Rd – No-Build Intersection LOS Summary (HCM: AWSC)

Analysis Year	Peak Period	Delay (LOS)								Max V/C Ratio
		EB		WB		NB		SB		
2022	AM	39.9	(E)	31.9	(D)	15.8	(C)	13.8	(B)	0.886
	PM	39.1	(E)	42.6	(E)	12.5	(B)	15.1	(C)	0.910
2042	AM	291.8	(F)	245.6	(F)	35.9	(E)	24.0	(C)	>1.000
	PM	263.4	(F)	285.3	(F)	18.8	(C)	28.6	(D)	>1.000

In this scenario, for the design year of 2022 the eastbound approach of SR 53 in the AM hours would experience the highest levels of delay, at 39.9 seconds/vehicle. In the PM hours, the westbound approach of SR 53 would experience the highest levels of delay, at 42.6 seconds/vehicle. If all delays are expected to increase then the greatest delay by the design year of 2042 would be 291.8 seconds/vehicle on the SR 53 eastbound approach in the AM hours. The second greatest delay by design year of 2042 would be 285.3 seconds/vehicle on the SR 53 westbound approach in the PM hours. As such, the southbound approach would have the highest level of delay in the AM and the northbound approach would have the highest levels of delay in the PM. This delay would give those approaches at worst a LOS F.

Traffic Signal Warrant Analysis

The Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition, chapter on traffic signal warrants states that the analysis of a signal warrant should include factors in the warrant that are applicable to the existing study location operation and safety. Traffic signal warrants 1 and 2 were evaluated with available traffic data. Warrant 3 was not considered as an applicable signal warrant as the MUTCD indicates that this warrant should only be applied in unusual circumstances where a large volume of traffic is discharged over a short period of time. Warrant 7 was also not considered since a trial of alternatives has not already been tested. Furthermore, the subject intersection was analyzed using one lane for the major street approaches and one lane for the minor approaches.

Traffic data for this evaluation reflect a typical weekday of traffic volumes for a 24-hour period during the 2022 build year. A compounding annual growth rate of +0.77 percent was applied to the 12-hour turning movement counts collected in August 28th, 2019. From this evaluation, the studying intersection fails to meet either Warrants 1 or 2 criteria as summarized in **Table 7**.

Table 7. Warrant 1 and 2 Evaluation Summary – (100% Right Turn Reduction)

Warrant	MUTCD Value		Number of Hours Warrant Satisfied	Meet?
	Major	Minor		
1A – 8-Hour (Minimum Vehicular Volume)	500	150	1	No
1B – 8-Hour (Interruption of Continuous Traffic)	750	75	3	No
2 – 4-Hour	Figure 4C-1 Curve		1	No

The resulting traffic signal warrant analysis reveals that the intersection of SR 53 and Malcom Bridge Road/Rays Church Road fails to satisfy any of the three warrants that were analyzed. This primarily is due to the fact that the minor approaches do not generate enough traffic to meet the minimum amount for the traffic signal warrants. Since signal warrants are not met, the signal alternative will not be carried forward for further evaluation.

Roundabout Evaluation

Atkins also evaluated the feasibility of a roundabout at this location based upon the traffic count data collected as part of this study. Atkins performed analysis procedures for the roundabout using GDOT's Roundabout Analysis Tool (version 4.1). **Appendix G** and **Appendix H** provides the full details on the operational analyses. **Table 8** provides a summary of the operational analysis results. First, the roundabout was evaluated for the build year of 2022 and design year of 2042 traffic assuming a single lane roundabout.

Table 8. Roundabout Intersection LOS Summary – Single Lane (Build Year – 2022)

Approach	Measure of Effectiveness	Period Analyzed			
		AM		PM	
2022 Build Year (Single Lane)		**GDOT**	**SIDRA**	**GDOT**	**SIDRA**
SR 53/Hog Mountain Road (Eastbound)	V/C Ratio	0.480	0.493	0.480	0.500
	Approach Delay (sec/veh)	**9.0**	**9.3**	**9.0**	**9.2**
	Avg. Queue Length (lane feet)	71.0	108.2	69.0	106.8
	LOS	**A**	**A**	**A**	**A**
SR 53/Hog Mountain Road (Westbound)	V/C Ratio	0.460	0.485	0.460	0.471
	Approach Delay (sec/veh)	**9.0**	**9.7**	**8.0**	**8.1**
	Avg. Queue Length (lane feet)	68.0	108.2	64.0	108.2
	LOS	**A**	**A**	**A**	**A**
Rays Church Road (Northbound)	V/C Ratio	0.290	0.295	0.120	0.119
	Approach Delay (sec/veh)	**9.0**	**8.6**	**6.0**	**6.2**
	Avg. Queue Length (lane feet)	32.0	49.9	10.0	18.4
	LOS	**A**	**A**	**A**	**A**
Malcom Bridge Road (Southbound)	V/C Ratio	0.150	0.161	0.230	0.226
	Approach Delay (sec/veh)	**6.0**	**6.5**	**7.0**	**6.6**
	Avg. Queue Length (lane feet)	15.0	25.8	22.0	35.3
	LOS	**A**	**A**	**A**	**A**
	Intersection Total:	**A**	**A**	**A**	**A**

Table 9. Roundabout Intersection LOS Summary – Single Lane (Design Year – 2042)

Approach	Measure of Effectiveness	Period Analyzed			
		AM		PM	
2042 Design Year (Single Lane)		**GDOT**	**SIDRA**	**GDOT**	**SIDRA**
SR 53/Hog Mountain Road (Eastbound)	V/C Ratio	0.76	0.754	0.80	0.783
	Approach Delay (sec/veh)	**18**	**17.5**	**20**	**19.1**
	Avg. Queue Length (lane feet)	207	287.1	223	313.9
	LOS	**C**	**C**	**C**	**C**
SR 53/Hog Mountain Road (Westbound)	V/C Ratio	0.77	0.780	0.70	0.695
	Approach Delay (sec/veh)	**20**	**20.6**	**14**	**13.1**
	Avg. Queue Length (lane feet)	213	327.3	161	225.6
	LOS	**C**	**C**	**B**	**B**
Rays Church Road (Northbound)	V/C Ratio	0.59	0.636	0.24	0.265
	Approach Delay (sec/veh)	**19**	**22.1**	**10**	**11.5**
	Avg. Queue Length (lane feet)	100	173.4	24	50.3
	LOS	**C**	**C**	**B**	**B**
Malcom Bridge Road (Southbound)	V/C Ratio	0.30	0.320	0.45	0.437
	Approach Delay (sec/veh)	**10**	**11.0**	**12**	**11.7**
	Avg. Queue Length (lane feet)	34	61.8	59	88.0
	LOS	**A**	**B**	**B**	**B**
	Intersection Total:	**C**	**C**	**C**	**C**

Under the GDOT tool, the single lane roundabout should operate at a LOS A when evaluated for to the design year of 2022. The SIDRA analysis showed similar results with the single lane roundabout operating at a LOS A when evaluated for the design year of 2022. However, the GDOT tool results show the single lane roundabout operating at a LOS C for the design year of 2042. The SIDRA analysis also shows the single lane roundabout operating at a LOS C for the design year of 2042. Overall the single lane roundabout would perform with little to no delays throughout the day in design year 2022 but would perform with increased delay throughout the day in design year 2042. However, the single lane roundabout should operate above a LOS D which is adequate for the intersection.

ENVIRONMENTAL SCREENING

Currently there are buildings/structures in three of the four quadrants of the intersection. The structures in the northeast and southeast quadrants have been identified as potential historical resources. However, the structure in the northeast quadrant is not anticipated to be considered eligible by the State Historic Preservation Office (SHPO). Further investigation of these properties would be completed during the Concept phase and an eligibility determination would be made by the SHPO at that time.

ALTERNATIVE AND COUNTERMEASURE EVALUATION

Given the traffic safety data outlined in the preceding sections, Atkins identified several potential design alternatives and countermeasures to improve both safety and operations at the study location. These potential design alternatives and countermeasures were evaluated for further implementation.

Intersection Control Evaluation

Atkins performed a formal intersection control evaluation (ICE), which is included in **Appendix J**. The alternatives evaluated within ICE correspond to the selected safety alternatives and recommendations that were analyzed as a part of this study. Converting the intersection to a single lane roundabout ranked first, while converting the intersection to a conventional all-way stop ranked second. The traffic signal was also included to be evaluated for, but as shown above, it was not included in a ranking due to the intersection failing to meet signal warrants. The factors considered for the potential alternatives are shown and summarized in the following sections.

Potential Safety Alternatives and Countermeasures

Table 9 summarizes the alternatives and countermeasures selected for further consideration as well as a crash modification factor (CMF) identified from the Highway Safety Manual (HSM), FHWA CMF Clearinghouse, or the GDOT ICE form. While many safety countermeasures are suggested, only those treatments with known safety performance impacts are analyzed.

Table 9. Suggested Safety Countermeasures and CMFs for SR 53 at Malcom Bridge Road/Rays Church Road

	Countermeasure	CMF (FI Crashes)	CMF (PDO Crashes)	Safety Issue Addressed	CMF Source
1	Convert the existing intersection to an all-way stop-controlled intersection.	0.230	0.320	1, 2	CMF ID: 3127 & 3128
2	Convert the existing intersection to a modern single-lane roundabout.	0.130	0.290	1, 2	CMF ID: 230 & 299

Conversion of the existing intersection to All-Way Stop-Controlled would address the safety issues by requiring all vehicles to stop at the intersection. It would meet some of the driver's expectations over the intersection being all-way stop-controlled as well as address sight distance issues between the approaches. With the limited sight distance however, drivers may not correctly identify in time the stop control ahead.

Conversion of the existing intersection to a single lane roundabout would also address the safety issues present at the intersection. The roundabout requires provides some speed control because all vehicles must slow down

in order to enter the roundabout. This helps to address some of the sight distance issues by having vehicles slow down on the major approach and requiring vehicles to only need to yield to traffic already in the roundabout. Addressing the relatively higher number of angle crashes, the roundabout's configuration reduces the number of vehicle conflicts and alters their angle to help reduce the severity of crashes that might still occur.

Safety Impact of Potential Alternatives and Countermeasures

While the suggested countermeasures are proven safety treatments that have been shown in prior research to reduce traffic crashes, not all treatments may be feasible or cost-effective at this location based upon further study. Therefore, it is important to consider several combinations of the evaluated treatments that may be selected for implementation. **Table 10** summarizes the estimated impacts on expected annual crash frequencies for various safety treatment combinations.

Table 10. Annual Safety Impact of Proposed Safety Countermeasures

Safety Countermeasure Combination	Combined CMFs		Expected Crashes without Treatment		Expected Crashes with Treatment		Annual Reduction	
	FI	PDO	FI	PDO	FI	PDO	FI	PDO
Convert the existing intersection to an all-way stop-controlled intersection	0.230	0.320	4.200	4.400	0.966	1.408	3.234	2.992
Convert the existing intersection to a modern single-lane roundabout.	0.130	0.290	4.200	4.400	0.546	1.276	3.654	3.124

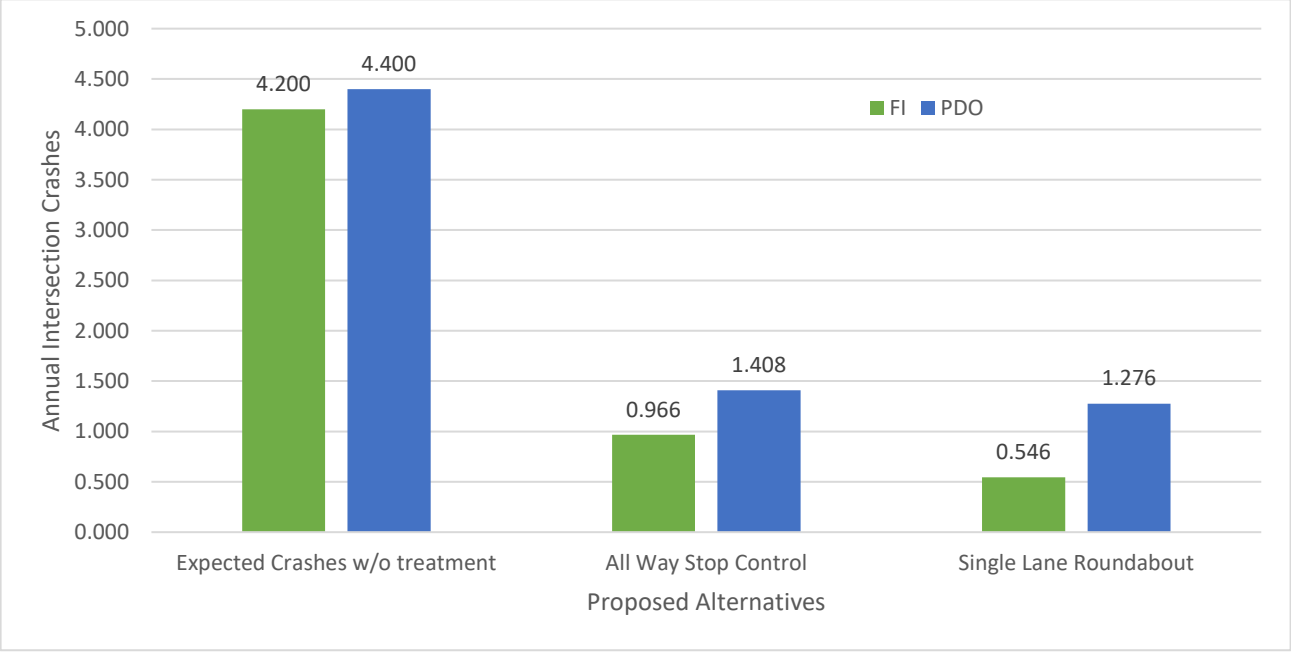


Figure 11. Annual Safety Impact of Proposed Alternatives and Countermeasures

All potential scenarios represent an improvement over the existing condition. However, the implementation of a single-lane roundabout offers noticeably improved safety performance over the other alternatives.

Additional operational analysis is required to determine the operational performance of these alternatives when compared to one another.

Operational Impact of Potential Alternatives and Countermeasures

Table 11 provides a summary of the operational impacts among the potential alternatives. Of these alternatives, the single lane roundabout was evaluated to produce the highest amount of operational improvement at the study intersection.

Table 11. Year 2042 Operational Analysis Results

Alternative	Conflict Points	Peak Period	Delay (LOS)					Max V/C Ratio
			EB	WB	NB	SB	Overall	
Existing Intersection	32	AM	0.1 (-)	0.8 (-)	>999 (F)	>999 (F)	>999 (F)*	>1.00
		PM	0.2 (-)	0.2 (-)	>999 (F)	>999 (F)	>999 (F)*	>1.00
AWSC Intersection	32	AM	291.8 (F)	245.6 (F)	35.9 (E)	24.0 (C)	208.8 (F)	>1.00
		PM	263.4 (F)	285.3 (F)	18.8 (C)	28.6 (D)	223.2 (F)	>1.00
Single Lane Roundabout	8	AM	17.5 (C)	20.6 (C)	22.1 (C)	11.0 (B)	18.8 (C)	0.78
		PM	19.1 (C)	13.1 (B)	11.5 (B)	11.7 (B)	15.1 (C)	0.78

**The HCM states the following for intersection LOS: (a) major-street through vehicles are assumed to experience zero delay; (b) the disproportionate number of major-street through vehicles at a typical TWSC intersection skews the weighted average of all movements, resulting in a very low overall average delay for all vehicles; and (c) the resulting low delay can mask LOS deficiencies for minor movements. Therefore, the critical movement was reported as the overall LOS and delay for TWSC scenarios.*

BENEFIT/COST ANALYSIS

Alternatives — Single Lane Roundabout

Benefits

- Eliminates conflict points associated with angle collisions
- Incorporates Pedestrian Safety
- Improved Traffic Operations
- Slows mainline speeds at the intersection

Concerns

- Potential Historic properties in the Northeast and Southeast quadrants
- Likely to displace business in the Northwest quadrant

Estimated Cost

PE	*$700,000.00*
UTL	*$150,000.00*
ROW	*$400,000.00*
CST	*$2,000,000.00*
Total	$3,250,000.00

Estimated Safety Benefit Cost

FHWA crash modification factors suggest converting the intersection from a TWSC to a single lane roundabout is expected to result in an 87% (ID:230) reduction in injury crashes and a 71% (ID:233) reduction in PDO crashes for all crash types.

Safety B/C = *13.62*

All Way Stop Control

Benefits

- Slows mainline speeds at the intersection
- Inexpensive

Concerns

- Maintains maneuvers with a documented injury angle crash pattern
- Operates at a LOS F during the design year

Estimated Cost

PE	*$10,000.00*
UTL	*$0.00*
ROW	*$0.00*
CST	*$50,000.00*
Total	**$60,000.00**

Estimated Safety Benefit Cost

FHWA crash modification factors suggest converting the intersection from a TWSC to an AWSC is expected to result in an 77% (ID:3128) reduction in injury crashes and a 48% (ID:315) reduction in PDO crashes for all crash types.

Safety B/C = *97.08*

CONCLUSION

The previous sections of this report demonstrate that the proposed alternatives and countermeasures will improve operations compared to the no-build condition, and have been proven in prior research to improve traffic safety. Therefore, GDOT should consider the recommended safety countermeasures and treatments presented in **Table 12** for implementation.

Table 12. Suggested Safety Countermeasures for SR 53 at Malcom Bridge Road/Rays Church Road Study Intersection

No.	Countermeasure	Approximate Implementation Timeline	Safety Issue Addressed
1	Install W4-4p (Cross Traffic Does Not Stop) signs below the stop signs on the Malcom Bridge Road and Rays Church Road approaches.	Short	2
2	Convert the existing intersection to a modern single-lane roundabout.	Long	1, 2

RECOMMENDATIONS

Based on the information presented in this report, the Atkins team proposes both short-term and long-term improvements to the SR 53 Malcom Bridge Road/Rays Church Road intersection. The short-term improvements include installing W4-4p (Cross Traffic Does Not Stop) signs below the existing stop signs. The long-term improvement is to convert the intersection into a modern single lane roundabout. A roundabout decreases the number of conflict points and helps provide a decrease in vehicular speeds. Therefore, a reduction in both severity and frequency of crashes at the intersection is expected. Since the roundabout can immediately address all the safety issues listed at the intersection and provide operational benefits as well, the Atkins team recommends that the Department move forward with a project to convert the intersection into a modern single-lane roundabout when resources become available. A conceptual layout of the proposed roundabout is provided in **Appendix O.**

RECOMMENDED BY: Travis Brewer **DATE** 2/21/2020

Travis Brewer, PE
Atkins Project Manager

RECOMMENDED BY: _____ **DATE** _____

Samuel Harris, PE
State Safety Engineer

RECOMMENDED BY: _____ **DATE** _____

Jason Dykes, PE
District Traffic Engineer

APPENDICES

Appendix A: Safety Risk Matrix Background

Appendix B: Planning Level Capacity Analysis

Appendix C: Collision Diagram

Appendix D: Turning Movement Count Summary

Appendix E: Existing Conditions Analysis – Synchro Reports

Appendix F: Roundabout Analysis (Build & Design Years) – GDOT Tool (v4.1)

Appendix G: Roundabout Analysis (Build & Design Years) – SIDRA 7

Appendix H: Traffic Signal Warrant Analyses

Appendix I: Projected Turning Movement Diagrams

Appendix J: Intersection Control Evaluation (ICE)

Appendix K: Right-Of-Way Information

Appendix L: Environmental Screening

Appendix M: Utility Risks

Appendix N: Important Documents/Other Risks

Appendix O: Proposed Conceptual Layout

Appendix A: Safety Risk Matrix Background

Crash Frequency

Estimated		Expected Crash Frequency (from HSM analysis)	Frequency Rating
Exposure	**Probability**		
High	High	10 or more crashes per year	Frequent
Medium	High		
High	Medium	1 to 9 crashes per year	Occasional
Medium	Medium		
High	Low	Less than 1 crash per year, but more than 1 crash every five years	Infrequent
Low	Medium		
Medium	Low	Less than 1 crash every five years	Rare
Low	Low		

Crash Severity

Types of crashes	Expected crash severity	Severity rating
Crashes involving high speeds or heavy vehicles, pedestrians, bicycles or motorcycles	Probable fatality or incapacitating injury	Extreme
Crashes involving medium to high speeds; lane departure, angle, or left-turn crashes	Moderate to severe injury	High
Crashes involving low to medium speeds angle or left-turn crashes or high speeds and rear end or side-swipe crashes	Minor to moderate injury	Moderate
Crashes involving low to medium speeds; rear end or sideswipe crashes	Property damage only or minor injury	Low

Safety Risk Matrix

Frequency Rating	Severity Rating			
	Low	Moderate	High	Extreme
Frequent	C	D	E	F
Occasional	B	C	D	E
Infrequent	A	B	C	D
Rare	A	A	B	C

Appendix B: Planning Level Capacity Analysis

GDOT's design policy manual states that the ideal capacity of a two-lane roadway is 1,700 vehicles per hour (vph) in each direction and 2,000 vph per lane for a multi-lane highway. The manual also states that two lane roadways are generally acceptable only if the design hour volume (DHV) is less than 800 vph in either direction. For the purposes of a "planning level capacity analysis," for two lane roadways, the acceptable DHV of 800 needs to be converted to an acceptable daily volume and compared with GDOT's average AADT counts to determine potential capacity issues. As the 800 vph is in either direction, it represents the directional design hour volume (DDHV). The calculation for DDHV using AADT is as follows:

DDHV = AADT * K * D where:
K = proportion of the AADT that occurs during the design hour
D = proportion of the DHV that occurs in the heavier direction of travel

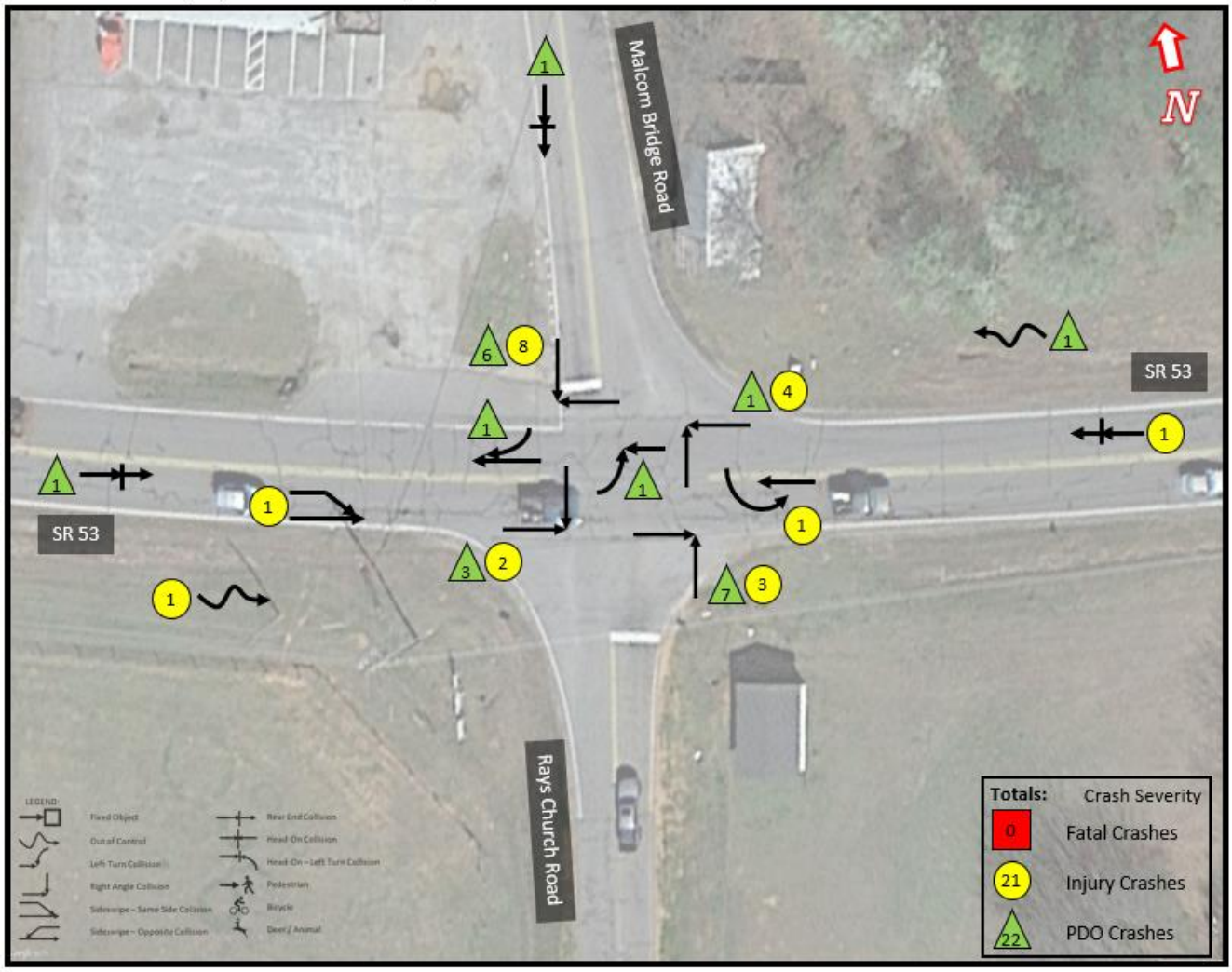
Since the DDHV is known (800 vph), assuming a K and D value allows for the calculation of a target daily volume or AADT in the above formula. Reasonable assumptions for K and D were made where K was assumed to be 0.10 (or 10%) and D was assumed to be 0.60 (or 60%). Using those in conjunction with GDOT's acceptable DDHV, the acceptable daily volume for a two-lane road is computed as follows:

Two lane acceptable daily volume = 800 / (0.10 * 0.60) = 13,333 (13,300 rounded).

Appendix C: Collision Diagrams

Collision Diagram

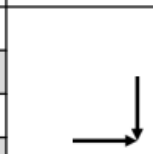
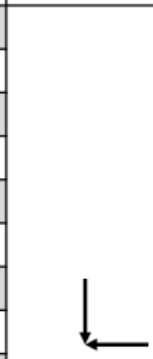
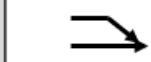
COUNTY: Oconee
LOCATION: Intersection of SR 53 @ Malcom Bridge Road/Rays Church Road
PERIOD: 07/01/2014 TO 07/01/2019



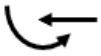
COUNTY: Oconee
LOCATION: Intersection of SR 53 @ Malcom Bridge Road/Rays Church Road
PERIOD: 07/01/2014 TO 07/01/2019

No.	Crash Type	Date	Day	Time	PDO	A	B	C	F	Light Cond.	Surface	Accident No.
1		1/10/2018	Wed	21:52:00	0	0	1	0	0	Night	Wet	6549557
2		10/5/2018	Fri	16:01:00	1	0	0	0	0	Day	Dry	6902617
3		3/28/2015	Sat	17:58:00	1	0	0	0	0	Day	Dry	5251865
4		8/22/2015	Sat	11:10:00	1	0	0	0	0	Day	Dry	5453391
5		3/25/2016	Fri	16:38:00	0	0	0	1	0	Day	Dry	5730638
6		10/7/2016	Fri	9:15:00	1	0	0	0	0	Day	Dry	5953381
7		1/4/2017	Wed	8:00:00	0	0	1	0	0	Day	Dry	6067014
8		4/27/2017	Thu	7:52:00	1	0	0	0	0	Day	Dry	6317808
9		6/8/2017	Thu	18:44:00	1	0	0	0	0	Day	Dry	6270381
10		6/23/2017	Fri	16:40:00	1	0	0	0	0	Day	Dry	6286546
11		7/9/2018	Mon	20:59:00	0	0	1	0	0	Night	Dry	6786036
12		10/26/2018	Fri	15:55:00	1	0	0	0	0	Day	Wet	6935080
13		1/3/2019	Thu	11:14:00	1	0	0	0	0	Day	Wet	7027181
14		4/1/2016	Fri	8:41:00	0	0	1	0	0	Dawn	Wet	5767342
15		5/15/2016	Sun	15:10:00	0	0	1	0	0	Day	Dry	5760375
16		12/28/2017	Thu	12:15:00	0	0	1	0	0	Day	Dry	6534043
17		2/9/2018	Fri	8:05:00	0	1	0	0	0	Day	Dry	6585806
18		2/6/2019	Wed	14:16:00	1	0	0	0	0	Day	Dry	7074767

COUNTY: Oconee
LOCATION: Intersection of SR 53 @ Malcom Bridge Road/Rays Church Road
PERIOD: 07/01/2014 TO 07/01/2019

No.	Crash Type	Date	Day	Time	PDO	A	B	C	F	Light Cond.	Surface	Accident No.
19		5/23/2015	Sat	16:33:00	1	0	0	0	0	Day	Dry	5304770
20		7/5/2016	Tue	20:16:00	0	0	1	0	0	Dusk	Dry	5830988
21		3/20/2017	Mon	17:45:00	1	0	0	0	0	Day	Dry	6244803
22		11/17/2017	Fri	15:14:00	0	0	1	0	0	Day	Dry	6478039
23		2/21/2018	Wed	8:06:00	1	0	0	0	0	Day	Dry	6675252
24		4/20/2015	Mon	18:04:00	1	0	0	0	0	Day	Dry	5298912
25		4/28/2015	Tue	17:30:00	1	0	0	0	0	Day	Dry	5272514
26		9/12/2015	Sat	11:26:00	1	0	0	0	0	Day	Dry	5480102
27		7/11/2016	Mon	0:00:00	1	0	0	0	0	Day	Dry	5891018
28		1/5/2017	Thu	19:27:00	1	0	0	0	0	Night	Dry	6161506
29		1/16/2017	Mon	8:55:00	0	1	0	0	0	Day	Dry	6088166
30		9/8/2017	Fri	16:23:00	0	0	1	0	0	Day	Dry	6520813
31		4/12/2018	Thu	16:27:00	0	0	1	0	0	Day	Dry	6715107
32		6/23/2018	Sat	12:38:00	0	0	0	1	0	Day	Dry	6770596
33		1/5/2019	Sat	21:11:00	0	0	1	0	0	Night	Dry	7032566
34		1/10/2019	Thu	9:22:00	0	0	1	0	0	Day	Dry	7037840
35		2/19/2019	Tue	16:45:00	0	1	0	0	0	Day	Wet	7098046
36		4/6/2019	Sat	14:20:00	1	0	0	0	0	Day	Dry	7154638
37		4/17/2019	Wed	17:48:00	0	0	1	0	0	Day	Dry	7187866
38		6/5/2015	Fri	8:31:00	0	0	1	0	0	Day	Dry	5316541

COUNTY: Oconee
LOCATION: Intersection of SR 53 @ Malcom Bridge Road/Rays Church Road
PERIOD: 07/01/2014 TO 07/01/2019

No.	Crash Type	Date	Day	Time	PDO	A	B	C	F	Light Cond.	Surface	Accident No.
39		8/24/2017	Thu	8:16:00	1	0	0	0	0	Day	Dry	6518853
40		11/6/2018	Tue	11:58:00	0	0	0	1	0	Day	Dry	7060530
41		3/23/2017	Thu	17:57:00	1	0	0	0	0	Day	Dry	6164126
42		9/23/2014	Tue	15:53:00	1	0	0	0	0	Day	Dry	4993442
43		9/26/2017	Tue	8:59:00	0	0	1	0	0	Day	Dry	6406472

Appendix D: Turning Movement Count Summary

INTERSECTION : SR 53 @ Malcolm Bridge Rd — PROJECT : SR 53 @ Malcolm Bridge Rd

DATE COUNT : Wednesday, August 28, 2019 — JOB NO. :

CONDITION : — COMP.BY : Atkins

TIME INTERVAL	SR 53 EASTBOUND					SR 53 WESTBOUND					Rays Church Rd NORTHBOUND					Malcolm Bridge Rd SOUTHBOUND					
	U	L	T	R	TOTAL	U	L	T	R	TOTAL	U	L	T	R	TOTAL	U	L	T	R	TOTAL	TOTALS
7:00 AM - 7:15 AM	0	0	59	5	64	0	0	74	10	84	0	3	11	1	15	0	7	11	0	18	181
7:15 AM - 7:30 AM	0	2	83	2	87	0	3	68	11	82	0	5	17	0	22	0	9	11	1	21	212
7:30 AM - 7:45 AM	0	0	119	1	120	0	2	75	11	88	0	5	41	5	51	0	17	7	0	24	283
7:45 AM - 8:00 AM	0	1	110	4	115	0	5	73	9	87	0	4	24	3	31	0	17	12	0	29	262
8:00 AM - 8:15 AM	0	2	104	10	116	0	19	78	13	110	0	2	22	6	30	0	9	15	0	24	280
8:15 AM - 8:30 AM	0	0	72	7	79	0	2	55	8	65	0	2	18	12	32	0	18	7	0	25	201
8:30 AM - 8:45 AM	0	1	65	2	68	0	2	58	10	70	0	2	14	7	23	0	12	4	0	16	177
8:45 AM - 9:00 AM	0	0	80	1	81	0	3	38	12	53	0	3	11	3	17	0	10	10	2	22	173
9:00 AM - 9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM - 9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM - 9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM - 10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM - 10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM - 10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM - 10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM - 11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM - 11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM - 11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM - 11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM - 12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM - 12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM - 12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM - 12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM - 1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM - 1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM - 1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM - 1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM - 2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM - 2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM - 2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM - 2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM - 3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM - 3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM - 3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM - 3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM - 4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM - 4:15 PM	0	3	81	1	85	0	3	66	12	81	0	3	18	5	26	0	9	17	0	26	218
4:15 PM - 4:30 PM	0	0	83	1	84	0	8	80	17	105	0	3	13	4	20	0	8	11	1	20	229
4:30 PM - 4:45 PM	0	0	74	6	80	0	8	79	17	104	0	6	8	7	21	0	10	19	1	30	235
4:45 PM - 5:00 PM	0	1	83	3	87	0	2	74	13	89	0	5	20	6	31	0	17	17	0	34	241
5:00 PM - 5:15 PM	0	0	97	3	100	0	2	81	13	96	0	4	9	1	14	0	17	15	0	32	242
5:15 PM - 5:30 PM	0	4	108	4	116	0	2	103	25	130	0	1	13	1	15	0	24	22	0	46	307
5:30 PM - 5:45 PM	0	4	104	3	111	0	3	105	23	131	0	0	6	5	11	0	21	13	2	36	289
5:45 PM - 6:00 PM	0	1	124	0	125	0	3	92	20	115	0	4	13	3	20	0	23	13	0	36	296
6:00 PM - 6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM - 6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM - 6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM - 7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	19	1446	53	1518	0	67	1199	224	1490	0	52	258	69	379	0	228	204	7	439	3826
GRAND TOTAL	0	19	1446	53	1518	0	67	1199	224	1490	0	52	258	69	379	0	228	204	7	439	3826

AM PEAK HOUR 7:15 AM TO 8:15 AM

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
TURN VOLUME	0	5	416	17	0	29	294	44	0	16	104	14	0	52	45	1
APPROACH TOTAL	438				367				134				98			
PEAK HOUR FAC.		0.91				0.83				0.66				0.84		

MID-DAY PEAK HOUR 11:00 AM TO 12:00 PM

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
TURN VOLUME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APPROACH TOTAL	0				0				0				0			
PEAK HOUR FAC.		0.00				0.00				0.00				0.00		

PM PEAK HOUR 5:00 PM TO 6:00 PM

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
TURN VOLUME	0	9	433	10	0	10	381	81	0	9	41	10	0	85	63	2
APPROACH TOTAL	452				472				60				150			
PEAK HOUR FAC.		0.90				0.90				0.75				0.82		

INTERSECTION : CONTROL — UNSIGNALIZED ☐ SIGNALIZED ☐ ACTUATED ☐ PRETIMED ☐ SEMI-ACTUATED

Appendix E: Existing Conditions Analysis – Synchro Reports

2019 AM

HCM 2010 TWSC

1: Rays Church Rd/Malcolm Bridge Rd & Hog Mountain Rd 12/03/2019

Intersection	
Int Delay, s/veh	20.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	416	17	29	294	44	16	104	14	52	45	1
Future Vol, veh/h	5	416	17	29	294	44	16	104	14	52	45	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	83	83	83	66	66	66	84	84	84
Heavy Vehicles, %	8	8	8	11	11	11	4	4	4	9	9	9
Mvmt Flow	5	457	19	35	354	53	24	158	21	62	54	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	407	0	0	476	0	0	955	954	467	1017	937	381
Stage 1	-	-	-	-	-	-	477	477	-	451	451	-
Stage 2	-	-	-	-	-	-	478	477	-	566	486	-
Critical Hdwy	4.18	-	-	4.21	-	-	7.14	6.54	6.24	7.19	6.59	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.19	5.59	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.19	5.59	-
Follow-up Hdwy	2.272	-	-	2.299	-	-	3.536	4.036	3.336	3.581	4.081	3.381
Pot Cap-1 Maneuver	1120	-	-	1041	-	-	236	257	592	210	258	651
Stage 1	-	-	-	-	-	-	565	553	-	575	559	-
Stage 2	-	-	-	-	-	-	565	553	-	497	539	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1120	-	-	1041	-	-	189	244	592	94	245	651
Mov Cap-2 Maneuver	-	-	-	-	-	-	189	244	-	94	245	-
Stage 1	-	-	-	-	-	-	562	550	-	572	534	-
Stage 2	-	-	-	-	-	-	485	529	-	340	536	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.7	60.4	111.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	251	1120	-	-	1041	-	-	133
HCM Lane V/C Ratio	0.809	0.005	-	-	0.034	-	-	0.877
HCM Control Delay (s)	60.4	8.2	0	-	8.6	0	-	111.4
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	6.2	0	-	-	0.1	-	-	5.7

SR 53 at Malcolm Bridge Rd 09/26/2019 Baseline
JRA

Synchro 10 Report
Page 1

2019 PM

HCM 2010 TWSC

1: Rays Church Rd/Malcolm Bridge Rd & Hog Mountain Rd 12/03/2019

Intersection	
Int Delay, s/veh	16.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	433	10	10	381	81	9	41	10	85	63	2
Future Vol, veh/h	9	433	10	10	381	81	9	41	10	85	63	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	75	75	75	82	82	82
Heavy Vehicles, %	2	2	2	4	4	4	0	0	0	1	1	1
Mvmt Flow	10	481	11	11	423	90	12	55	13	104	77	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	513	0	0	492	0	0	1037	1042	487	1031	1002	468
Stage 1	-	-	-	-	-	-	507	507	-	490	490	-
Stage 2	-	-	-	-	-	-	530	535	-	541	512	-
Critical Hdwy	4.12	-	-	4.14	-	-	7.1	6.5	6.2	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Follow-up Hdwy	2.218	-	-	2.236	-	-	3.5	4	3.3	3.509	4.009	3.309
Pot Cap-1 Maneuver	1052	-	-	1061	-	-	211	232	585	212	243	597
Stage 1	-	-	-	-	-	-	552	543	-	562	550	-
Stage 2	-	-	-	-	-	-	536	527	-	527	538	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1052	-	-	1061	-	-	154	226	585	165	236	597
Mov Cap-2 Maneuver	-	-	-	-	-	-	154	226	-	165	236	-
Stage 1	-	-	-	-	-	-	545	536	-	555	542	-
Stage 2	-	-	-	-	-	-	451	519	-	456	531	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	28.2	105
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	234	1052	-	-	1061	-	-	191
HCM Lane V/C Ratio	0.342	0.01	-	-	0.01	-	-	0.958
HCM Control Delay (s)	28.2	8.5	0	-	8.4	0	-	105
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	1.4	0	-	-	0	-	-	7.8

2022 AM

HCM 2010 TWSC

1: Rays Church Rd/Malcolm Bridge Rd & Hog Mountain Rd 12/03/2019

Intersection	
Int Delay, s/veh	33.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	440	20	30	310	45	15	110	15	55	45	1
Future Vol, veh/h	5	440	20	30	310	45	15	110	15	55	45	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	83	83	83	66	66	66	84	84	84
Heavy Vehicles, %	8	8	8	11	11	11	4	4	4	9	9	9
Mvmt Flow	5	484	22	36	373	54	23	167	23	65	54	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	427	0	0	506	0	0	1005	1004	495	1072	988	400
Stage 1	-	-	-	-	-	-	505	505	-	472	472	-
Stage 2	-	-	-	-	-	-	500	499	-	600	516	-
Critical Hdwy	4.18	-	-	4.21	-	-	7.14	6.54	6.24	7.19	6.59	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.19	5.59	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.19	5.59	-
Follow-up Hdwy	2.272	-	-	2.299	-	-	3.536	4.036	3.336	3.581	4.081	3.381
Pot Cap-1 Maneuver	1101	-	-	1014	-	-	218	240	571	192	240	635
Stage 1	-	-	-	-	-	-	546	537	-	560	547	-
Stage 2	-	-	-	-	-	-	549	540	-	476	523	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1101	-	-	1014	-	-	171	227	571	71	227	635
Mov Cap-2 Maneuver	-	-	-	-	-	-	171	227	-	71	227	-
Stage 1	-	-	-	-	-	-	543	534	-	557	521	-
Stage 2	-	-	-	-	-	-	469	515	-	313	520	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.7	81.3	213.5
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	234	1101	-	-	1014	-	-	104
HCM Lane V/C Ratio	0.907	0.005	-	-	0.036	-	-	1.156
HCM Control Delay (s)	81.3	8.3	0	-	8.7	0	-	213.5
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	7.7	0	-	-	0.1	-	-	7.8

2022 PM

HCM 2010 TWSC

1: Rays Church Rd/Malcolm Bridge Rd & Hog Mountain Rd 12/03/2019

Intersection	
Int Delay, s/veh	25.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	10	460	10	10	405	85	10	45	10	90	65	1
Future Vol, veh/h	10	460	10	10	405	85	10	45	10	90	65	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	75	75	75	82	82	82
Heavy Vehicles, %	2	2	2	4	4	4	0	0	0	1	1	1
Mvmt Flow	11	511	11	11	450	94	13	60	13	110	79	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	544	0	0	522	0	0	1098	1105	517	1094	1063	497
Stage 1	-	-	-	-	-	-	539	539	-	519	519	-
Stage 2	-	-	-	-	-	-	559	566	-	575	544	-
Critical Hdwy	4.12	-	-	4.14	-	-	7.1	6.5	6.2	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Follow-up Hdwy	2.218	-	-	2.236	-	-	3.5	4	3.3	3.509	4.009	3.309
Pot Cap-1 Maneuver	1025	-	-	1034	-	-	192	213	562	192	224	575
Stage 1	-	-	-	-	-	-	530	525	-	542	534	-
Stage 2	-	-	-	-	-	-	517	511	-	505	521	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1025	-	-	1034	-	-	134	207	562	142	217	575
Mov Cap-2 Maneuver	-	-	-	-	-	-	134	207	-	142	217	-
Stage 1	-	-	-	-	-	-	522	517	-	534	526	-
Stage 2	-	-	-	-	-	-	432	503	-	429	513	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	33.7	167.6
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	210	1025	-	-	1034	-	-	167
HCM Lane V/C Ratio	0.413	0.011	-	-	0.011	-	-	1.139
HCM Control Delay (s)	33.7	8.6	0	-	8.5	0	-	167.6
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	1.9	0	-	-	0	-	-	10

2042 AM

HCM 2010 TWSC

1: Rays Church Rd/Malcolm Bridge Rd & Hog Mountain Rd 12/03/2019

Intersection	
Int Delay, s/veh	202.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	655	25	45	465	70	25	165	20	80	70	1
Future Vol, veh/h	5	655	25	45	465	70	25	165	20	80	70	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	83	83	83	66	66	66	84	84	84
Heavy Vehicles, %	8	8	8	11	11	11	4	4	4	9	9	9
Mvmt Flow	5	720	27	54	560	84	38	250	30	95	83	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	644	0	0	747	0	0	1496	1496	734	1594	1467	602
Stage 1	-	-	-	-	-	-	744	744	-	710	710	-
Stage 2	-	-	-	-	-	-	752	752	-	884	757	-
Critical Hdwy	4.18	-	-	4.21	-	-	7.14	6.54	6.24	7.19	6.59	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.19	5.59	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.19	5.59	-
Follow-up Hdwy	2.272	-	-	2.299	-	-	3.536	4.036	3.336	3.581	4.081	3.381
Pot Cap-1 Maneuver	913	-	-	822	-	-	100	~ 121	417	~ 83	123	487
Stage 1	-	-	-	-	-	-	403	419	-	414	426	-
Stage 2	-	-	-	-	-	-	399	415	-	331	406	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	913	-	-	822	-	-	~ 34	~ 107	417	-	109	487
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 34	~ 107	-	-	109	-
Stage 1	-	-	-	-	-	-	399	415	-	410	382	-
Stage 2	-	-	-	-	-	-	279	372	-	121	402	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.8	$ 1239.2	
HCM LOS			F	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	90	913	-	-	822	-	-	-
HCM Lane V/C Ratio	3.535	0.006	-	-	0.066	-	-	-
HCM Control Delay (s)	$ 1239.2	9	0	-	9.7	0	-	-
HCM Lane LOS	F	A	A	-	A	A	-	-
HCM 95th %tile Q(veh)	32.2	0	-	-	0.2	-	-	-

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

2042 PM

HCM 2010 TWSC

1: Rays Church Rd/Malcolm Bridge Rd & Hog Mountain Rd 12/03/2019

Intersection	
Int Delay, s/veh	771.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	680	15	15	600	125	15	65	15	135	100	5
Future Vol, veh/h	15	680	15	15	600	125	15	65	15	135	100	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	75	75	75	82	82	82
Heavy Vehicles, %	2	2	2	4	4	4	0	0	0	1	1	1
Mvmt Flow	17	756	17	17	667	139	20	87	20	165	122	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	806	0	0	773	0	0	1634	1639	765	1623	1578	737
Stage 1	-	-	-	-	-	-	799	799	-	771	771	-
Stage 2	-	-	-	-	-	-	835	840	-	852	807	-
Critical Hdwy	4.12	-	-	4.14	-	-	7.1	6.5	6.2	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Follow-up Hdwy	2.218	-	-	2.236	-	-	3.5	4	3.3	3.509	4.009	3.309
Pot Cap-1 Maneuver	819	-	-	833	-	-	82	101	406	~ 83	~ 110	420
Stage 1	-	-	-	-	-	-	382	401	-	394	411	-
Stage 2	-	-	-	-	-	-	365	384	-	356	396	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	819	-	-	833	-	-	-	94	406	~ 15	~ 102	420
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	94	-	~ 15	~ 102	-
Stage 1	-	-	-	-	-	-	368	387	-	380	395	-
Stage 2	-	-	-	-	-	-	239	369	-	253	382	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2		$ 5351.2
HCM LOS			-	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	819	-	-	833	-	-	24
HCM Lane V/C Ratio	-	0.02	-	-	0.02	-	-	12.195
HCM Control Delay (s)	-	9.5	0	-	9.4	0	-	$ 5351.2
HCM Lane LOS	-	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	-	0.1	-	-	0.1	-	-	36.6

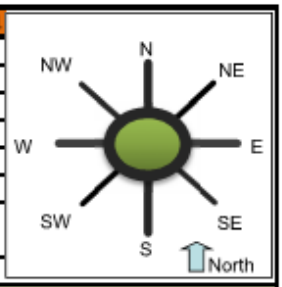
Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Appendix F: Roundabout Analysis (Build & Design Years) – GDOT Tool (v4.1)

Roundabout Analysis Tool
Single Lane

11/18/2019
Version 4.1

General & Site Information	v 4.1
Analyst:	JRA
Agency/Co:	Atkins
Date:	9/27/2019
Project or PI#:	N/A
Year, Peak Hour:	Future 2022 AM Peak
County/District:	Oconee
Intersection Name:	SR 53 @ Malcolm Bridge Rd



Volumes		Entry Legs (FROM) N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
	N (1), vph			45		110		5	
Exit	NE (2), vph								
Legs	E (3), vph	55				15		440	
(TO)	SE (4), vph								
	S (5), vph	45		30				20	
	SW (6), vph								
	W (7), vph	1		310		15			
	NW (8), vph								
Output	Total Vehicles	101	0	385	0	140	0	465	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	91.0%	100.0%	89.0%	100.0%	96.0%	100.0%	92.0%	100.0%
% Heavy Vehicles	9.0%	0.0%	11.0%	0.0%	4.0%	0.0%	8.0%	0.0%
% Bicycle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.84*	*0.95*	*0.83*	*0.95*	*0.66*	*0.95*	*0.91*	*0.95*
F_{HV}	0.917	1.000	0.901	1.000	0.962	1.000	0.926	1.000
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	60	0	173	0	6	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	71	0	0	0	24	0	522	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	58	0	40	0	0	0	24	0
SW (6), pcu/h	0	0	0	0	0	0	0	0
W (7), pcu/h	1	0	415	0	24	0	0	0
NW (8), pcu/h	0	0	0	0	0	0	0	0
Entry flow, pcu/h	131	0	515	0	221	0	552	0
Conflicting flow, pcu/h	478	0	203	0	600	0	170	0

Results: Approach Measures of Effectiveness								
HCM 6th Edition	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	777	NA	1011	NA	720	NA	1074	NA
Entry Flow Rates, vph	120	NA	464	NA	212	NA	511	NA
V/C ratio	**0.15**		**0.46**		**0.29**		**0.48**	
Control Delay, sec/pcu	**6**		**9**		**9**		**9**	
LOS	A		A		A		A	
95th % Queue (ft)	**15**		**68**		**32**		**71**	

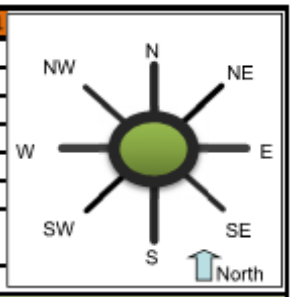
Notes: v 4.0

Georgia Department of Transportation
Office of Traffic Operations

Roundabout Analysis Tool
Single Lane

11/18/2019
Version 4.1

General & Site Information	v 4.1
Analyst:	JRA
Agency/Co:	Atkins
Date:	9/27/2019
Project or PI#:	N/A
Year, Peak Hour:	Future 2022 PM Peak
County/District:	Oconee
Intersection Name:	SR 53 @ Malcolm Bridge Rd



Volumes		Entry Legs (FROM) N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
	N (1), vph			85		45		10	
Exit	NE (2), vph								
Legs	E (3), vph	90				10		460	
(TO)	SE (4), vph								
	S (5), vph	65		10				10	
	SW (6), vph								
	W (7), vph	1		405		10			
	NW (8), vph								
Output	Total Vehicles	156	0	500	0	65	0	480	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	99.0%	100.0%	96.0%	100.0%	100.0%	100.0%	98.0%	100.0%
% Heavy Vehicles	1.0%	0.0%	4.0%	0.0%	0.0%	0.0%	2.0%	0.0%
% Bicycle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.82*	*0.95*	*0.90*	*0.95*	*0.75*	*0.95*	*0.90*	*0.95*
F_{HV}	0.990	1.000	0.962	1.000	1.000	1.000	0.980	1.000
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	98	0	60	0	11	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	111	0	0	0	13	0	521	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	80	0	12	0	0	0	11	0
SW (6), pcu/h	0	0	0	0	0	0	0	0
W (7), pcu/h	1	0	468	0	13	0	0	0
NW (8), pcu/h	0	0	0	0	0	0	0	0
Entry flow, pcu/h	192	0	578	0	87	0	544	0
Conflicting flow, pcu/h	493	0	85	0	644	0	202	0

Results: Approach Measures of Effectiveness								
HCM 6th Edition	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	826	NA	1217	NA	716	NA	1100	NA
Entry Flow Rates, vph	190	NA	556	NA	87	NA	533	NA
V/C ratio	**0.23**		**0.46**		**0.12**		**0.48**	
Control Delay, sec/pcu	**7**		**8**		**6**		**9**	
LOS	A		A		A		A	
95th % Queue (ft)	**22**		**64**		**10**		**69**	

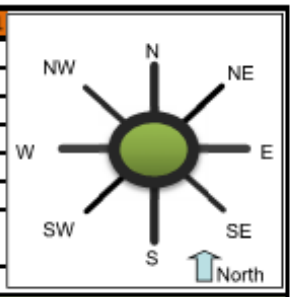
Notes: v 4.0

Georgia Department of Transportation
Office of Traffic Operations

Roundabout Analysis Tool
Single Lane

11/18/2019
Version 4.1

General & Site Information	v 4.1
Analyst:	JRA
Agency/Co:	Atkins
Date:	9/27/2019
Project or PI#:	N/A
Year, Peak Hour:	Future 2042 AM Peak
County/District:	Oconee
Intersection Name:	SR 53 @ Malcolm Bridge Rd



Volumes		Entry Legs (FROM) N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
	N (1), vph			70		165		5	
Exit	NE (2), vph								
Legs	E (3), vph	80				20		655	
(TO)	SE (4), vph								
	S (5), vph	70		45				25	
	SW (6), vph								
	W (7), vph	1		465		25			
	NW (8), vph								
Output	Total Vehicles	151	0	580	0	210	0	685	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	91.0%	100.0%	89.0%	100.0%	96.0%	100.0%	92.0%	100.0%
% Heavy Vehicles	9.0%	0.0%	11.0%	0.0%	4.0%	0.0%	8.0%	0.0%
% Bicycle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.84*	*0.95*	*0.83*	*0.95*	*0.66*	*0.95*	*0.91*	*0.95*
F_{HV}	0.917	1.000	0.901	1.000	0.962	1.000	0.926	1.000
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	94	0	260	0	6	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	104	0	0	0	32	0	777	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	91	0	60	0	0	0	30	0
SW (6), pcu/h	0	0	0	0	0	0	0	0
W (7), pcu/h	1	0	622	0	39	0	0	0
NW (8), pcu/h	0	0	0	0	0	0	0	0
Entry flow, pcu/h	196	0	776	0	331	0	813	0
Conflicting flow, pcu/h	721	0	305	0	887	0	255	0

Results: Approach Measures of Effectiveness								
HCM 6th Edition	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	607	NA	911	NA	537	NA	985	NA
Entry Flow Rates, vph	180	NA	699	NA	318	NA	753	NA
V/C ratio	**0.30**		**0.77**		**0.59**		**0.76**	
Control Delay, sec/pcu	**10**		**20**		**19**		**18**	
LOS	A		C		C		C	
95th % Queue (ft)	**34**		**213**		**100**		**207**	

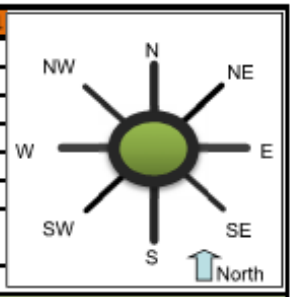
Notes: v 4.0

Georgia Department of Transportation
Office of Traffic Operations

Roundabout Analysis Tool
Single Lane

11/18/2019
Version 4.1

General & Site Information		v 4.1
Analyst:	JRA	
Agency/Co:	Atkins	
Date:	9/27/2019	
Project or PI#:	N/A	
Year, Peak Hour:	Future 2042 PM Peak	
County/District:	Oconee	
Intersection Name:	SR 53 @ Malcolm Bridge Rd	



Volumes		Entry Legs (FROM) N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
	N (1), vph			125		65		15	
Exit	NE (2), vph								
Legs	E (3), vph	135				15		680	
(TO)	SE (4), vph								
	S (5), vph	100		15				15	
	SW (6), vph								
	W (7), vph	5		600		15			
	NW (8), vph								
Output	Total Vehicles	240	0	740	0	95	0	710	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	99.0%	100.0%	96.0%	100.0%	100.0%	100.0%	98.0%	100.0%
% Heavy Vehicles	1.0%	0.0%	4.0%	0.0%	0.0%	0.0%	2.0%	0.0%
% Bicycle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.82*	*0.95*	*0.90*	*0.95*	*0.75*	*0.95*	*0.90*	*0.95*
F_{HV}	0.990	1.000	0.962	1.000	1.000	1.000	0.980	1.000
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	144	0	87	0	17	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	166	0	0	0	20	0	771	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	123	0	17	0	0	0	17	0
SW (6), pcu/h	0	0	0	0	0	0	0	0
W (7), pcu/h	6	0	693	0	20	0	0	0
NW (8), pcu/h	0	0	0	0	0	0	0	0
Entry flow, pcu/h	296	0	855	0	127	0	805	0
Conflicting flow, pcu/h	731	0	124	0	954	0	307	0

Results: Approach Measures of Effectiveness

HCM 6th Edition	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	648	NA	1170	NA	522	NA	989	NA
Entry Flow Rates, vph	293	NA	822	NA	127	NA	789	NA
V/C ratio	**0.45**		**0.70**		**0.24**		**0.80**	
Control Delay, sec/pcu	**12**		**14**		**10**		**20**	
LOS	B		B		B		C	
95th % Queue (ft)	**59**		**161**		**24**		**223**	

Notes: v 4.0

Georgia Department of Transportation
Office of Traffic Operations

Appendix G: Roundabout Analysis (Build & Design Years) – SIDRA 7

MOVEMENT SUMMARY

Site: 101 [SR 53 @ Malcolm Bridge Rd 2022 AM]

SR 53 @ Malcolm Bridge Rd
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Rays Church Rd											
1	L2	23	4.0	0.295	8.6	LOS A	1.9	49.9	0.76	0.68	38.4
6	T1	167	4.0	0.295	8.6	LOS A	1.9	49.9	0.76	0.68	38.7
16	R2	23	4.0	0.295	8.6	LOS A	1.9	49.9	0.76	0.68	37.6
Approach		212	4.0	0.295	8.6	LOS A	1.9	49.9	0.76	0.68	38.5
East: SR 53											
7	L2	36	11.0	0.485	9.7	LOS A	4.0	108.2	0.63	0.45	33.4
4	T1	373	11.0	0.485	9.7	LOS A	4.0	108.2	0.63	0.45	33.6
14	R2	54	11.0	0.485	9.7	LOS A	4.0	108.2	0.63	0.45	32.7
Approach		464	11.0	0.485	9.7	LOS A	4.0	108.2	0.63	0.45	33.5
North: Malcolm Bridge Rd											
5	L2	65	9.0	0.161	6.5	LOS A	1.0	25.8	0.66	0.53	37.4
2	T1	54	9.0	0.161	6.5	LOS A	1.0	25.8	0.66	0.53	37.8
12	R2	1	9.0	0.161	6.5	LOS A	1.0	25.8	0.66	0.53	36.7
Approach		120	9.0	0.161	6.5	LOS A	1.0	25.8	0.66	0.53	37.6
West: SR 53											
3	L2	5	8.0	0.493	9.3	LOS A	4.1	108.2	0.57	0.38	34.2
8	T1	484	8.0	0.493	9.3	LOS A	4.1	108.2	0.57	0.38	34.4
18	R2	22	8.0	0.493	9.3	LOS A	4.1	108.2	0.57	0.38	33.4
Approach		511	8.0	0.493	9.3	LOS A	4.1	108.2	0.57	0.38	34.4
All Vehicles		1307	8.5	0.493	9.1	LOS A	4.1	108.2	0.63	0.47	34.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: ATKINS NORTH AMERICA | Processed: Friday, November 15, 2019 7:44:06 AM
Project: M:\TP_Projects\2019\GDOT Safety\SR 53_Malcolm Bridge Rd\SIDRA\SR 53 @ Malcolm Bridge Rd.sip7

MOVEMENT SUMMARY

Site: 101 [SR 53 @ Malcolm Bridge Road 2022 PM]

SR 53 @ Malcolm Bridge Road
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Rays Church Road											
1	L2	13	0.0	0.119	6.2	LOS A	0.7	18.4	0.72	0.59	40.6
6	T1	60	0.0	0.119	6.2	LOS A	0.7	18.4	0.72	0.59	40.7
16	R2	13	0.0	0.119	6.2	LOS A	0.7	18.4	0.72	0.59	39.6
Approach		87	0.0	0.119	6.2	LOS A	0.7	18.4	0.72	0.59	40.5
East: SR 53											
7	L2	11	4.0	0.471	8.1	LOS A	4.2	108.2	0.42	0.22	35.4
4	T1	450	4.0	0.471	8.1	LOS A	4.2	108.2	0.42	0.22	35.5
14	R2	94	4.0	0.471	8.1	LOS A	4.2	108.2	0.42	0.22	34.5
Approach		556	4.0	0.471	8.1	LOS A	4.2	108.2	0.42	0.22	35.3
North: Malcolm Bridge Road											
5	L2	110	1.0	0.226	6.6	LOS A	1.4	35.3	0.66	0.54	38.5
2	T1	79	1.0	0.226	6.6	LOS A	1.4	35.3	0.66	0.54	38.7
12	R2	1	1.0	0.226	6.6	LOS A	1.4	35.3	0.66	0.54	37.7
Approach		190	1.0	0.226	6.6	LOS A	1.4	35.3	0.66	0.54	38.6
West: SR 53											
3	L2	11	2.0	0.500	9.2	LOS A	4.2	106.8	0.61	0.43	35.1
8	T1	511	2.0	0.500	9.2	LOS A	4.2	106.8	0.61	0.43	35.2
18	R2	11	2.0	0.500	9.2	LOS A	4.2	106.8	0.61	0.43	34.2
Approach		533	2.0	0.500	9.2	LOS A	4.2	106.8	0.61	0.43	35.2
All Vehicles		1366	2.5	0.500	8.2	LOS A	4.2	108.2	0.55	0.37	36.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: ATKINS NORTH AMERICA | Processed: Friday, November 15, 2019 8:05:13 AM
Project: M:\TP_Projects\2019\GDOT Safety\SR 53_Malcolm Bridge Rd\SIDRA\SR 53 @ Malcolm Bridge Rd.sip7

MOVEMENT SUMMARY

Site: 101 [SR 53 @ Malcolm Bridge Rd 2042 AM]

SR 53 @ Malcolm Bridge Road
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Rays Church Rd											
1	L2	38	4.0	0.636	22.1	LOS C	6.7	173.4	1.00	1.12	31.3
6	T1	250	4.0	0.636	22.1	LOS C	6.7	173.4	1.00	1.12	31.4
16	R2	30	4.0	0.636	22.1	LOS C	6.7	173.4	1.00	1.12	30.7
Approach		318	4.0	0.636	22.1	LOS C	6.7	173.4	1.00	1.12	31.3
East: SR 53											
7	L2	54	11.0	0.780	20.6	LOS C	12.0	327.3	0.99	0.94	28.8
4	T1	560	11.0	0.780	20.6	LOS C	12.0	327.3	0.99	0.94	29.0
14	R2	84	11.0	0.780	20.6	LOS C	12.0	327.3	0.99	0.94	28.2
Approach		699	11.0	0.780	20.6	LOS C	12.0	327.3	0.99	0.94	28.9
North: Malcolm Bridge Rd											
5	L2	95	9.0	0.320	11.0	LOS B	2.3	61.8	0.89	0.82	35.0
2	T1	83	9.0	0.320	11.0	LOS B	2.3	61.8	0.89	0.82	35.3
12	R2	1	9.0	0.320	11.0	LOS B	2.3	61.8	0.89	0.82	34.3
Approach		180	9.0	0.320	11.0	LOS B	2.3	61.8	0.89	0.82	35.1
West: SR 53											
3	L2	5	8.0	0.754	17.5	LOS C	10.8	287.1	0.90	0.77	30.5
8	T1	720	8.0	0.754	17.5	LOS C	10.8	287.1	0.90	0.77	30.6
18	R2	27	8.0	0.754	17.5	LOS C	10.8	287.1	0.90	0.77	29.8
Approach		753	8.0	0.754	17.5	LOS C	10.8	287.1	0.90	0.77	30.6
All Vehicles		1949	8.5	0.780	18.8	LOS C	12.0	327.3	0.95	0.89	30.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: ATKINS NORTH AMERICA | Processed: Friday, November 15, 2019 7:49:58 AM
Project: M:\TP_Projects\2019\GDOT Safety\SR 53_Malcolm Bridge Rd\SIDRA\SR 53 @ Malcolm Bridge Rd.sip7

MOVEMENT SUMMARY

Site: 101 [SR 53 @ Malcolm Bridge Road 2042 PM]

SR 53 @ Malcolm Bridge Road
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Rays Church Road											
1	L2	20	0.0	0.265	11.5	LOS B	2.0	50.3	0.96	0.89	37.1
6	T1	87	0.0	0.265	11.5	LOS B	2.0	50.3	0.96	0.89	37.2
16	R2	20	0.0	0.265	11.5	LOS B	2.0	50.3	0.96	0.89	36.2
Approach		127	0.0	0.265	11.5	LOS B	2.0	50.3	0.96	0.89	37.0
East: SR 53											
7	L2	17	4.0	0.695	13.1	LOS B	8.7	225.6	0.70	0.42	32.8
4	T1	667	4.0	0.695	13.1	LOS B	8.7	225.6	0.70	0.42	32.9
14	R2	139	4.0	0.695	13.1	LOS B	8.7	225.6	0.70	0.42	32.0
Approach		822	4.0	0.695	13.1	LOS B	8.7	225.6	0.70	0.42	32.8
North: Malcolm Bridge Road											
5	L2	165	1.0	0.437	11.7	LOS B	3.5	88.0	0.90	0.86	35.6
2	T1	122	1.0	0.437	11.7	LOS B	3.5	88.0	0.90	0.86	35.8
12	R2	6	1.0	0.437	11.7	LOS B	3.5	88.0	0.90	0.86	34.9
Approach		293	1.0	0.437	11.7	LOS B	3.5	88.0	0.90	0.86	35.7
West: SR 53											
3	L2	17	2.0	0.783	19.1	LOS C	12.4	313.9	0.97	0.89	30.5
8	T1	756	2.0	0.783	19.1	LOS C	12.4	313.9	0.97	0.89	30.5
18	R2	17	2.0	0.783	19.1	LOS C	12.4	313.9	0.97	0.89	29.8
Approach		789	2.0	0.783	19.1	LOS C	12.4	313.9	0.97	0.89	30.5
All Vehicles		2030	2.5	0.783	15.1	LOS C	12.4	313.9	0.85	0.69	32.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: ATKINS NORTH AMERICA | Processed: Friday, November 15, 2019 8:13:51 AM
Project: M:\TP_Projects\2019\GDOT Safety\SR 53_Malcolm Bridge Rd\SIDRA\SR 53 @ Malcolm Bridge Rd.sip7

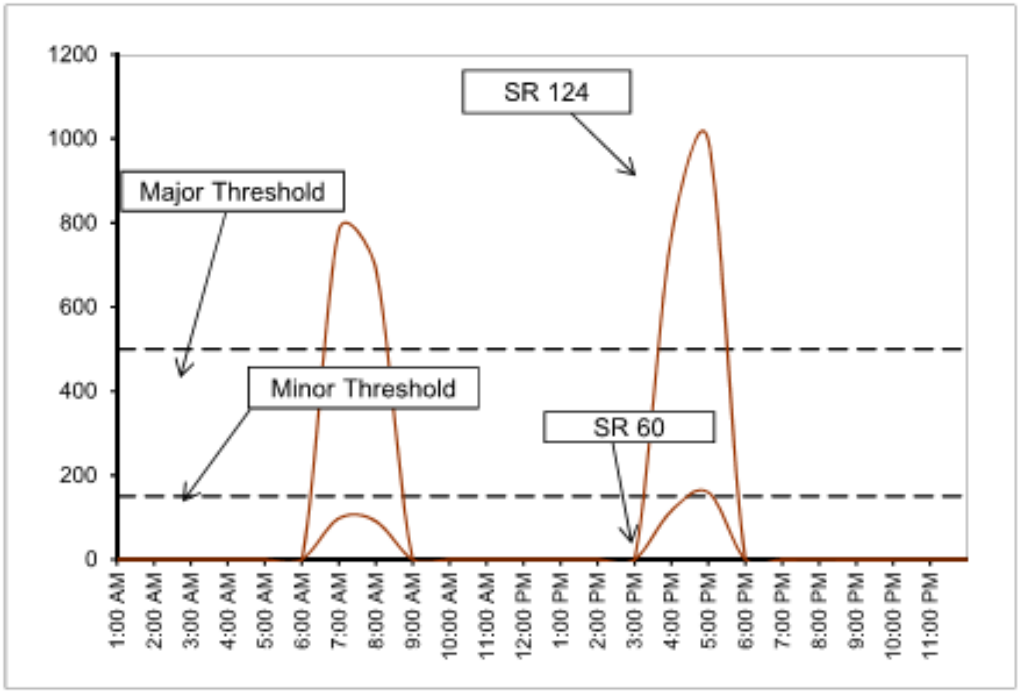
Appendix H: Traffic Signal Warrant Analyses

SR 53 @ Malcolm Bridge Rd
Warrant 1A Check: 1 lanes major, 1 lanes minor

Testing normal warrant requirements:

hour	major st volume	minor st volume	major st criteria	minor st criteria	test
1:00 AM	0	0	500	150	0
2:00 AM	0	0	500	150	0
3:00 AM	0	0	500	150	0
4:00 AM	0	0	500	150	0
5:00 AM	0	0	500	150	0
6:00 AM	0	0	500	150	0
7:00 AM	783	98	500	150	0
8:00 AM	691	92	500	150	0
9:00 AM	0	0	500	150	0
10:00 AM	0	0	500	150	0
11:00 AM	0	0	500	150	0
12:00 PM	0	0	500	150	0
1:00 PM	0	0	500	150	0
2:00 PM	0	0	500	150	0
3:00 PM	0	0	500	150	0
4:00 PM	770	116	500	150	0
5:00 PM	995	159	500	150	1
6:00 PM	0	0	500	150	0
7:00 PM	0	0	500	150	0
8:00 PM	0	0	500	150	0
9:00 PM	0	0	500	150	0
10:00 PM	0	0	500	150	0
11:00 PM	0	0	500	150	0
12:00 AM	0	0	500	150	0

Conclusion: Signal is Not Warranted SUM= **1**

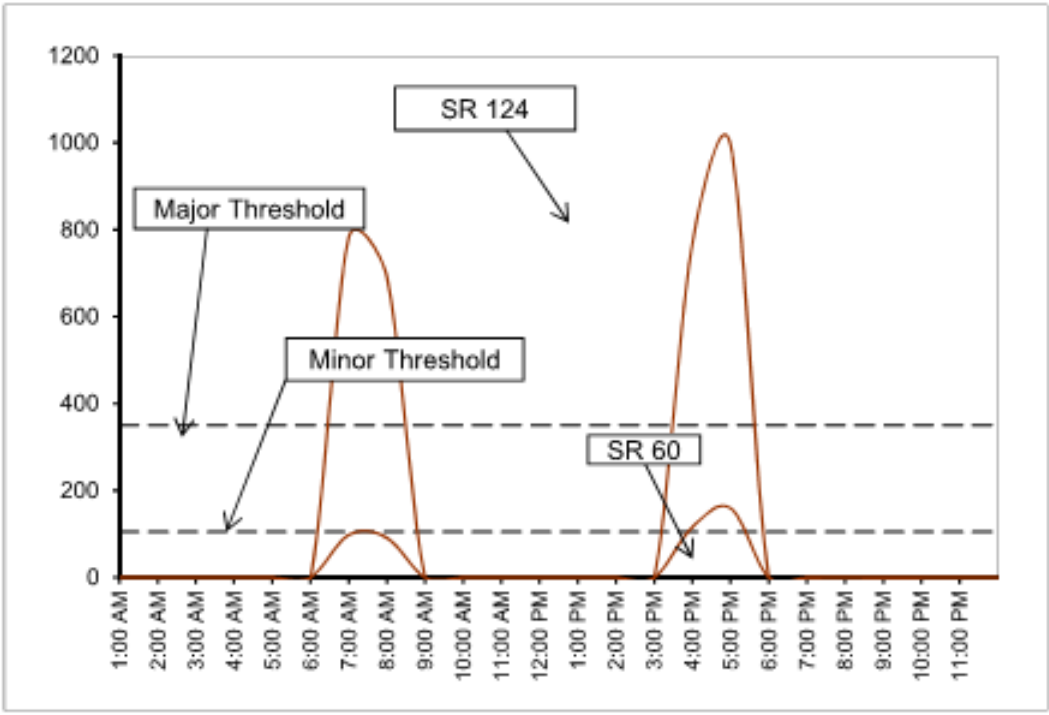


SR 53 @ Malcolm Bridge Rd

Warrant 1A 70% Check: 1 lanes major, 1 lanes minor

Testing normal warrant requirements:

hour	major st volume	minor st volume	major st criteria	minor st criteria	test
1:00 AM	0	0	350	105	0
2:00 AM	0	0	350	105	0
3:00 AM	0	0	350	105	0
4:00 AM	0	0	350	105	0
5:00 AM	0	0	350	105	0
6:00 AM	0	0	350	105	0
7:00 AM	783	98	350	105	0
8:00 AM	691	92	350	105	0
9:00 AM	0	0	350	105	0
10:00 AM	0	0	350	105	0
11:00 AM	0	0	350	105	0
12:00 PM	0	0	350	105	0
1:00 PM	0	0	350	105	0
2:00 PM	0	0	350	105	0
3:00 PM	0	0	350	105	0
4:00 PM	770	116	350	105	1
5:00 PM	995	159	350	105	1
6:00 PM	0	0	350	105	0
7:00 PM	0	0	350	105	0
8:00 PM	0	0	350	105	0
9:00 PM	0	0	350	105	0
10:00 PM	0	0	350	105	0
11:00 PM	0	0	350	105	0
12:00 AM	0	0	350	105	0
Conclusion: Signal is	***Not Warranted***			SUM=	**2**



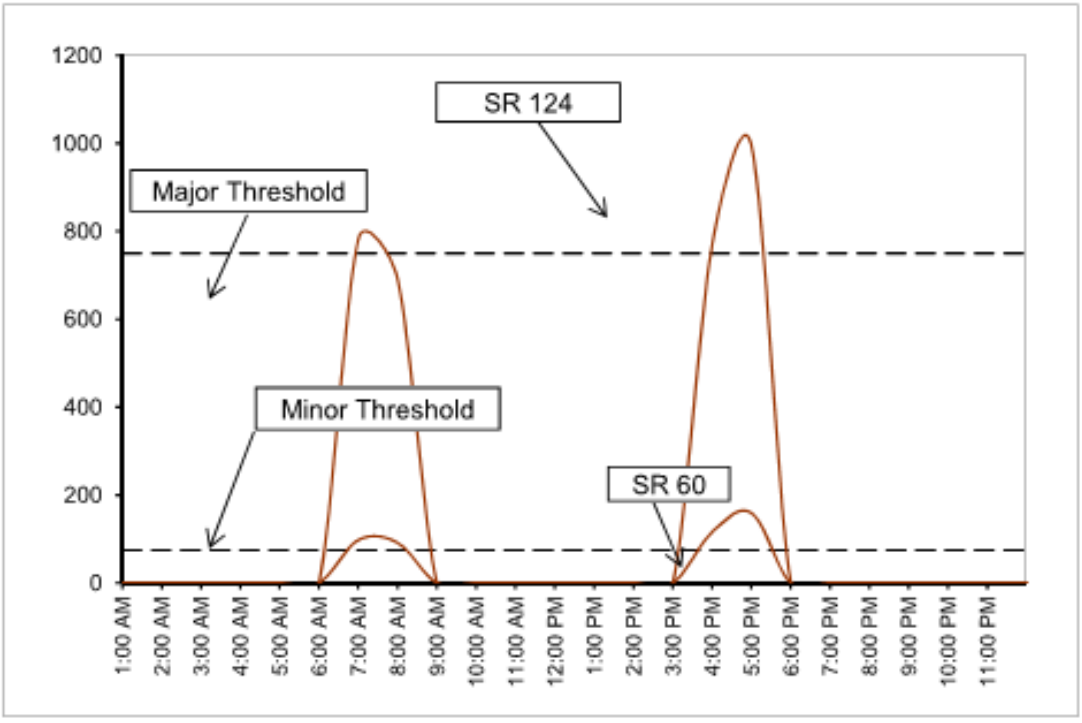
SR 53 @ Malcolm Bridge Rd

Warrant 1B Check: 1 lanes major, 1 lanes minor

Testing normal warrant requirements:

hour	major st volume	minor st volume	major st criteria	minor st criteria	test
1:00 AM	0	0	750	75	0
2:00 AM	0	0	750	75	0
3:00 AM	0	0	750	75	0
4:00 AM	0	0	750	75	0
5:00 AM	0	0	750	75	0
6:00 AM	0	0	750	75	0
7:00 AM	783	98	750	75	1
8:00 AM	691	92	750	75	0
9:00 AM	0	0	750	75	0
10:00 AM	0	0	750	75	0
11:00 AM	0	0	750	75	0
12:00 PM	0	0	750	75	0
1:00 PM	0	0	750	75	0
2:00 PM	0	0	750	75	0
3:00 PM	0	0	750	75	0
4:00 PM	770	116	750	75	1
5:00 PM	995	159	750	75	1
6:00 PM	0	0	750	75	0
7:00 PM	0	0	750	75	0
8:00 PM	0	0	750	75	0
9:00 PM	0	0	750	75	0
10:00 PM	0	0	750	75	0
11:00 PM	0	0	750	75	0
12:00 AM	0	0	750	75	0

Conclusion: Signal is Not Warranted SUM= **3**

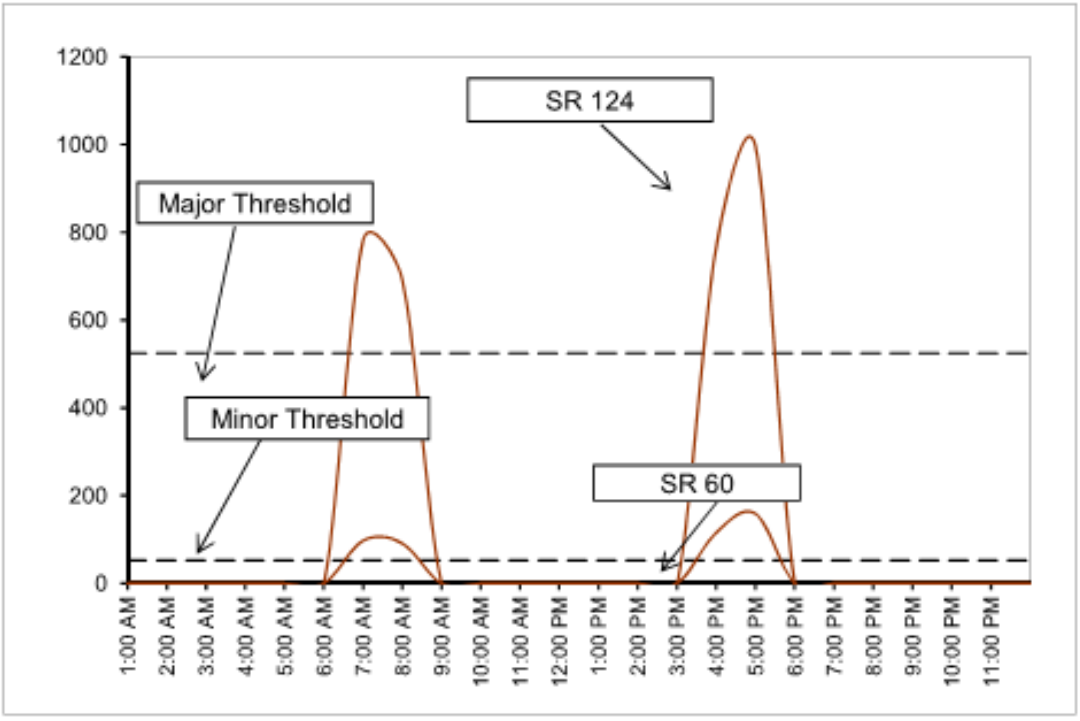


SR 53 @ Malcolm Bridge Rd

Warrant 1B 70% Check: 1 lanes major, 1 lanes minor

Testing normal warrant requirements:

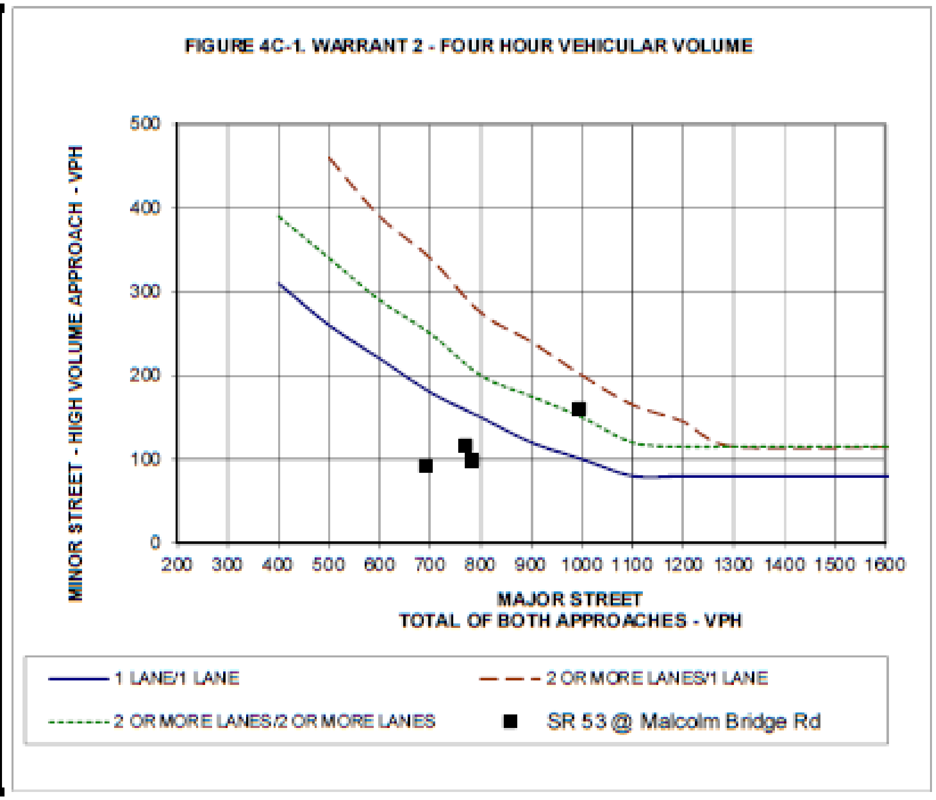
hour	major st volume	minor st volume	major st criteria	minor st criteria	test
1:00 AM	0	0	525	53	0
2:00 AM	0	0	525	53	0
3:00 AM	0	0	525	53	0
4:00 AM	0	0	525	53	0
5:00 AM	0	0	525	53	0
6:00 AM	0	0	525	53	0
7:00 AM	783	98	525	53	1
8:00 AM	691	92	525	53	1
9:00 AM	0	0	525	53	0
10:00 AM	0	0	525	53	0
11:00 AM	0	0	525	53	0
12:00 PM	0	0	525	53	0
1:00 PM	0	0	525	53	0
2:00 PM	0	0	525	53	0
3:00 PM	0	0	525	53	0
4:00 PM	770	116	525	53	1
5:00 PM	995	159	525	53	1
6:00 PM	0	0	525	53	0
7:00 PM	0	0	525	53	0
8:00 PM	0	0	525	53	0
9:00 PM	0	0	525	53	0
10:00 PM	0	0	525	53	0
11:00 PM	0	0	525	53	0
12:00 AM	0	0	525	53	0
Conclusion:	***Signal is***	***Not Warranted***		SUM=	**4**



SR 53 @ Malcolm Bridge Rd
Warrant 2 Check: 1 lanes major, 1 lanes minor

Hour	Major Street Volume*	Minor Street Approach	Minor Approach Criteria**	Criteria Satisfied
1:00 AM	0	0	310	No
2:00 AM	0	0	310	No
3:00 AM	0	0	310	No
4:00 AM	0	0	310	No
5:00 AM	0	0	310	No
6:00 AM	0	0	310	No
7:00 AM	783	98	180	No
8:00 AM	691	92	220	No
9:00 AM	0	0	310	No
10:00 AM	0	0	310	No
11:00 AM	0	0	310	No
12:00 PM	0	0	310	No
1:00 PM	0	0	310	No
2:00 PM	0	0	310	No
3:00 PM	0	0	310	No
4:00 PM	770	116	180	No
5:00 PM	995	159	120	Yes
6:00 PM	0	0	310	No
7:00 PM	0	0	310	No
8:00 PM	0	0	310	No
9:00 PM	0	0	310	No
10:00 PM	0	0	310	No
11:00 PM	0	0	310	No
12:00 AM	0	0	310	No

Conclusion: Signal is ***Not Warranted*** ***1***



Warrant is Satisfied when any Four Hours of an Average Day Exceed the Threshold

* Major Street Volume is Total for Both Approaches
** From MUTCD Figure 4C-1

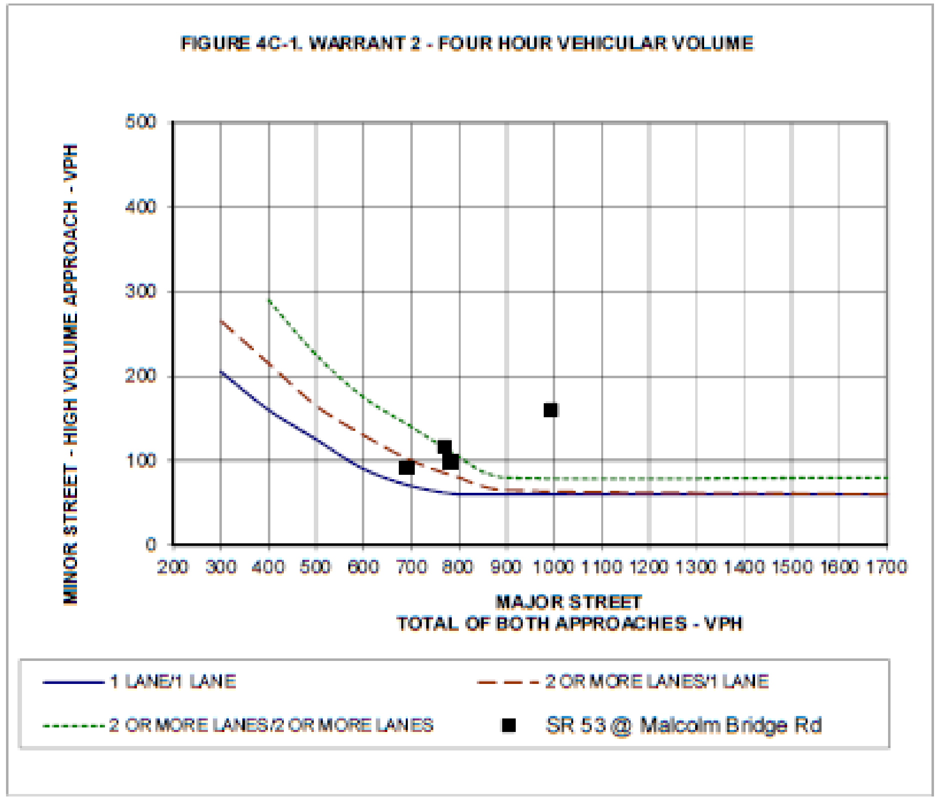
SR 53 @ Malcolm Bridge Rd
Warrant 2 70% Check: 1 lanes major, 1 lanes minor

Hour	Major Street Volume*	Minor Street Approach	Minor Approach Criteria**	Criteria Satisfied
1:00 AM	0	0	205	No
2:00 AM	0	0	205	No
3:00 AM	0	0	205	No
4:00 AM	0	0	205	No
5:00 AM	0	0	205	No
6:00 AM	0	0	205	No
7:00 AM	783	98	205	No
8:00 AM	691	92	205	No
9:00 AM	0	0	205	No
10:00 AM	0	0	205	No
11:00 AM	0	0	205	No
12:00 PM	0	0	205	No
1:00 PM	0	0	205	No
2:00 PM	0	0	205	No
3:00 PM	0	0	205	No
4:00 PM	770	116	205	No
5:00 PM	995	159	205	No
6:00 PM	0	0	205	No
7:00 PM	0	0	205	No
8:00 PM	0	0	205	No
9:00 PM	0	0	205	No
10:00 PM	0	0	205	No
11:00 PM	0	0	205	No
12:00 AM	0	0	205	No

Conclusion: Signal is ***Not Warranted*** ***0***

Warrant is Satisfied when any Four Hours of an Average Day Exceed the Threshold

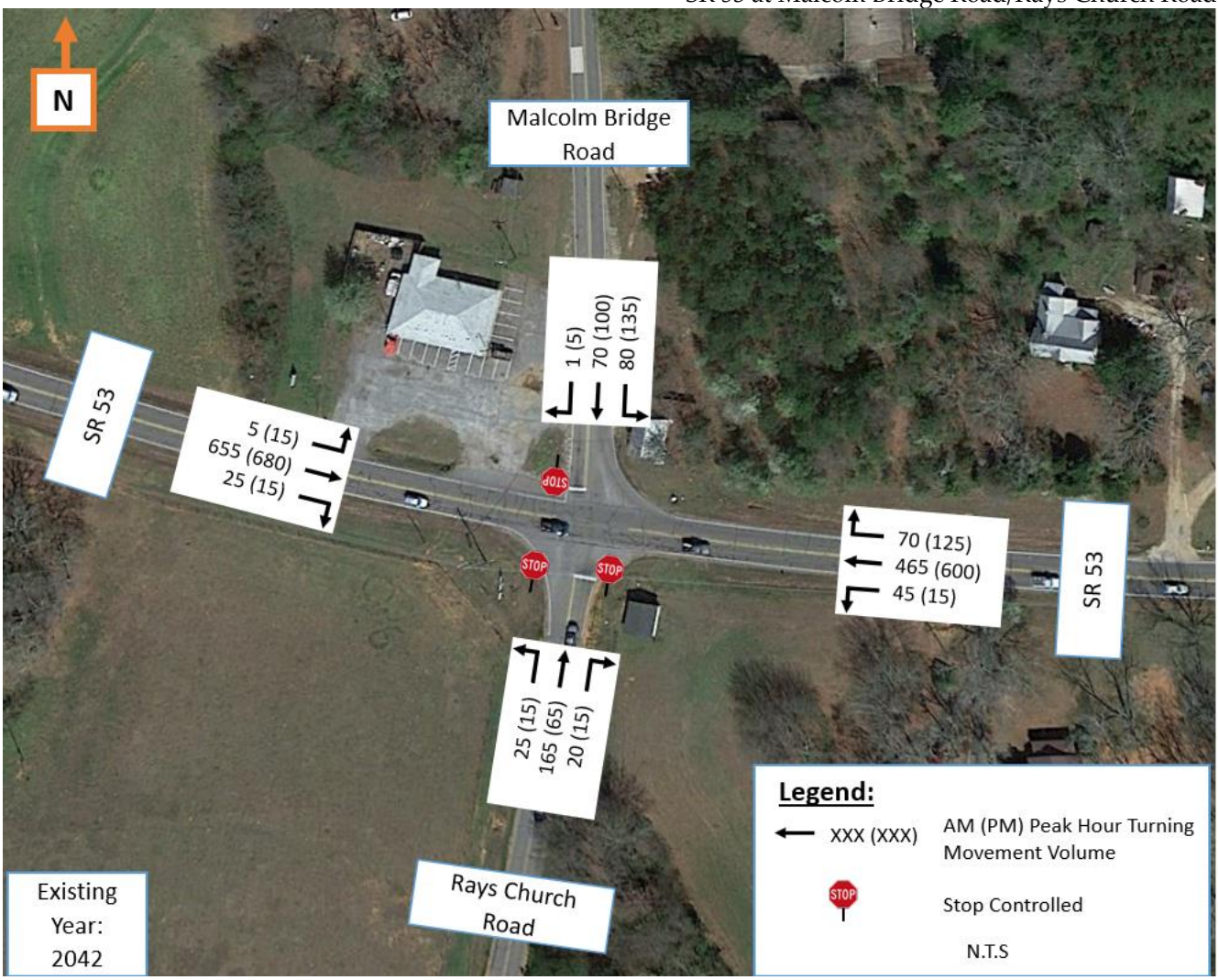
* Major Street Volume is Total for Both Approaches
** From MUTCD Figure 4C-1



Appendix I: Projected Turning Movement Diagrams

SR 53 at Malcom Bridge Road/Rays Church Road

SR 53 at Malcom Bridge Road/Rays Church Road



Appendix J: Intersection Control Evaluation (ICE)

GDOT ICE STAGE 2: ALTERNATIVE SELECTION DECISION RECORD

ICE Version 2.15 | Revised 07/01/2019

GDOT PI # (or N/A): N/A
County: Oconee
Project Location: SR 53 @ Malcolm Bridge
Existing Intersection Control: Conventional (Minor Stop)

GDOT District: 1 - Gainesville
Area Type: Rural

Date: 9/26/2019
Agency/Firm: Atkins
Analyst: JRA
Type of Analysis: Safety Funded Project

Opening / Design Year Traffic Operations

Intersection meets signal/AWS warrants?	Meets AWS only	
Traffic Analysis Measure of Effectiveness	Intersection Delay	
Traffic Analysis Software Used	Synchro 10	
Analysis Time Period	AM Peak Hr	PM Peak Hr
2022 Opening Yr No-Build Peak Hr Intersection Delay	36.9 sec	27.0 sec
2022 Opening Yr No-Build Peak Hr Intersection V/C	1.23	1.17
2042 Design Yr No-Build Peak Hr Intersection Delay	500.0 sec	500.0 sec
2042 Design Yr No-Build Peak Hr Intersection V/C	5.00	5.00

Complete Streets Warrants Met?
- ☐ PEDESTRIANS
- ☐ BICYCLES
- ☐ TRANSIT

Crash Type (Crash Data: Enter most recent 5 years of crash data)	Crash Severity: PDO	Injury Crash*	Fatal Crash*	
Angle	18	17	0	81%
Head-On	0	0	0	0%
Rear End	2	1	0	7%
Sideswipe - same	1	1	0	5%
Sideswipe - opposite	0	1	0	2%
Not Collision w/Motor Veh	1	1	0	5%
TOTALS:	22	21	0	43

* Number of crashes resulting in injuries / fatalities, not number of persons

Alternatives Analysis:	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Proposed Control Type/Improvement:	Conventional (All-Way Stop)	Single Lane Roundabout	Traffic Signal	N/A	N/A
Project Cost: (From CostEst Worksheet)	*Additional description here*	*Additional description here*	*Add LT bays all approaches*		
Construction Cost	$50,000	$2,000,000	$507,000		
ROW Cost	$0	$400,000	$0		
Environmental Cost	$0	$0	$0		
Reimbursable Utility Cost	$0	$150,000	$10,000		
Design & Contingency Cost	$10,000	$700,000	$177,000		
Cost Adjustment (justification req'd)	0%	0%	0%		
Total Cost	$60,000	$3,250,000	$694,000		
Traffic Operations:	User Cost Override	User Cost Override			
Traffic Analysis Software Used	Synchro 10		SIDRA 7		Synchro 10			
Analysis Period	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr		
2042 Design Yr Build Intersection Delay	208.8 sec	223.2 sec	18.8 sec	15.1 sec	20.4 sec	18.4 sec		
2042 Design Yr Build Intersection V/C	1.72	1.72	0.78	0.78	0.89	0.86		
Safety Analysis:								
Predefined CRF: PDO	48%		71%		44%			
Predefined CRF: Fatal/Inj	77%		87%		40%			
Predefined CRF Source:	FHWA Clearinghouse #s 315 / 3128		FHWA Clearinghouse #s 233 / 230		FHWA Clearinghouse #s 7982 / 7984			
User Defined CRF: PDO								
User Defined CRF: Fatal/Inj								
User Defined CRF Source (write in if applicable):								
Environmental Impacts:[1]								
Historic District/Property	None		None		None			
Archaeology Resources	None		None		None			
Graveyard	None		None		None			
Stream	None		None		None			
Underground Tank/Hazmat	None		None		None			
Park Land	None		None		None			
EJ Community	None		None		None			
Wooded Area	None		None		None			
Wetland	None		None		None			
Stakeholder Posture:	*Note: If environmental impact is significant (RED), provide justification impact won't jeopardize project delivery using "Env" worksheet*							
	[1] *Environmental impacts are only preliminary estimates; detailed environmental impact documentation will be included with project concept report*							
Local Community Support	Neutral		Supportive		Neutral			
GDOT Support	Neutral		Supportive		Neutral			
Final ICE Stage 2 Score:	4.1		6.4		-			
Rank of Control Type Alternatives:	2		1		-			

Note: Stage 2 score is not given (shown as "-") if signal or AWS is selected as control type but respective warrants are not met

Provide additional comments and/or explain any unique analysis inputs, or results (as necessary):

GDOT ICE STAGE 1: SCREENING DECISION RECORD

ICE Version 2.15 | Revised 07/01/2019

GDOT PI #	N/A
Project Location:	SR 53 @ Malcolm Bridge
Existing Control:	Conventional (Minor Stop)
Prepared by:	Atkins
Date:	9/26/2019

Answer "Yes" or "No" to each policy question for each control type to identify which alternatives should be evaluated in the Stage 2 Decision Record; enter justification in the rightmost column

Note: Up to 5 alternatives maybe selected and evaluated; Use this ICE Stage 1 to screen 5 or fewer alternatives to evaluate in Stage 2

	Intersection Alternative (see "Intersections" tab for detailed description of intersection/interchange type)	1. Does alternative address the project need in a balanced manner and in scale with the project?	2. Does alternative improve safety performance in terms of reducing severe crashes?	3. Does alternative incorporate safety, convenience and accessibility for pedestrians and/or bicyclists?	4. Does alternative improve (or preserve) traffic operations (congestion, delay, reliability, etc.)?	5. Does alternative appear feasible given the site characteristics, constrains & location context?	6. Does alternative appear feasible with respect to other project factors?	7. Overall feasible alternative (select alternative for further evaluation in Stage 2)?	Screening Decision Justification:
Unsignalized Intersections	Conventional (Minor Stop)	No	No	No	No	No	No	No	Existing Condition
	Conventional (All-Way Stop)	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	Potential Alternative to Evaluate
	Mini Roundabout	No	No	No	No	No	No	No	not ideal on roads with speed limits greater than 35 mph
	Single Lane Roundabout	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	Potential Alternative to Evaluate
	Multilane Roundabout	No	No	No	No	No	No	No	single lane roundabout is adequate
	RCUT (stop control)	No	No	No	No	No	No	No	No median for u-turns, would add significant costs to project
	RIRO w/down stream U-Turn	No	No	No	No	No	No	No	No median for u-turns, would add significant costs to project
	High-T (unsignalized)	No	No	No	No	No	No	No	not a t-intersection
	Offset-T Intersections	No	No	No	No	No	No	No	would require significant ROW
	Diamond Interch (Stop Control)	No	No	No	No	No	No	No	N/A - volumes & context not to scale
	Diamond Interch (RAB Control)	No	No	No	No	No	No	No	N/A - volumes & context not to scale
	No LT Lane Improvements No RT Lane Improvements	No	No	No	No	No	No	No	N/A
	Other unsignalized (provide description):	No	No	No	No	No	No	No	N/A
Signalized Intersections	Traffic Signal	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	Potential Alternative to Evaluate
	Median U-Turn (Indirect Left)	No	No	No	No	No	No	No	No median for u-turns, would add significant costs to project
	RCUT (signalized)	No	No	No	No	No	No	No	No median for u-turns, would add significant costs to project
	Displaced Left Turn (CFI)	No	No	No	No	No	No	No	N/A - volumes & context not to scale
	Continuous Green-T	No	No	No	No	No	No	No	not a t-intersection
	Jughandle	No	No	No	No	No	No	No	N/A - volumes & context not to scale
	Quadrant Roadway	No	No	No	No	No	No	No	N/A - volumes & context not to scale
	Diamond Interch (Signal Control)	No	No	No	No	No	No	No	N/A - volumes & context not to scale
	Diverging Diamond	No	No	No	No	No	No	No	N/A - volumes & context not to scale
	Single Point Interchange	No	No	No	No	No	No	No	N/A - volumes & context not to scale
	No LT Lane Improvements No RT Lane Improvements	No	No	No	No	No	No	No	N/A
	Other Signalized (provide description):	No	No	No	No	No	No	No	N/A

= Intersection type selected for more detailed analysis in Stage 2 Alternative Selection Decision Record

GDOT ICE STAGE 2: ALTERNATIVE SELECTION DECISION RECORD

ICE Version 2.15 | Revised 07/01/2019

GDOT PI # (or N/A): N/A
County: Oconee
Project Location: SR 53 @ Malcolm Bridge
Existing Intersection Control: Conventional (Minor Stop)

GDOT District: 1 - Gainesville
Area Type: Rural

Date: 9/26/2019
Agency/Firm: Atkins
Analyst: JRA

Type of Analysis: Safety Funded Project

Opening / Design Year Traffic Operations

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2042 Design Yr No-Build Peak Hr Intersection V/C	5.00	5.00

Complete Streets Warrants Met?
- ☐ PEDESTRIANS
- ☐ BICYCLES
- ☐ TRANSIT

Crash Type (Crash Data: Enter most recent 5 years of crash data)	Crash Severity: PDO	Injury Crash*	Fatal Crash*	
Angle	18	17	0	81%
Head-On	0	0	0	0%
Rear End	2	1	0	7%
Sideswipe - same	1	1	0	5%
Sideswipe - opposite	0	1	0	2%
Not Collision w/Motor Veh	1	1	0	5%
TOTALS:	22	21	0	43

* Number of crashes resulting in injuries / fatalities, not number of persons

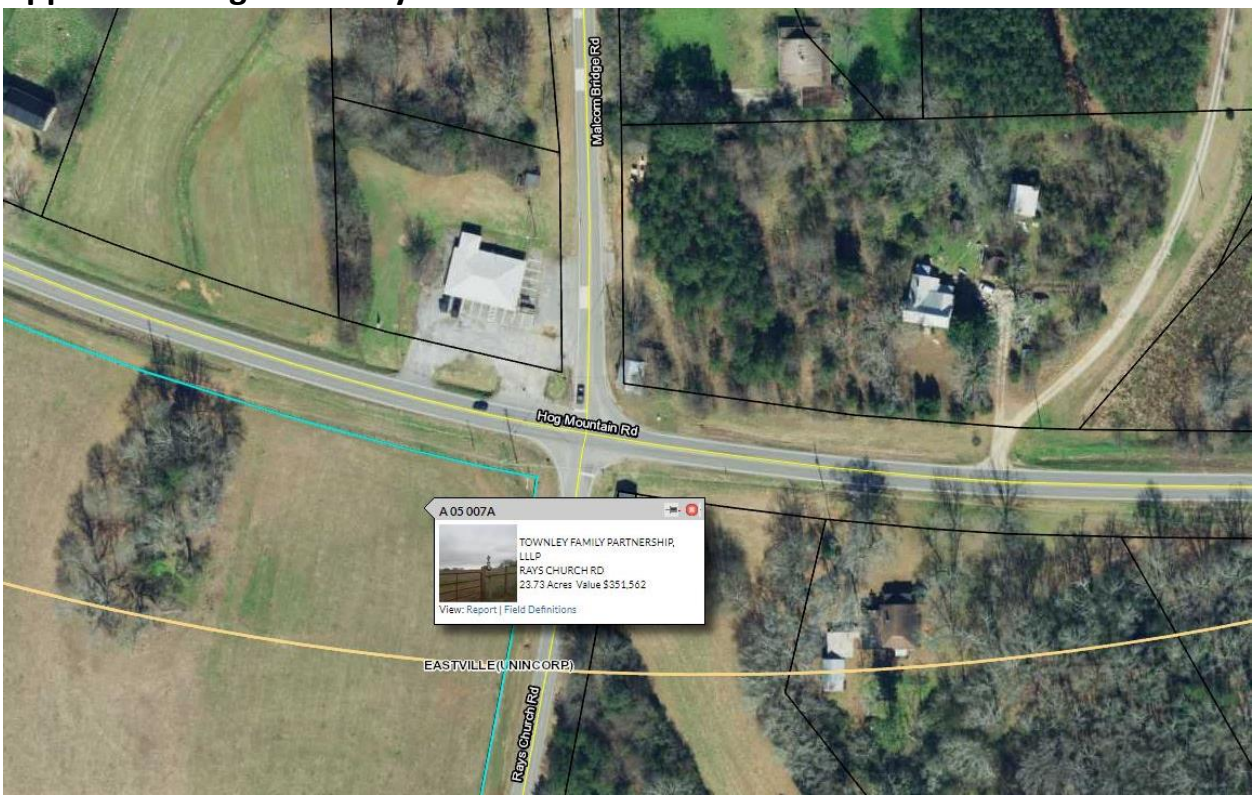
Alternatives Analysis:

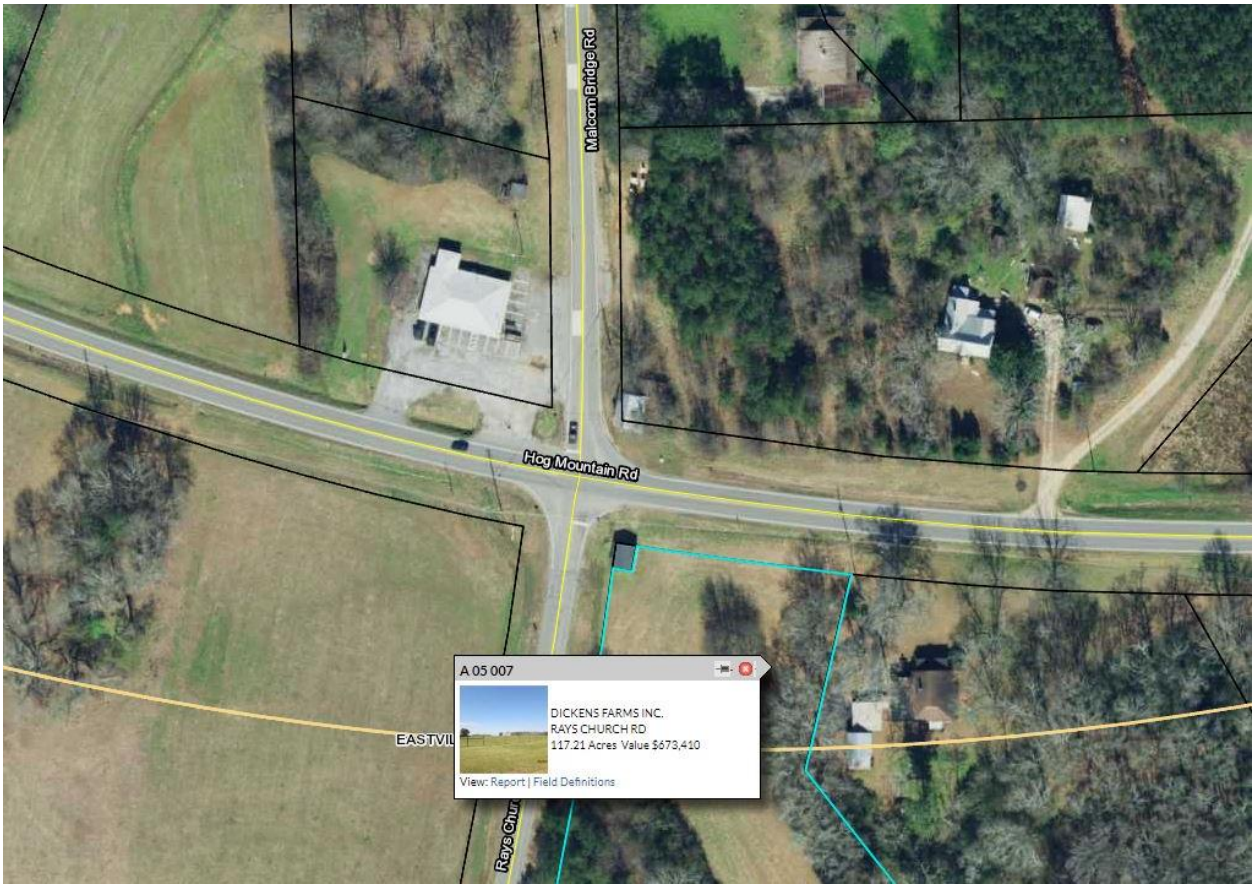
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Proposed Control Type/Improvement:	Conventional (All-Way Stop)	Single Lane Roundabout	Traffic Signal	N/A	N/A
Project Cost: (From CostEst Worksheet)	*Additional description here*	*Additional description here*	*Add LT bays all approaches*		
Construction Cost	$50,000	$2,000,000	$507,000		
ROW Cost	$0	$400,000	$0		
Environmental Cost	$0	$0	$0		
Reimbursable Utility Cost	$0	$150,000	$10,000		
Design & Contingency Cost	$10,000	$700,000	$177,000		
Cost Adjustment (justification req'd)	0%	0%	0%		
Total Cost	$60,000	$3,250,000	$694,000		
Traffic Operations:	User Cost Override	User Cost Override			
Traffic Analysis Software Used	Synchro 10		GDOT RND Tool 4.1		Synchro 10			
Analysis Period	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr		
2042 Design Yr Build Intersection Delay	208.8 sec	223.2 sec	18.8 sec	15.1 sec	20.4 sec	18.4 sec		
2042 Design Yr Build Intersection V/C	1.72	1.72	0.78	0.78	0.89	0.86		
Safety Analysis:								
Predefined CRF: PDO	48%		71%		44%			
Predefined CRF: Fatal/Inj	77%		87%		40%			
Predefined CRF Source:	FHWA Clearinghouse #s 315 / 3128		FHWA Clearinghouse #s 233 / 230		FHWA Clearinghouse #s 7982 / 7984			
User Defined CRF: PDO								
User Defined CRF: Fatal/Inj								
User Defined CRF Source (write in if applicable):								
Environmental Impacts:[1]								
Historic District/Property	None		None		None			
Archaeology Resources	None		None		None			
Graveyard	None		None		None			
Stream	None		None		None			
Underground Tank/Hazmat	None		None		None			
Park Land	None		None		None			
EJ Community	None		None		None			
Wooded Area	None		None		None			
Wetland	None		None		None			
Stakeholder Posture:	*Note: If environmental impact is significant (RED), provide justification impact won't jeopardize project delivery using "Env" worksheet*							
	[1] *Environmental impacts are only preliminary estimates; detailed environmental impact documentation will be included with project concept report*							
Local Community Support	Neutral		Supportive		Neutral			
GDOT Support	Neutral		Supportive		Neutral			
Final ICE Stage 2 Score:	4.1		6.4		-			
Rank of Control Type Alternatives:	2		1		-			

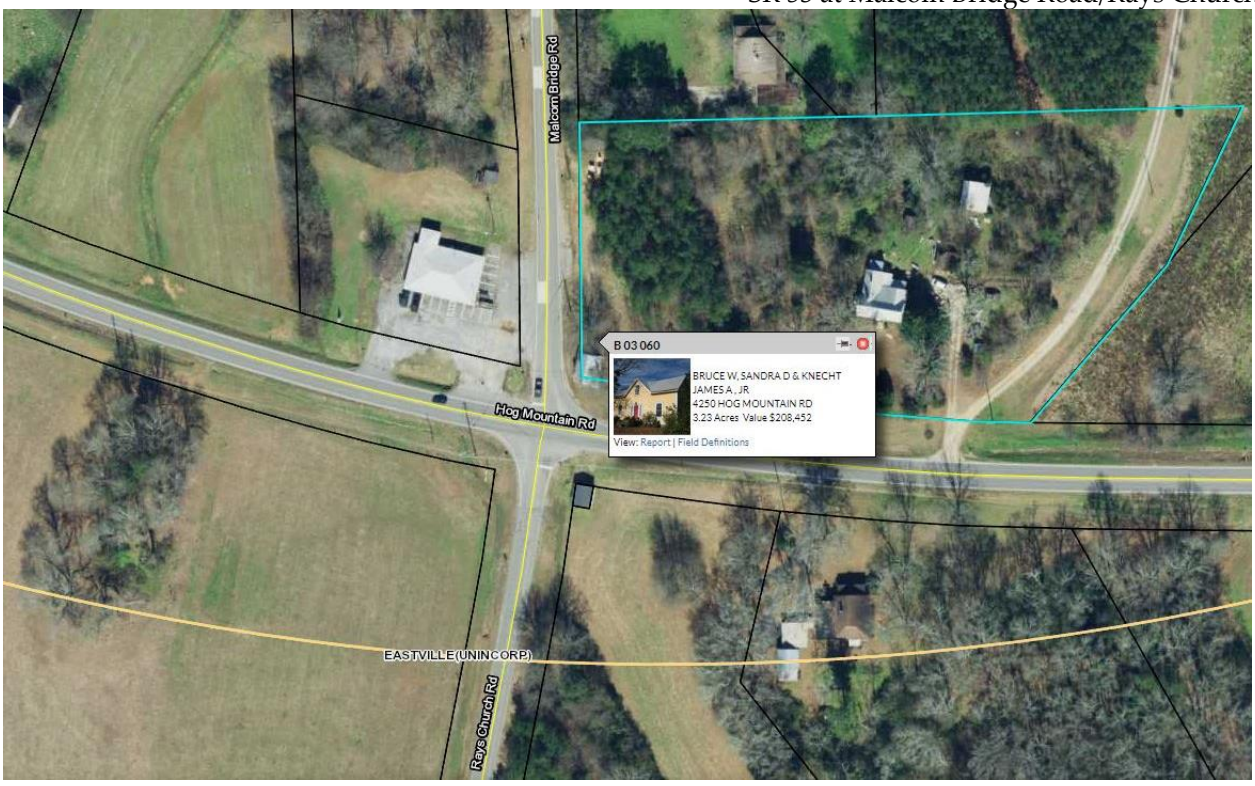
Note: Stage 2 score is not given (shown as "-") if signal or AWS is selected as control type but respective warrants are not met

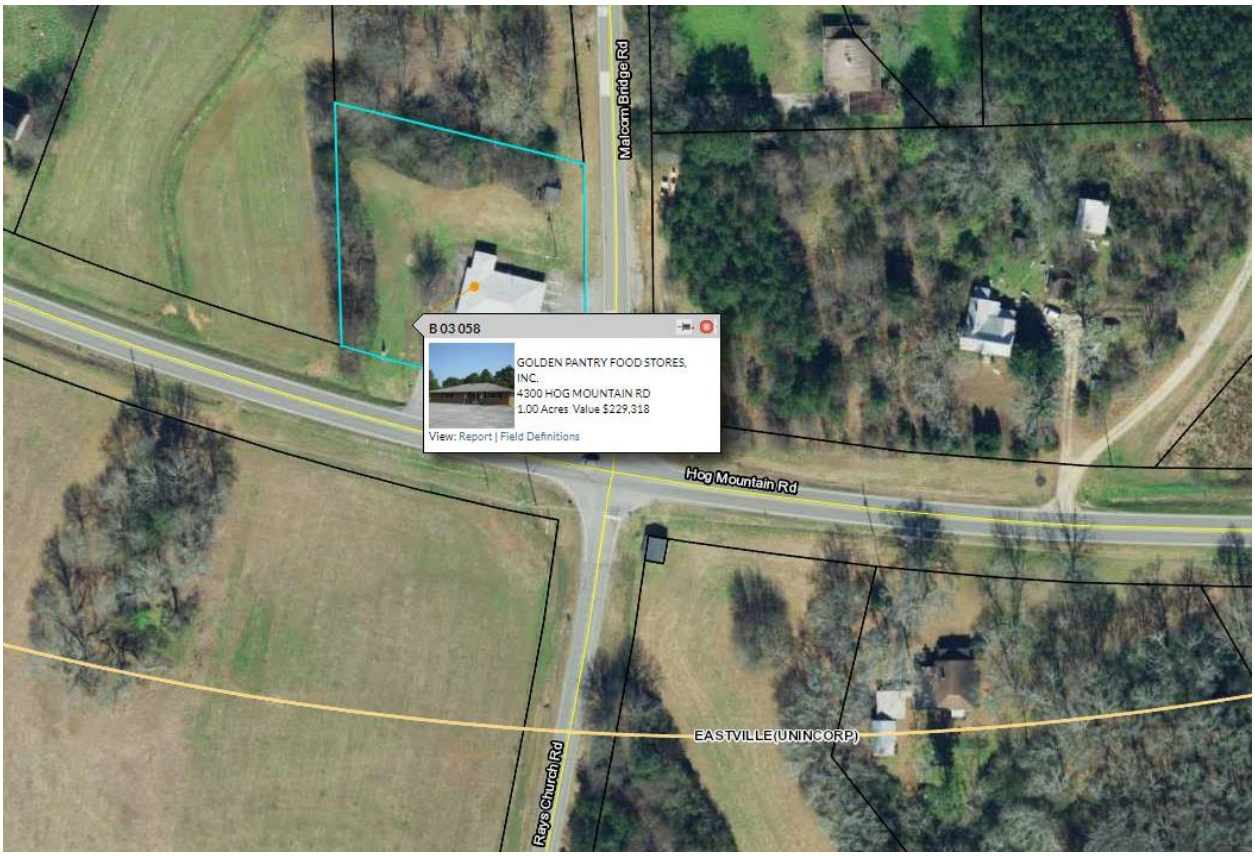
Provide additional comments and/or explain any unique analysis inputs, or results (as necessary):

Appendix K: Right-Of-Way Information






Malcom Bridge Rd
B 03 060
BRUCE W, SANDRA D & KNECHT JAMES A, JR
4250 HOG MOUNTAIN RD
3.23 Acres Value $208,452
View: Report | Field Definitions
Hog Mountain Rd
EASTVILLE (UNINCORP)
Rays Church Rd


Malcom Bridge Rd
B 03 058
GOLDEN PANTRY FOOD STORES, INC.
4300 HOG MOUNTAIN RD
1.00 Acres Value $229,318
View: Report | Field Definitions
Hog Mountain Rd
EASTVILLE (UNINCORP)
Rays Church Rd

Appendix L: Environmental Screening

Currently there are buildings/structures in three of the four quadrants of the intersection. The structures in the northeast and southeast quadrants have been identified as potential historical resources. However, the structure in the northeast quadrant is not anticipated to be considered eligible by the State Historic Preservation Office (SHPO). Further investigation of these properties would be completed during the Concept phase and an eligibility determination would be made by the SHPO at that time.

Building in Southeast quadrant.

Building in Northeast quadrant.

Appendix M: Utility Risks

There is a Utility pole in the Southwest quadrant that is approximately 25’ from the edge of pavement.

The utility pole is impacted in the proposed layout included in Appendix O.

Appendix N: Important Documents/Other Risks

Person	Date	Position	Email
Landon Perry	August 15, 2019	State Traffic Operations Manager	It appears that both locations have been transferred to the safety section based on their screening results.
Radney Simpson	October 8, 2019	Asst. State Transporation Planning Administrator	The locals have indicated a desire to contribute local funding towards one / both of the roundabout projects…..when does your team need to know the funding amount?
Samuel Harris	October 9, 2019	State Safety Engineering Manager	As to your question below, these project are within my program and will be funded by HSIP funds.
John Daniell	October 23, 2019	Oconee Chairman	We can provide PE and ROW for both projects. We can also provide up to $250,000 for CST on each project based on acceleration.
Thomas Caiafa	November 8, 2019	Branch Chief	Following up on the below, after review by GDOT Traffic Operations, we have received high-level cost estimates and potential programming years for both of the subject projects which are shown below: SR 53 at Snows Mill Road: PE – $800,000 FY 2021 ROW - $200,000 FY 2023 UTL - $250,000 FY 2024 CST-$2,000,000 FY 2024 TOTAL – 3,250,000 SR 53 at Malcolm Bridge Road/Rays Church Road: PE – $800,000 FY 2021 ROW – $600,000 FY 2023 UTL - $250,000 FY 2024 CST- $2,400,000 FY 2024 TOTAL - $4,050,000 Some additional notes: -Federal funding would be used to cover costs outside of the local contribution. -Per Traffic Ops, the projected costs for the Malcolm Bridge intersection is slightly higher due to concerns about historic properties in the northeast and southeast quadrants. -PE work could also start prior to FY 2021 if there is a 100% local contribution to the PE Phases (which you did mention below).
John Daniell	November 8, 2019	Oconee Chairman	We believe we can complete design and ROW in current FY. Can construction be moved to FY 21?

Stenley Mack	November 9, 2019	Traffic Operations Program Manager	It is not feasible to shift Construction to FY 2021. Even if we were to fast track this project for environmental and preliminary design, Right of Way would still need a minimum of 12 months to complete acquisition. We have not yet identify utility and environmental impacts that could affect fast tracking the project. From my view at this stage of the project I cannot see us committing to anything earlier than FY 2023 for construction, keep in mind we are almost halfway through FY 2020 and we have not started Concept development yet.
John Daniell	November 12, 2019	Oconee Chairman	We have a design consultant ready to go for design. Our plan was to commission the design with county funds. Concept design and completed plans to be approved by appropriate GDOT staff. We have an cooperative land owner and the county would transact the ROW purchase then transfer to GDOT. I understand the SR53@ Malcom Bridge/Ray's Church maybe a little more complicated but our goal is to avoid the NE and SE quadrants. What about the following: SR 53 at Snows Mill Road: PE – Oconee County completed by March of 2020 ROW – Oconee County competed by March 2020 UTL - $250,000 FY 2020 CST-$2,000,000 FY 2021 TOTAL – 2,250,000 SR 53 at Malcolm Bridge Road/Rays Church Road: PE – Oconee County completed by September 2020 ROW – Oconee County completed September 2020 UTL - $250,000 FY 2021 CST- $2,400,000 FY 2022 TOTAL - $2,650,000
Radney Simpson	December 3, 2019	Asst. State Transporation Planning Administrator	Thank you both for assisting Oconee County Chairman understand the process moving forward…..based on the call….it is my understanding that for Snow Mill Rd the PE & RW phases would be funded with Loc funds - PE would shift to FY 20 - all the other phases can remain as noted on the attached PDF. The CST phase would be funded with Fed funds with State match as needed. For Malcom Bridge project, the PE and RW phases would be funded with local funds. CST phase would be Fed funded (with state match as needed) project phases would remain as noted on the attached PDF.

Samuel Harris	December 10, 2019	State Safety Engineering Manager	As an FYI, we are currently doing an environmental screening at this location to confirm what can be done in terms of displacement. I just wanted to know if these buildings have already been discussed with the property owners.
John Daniell	December 10, 2019	Oconee Chairman	We hope to shift NW and SW to avoid both structures. The SE land owner is not friendly to ROW expansion. The more we can shift to the SW land owner, the better for ROW acquisition.

Appendix O: Proposed Conceptual Layout

See attached 11” x 17” sheet.

MALCOM BRIDGE RD

SR 53/HOG MOUNTAIN RD

SR 53/HOG MOUNTAIN RD

ELLIPSE
INSCRIBED DIAMETERS
160 FT AND 140 FT

RAYS CHURCH RD

N

DATE: 12/16/2019

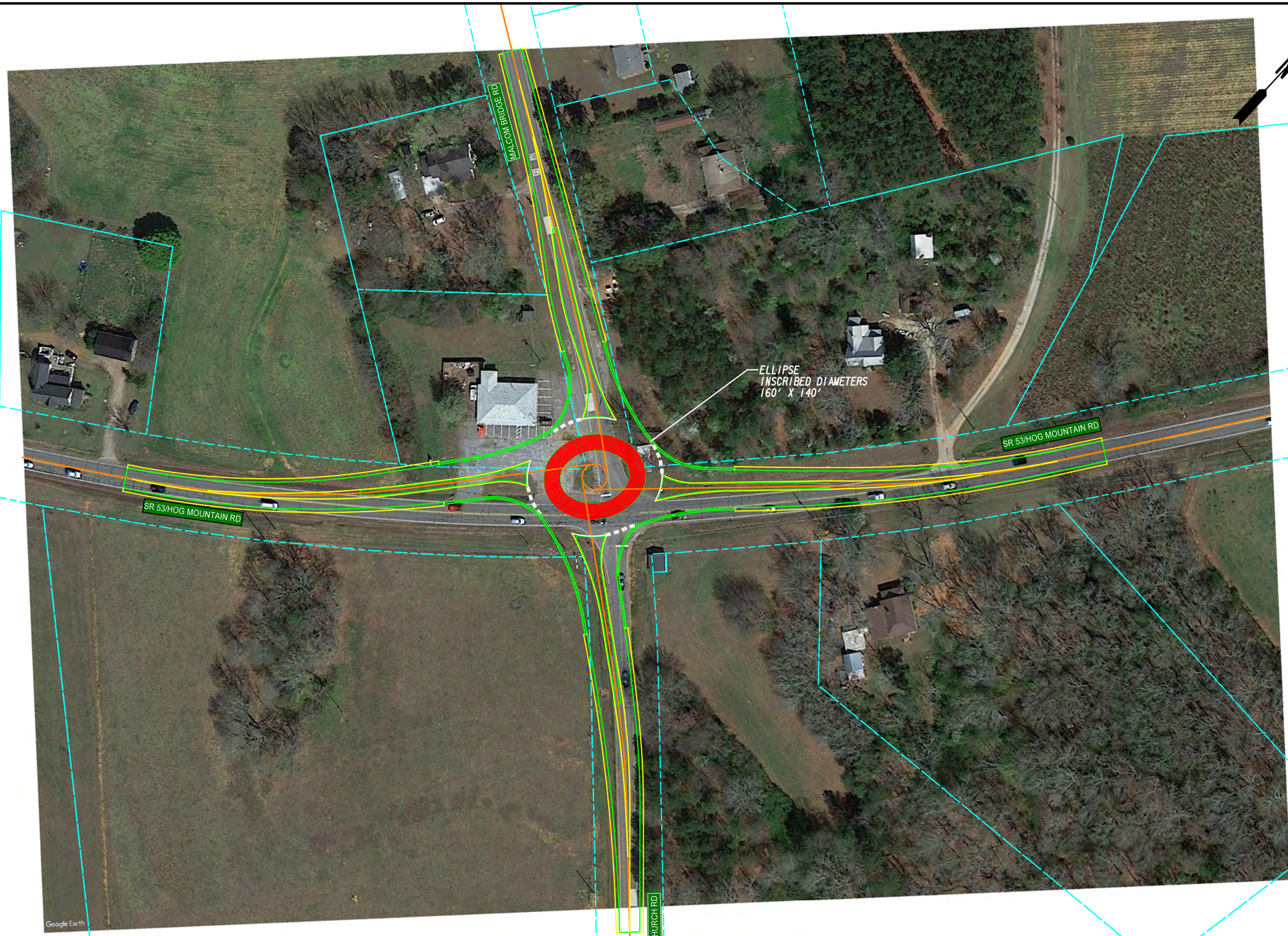
SR 53 @ MALCOM BRIDGE RD
ROUNDABOUT DESIGN

SCALE IN FEET

0 50 100 200

ATKINS

DATE: 1/20/2020



SR 53 @ MALCOM BRIDGE RD
ROUNDABOUT DESIGN

SCALE IN FEET

0 60 120 240

ATKINS